# ADOPTION OF BLOCK CHAIN TECHNOLOGY TO ENHANCE PATIENT RECORDS MANAGEMENT: A CASE OF MULAGO NATIONAL REFERRAL HOSPITAL

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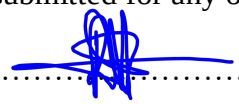
**Declaration**

I, Sseggujja Ronald, do hereby declare that this dissertation is my original work and has not been published or submitted for any other degree award to any other university before.

Signature……  ……

Date……09th May, 2024……

**Approval**

This is to certify that this dissertation titled **"ADOPTION OF BLOCK CHAIN TECHNOLOGY TO ENHANCE PATIENT RECORDS MANAGEMENT: A CASE OF MULAGO NATIONAL REFERRAL HOSPITAL"** has been written under my guidance and supervision. The work presented is original, worthy, and ready for submission in partial fulfillment of the requirements for the award of Master of Information Technology of Uganda Christian University.

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## Dedication

I dedicate this dissertation to my spouse and my parents, whose unwavering love, support, and sacrifices have been the cornerstone of my journey, I extend my deepest gratitude. Your encouragement and belief in me have been my guiding light through the challenges of academic pursuit. This achievement is a testament to your endless dedication and belief in my potential. Thank you for always being my source of strength and inspiration.

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**Abstract**

Block chain technology holds immense potential for transforming patient records management in healthcare settings. However, its adoption faces numerous challenges, particularly in resource-constrained environments such as Mulago National Referral Hospital. In this study, we aimed to investigate the factors influencing the adoption of block chain technology to enhance patient records management at Mulago Hospital.

Using a quantitative methods approach, data was collected from healthcare professionals at Mulago Hospital through a structured questionnaire survey. Participants were selected based on their involvement in patient record management processes. Data collection involved administering the questionnaire to key stakeholders. The collected data were analyzed using descriptive statistics.

The findings reveal several key insights into the factors affecting the adoption of block chain technology at Mulago Hospital. Organizational support, regulatory compliance, and training programs emerged as critical determinants of perceived usefulness and ease of use of block chain technology. The study also identified concerns regarding data security and interoperability as significant barriers to adoption. Despite these challenges, there is a consensus among healthcare professionals about the potential benefits of block chain technology in improving patient record management practices.

The implications of these findings underscore the importance of addressing organizational and technical challenges to facilitate the successful adoption of block chain technology in healthcare settings. By providing insights into the perceptions and attitudes of healthcare professionals, this study contributes to the growing body of literature on technology adoption in healthcare. Ultimately, the successful implementation of block chain technology at Mulago Hospital could serve as a model for similar healthcare facilities facing similar challenges worldwide.

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**List of acronyms**

| | |
|---|---|
| AU | Actual Usage |
| BI | Behavioral Intention |
| CAC | Cronbach Alpha Coefficient |
| CIA | Confidentiality, Integrity, and Availability |
| CVI | Content Validity Index |
| DSR | Design Science Research |
| EE | Effort Expectancy |
| EHR | Electronic Health Record |
| FC | Facilitating Conditions |
| GDPR | General Data Protection Regulation |
| HIPAA | Health Insurance Portability and Accountability Act |
| IT | Information Technology |
| MoH | Ministry of Health |
| NARA | National Archives and Records Administration |
| PE | Performance Expectancy |
| PEOU | Perceived Ease of Use |
| PU | Perceived Usefulness |
| ROI | Return On Investment |
| SI | Social Influence |
| TAM | Technology Acceptance Model |
| UAE | United Arab Emirates |
| UBOS | Uganda Bureau of Statistics |
| UNDP | United Nations Development Programme |
| UTAUT | Unified Theory of Acceptance and Use of Technology |
| WHO | World Health Organization |

# 1. CHAPTER ONE

## 1.0 Introduction

The healthcare sector is one of the most important industries in the world, and patient records are a vital part of its operations (Oleribe et al., 2019). Patient records contain sensitive information such as medical history, medications, and other personal data that must be kept private and secure (Wåhlberg et al., 2017). According to the World Health Organization (WHO), healthcare is a fundamental determinant of societal progress, with health outcomes directly linked to economic development and human capital (WHO, 2017). A healthy population is more productive and contributes significantly to national and global economies, thereby emphasizing the irrefutable importance of the healthcare industry (Huang et al., 2022). Zooming into continental and regional contexts further underscores the prominence of healthcare. For instance, the African Union's Agenda 2063 recognizes healthcare as a core pillar for achieving the continent's sustainable development objectives (African Union, 2020). It outlines a vision of an Africa with universal access to quality healthcare services, highlighting the sector's role in shaping Africa's future.

Nationally, healthcare remains crucial for societal welfare and progress. Statistical data at the country level reinforces this assertion. In Uganda, for example, healthcare expenditure has been steadily increasing over the years (Lukwago, 2016). The Uganda Bureau of Statistics (UBOS) reports that in 2018/19, the government allocated approximately 7.2% of its total budget to the healthcare sector, reflecting a profound commitment to healthcare's pivotal role in the nation's development (UBOS, 2020). Patient records, constituting a fundamental component of the healthcare system, encapsulate a wealth of sensitive information, including medical histories, medications, and personal data (Bali et al., 2011). The safeguarding of this data is not just a regulatory requirement but a moral and ethical imperative in ensuring quality healthcare delivery (Basil et al., 2022). However, current patient records systems are often inefficient and prone to errors due to the complexity and manual nature of the process (Sue, 2013). In addition, patient records are often stored on multiple systems, making it difficult to access and share information between organizations (Vos et al., 2020).

The Government of Uganda is actively working towards digitizing the economy by empowering different sectors like health sectors including the technology industry (UNDP, 2023). A key objective of this initiative is to reduce disparities in the healthcare sector by addressing health challenges through technological advancements (MoH, 2021). This involves establishing

convenient pathways to Electronic Health Records (EHRs) for efficient sharing of health information. Nevertheless, there are notable challenges regarding the digital health record and that is privacy, accuracy, and accessibility (PAA) or applying confidentiality, integrity, and availability (CIA) (Ozair et al., 2015). Privacy ensures that only authorized individuals can access patients' data, as patients have the autonomy to determine the who, where, and when of their health information retrieval (Neame, 2013). Integrity focuses on ensuring that only authorized individuals can modify patients' data to maintain data consistency, while availability guarantees that patients have full access to their information at all times (Tertulino et al., 2023). The use of Electronic Health Records (EHR) systems is growing in Uganda Similar to other developing (Banshanga & Ejiri, 2016). Given the widely acknowledged significance of the healthcare industry, these issues must be addressed to further improve the efficacy and efficiency of healthcare services. This study explores how block chain technology can revolutionize patient record management, address these pressing problems, and bring in a new era of improved security, interoperability, and patient-centered care in healthcare.

As asserted by Pandey and Hennessey (2018), block chain technology offers a dual assurance of trust and traceability, effectively addressing the pervasive issue of trust across federated, public, and organizational levels (Filippi et al., 2020). Embracing block chain technology, a hallmark of this Fourth Industrial Revolution was widely adopted in numerous healthcare settings and holds the potential to fortify security models and enhance government efficiency in delivering public health services (Ingraham & Clair, 2020). The inevitable adoption of block chain technology will exert substantial pressure on public authorities, necessitating a reevaluation and transformation of government hospital operations, ultimately leading to the amelioration of patient records management. The integration of block chain technology presents a promising solution to the challenges at hand, furnishing a secure and streamlined approach to patient records storage and administration (Haleem et al., 2021). Block chain, functioning as a decentralized ledger system, facilitates the secure and encrypted storage and sharing of data across multiple systems (Han et al., 2022). Additionally, it simplifies data exchange between organizations, obviating the need for labor-intensive manual processes.

## 1.1 Background to the Study

Patient records management is important in the healthcare sector to provide high-quality services (Mathebeni, 2015). Electronic health records are created using ICTs and manage patient records. Computer software is used by Electronic Health Records (EHR) to collect, store, and distribute patient data in an organized manner (Amiri, 2012). According to Staggers et al. (2008), an electronic health record (EHR) allows all authorized parties involved in a patient's care to share medical information, including doctors, labs, pharmacies, emergency rooms, nursing homes, state registries, and the patients themselves. Electronic Health Records (EHRs) are widely used in healthcare facilities to improve patient data security, efficiency, and reduction of redundant data (Cowie et al., 2017).

### 1.1.1 Global Perspective

The problem area of patient records management extends beyond individual healthcare facilities to become a global concern in the healthcare sector (Pai et al., 2021). Across the world, healthcare organizations are grappling with the challenges of managing patient records efficiently, securely, and in a manner that facilitates seamless access and sharing of information among relevant stakeholders (Goniewicz et al., 2021). In developed countries, traditional paper-based record-keeping systems have proven to be cumbersome, prone to errors, and inefficient in meeting the demands of modern healthcare delivery (Mathebeni, 2015). The increasing digitization of healthcare data has introduced new complexities, including concerns related to data security, privacy, and interoperability (Hasselgren et al., 2020).

The emergence of block chain technology offers promising solutions to address these global challenges in patient records management. Block chain, as a decentralized and immutable ledger system, has garnered significant attention for its potential to revolutionize various industries, including healthcare (Raja & Muthuswamy, 2022). Its unique characteristics, such as tamper-proof data storage, transparency, and decentralized consensus mechanisms, make it an attractive option for ensuring the integrity, security, and interoperability of patient records on a global scale (Federal Department of Economic affairs, 2019). By leveraging block chain technology, healthcare organizations worldwide can overcome the limitations of traditional record-keeping systems and establish robust infrastructures for managing patient data securely and efficiently (Kehinde et al., 2024).

### 1.1.2 Regional Perspective

In the regional context, the challenges associated with patient records management vary depending on the socioeconomic and technological landscape of each region. Across various regions, healthcare facilities face common hurdles such as fragmented data systems, interoperability issues, and data security concerns (Ali et al., 2023). However, the extent and severity of these challenges may differ based on factors such as healthcare infrastructure, regulatory frameworks, and technological adoption rates (Abdulazeez et al., 2015).

In many regions, particularly in developing countries, healthcare facilities grapple with resource constraints, inadequate infrastructure, and limited access to technology (Asogwa, 2018). These factors exacerbate the difficulties in managing patient records effectively, leading to inefficiencies, errors, and compromised patient care outcomes (Newa & Mwantimwa, 2019). Moreover, regional disparities in healthcare delivery further complicate the sharing and exchange of patient information among different healthcare providers and institutions (Srivastava, 2016).

Despite these challenges, regional initiatives and collaborations are emerging to address the shortcomings in patient records management. In some regions of Kenya and Ghana there partnerships between public and private sector entities, as well as international organizations, aim to leverage technology and innovation to improve healthcare data management practices (Suchman et al., 2018). In this context, block chain technology presents an opportunity for regional healthcare systems to leapfrog traditional approaches and adopt more advanced and secure methods for managing patient records.

### 1.1.3 National Perspective

From a national perspective, the state of patient records management reflects the broader healthcare landscape, including policy frameworks, regulatory environments, and healthcare delivery models (Oni et al., 2014). National healthcare systems grapple with the dual challenge of ensuring universal access to quality healthcare services while safeguarding patient data privacy and security. At the national level, healthcare organizations are increasingly recognizing the importance of adopting modern technologies to address the shortcomings in patient records management (Mirza & El-Masri, 2013). Governments and regulatory bodies are promoting initiatives to incentivize the adoption of electronic health records (EHRs) and interoperable data systems to facilitate seamless information exchange among healthcare providers (Alotaibi & Federico, 2017). However, challenges such as data silos, lack of standardization, and cybersecurity

threats persist, hindering the widespread implementation of integrated healthcare information systems (Kruse et al., 2016).

In response to these challenges, national governments are exploring innovative solutions such as block chain technology to modernize healthcare data management practices. By investing in research, infrastructure development, and policy reforms, countries can create an enabling environment for the adoption of block chain-based solutions in healthcare (El-gazzar & Agbozo, 2023). These efforts align with broader national agendas aimed at harnessing technology and innovation to improve healthcare outcomes, enhance patient safety, and drive efficiencies in healthcare delivery (Saeed et al., 2022).

## 1.2 Problem statement

Effective patient data management is essential for the efficient and high-quality delivery of services in the healthcare industry (Adane et al., 2019). The Ministry of Health in Uganda introduced an electronic health system that streamlined the entire process by automating the workflow for public hospitals (The Digital Health Symposium Report, 2018). However, the implementation of EHRs in public hospitals has been accompanied by a spectrum of challenges as revealed by recent studies (Mutesi et al., 2022). These challenges encompass a dearth of skilled personnel specialized in electronic records management, intermittent and inadequate staff training initiatives, suboptimal management of records at the active stage, limitations in both storage resources and physical storage space, and deficiencies in the formulation and adherence to records management policies and guidelines (Kashaija, 2022). The cumulative impact of these challenges includes impediments to the efficient delivery of healthcare services, increased risks of record mismanagement and loss, and the creation of a cumbersome process for retrieving patient data (Danso, 2015 (Mutesi et al., 2022)). Addressing these challenges is imperative to unlock the full potential of EHRs in improving healthcare quality and efficiency at Mulago Hospital.

Within this context, it becomes evident that the adoption of block chain technology holds the potential to mitigate these EHR-related challenges (Han et al., 2022). The distributed and immutable ledger system known for block chain has proven to have extraordinary potential in several industries. The existing literature highlights the transformative impact of block chain on healthcare data security, patient privacy, and interoperability (Yogesh & Karthikeyan, 2022). However, its use in healthcare, particularly in the context of Uganda, is yet largely unexplored

(Ahishakiye et al., 2018). While some research has delved into block chain's broader applications in healthcare, a comprehensive examination of its adoption and integration into the EHR ecosystem within the Ugandan context remains limited (El-gazzar & Agbozo, 2023). Thus, this study seeks to explore the adoption of block chain technology to enhance the management of patient health information in Mulago Referral Hospital.

## 1.3 Research objectives

### 1.3.1 Main objective

The study aimed to develop a model for supporting adoption of block chain technology for enhanced patient record management at Mulago Hospital.

### 1.3.2 Specific objective

i. To investigate the factors affecting the utilization of electronic health records at Mulago hospital in order to determine requirements for a model for supporting adoption of block chain technology for enhanced patient record management
ii. To design a model for supporting adoption of block chain technology for enhanced patient record management at Mulago Hospital.
iii. To test a model for supporting adoption of block chain technology for enhanced patient record management at Mulago Hospital.

## 1.4 Research questions

i. What are the factors influencing the current state of Electronic Health Records (EHR) implementation at Mulago National Referral Hospital?
ii. How can block chain technology be effectively implemented at Mulago national referral hospital?
iii. To what extent does the proposed block chain model effectively address the challenges identified in patient records management at Mulago National Referral Hospital?

## 1.4 Scope of the study

### 1.4.1 scope

The adoption of block chain technology for enhanced patient record management in health care presents a multifaceted landscape characterized by various adoption challenges and opportunities (Faisal et al., 2022). We investigated factors such as the complexity of healthcare systems, user resistance, regulatory compliance, and interoperability concerns that often act as barriers to technology adoption within healthcare settings (Kruse et al., 2016). To comprehensively address these challenges, our study employed the Technology Acceptance Model (TAM) as the model of adoption. TAM has been selected for its proven effectiveness in assessing technology adoption in healthcare contexts (Rahimi et al., 2018). By exploring healthcare professionals' perceptions of these factors in the context of block chain technology, we can gain insights into their intention to adopt and ultimately improve patient record management. TAM's well-established model provided a structured approach to understanding adoption dynamics, making it a suitable choice for our research.

### 1.4.2 Geographical scope

EHRs, heralded as a transformative tool in healthcare, have indeed revolutionized the management of patient health information, replacing traditional paper-based records (Ratwani, 2018). Yet, their implementation at Mulago Hospital presents multifaceted challenges. Such challenges hinder efficient healthcare delivery and result in record mismanagement, losses, and cumbersome patient data retrieval and these can be solved through the adoption of block chain technology (Danso, 2015).

### 1.4.3 Time scope

The study was conducted for 15 weeks and this time involved writing the research proposal, collecting data, analyzing data, and report writing.

## 1.5 Significance of the study

Significance is a fundamental concept that permeates various aspects of our lives, from the world of science and research to personal experiences and societal matters (Kivunja & Kuyini, 2017). It refers to the importance, relevance, or impact of something, whether it be an event, an idea, a discovery, or an action (Reed et al., 2021). The significance of this study is profound, as it delves

into the cutting-edge realm of block chain technology to address critical issues in healthcare, with a primary focus on patient record management at the renowned Public Hospital.

**Users (Healthcare Professionals and Staff)**

The study holds significance for the users, including doctors, nurses, and administrative staff at Mulago National Referral Hospital. By exploring factors that influence the current state of Electronic Health Records (EHR) implementation and designing a model for block chain technology adoption, users can benefit from more efficient and user-friendly systems. This leads to improved patient record management, streamlined data access, and enhanced job satisfaction.

**Mulago National Referral Hospital**

The study holds great significance for the hospital. Understanding the challenges and potential solutions in adopting block chain technology for patient record management can significantly enhance operational efficiency, reduce data security risks, and contribute to better healthcare coordination. The proposed block chain model tailored to the hospital's context can lead to cost-effective and seamless data management, benefiting both the institution and the patients it serves.

**Policy Makers and Healthcare Regulators**

The results of this study can be used by policymakers to inform their decisions regarding the implementation of block chain technology in healthcare settings. Insights gained from the study may inform the development of regulatory models that support the secure implementation of block chain while ensuring compliance with healthcare laws and data privacy regulations.

**Advancement of the Body of Knowledge**

This study adds to the body of knowledge already available on the adoption of block chain technology in healthcare. By assessing factors that influence EHR implementation and evaluating the adoption of block chain for patient record management, the study adds to the academic understanding of healthcare technology adoption models and strategies. This study adds to the corpus of information already available on the adoption of block chain technology in healthcare. These results can serve as a foundation for future research in this developing field by academics and researchers.

**Healthcare Industry at Large**

The study's findings can be extrapolated to the broader healthcare industry, influencing how healthcare systems worldwide adopt and implement technology. Lessons learned from Mulago National Referral Hospital's experience with block chain adoption can provide insights and best practices that are transferable to healthcare facilities in other regions.

**Patients and the General Public**

Ultimately, patients benefit from enhanced patient record management. Their data remains secure, accessible, and accurate, leading to better healthcare decisions and patient outcomes. The public gains trust in the healthcare system, knowing that their personal health information is well-protected and efficiently managed.

As a result, this study provides a clear understanding of how block chain technology can enhance patient records management and the factors and benefits that influence the adoption of block chain technology to improve patient records management in the healthcare sector. However, it is believed that the designed model from this study may act as a recommendation for the successful adoption and implementation of block chain technology in improving patient records management in health.

# CHAPTER TWO

# LITERATURE REVIEW

## *2.1 Chapter Overview*

This literature review section focuses on the existing literature on the adoption of block chain and the use of block chain in the healthcare sector more so, the section discusses Mulago referral hospital as a healthcare sector and describes the management of patients' records with emphasis on the challenges patients face in their records management and explores the adoption of block chain in Mulago referral hospital to enhance patient records management.

## 2.2 Electronic health records

In healthcare, efficient electronic records management is critical for improving patient care, enhancing data accessibility, and streamlining administrative processes. Previous studies have highlighted the importance of implementing robust electronic records management systems to overcome challenges associated with paper-based documentation (Waithera, 2017). These systems facilitate seamless data exchange, enable timely access to patient information, and support evidence-based decision-making by healthcare providers. A digital version of a patient's medical history maintained by a healthcare provider for a certain amount of time is called an electronic health record. It includes all the administrative and clinical data that is essential to the care that a specific provider provides for a given patient, including demographics, progress reports, issues, prescriptions, vital signs, medical history, immunization records, laboratory results, and radiological reports (Keshta & Odeh, 2021). Integrated health records systems, according to Carey et al., (2016), are far more beneficial and have several advantages, including low operating costs, better health care quality, encouragement of the use of evidence-based medicine, assistance with record keeping, and guaranteeing record mobility.

They also state that for electronic health record systems to continue to be accurate and efficient, they must meet several requirements, including obtaining complete data, resilience to failure, high availability, and compliance with security guidelines (Fatokun and Sharma,2021). Because of the anticipated advantages, many governments have expressed interest in implementing integrated electronic health records (Rasmi et al., 2020)

### 2.2.1 The role of electronic records management in Healthcare service delivery

Managing electronic records in an organized and methodical manner over the course of their existence is known as electronic records management. In recent years, the need for effective ERM has become more critical, as organizations increasingly rely on digital information and face new regulatory requirements for managing electronic records. Electronic records management is crucial for hospitals that seek to improve healthcare services' performance and quality assurance in healthcare because they can store massive data that is readily available (Hoover, 2017).

According to Liu, et al. (2016), Electronic Records Management involves a range of activities, including record creation, classification, capture, storage, retrieval, and disposal. The authors argue that effective Electronic Records Management requires a combination of technical solutions, such as document management systems and digital preservation tools, as well as organizational policies and procedures for managing records. Chua, et 2018, highlights the importance of user adoption in Electronic Records Management, arguing that user resistance and non-compliance can hinder the effectiveness of Electronic Records Management systems. The authors suggest that training and education programs, along with user-friendly interfaces and intuitive search functionalities, can help improve user adoption and engagement with Electronic Records Management

In terms of regulatory requirements for Electronic Records Management, many countries have enacted laws and regulations governing the management of electronic records. The National Archives and Records Administration (NARA) in the United States establishes guidelines for the management of electronic records, whereas the General Data Protection Regulation (GDPR) was enacted by the European Union to govern the processing of personal data.

Therefore, Electronic Records Management is essential for organizations to comply with regulatory requirements, improve operational efficiency, and mitigate risks associated with information governance. Research suggests that a combination of technical solutions and organizational policies, along with user engagement and compliance, is key to achieving effective ERM (Liu, et al., 2016; Chua, et al., 2018).

## 2.3 Block chain Technology

Recent years have seen a major increase in interest in block chain technology because of its potential to change multiple sectors and open up new applications. A review of the literature reveals that block chain technology has been studied from different perspectives, including its technical, economic, legal, and social aspects (Kshetri, 2018). Some studies have focused on the technical aspects of block chain, including its architecture, consensus mechanisms, and scalability (Zheng et al., 2017). Other studies have explored the economic implications of block chain, such as its impact on business models, value creation, and innovation (Swan, 2015). Legal and regulatory issues related to block chain technology have also been studied, such as its implications for data protection, privacy, and intellectual property rights (Kshetri, 2018). social and organizational factors have been investigated, including the adoption and diffusion of block chain technology, and the role of trust and collaboration in block chain ecosystems (Yli-Huumo et al., 2016).

According to the literature, block chain technology can revolutionize several industries by opening up new application spaces, cutting expenses, and boosting productivity. To fully realize the potential of block chain technology, however, several issues including scalability, interoperability, and security must be resolved (Kshetri, 2018). Various stakeholders are investigating block chain technology to improve patient outcomes, streamline operations, lower costs, increase compliance, and facilitate more effective use of data related to healthcare (Mackey et al., 2019). The amount of research on block chain technology and its application to the medical field is growing. According to current trends, it is mostly utilized for access control, data sharing, and medical records; it is sporadically used for other purposes, like supply chain management or medication prescription management (Hölbl et al., 2018). By enhancing patient record management, block chain technology—which is predicated on a decentralized, immutable ledger—has the potential to completely transform the healthcare industry, including Mulago referral hospitals. Transparency, interoperability, and enhanced data security are just a few advantages of the technology. The use of block chain technology in healthcare has gained popularity in recent years, and numerous studies have looked into the possible advantages of this innovative field.

### 2.3.1 Benefits of Block Chain Technology

Block chain technology offers numerous potential benefits for healthcare, including enhanced data security, increased transparency, and improved interoperability. Research has shown that block chain can mitigate security risks associated with traditional centralized databases by providing tamper-proof, immutable records (Jianting et al., 2023). Additionally, its decentralized nature ensures data integrity and enables secure sharing of sensitive information across healthcare networks (Obotu et al., 2018). The decentralization nature of block chain results in the replication of data across the block chain which helps avoid a single point of failure and helps the fault tolerance of the block chain system (Ismail and Materwala, 2020; Ismail et al., 2020; Joshi et al., 2018). It is because of this replication that block chain is resilient to natural disasters; if one region experiences a natural disaster, the data will not all be lost since the block chain network can be globally replicated which aids fault tolerance (Ismail et al., 2020). Block chain technology can make it possible for various platforms and systems to communicate with one another, which will enhance coordination and data sharing (Crosby et al., 2016).

A block chain network makes it difficult for data (information, digital assets) to be altered or hacked (Pawar and Vanarote, 2020). Block chain technology consensus mechanisms and cryptography are used to validate the legitimacy of transactions (Yang, Yu, Si, Yang, and Zhang, 2019). Some of the advantages of block chain technology include transparency, reliability, and security (Nakamoto, 2008). It is easy to trace any fraud in the block chain network because of the transparency of block chain technology (Ismail et al., 2020). This makes block chain resistant to data fraud. Block chain technology can automate processes, reduce intermediaries, and eliminate the need for manual reconciliation, which can increase efficiency and reduce costs. (Lacity et al., 2017)

### 2.3.2 Use of block chain in electronic health records

The integration of block chain technology into electronic health records (EHRs) has gained traction in recent years due to its potential to address various challenges in healthcare data management. Studies have explored the use of block chain technology to create a single source of truth for patient data, thereby reducing data fragmentation and improving data accuracy (Ndzimakhwe et al., 2023). By leveraging block chain's cryptographic features, EHRs can maintain patient privacy while allowing authorized stakeholders to access and update medical records securely. Recent studies

have looked into how block chain technology might be used in the medical field to increase the effectiveness of patient record management (Mehta et al., 2020). They concluded that implementing block chain technology could lower the expense of record management while also enhancing the security and privacy of patient records (Yuan et al., 2023). The authors also proposed using block chain technology to make it easier for healthcare providers to share patient records, which would increase the precision of medical diagnosis and treatment (Elvas et al., 2023).

A study by Zhang et al. (2021) claims that block chain technology improves data privacy and security by enabling safe, tamper-proof, and decentralized health data storage and sharing. Block chain technology can also make it easier for various healthcare organizations and providers to securely and interoperable share patient data, which can enhance patient outcomes and care quality. Because block chain technology makes it possible to create a common and standardized infrastructure for health data, it can aid in addressing data fragmentation issues. Block chain technology gives patients the ability to own and manage their health data, empowering them to take a more active role in their care and improving health outcomes.

In their exploration of block chain technology's potential in healthcare, Azaria al. (2016) emphasized the advantages of a decentralized, transparent, and secure platform for the management of patient records. According to the study, block chain has the potential to increase patient privacy, decrease errors, and improve data accuracy. Another study by Kshetri (2018), examined the potential benefits of block chain technology in enhancing patient records. The study highlighted the potential for block chain to improve drug supply chain management, reduce medication errors, and improve patient outcomes. The study also suggested that block chain could enhance data privacy and security, ensuring that patient data is protected from cyber threats and unauthorized access.

Block chain technology adoption in healthcare presents both opportunities and challenges, according to a recent study by Yaqoob et al. (2020). The study demonstrated how block chain technology, by offering a transparent and safe platform for patient records management, can enhance medical records. The report also noted several obstacles to block chain adoption, such as the requirement for interoperability, technical difficulties, and regulatory restrictions.

Block chain technology offers several benefits in enhancing patient records management in healthcare. However, the study identified the factors or benefits that could influence the adoption of the technology to enhance patient records management and develop a model that should be addressed to ensure its successful implementation.

### 2.4 Challenges faced in the adoption of block chain for health records management

Despite its promise, the adoption of block chain technology in healthcare is not without challenges. Issues such as scalability, interoperability, and regulatory compliance have been identified as barriers to widespread implementation (Taherdoost, 2023). Research has highlighted the need to address these challenges to realize the full potential of block chain in health records management (Nzuva, 2019). Additionally, concerns regarding the complexity of block chain technology and the associated learning curve may hinder its adoption among healthcare professionals. To effectively develop strategies to overcome these obstacles, one must have a thorough understanding of these challenges. We explore the main obstacles to the widespread use of block chain technology in health records administration in this section.

1. **Regulatory Complexity**

Block chain adoption in healthcare must align with stringent regulatory models and data privacy laws (Miyachi & Mackey, 2021). Adherence to regulatory models like the General Data Protection Regulation (GDPR) in the European Union and the Health Insurance Portability and Accountability Act (HIPAA) in the United States presents notable obstacles (Nasir et al., 2021). Understanding and navigating these complex legal requirements is crucial to ensure the secure and lawful handling of patient data.

2. **Interoperability Issues**

The technologies and legacy systems that makeup healthcare systems are frequently patched together. It can be difficult to seamlessly integrate block chain with these current systems (Rasheed & Mimirinis, 2023). Ensuring that block chain technology can effectively exchange data with Electronic Health Records (EHRs) and other healthcare applications is a critical consideration and a bit challenging.

### 3. Scalability Concerns

Block chain networks, particularly public ones like Ethereum, have faced scalability limitations, leading to transaction processing bottlenecks (Khan et al., 2021). In a healthcare context where large volumes of patient data need to be recorded and accessed, scalability challenges must be addressed to ensure smooth and efficient operations.

### 4. User Acceptance and Training

User acceptance and adoption of block chain within healthcare organizations can be met with resistance (Choi et al., 2020). Healthcare professionals may be unfamiliar with block chain technology, leading to skepticism and hesitation. Effective training programs and educational initiatives are necessary to facilitate user acceptance and competence.

### 5. Cost of Implementation

Implementing block chain technology, particularly in resource-constrained healthcare settings, can be cost-intensive (El-gazzar & Agbozo, 2023). Acquiring the necessary infrastructure, investing in training, and ensuring ongoing maintenance can strain budgets. Demonstrating a clear return on investment (ROI) is essential to justify these costs (Khan et al., 2021).

### 6. Standardization and Governance

Block chain networks often require well-defined governance models and standards to operate efficiently (Tan et al., 2022). Establishing governance structures and industry-wide standards specific to healthcare can be challenging but is essential for ensuring the interoperability and sustainability of block chain solutions.

## 2.5 Security Considerations in Block Chain Implementation

Security is paramount in block chain implementation, especially in healthcare settings where sensitive patient data is involved (Taherdoost, 2023). Studies have emphasized the importance of implementing robust security measures to protect block chain networks from cyber threats and unauthorized access (Kehinde et al., 2024). Techniques such as cryptographic hashing, consensus mechanisms, and access control mechanisms are commonly employed to safeguard block chain-based systems against security breaches (Lashkari & Musilek, 2021). Many advantages, including

decentralization, transparency, and immutability, are provided by block chain technology. However, like any technology, it is essential to acknowledge and address potential security challenges (Singh et al., 2021). In the context of implementing block chain for patient record management at Mulago National Referral Hospital, the following security considerations merit attention:

- Data Encryption and Decryption

Block chain relies on cryptographic principles to secure data (Long et al., 2023). It's crucial to ensure robust encryption and decryption mechanisms to protect sensitive patient information from unauthorized access (Guerrero et al., 2020).

- Smart Contract Vulnerabilities

The block chain-based smart contracts that automate and enforce the execution of pre-established agreements could have security flaws (Ante, 2020). A comprehensive security audit of smart contracts is necessary to identify and mitigate potential risks (Nzuva, 2019).

- Consensus Mechanism Security

The consensus mechanism, which validates transactions on the block chain, must be secure and resistant to attacks (Shadab, 2023). The integrity of patient records must be preserved by rigorous testing and assessment of the selected consensus algorithm (Lashkari & Musilek, 2021).

- Identity Management

Establishing a secure identity management system is critical to ensuring that only authorized individuals have access to patient records (Costa et al., 2023). Block chain's decentralized nature can contribute to enhanced identity security (Stockburger et al., 2021).

- Integration with Existing Systems

Integrating block chain with existing healthcare systems introduces potential points of vulnerability (Haleem et al., 2021). Careful consideration and robust security measures must be in place during the integration process.

- Regulatory Compliance

It is critical to follow healthcare regulations and data privacy laws. The implementation of block chain should align with relevant regulatory models to safeguard patient confidentiality and meet legal requirements (Taherdoost, 2023).

- User Authentication and Access Control

Implementing strong user authentication methods and access control mechanisms is fundamental for restricting access to patient records based on predefined roles and responsibilities (Islam et al., 2023).

### 2.6 Ensuring block chain security in this study

In this study, ensuring the security of block chain implementation is a top priority. By following best practices in block chain security and leveraging advanced encryption techniques, the research aims to create a secure and trustworthy platform for managing patient records at Mulago National Referral Hospital. Through rigorous testing and validation processes, the study seeks to identify and address potential vulnerabilities in the block chain infrastructure to ensure the confidentiality, integrity, and availability of patient data. The study implemented security in the proposed model in the following ways;

1. Building Security in from the Start

Incorporating security measures right from the beginning of block chain development is crucial (Alajlan et al., 2023). It involves identifying and addressing potential security risks during the design and implementation phases.

2. Strong Authentication

Strong authentication guarantees that only authorized users have access to the block chain (Prasad & Rekha, 2023). This involves robust methods, like multi-factor authentication, to verify the identity of individuals interacting with the system (Ezazul et al., 2023).

3. Cryptographic Key Vaulting

Cryptographic key vaulting involves securely storing and managing cryptographic keys used in block chain transactions (Vanin et al., 2023). These keys, like private keys, play a vital role in ensuring the integrity and confidentiality of data. Storing them in a secure vault adds an extra layer of protection against unauthorized access (Malomo et al., 2020).

## 2.7 Existing studies on the adoption of block chain for health records management

Having a thorough understanding of the body of current research is crucial because it highlights knowledge gaps, offers insightful information, and places our findings in the larger context of block chain adoption in healthcare.

### 2.7.1 Adoption Trends and Patterns

Global interest in the application of block chain technology for health records management has grown. (Han et al., 2022). Understanding the trends and patterns of adoption is crucial to gaining insights into the current state of block chain integration in healthcare. This analysis extends to both national and international levels, offering a comprehensive perspective on the adoption landscape.

#### National Trends

At the national level, several countries have embarked on initiatives to integrate block chain technology into their healthcare systems (Aljaloud & Razzaq, 2023). For example, Estonia in 2016 implemented block chain to secure and manage healthcare data, providing patients with secure access to their medical records (Einaste, 2018). Similarly, the United Arab Emirates (UAE) has explored block chain for sharing patient data across healthcare providers, enhancing care coordination (Kong, 2020).

#### International Collaborations

Beyond individual nations, international collaborations have emerged to explore block chain's potential in healthcare. Consortia like the Synaptic Health Alliance and Hyperledger Healthcare Working Group have brought together healthcare organizations and technology companies to develop block chain solutions for various aspects of health records management (Marc, 2023).

#### Block chain in Public and Private Sectors

The adoption of block chain is not limited to public healthcare systems. Private healthcare institutions and networks have also recognized the need for this technology.

## 2.8 Technology Adoption models

This section examines adoption models and models that offer insightful information about how new technologies block chain technology in particular are adopted in the healthcare industry.

These models aid in our comprehension of the variables affecting adoption as well as the difficulties involved in putting such revolutionary solutions into practice.

### 2.8.1 Technology Adoption Model (TAM)

The Technology Acceptance Model (TAM) is a widely recognized theoretical model for assessing the adoption and acceptance of new technologies. The TAM model, developed by Davis (1986), postulates that perceived ease of use and perceived usefulness significantly influence users' behavioral intentions to use technology, ultimately affecting actual usage (Binyamin, 2019). Key Constructs of TAM include; Perceived Ease of Use (PEOU) which examines users' perceptions of the ease or difficulty associated with using a specific technology. Perceived Usefulness (PU) measures users' beliefs regarding the extent to which a technology can enhance their job performance or tasks. Behavioral Intention (BI) represents users' intentions to use the technology, which directly influences actual usage. Actual Usage (AU) measures the extent to which users have effectively integrated the technology into their daily activities.

Previous studies in the healthcare domain have frequently employed the Technology Acceptance Model (TAM) to explore technology adoption patterns among healthcare professionals. For instance, a study by Yarbrough & Todd (2007), examined the technology acceptance patterns among physicians, providing insights into how TAM can be used to understand healthcare professionals' attitudes and intentions toward adopting new technologies. Similarly, in a study conducted by Holden and Karsh (2010), TAM was employed to examine nurses' acceptance of clinical information systems. Their research highlighted the critical role of perceived ease of use and perceived usefulness in shaping nurses' behavioral intentions regarding technology adoption (Holden & Karsh, 2010). These studies, among others, showcase the applicability of TAM in the healthcare context and its effectiveness in understanding the adoption of technology-driven solutions within the field.

**Figure 2.1 shows TAM and its constructs.**

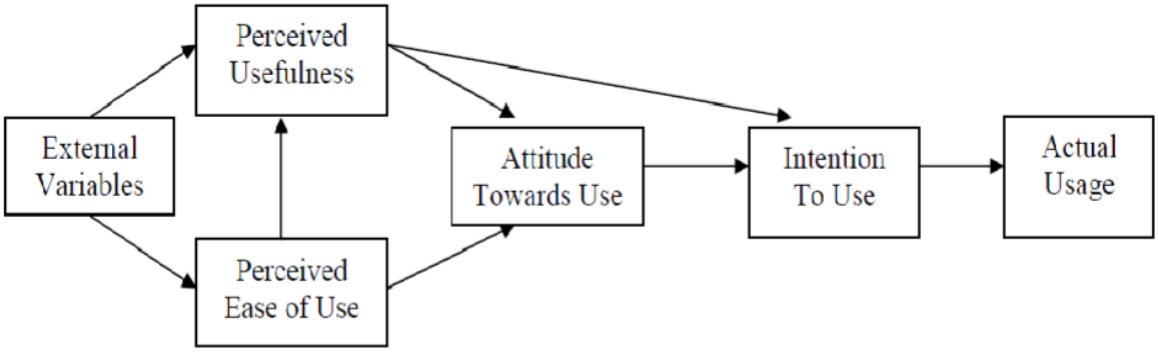



*Figure 0.1 Technology Acceptance Model (TAM) (Davis, 1986)*

### 2.8.2 Unified Theory of Acceptance and Use of Technology (UTAUT)

The Unified Theory of Acceptance and Use of Technology (UTAUT) is another relevant model for assessing technology adoption (Venkatesh et al., 2003). To forecast user acceptance of technology, UTAUT incorporates many constructs, including performance expectancy, effort expectancy, social influence, and facilitating conditions (Shachak et al., 2019). It seeks to explain and forecast how members of an organization will accept and use new technologies. UTAUT is a well-known and significant model in the field of information systems and technology adoption since it incorporates essential elements from several well-established technology adoption models (Dwivedi et al., 2019). UTAUT identifies several key constructs that influence users' intentions to accept and use technology. These constructs include:

Performance Expectancy (PE). This construct refers to the degree to which users believe that using a particular technology will help them perform their tasks more effectively or improve their job performance.

Effort Expectancy (EE). Effort expectancy relates to the users' perception of how easy or difficult it is to use the technology. It examines whether users believe that adopting block chain for patient record management would be a straightforward and user-friendly process.

Social Influence (SI). Social influence considers the impact of external factors, such as the influence of colleagues, supervisors, or organizational norms, on an individual's intention to use technology.

Facilitating Conditions (FC). Facilitating conditions assess the extent to which users believe that the necessary resources and support are available to facilitate the adoption of technology.

Behavioral Intention (BI). The behavioral intention in UTAUT represents the user's intention to use the technology. It is a direct precursor to actual usage and reflects the individual's willingness to adopt the technology.

Actual Usage (AU). Actual usage assesses the extent to which users have effectively adopted and employed the technology in their daily tasks.

The Unified Theory of Acceptance and Use of Technology (UTAUT) has become a useful model in healthcare research to comprehend technology adoption among different stakeholders. One notable study by Cimperman et al., (2016) employed an extended UTAUT model to delve into the acceptance behavior of older users toward home telehealth services. This extension of the UTAUT model accommodated factors specific to the elderly population, shedding light on their acceptance patterns (Cimperman et al., 2016). Additionally, the work of Holden and Karsh (2010) explored the technology acceptance model's history and its future in healthcare. While primarily focused on TAM, Holden and Karsh (2010) also discussed the application of UTAUT within healthcare contexts, particularly in understanding how healthcare professionals embrace clinical information systems (Holden & Karsh, 2010).

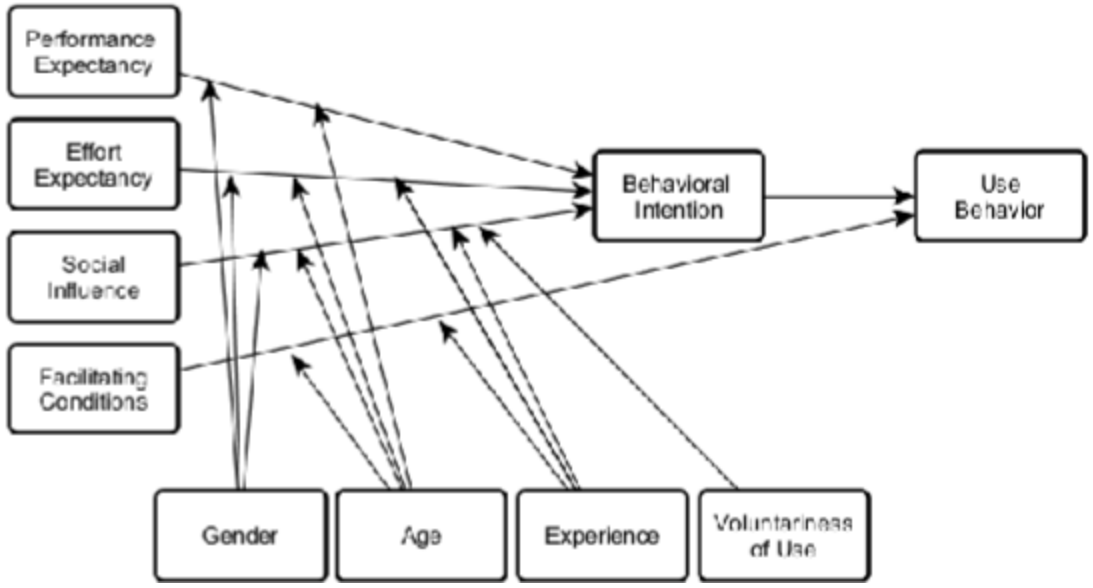



*Figure 0.2 Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003)*

## 2.9 Conceptual Model

While existing adoption models such as TAM and UTAUT (Davis, 1989; Venkatesh et al., 2003) provide valuable insights, we acknowledge the need for a customized adoption model specific to our research context Thus, we adopted TAM in the study and incorporated factors unique to Mulago Hospital, such as organizational culture, regulatory requirements, and the readiness of the healthcare infrastructure for block chain integration to derive a conceptual model that will guide our study and provide a tailored approach to assessing block chain adoption.

The technology acceptance model (TAM), which provides insight into how users accept and adopt new technologies, serves as the foundation for the conceptual model (Venkatesh et al., 2003). According to Ajibade (2019), the TAM model looks at several constructs, including Actual Usage (AU), Behavioral Intention (BI), Perceived Usefulness (PU), and Perceived Ease of Use (PEOU); these are described below;

1. Perceived Usefulness (PU): This dimension assesses whether individuals believe that using block chain technology in patient records management will enhance their performance or job effectiveness.
2. Perceived Ease of Use (PEOU): PEOU measures how comfortable or easy people think it is to use block chain technology.

3. Behavioral Intention (BI): TAM also includes a behavioral intention to use technology. In this context, this can be framed as the intention of healthcare professionals and staff to adopt and utilize block chain for patient records management.
4. Actual Usage (AU): This assesses whether the intentions to use it translate into real adoption.
5. External Variables refer to external factors or variables that can influence users' perceptions, attitudes, and behaviors toward adopting and using a technology. External factors included in this study's conceptual model were derived from the synthesis of challenges affecting the adoption of block chain technology.

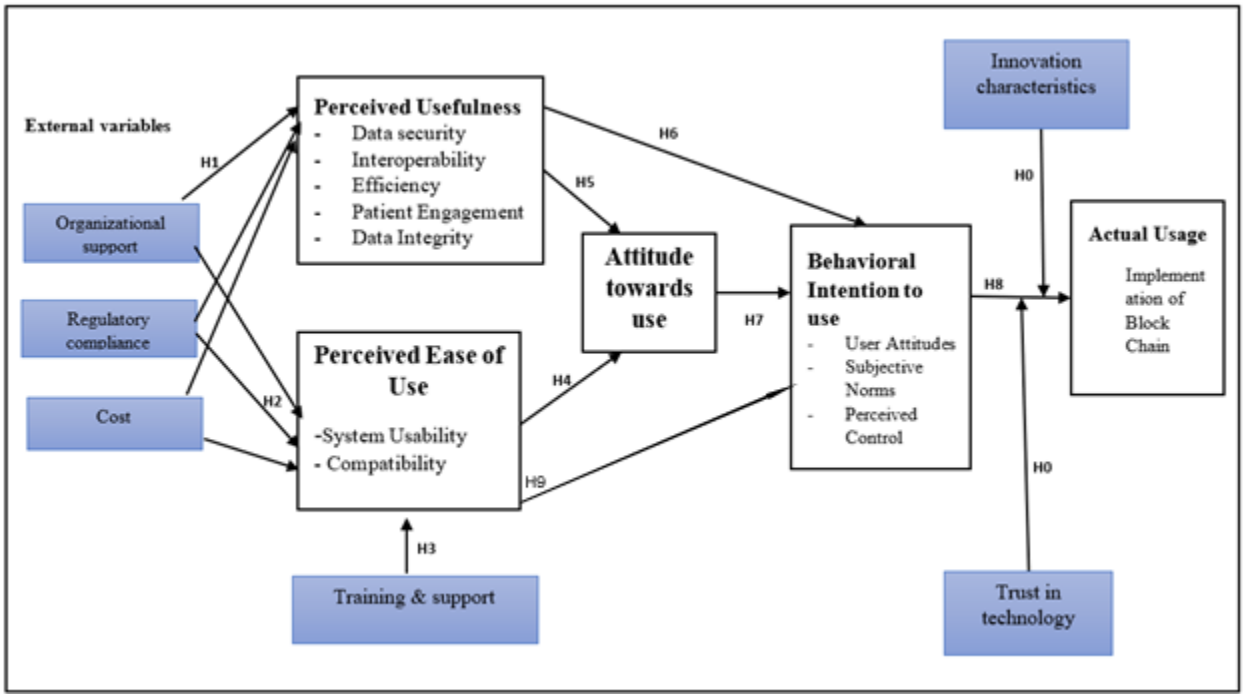



*Figure 0.3 Conceptual model for adoption of block chain*

### 2.9.1 Variables in the Model

i. Perceived Ease of Use (PEOU)

Specification: This variable measures the perceived ease of using block chain technology for patient record management at Mulago Hospital.

Changes: By including PEOU in the model, we can assess how user-friendly and efficient the block chain-based system is perceived to be, providing insights into the usability challenges and opportunities for improvement.

ii. Perceived Usefulness (PU)

Specification: This variable evaluates the perceived usefulness of block chain technology in enhancing patient record management.

Changes: Incorporating PU allows us to understand how healthcare professionals perceive the benefits of using block chain, such as improved data security and interoperability, guiding decision-making regarding technology adoption.

iii. Behavioral Intention (BI)

Specification: BI assesses healthcare professionals' intention to adopt and use block chain technology for patient record management.

Changes: Including BI helps identify factors influencing individuals' willingness to embrace block chain, such as perceived benefits, ease of use, and organizational support, informing strategies to promote adoption.

iv. Actual Usage (AU)

Specification: AU measures the extent to which block chain technology is actively utilized in patient record management at Mulago Hospital.

Changes: By examining AU, we can gauge the practical implementation of block chain and identify barriers or facilitators to its adoption, informing recommendations for optimizing usage.

v. External Variables (External Factors)

Specification: External Variables encompass regulatory compliance and organizational support, influencing the adoption and utilization of block chain technology.

Changes: Including External Variables allows for a holistic assessment of the external environment's impact on technology adoption, highlighting the importance of regulatory frameworks and organizational culture.

vi. Training and Support

Specification: This variable evaluates the availability and effectiveness of training programs and support mechanisms during block chain technology adoption.

Changes: Incorporating Training and Support helps assess the readiness of healthcare professionals to embrace block chain technology, identifying gaps in knowledge and skills that require attention.

vii. Trust in Technology

Specification: Trust in Technology measures healthcare professionals' confidence in the reliability and security of block chain technology.

Changes: Adding Trust in Technology enables us to explore the role of trust in influencing technology adoption decisions, addressing concerns about data security and privacy.

viii. Innovation Characteristics

Specification: Innovation Characteristics assess the innovative features and capabilities of block chain technology.

Changes: Including Innovation Characteristics provides insights into the unique attributes of block chain that differentiate it from traditional record management systems, highlighting its potential transformative impact on healthcare.

## 2.10 Study Hypothesis

$H_a6$: Perceived usefulness positively influences behavioral intention to use block chain technology

$H_a5$: The perceived usefulness positively influences attitude towards the use of block chain technology.

$H_a4$: The perceived ease of use positively influences attitude towards the use of block chain technology.

$H_a3$: Training and support positively influence perceived ease of use

$H_a7$: Attitude positively influences behavioral intention to use block chain technology

$H_a10$: Trust in a technology moderates the relationship between behavioral intention and actual usage of block chain technology

H6: Behavioral intention to use is positively correlated with perceived usefulness.

H7: There is a positive correlation between users' behavioral intention to use block chain technology and their attitudes towards using it.

H9: The perceived ease of use positively influences Behavioral intention to use towards the use of block chain technology.

$H_a8$: Behavioral Intention positively influences the actual use of block chain technology.

$H_a11$: Innovation characteristics have a moderating effect on the relationship between behavioral intention and actual use of technology.

# CHAPTER THREE

# RESEARCH METHODOLOGY

## *3.1 Chapter Overview*

This chapter describes the research methods used to carry out the study. It also covers the research design, target population, sample size and technique, data collection methods and tools, validity and reliability, variable measurement, and data analysis.

## 3.2 Research Approach

There are three broad research approaches that researchers employ to carry out their investigations and direct the choice of tools, methods, and procedures for data collection and analysis (Kilani & Kobziev, 2016). The research approaches include the inductive, deductive, and abductive research approaches as explained below.

### 3.2.1 Inductive Approach

Inductive research is an approach that involves moving from specific observations and patterns to more generalizations and theories (Soiferman, 2010). In this approach, researchers gather detailed data, analyze it for patterns and trends, and then formulate general concepts or theories based on their observations. Inductive research is often used in qualitative studies where the goal is to explore new insights and develop theories grounded in the data (Kivunja & Kuyini, 2017).

### 3.2.2 Deductive Approach

Deductive research is a method that begins with a broad theory or hypothesis and then verifies it with detailed observations and data gathering (Burney & Saleem, 2008). Researchers begin with an existing theory or hypothesis and seek to confirm or disconfirm it using empirical evidence. Deductive research is often associated with quantitative studies, where researchers aim to test existing theories or hypotheses (Creswell, 2014).

### 3.2.3 Abductive Approach

The abductive approach is a research methodology that combines elements of both inductive and deductive reasoning (Fernando et al., 2013). It involves forming plausible explanations or hypotheses based on observed evidence and then testing these explanations through further

investigation. In essence, abductive reasoning seeks to bridge the gap between observed data and theoretical understanding by proposing likely explanations for the observed phenomena.

### 3.2.4 Approach for the Study

A research approach can be chosen by a researcher based on the type of research questions and the objectives of the study (Sam, 2012). The approach to be used in this study was deductive because the model was built on existing theories and data collected from the field. The deductive approach was deemed appropriate as it allowed for the development of a conceptual model based on established theories such as the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT). By utilizing existing theories as a foundation, the deductive approach facilitated the exploration of how these theories could be applied to understand the adoption of block chain technology in healthcare settings.

Furthermore, the deductive approach enabled the researcher to systematically test hypotheses derived from these theories using empirical data collected from the field. This approach enhances the rigor and validity of the study by providing a structured model for data analysis and interpretation.

## 3.3 Research methods

### 3.3.1 Design Science Research Method

Design Science Research (DSR) is an approach to problem-solving that seeks to advance human understanding by producing and assessing cutting-edge IT artifacts (Hevner, 2007). This means developing artifacts to address issues that are noticed, participating in research, assessing the designs, and presenting the findings to the right people (Hevner et al., 2004). Constructs, models, methods, and instantiations are examples of artifacts that are mentioned in the context of the DS paradigm (Gregor & Hevner, 2013). The relevance, design, and rigor cycles are the three inherent cycles of the design science research methodology, as Figure 3.1 below illustrates (Hevner, 2007).

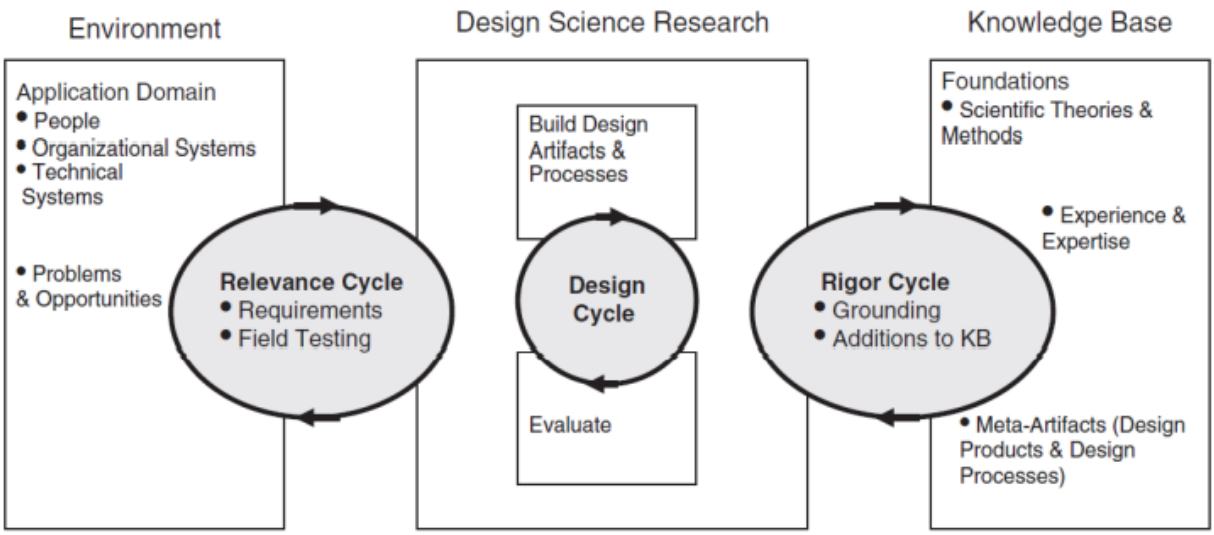



*Figure 0.1 Design science cycles*

### 3.3.1 Action Research Method

Action research is an evidence-based approach to practice improvement that combines critical reflection, action, and evaluation (O'Brien, 1998). It typically requires researchers to actively participate in research in their professional environment and meets the main features of dealing with real-world problems, dealing with practical challenges, providing feedback, and ensuring key personnel engagement (Compton, 2004). The action research is illustrated below;


*Figure 0.2 Action research cycle*

### 3.3.2 Case Study Methodology

By carefully examining the context of a limited number of events and their connections, this research methodology looks into and examines current real-life phenomena. Zainal is thus able to demonstrate a series of events in progress (Zainal, 2007). This methodology provides three major advantages namely; The phenomenon is studied in its natural environment, and a meaningful theory can be developed based on what you have learned through experience. The methodology enables researchers to answer the questions of why, what, and how while also gaining a relatively complete understanding of the nature and complexity of the overall phenomenon. Finally, this methodology is ideal for early, exploratory studies (Ebneyamini & Moghadam, 2018).

### 3.3.3 Research method for this study

The Design Science Research (DSR) Method is driven by it being well-suited for addressing complex problems and designing practical solutions (Gregor & Hevner, 2013). In this study, the adoption of block chain technology in patient record management at Mulago Hospital represents a multifaceted challenge that requires innovative practical solutions. In addition, DSR emphasizes the creation of artifacts, such as models, models, or systems, to address specific problems (Hevner et al., 2004). In the context of this study, the objective is to design a comprehensive model for the successful implementation of block chain technology in healthcare.

## Instantiation of the design science cycles in this study

### Relevance cycle

Design science is particularly pertinent in this study, which aims to develop a practical block chain-based model for improving patient record management at Mulago Hospital. Design science's emphasis on creating innovative artifacts aligns with our goal of addressing the real-world challenge of healthcare record management. The resulting model has direct applications in a healthcare setting, making this method highly relevant.

In this initial phase, we identified and defined the challenges within the current patient record management system at Mulago Hospital. A thorough literature review was conducted to understand the existing state-of-the-art in block chain technology and health informatics.

In order to comprehensively understand the problem environment and ascertain the existence of challenges within the patient record management system at Mulago Hospital, a field study was

conducted as part of the design science cycle. This phase involved direct engagement with healthcare professionals, IT specialist, administrators, and stakeholders involved in the management and utilization of patient records. Through questionnaire, valuable insights were gathered regarding the current state of the hospital's record management system. The field study aimed to identify inefficiencies, bottlenecks, and pain points experienced by users in accessing, updating, and maintaining patient records. Additionally, it provided an opportunity to explore the specific needs and requirements of healthcare professionals in terms of functionality, usability, and security of the system. By actively involving stakeholders in the problem identification process, the field study facilitated a nuanced understanding of the challenges and laid the groundwork for designing a tailored solution using block chain technology.

### 3.4 Target Population

The research on block chain technology adoption to enhance patient records management at Mulago National Referral Hospital was centered on its investigation of key stakeholders and entities directly involved in healthcare data management and decision-making processes in the relevancy cycle’s environment domain. The target population encompasses individuals and organizations from both the healthcare and technology departments, as follows:

1. Healthcare Professionals and Administrators: This group includes physicians, nurses, healthcare administrators, and staff directly responsible for patient records management within Mulago National Referral Hospital. Their insights into the daily challenges and requirements of patient records management are vital to the study.
2. Information Technology (IT) Specialists: IT professionals working within Mulago Hospital, responsible for maintaining and managing the hospital's digital infrastructure, were an integral part of the target population. Their perspectives on technology integration and data security are critical.
3. Hospital Management and Decision-Makers: Hospital executives, managers, and decision-makers who play pivotal roles in the strategic planning and policy formulation regarding patient records management were included. Their input is essential in understanding the hospital's vision and goals.

***Table 0:1 Target population distribution***

| Category | Target population |
|---|---|
| Healthcare Professionals and Administrators | 85 |
| Information Technology (IT) Specialists | 6 |
| Hospital Management and Decision-Makers | 25 |
| **Total** | 116 |

### 3.5 Sample size and procedure

The study considered a sample size of 70 respondents from healthcare professionals, 6 from the IT department, and 24 from the management. The sampling technique used was purposive where the researcher collected data from key respondents that provided key information to the study variables. The sample size was calculated as follows;

The sample size required a function of the confidence interval of (+/-) 5%, for a confidence level of 95% and the population size. Therefore, the sample size is determined using the following formula $SS = \frac{Z^2 * (X) * (1-X)}{C^2}$ and $S = \frac{SS}{\frac{1+(SS-1)}{P}}$ (Cochran, 1977; Krejcie & Morgan, 1970)

Where: SS = Required Sample Size; Z = Z Value (for example 1.96 for 95% confidence interval); X = percentage of picking a choice, expressed as decimal (0.5 used for sample size needed); C = confidence interval, expressed as decimal (0.05 +/- 5 used for sample size needed).

$SS = \frac{Z^2 * (X) * (1-X)}{C^2}$ …… (Equation 1)

Substitution of the values in the formula above;

$$SS = \frac{(1.96^2) * 0.5 * (1 - 0.5)}{0.05^2}$$

SS= 384

By using Cochran's (1977) correction formula we calculate the final (new) sample size S for each category according to equation 2 as follows:

$S = \frac{SS}{\frac{1+(SS-1)}{P}}$ …… (Equation 2)

- For a target population of 85 Healthcare Professionals

New S = 384/ 1+((384-1)/ 85)

New S= 70

- For a target population of 6 IT Specialists

New S = 384/ 1+((384-1)/ 6)

New S= 6

- For a target population of 25 Hospital Management and Decision-Makers

New S = 384/ 1+((384-1)/ 25)

New S= 24

**Table 0:2 Sample size distribution**

| Category | Target population | Sample size |
|---|---|---|
| Healthcare Professionals and Administrators | 85 | 70 |
| Information Technology (IT) Specialists | 6 | 6 |
| Hospital Management and Decision-Makers | 25 | 24 |
| Total sample size | | 100 |

### 3.6 Data Collection Methods

The research employed a survey method to gather quantitative data through the use of questionnaires. In this approach, researchers obtain information from a particular population or sample by conducting surveys or administering questionnaires (Sam, 2012).

#### 3.6.1 Questionnaire Survey Method

The questionnaires were utilized to gather measurable firsthand information from the chosen participants, which were distributed to them. It was given to healthcare professionals, with respondents indicating their answers from a set of defined options. The choice of questionnaires was made due to its capacity to effectively collect substantial amounts of data in a brief period and with limited resources, making it a feasible and efficient choice (Muhammad & Kabir, 2018).

### 3.6.2 Data Collection Instruments

The study used a close-ended self-administered questionnaire divided into sections of background information, challenges faced with current electronic health records management, and ways in which block chain technology can be used to enhance secure and efficient records management.

## 3.7 Validity and Reliability

### 3.7.1 Validity

The instruments' validity was assessed through the application of the Content Validity Index. This test evaluates how well the content areas of the study are reflected (Chiwaridzo et al., 2017). The Content Validity Index (CVI) was arrived at using Nunnally and Bernstein (1994) formula below (Nunnally & Bernstein, 1994);

$$CVI = \frac{\text{Total number of items declared valid}}{\text{Total number of items}}$$

### 3.7.2 Reliability

Reliability tests assess how consistently and dependably a research tool provides results when used repeatedly (Isaac & Michael, 1995). To evaluate the reliability of the study's questionnaires and interview guide, a pretest was conducted on a sample of 10 targeted respondents. This pretest scrutinized individual questions as well as the structured questionnaires. The Cronbach Alpha Coefficient (CAC) is employed as the primary statistical measure for gauging the reliability and consistency of research instruments, a widely used method (Devon et al., 2007). The study utilized the Cronbach's alpha coefficient test through the Software Package for Social Sciences (SPSS) to demonstrate data reliability, considering only variables scoring above 0.70 as recommended by Nunnally and Bernstein (1994).

### Design cycle

Our study's design phase encompasses the design of a conceptual model for supporting the adoption of block chain technology and testing the model using statistical analysis methods as shown in Chapter 4. The model includes the contextual and specific needs of Mulago Hospital. In the design cycle, the conceptual model for this study is drawn from existing theories, notably the Technology Acceptance Model (TAM). This theory provided a solid foundation for understanding

the factors that influence the acceptance and adoption of new technologies in various contexts, including healthcare. By leveraging the constructs within TAM, such as perceived ease of use, perceived usefulness, and behavioral intention, we have developed a tailored model that reflects the unique challenges and requirements of adopting block chain technology to enhance patient record management at Mulago Hospital. Therefore, the design involved the detailed design of the study's model.

**Rigor cycle**

The research study is guaranteed to be innovative by the rigor cycle, which offers theories and experiences from prior knowledge. To ensure that the designs generated are research contributions rather than routine designs based on the application of well-known processes, it is the responsibility of the researcher to conduct in-depth research and consult the knowledge base. To ensure rigor, we conducted a thorough review of extant adoption theories and literature to provide a solid foundation for the research.

In conducting this study, several key theories were reviewed to inform the development of the conceptual model and the subsequent design of the block chain-based patient record management system. Among the prominent theories reviewed were the Technology Acceptance Model (TAM), which provided insights into users' perceptions and acceptance of new technologies, and the Unified Theory of Acceptance and Use of Technology (UTAUT), which offered a comprehensive model for understanding technology adoption in organizational contexts.

Furthermore, this study contributes to theory by synthesizing insights from these existing theories with empirical evidence gathered from the field. By integrating elements of TAM within the proposed conceptual model, we aimed to enrich our understanding of technology adoption within the healthcare domain, particularly concerning block chain technology for patient record management. This study extends existing theoretical models by incorporating contextual factors specific to the healthcare environment, such as regulatory compliance, organizational support, and data security concerns, which are critical determinants of technology acceptance and utilization in healthcare settings.

This research contributes to the evolving discourse on the application of block chain technology in healthcare by proposing a practical model tailored to the needs and challenges of Mulago National Referral Hospital. By bridging theoretical insights with practical implementation

strategies, the study seeks to advance theoretical understanding while offering actionable guidance for healthcare practitioners and policymakers navigating the complexities of technology adoption and innovation in healthcare delivery.

### 3.8 Data Analysis

#### 3.8.1 Quantitative Analysis

Descriptive statistics of frequencies, percentages, means, and standard deviations were applied to the quantitative data to illustrate the response distribution for each of the study's variables. Utilizing SPSS and Microsoft Excel. In addition, correlation analysis was used to test the relationship between the variables. Additionally, T-statistics and P-value were used to test the significance of the relationship between independent and dependent variables.

### 3.9 Ethical considerations

During the research period, the following moral standards were established:

1. At all times, the participants' well-being and dignity were respected.

2. Throughout the study, the research data was kept private.

3. The final report has to undergo defense at Viva, where a panel is appointed by UCU to review it. 4. The report was presented for approval and consideration of the proposed recommendations.

# CHAPTER FOUR

# PRESENTATION AND INTERPRETATION OF STUDY FINDINGS

## *4.1 Chapter Overview*

The chapter opens with a description of the survey response rate and a scientific evaluation of the research tools.

In the context of Mulago National Referral Hospital, the study looks into the details of block chain implementation for enhancing patient records management. Beyond the confines of theoretical discourse, the approach ventures into the practical realm, integrating insights from both literature review and field study. The aim is not merely to supplement existing data but to validate and enrich our understanding of the factors pivotal to successful block chain adoption within the healthcare landscape.

This research is based on the understanding that block chain technology works in ways that go beyond theory. Its actual effectiveness will be determined by how it is used in actual environments, such as Mulago Hospital. By means of an extensive combination of academic research and community involvement, the researcher aimed to uncover the dynamics that influence the application of block chain technology in patient record administration. Through a comprehensive approach, the successful integration of block chain technology is supported by an interplay of technical, organizational, and regulatory factors. This will open the door to more informed decision-making and significant outcomes in the delivery of healthcare.

## 4.2 Response Rate

After screening, out of the 100 questionnaires that were distributed, the study participants returned 95 and all were valid giving a response rate of 95%. This is consistent with an acceptable response rate of more than 50% to represent the actual scenario and a 90% response rate deemed excellent (Roth & BeVier, 1998).

***Table 4:0:1 Response rate***

| **Status** | **Frequency** | **Percentages** |
|---|---|---|
| Returned | 95 | 95% |
| Not returned | 5 | 5% |
| Total | 100 | 100% |

### 4.3 Demographic Information

The demographic information of the respondents including gender, age, level of formal education, role in the hospital, and length of service was the focus of the study. Table 4.2 presents the results of the respondents' demographic characteristics.

Participant characteristics examined in this study encompass age, gender, level of formal education, roles within their respective fields, and the number of years spent in their roles. Understanding these demographics is crucial for comprehensively interpreting the study findings and gaining a nuanced understanding of the perspectives and experiences of the respondents. Results on participant demographics are presented in table 4.2.

***Table 4:0:2 Demographic characteristics of student***

| **Respondent characteristic** | | **Frequency (N=95)** | **Percentage %** |
|---|---|---|---|
| Age | 18-25 years | 14 | 14.74 |
| | 26-30 years | 36 | 37.89 |
| | 31-40 years | 32 | 34 |
| | 41-50 years | 10 | 11 |
| | 50 and above | 3 | 3 |
| Gender | Male | 48 | 51 |
| | Female | 47 | 49 |
| Level of formal education | Certificate | 18 | 19 |
| | Diploma | 25 | 26 |
| | Bachelors | 41 | 43 |
| | Masters | 9 | 9 |
| | PhD | 2 | 2 |
| | Others | 0 | 0 |
| Roles | Doctor | 7 | 7 |
| | Specialist | 11 | 12 |
| | Clinical officer | 53 | 56 |
| | IT specialist | 11 | 12 |
| | Another category of staff | 13 | 14 |

| | | | |
|---|---|---|---|
| Number of years in the role | Less than two years | 22 | 23 |
| | 2-5 years | 58 | 61 |
| | 5-10 years | 14 | 14.74 |
| | 10 years and above | 1 | 1 |

Based on the study findings in table 4.2, the majority of respondents fell within the age range of 26-30 years (37.89%), followed by 31-40 years (34%). Gender distribution was almost equal, with 51% male and 49% female. In terms of education, a significant portion held bachelor's degrees (43%) or diplomas (26%), while 19% had certificates. Regarding roles, clinical officers constituted the largest group (56%), followed by IT specialists (12%) and specialists (12%). Most respondents had 2-5 years of experience in their roles (61%), with fewer having less than two years (23%) or 5-10 years (14.74%).

**Age Distribution**

The analysis of respondents' age distribution reveals a varied demographic landscape. The largest cohort falls within the 26-30 age range, constituting 37.89% of the participants. Notably, respondents aged 18-25 contributed 14.74%, indicating a presence of younger individuals. In contrast, those aged 41-50 and 50 and above represent 11% and 3%, respectively, suggesting a diverse age representation among the surveyed individuals.

**Gender Distribution**

The gender distribution among participants is nearly balanced, with 51% identifying as male and 49% as female. This parity ensures a representative and inclusive sample, allowing for diverse perspectives from both genders in the study.

**Levels of Formal Education**

Examining the educational background of participants, a majority hold a Bachelor's degree, constituting 43% of the respondents. Additionally, 26% possess a diploma, while 19% have a certificate. The distribution indicates a well-educated participant base, with diverse educational qualifications.

### Roles Held

The roles held by respondents display a predominant presence of clinical officers, comprising 56% of the participants. Specialists and IT specialists contribute 12% each, while doctors constitute 7%. Another 14% fall into the category of other staff roles. This distribution suggests a strong representation of frontline healthcare professionals, reflecting the study's focus on block chain technology in healthcare.

### Years Spent in Role

An analysis of the duration that participants have spent in their current roles shows that 61% have been in their positions for 2-5 years, indicating a cohort in the early to mid-career stage. Those with less than two years of experience make up 23%, while 5-10 years and 10 years and above constitute 14.74% and 1%, respectively. This distribution provides insights into the experience levels of the surveyed individuals.

## 4.4 Descriptive statistics of the constructs in the model

The constructs tested in this study include perceived usefulness, perceived ease of use, behavioral intention to use, actual usage, external variables, training and support, innovation characteristics, and trust in technology. Results on descriptive statistics of the study constructs are presented in the following subsections**.**

### 4.4.1 Perceived Usefulness

The analysis of respondents' perceptions regarding the perceived usefulness of block chain technology for record management is presented in Figure 4.1.

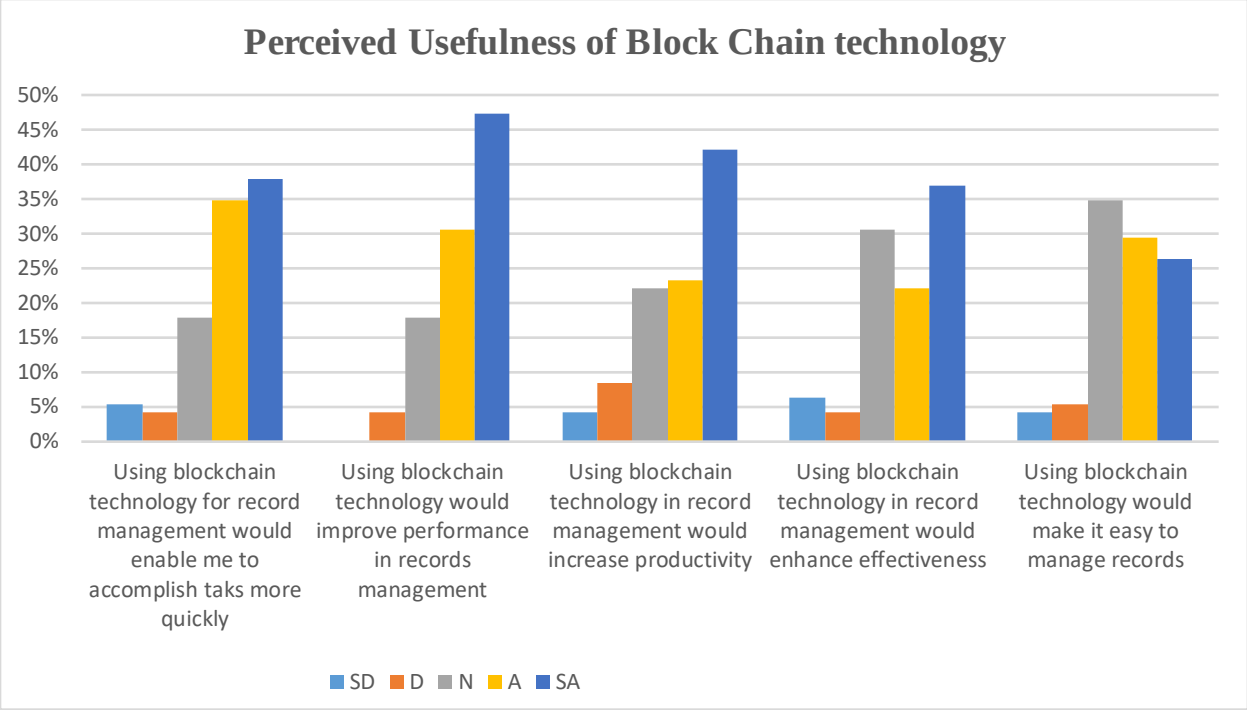



*Figure 0.1: Results on Perceived Usefulness*

Based on the findings in Figure 4.1, the majority of the participants 73% (A=35%, SA=38%) agreed that block chain technology has the potential to accelerate task accomplishment, indicating a prevailing positive sentiment among the surveyed individuals. Moreover, a resounding 78% (A=31%, SA=47%) of participants believe that employing block chain would elevate performance in records management, underlining a collective acknowledgment of its potential benefits.

Participants also conveyed optimism about the impact on productivity, with 65% (A=23%, SA=42%) agreeing that block chain technology could contribute to increased productivity in record management. Similarly, regarding the enhancement of effectiveness, 59% (A=22%, SA=37%) agreed, signifying a consensus on the positive influence of block chain technology.

When it comes to the ease of managing records through block chain technology, opinions are more varied. While a significant 55% (A=29%, SA=26%) agree that it would make record management easier, there is a noticeable 9% (SD=4%, D=5%) who express some level of disagreement. This suggests a nuanced perspective among respondents, indicating potential areas for further investigation or clarification in understanding the perceived usefulness of block chain technology for record management.

**Significance**

The findings from the analysis of perceived usefulness in Figure 4.1 reveal a widespread positive sentiment among respondents towards the potential benefits of block chain technology in record management, highlighting its capacity to enhance task accomplishment, performance, and productivity. This underscores the significance of block chain technology in streamlining healthcare operations and improving overall efficiency. The implications suggest a promising avenue for leveraging block chain technology to optimize record management processes, leading to more streamlined workflows and enhanced productivity in healthcare settings.

### 4.4.2 Perceived ease of use

The findings from the analysis of respondents' perceptions regarding the perceived ease of use of block chain technology reveal various attitudes among the staff at Mulago National Referral Hospital. The responses indicate a mixed sentiment, with a considerable proportion of participants expressing uncertainty or neutrality in their views as shown in Figure 4.2.

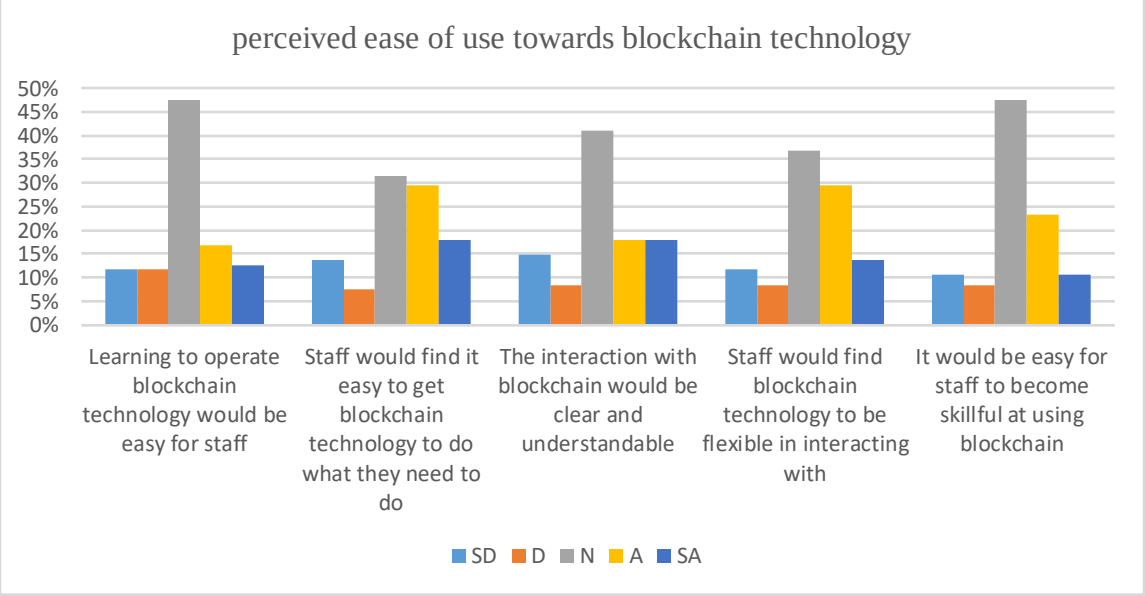



*Figure 0.2: Results on perceived ease of use*

Based on the findings in figure 4.2, concerns about the ease of learning to operate block chain technology are evident, as a substantial number of respondents either disagreed or strongly disagreed that acquiring skills in using block chain technology would be easy for them. Similarly,

the perception of staff finding it easy to get block chain technology to perform required tasks appears divided, with a notable percentage expressing neutral sentiments.

Moreover, the results in Figure 4.2 suggest that staff members are not entirely aligned on the clarity and understandability of their interaction with block chain technology. A significant portion of respondents indicated uncertainty or neutrality in their views regarding the clarity and understandability of engaging with block chain. Despite these mixed sentiments, a noteworthy proportion of participants agreed that staff would find block chain technology flexible in interaction, and it would be relatively easy for them to become skillful at using block chain technology. This positive response indicates a potential openness among some staff members toward adapting to and mastering block chain technology.

The findings in Figure 4.2 on the perceived ease of use of block chain technology hold significant implications for the proposed model in the study, addressing the perceived ease of use is pivotal in ensuring the successful adoption of block chain technology at Mulago National Referral Hospital. Tailored interventions and support strategies should be implemented to bridge the gaps identified in staff perceptions, fostering a more positive and confident attitude toward the utilization of block chain in healthcare record management.

**Significance**

The results presented in Figure 4.2 on perceived ease of use indicate mixed sentiments among respondents regarding the ease of learning and interacting with block chain technology. While some express confidence in mastering block chain technology, others highlight challenges in understanding and navigating its functionalities. This underscores the importance of user-friendly interfaces and comprehensive training programs to facilitate the seamless adoption of block chain technology. The implications suggest the need for tailored training initiatives to enhance staff proficiency and confidence in utilizing block chain technology for record management, ultimately improving user experience and adoption rates.

### 4.4.3 Behavioral intention to use

The analysis of responses regarding the behavioral intention to use block chain technology reveals various perceptions among the staff at Mulago National Referral Hospital as illustrated in Figure 4.3

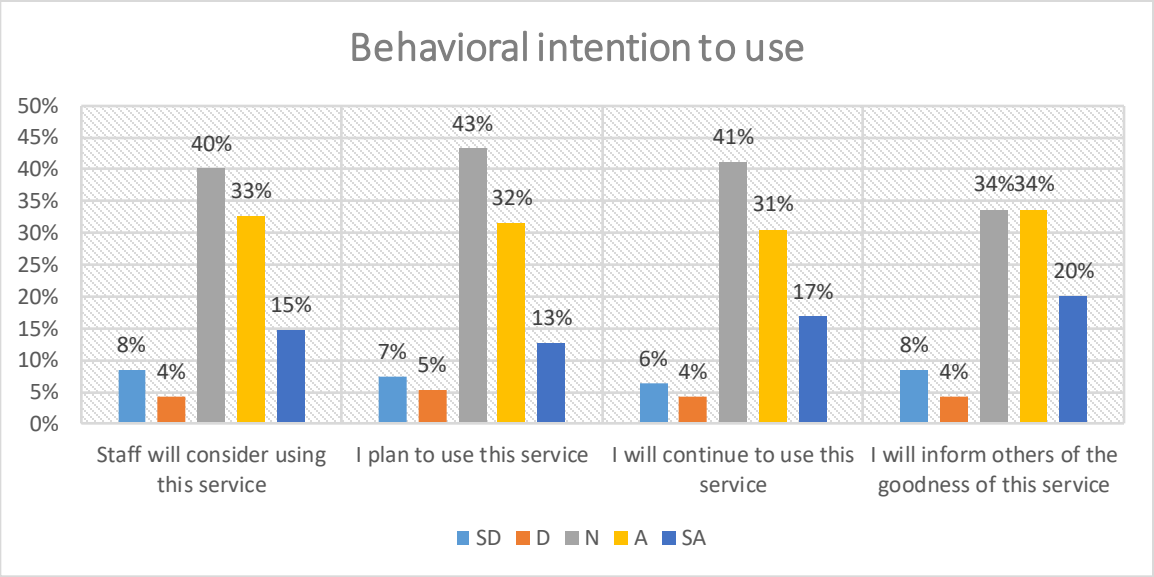



*Figure 0.3: Results on behavioral intention to use*

Based on the findings in Figure 4.3, approximately 40% of respondents express a neutral stance, indicating a lack of strong commitment or intention toward incorporating block chain technology into their daily practices.

While a considerable portion (45%) agree and strongly agree intending to inform others about the benefits of the block chain service, this positive inclination is not uniform across all aspects of behavioral intention. The comparatively lower agreement percentages for considering (41%), planning (39%), and continuing to use the service (48%) suggest a need for focused strategies to boost acceptance and commitment among the staff.

The findings underscore the significance of addressing factors that influence behavioral intentions, such as user attitudes, subjective norms, and perceived control. Tailoring interventions to enhance these factors could contribute to a more positive disposition toward the adoption of block chain technology for patient record management.

**Significance**

Regarding behavioral intention to use, as depicted in Figure 4.3, the findings suggest varying levels of commitment among respondents toward incorporating block chain technology into their daily practices. While some express a positive intention to inform others about its benefits, others exhibit hesitancy in planning and continuing its usage. This highlights the need for targeted strategies to enhance acceptance and commitment among healthcare professionals, emphasizing the importance of addressing concerns and providing incentives for adopting block chain technology. The implications underscore the significance of fostering a supportive organizational culture and incentivizing staff engagement to promote the successful adoption of block chain technology in healthcare settings.

### 4.4.4 Actual Usage of block chain technology

The analysis of responses regarding the actual usage of block chain technology reveals diverse perspectives among the staff at Mulago National Referral Hospital as shown in figure 4.4.

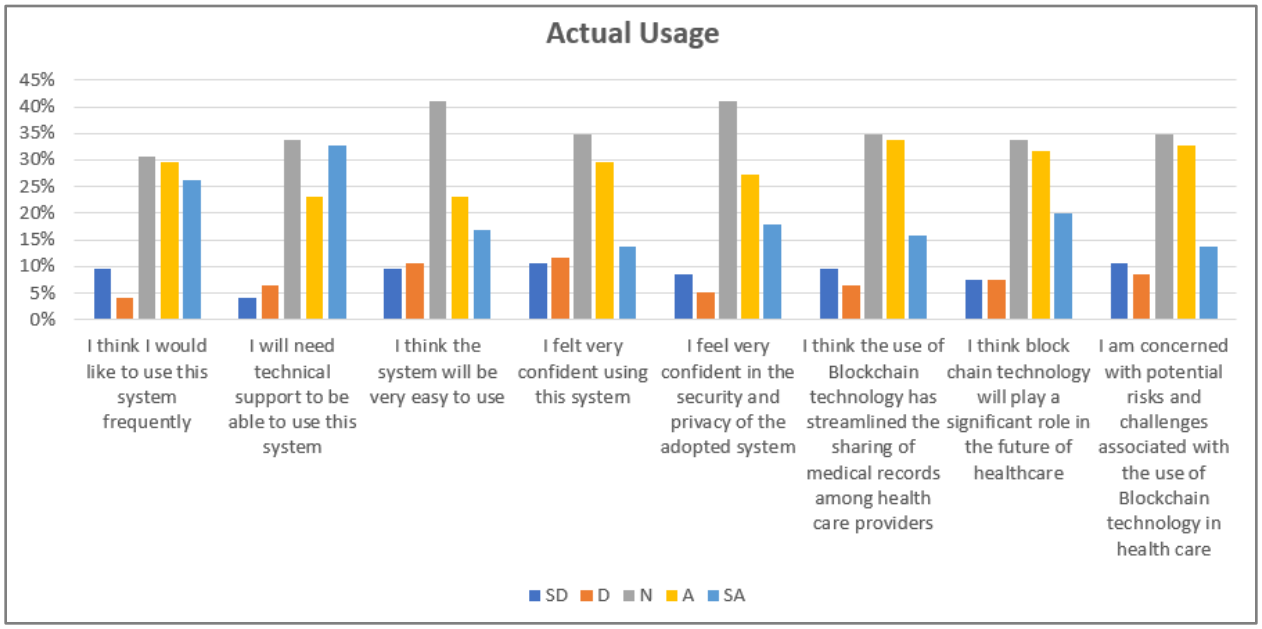



*Figure 0.4: Results on actual Usage of block chain technology*

Based on the findings in Figure 4.4, a substantial portion (60%) expresses a neutral stance or disagreement when asked about their inclination to use the system frequently. This suggests a notable level of uncertainty or hesitation among respondents regarding the frequency of system use.

Concerns about technical support are apparent, with a considerable percentage (67%) expressing a need for assistance. This highlights the importance of robust technical support mechanisms to facilitate the effective utilization of block chain technology. Moreover, the perceived ease of use and confidence in system usage demonstrate a mixed sentiment among respondents, emphasizing the need for user-friendly interfaces and comprehensive training programs.

While a majority (72%) believe in the security and privacy of the adopted system, a noteworthy proportion (41%) still harbors concerns about potential risks and challenges associated with block chain technology in healthcare. This points to the significance of addressing and mitigating perceived risks to foster a more favorable perception of block chain technology.

The results highlight the complexity of respondents' views on real usage, underscoring the need for focused interventions to allay worries, improve technical assistance, and guarantee a good user experience to successfully implement block chain technology in healthcare services.

**Significance**

In Figure 4.4, the analysis of actual usage of block chain technology reveals a nuanced perspective among respondents regarding its frequency of use and perceived challenges. While some express confidence in its security and privacy features, others voice concerns about technical support and associated risks. This underscores the importance of addressing barriers to usage, such as resource allocation and technical assistance, to ensure the effective implementation of block chain technology. The implications highlight the need for robust support mechanisms and risk mitigation strategies to overcome adoption barriers and maximize the benefits of block chain technology in healthcare.

### 4.4.5 External variables related to the block chain technology

The analysis of responses concerning external variables related to the adoption of block chain technology reveals various perspectives among staff members at Mulago National Referral Hospital as shown in Figure 4.5.

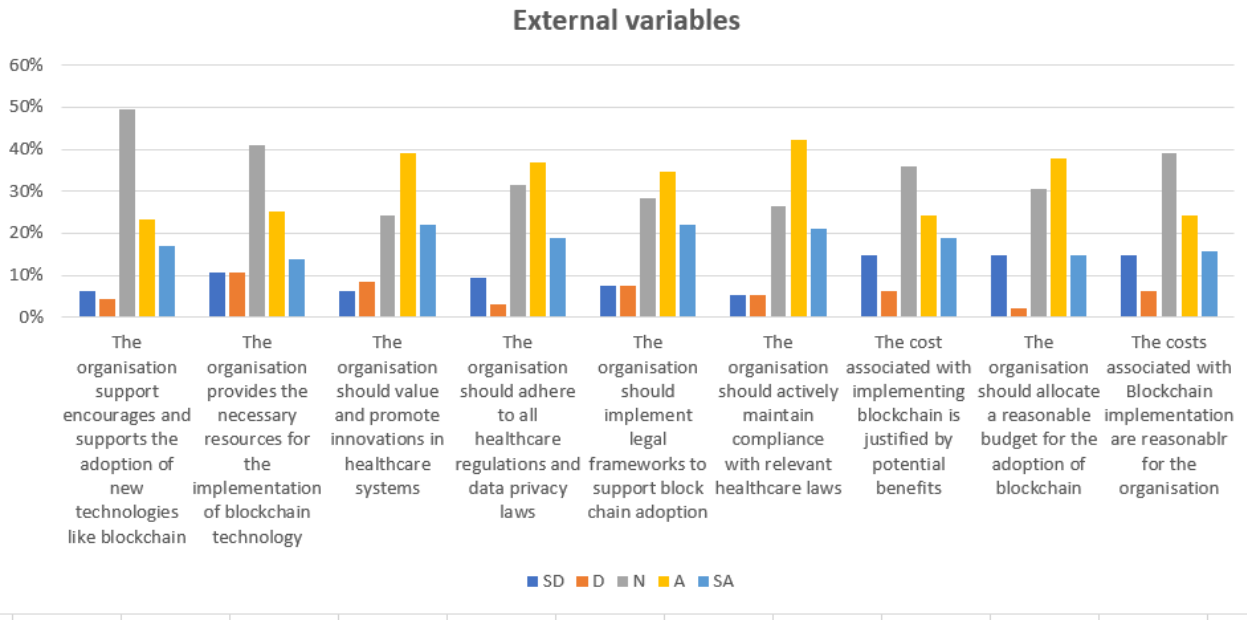



*Figure 0.5: Results on external variables related to the block chain technology*

Based on the findings in Figure 4.5, a substantial proportion of respondents (71%) express a neutral stance or disagreement regarding the organization's support for the adoption of new technologies like block chain. This indicates a significant need for enhanced organizational encouragement and support to foster a conducive environment for technology adoption.

Concerns regarding resource allocation are evident, with a considerable percentage (60%) expressing dissatisfaction or uncertainty about the organization's provision of necessary resources for block chain implementation. This highlights the importance of adequate resource allocation to facilitate the successful integration of block chain technology into healthcare systems.

The organization's attitude towards innovation also emerges as a significant factor, with a notable proportion (52%) emphasizing the importance of valuing and promoting innovations in healthcare systems. This underscores the need for organizational policies and initiatives that prioritize and incentivize innovative approaches to healthcare delivery.

Furthermore, adherence to healthcare regulations and data privacy laws is deemed crucial by the majority of respondents (56%), signaling the importance of regulatory compliance in ensuring the secure and ethical use of block chain technology in healthcare settings.

Despite concerns about costs, a considerable percentage of respondents (58%) acknowledge the potential benefits of block chain implementation, suggesting a recognition of its long-term value proposition. However, there remains a need for organizations to justify and allocate budgets appropriately to support block chain adoption initiatives effectively.

**Significance**

The analysis of external variables related to block chain technology adoption, as depicted in Figure 4.5, highlights key organizational and regulatory factors influencing the adoption landscape. Concerns regarding organizational support, resource allocation, and regulatory compliance underscore the need for comprehensive strategies to address structural barriers and foster a conducive environment for block chain technology adoption. The implications emphasize the importance of organizational leadership, policy frameworks, and stakeholder collaboration in driving successful block chain initiatives in healthcare settings.

### 4.4.6 Training & Support Mechanisms for block chain technology

The analysis of responses regarding training and support mechanisms for block chain technology implementation reveals varying perceptions among healthcare professionals at Mulago National Referral Hospital as shown in Figure 4.6.

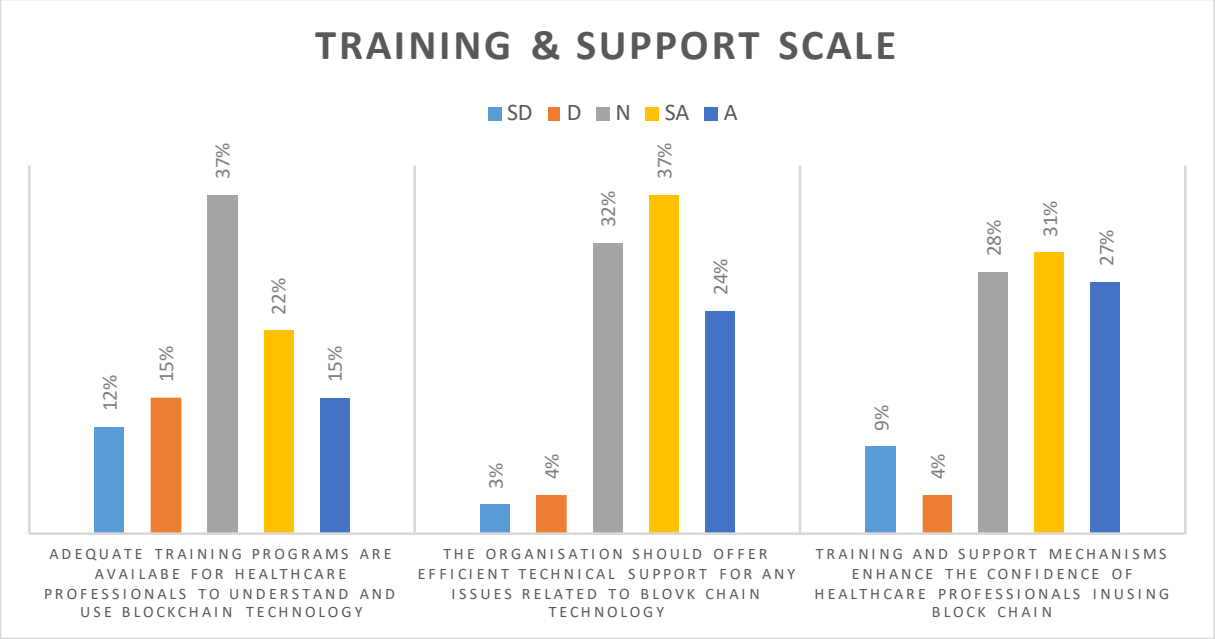



*Figure 0.6: Results on training & Support mechanisms for block chain technology*

Based on Figure 4.6, a notable finding is that a significant proportion of respondents (57%) express dissatisfaction or uncertainty about the availability of adequate training programs for healthcare professionals to understand and use block chain technology. This suggests a clear need for the development and implementation of comprehensive training initiatives tailored to the specific needs of healthcare staff, aimed at enhancing their proficiency in block chain utilization.

Furthermore, results in Figure 4.6 show that there is a considerable emphasis on the importance of efficient technical support, with the majority of respondents (61%) agreeing or strongly agreeing that the organization should offer reliable technical assistance for any issues related to block chain technology. This underscores the critical role of ongoing technical support in mitigating challenges and ensuring the smooth operation of block chain systems within healthcare settings.

The findings in figure 4.6 also, highlight the positive correlation between training and support mechanisms and the confidence of healthcare professionals in using block chain technology. A significant percentage of respondents (58%) agree or strongly agree that training and support mechanisms enhance their confidence in utilizing block chain, indicating the potential of structured training programs and robust technical assistance in fostering staff confidence and competence.

**Significance**

The results presented in Figure 4.6 regarding training and support mechanisms for block chain technology implementation reveal significant insights into the readiness of healthcare professionals at Mulago National Referral Hospital. The findings underscore the importance of tailored training programs and robust technical support in enhancing staff proficiency and confidence in utilizing block chain technology. The implications suggest a critical need for organizations to invest in comprehensive training initiatives and reliable technical assistance to facilitate the successful integration of block chain technology into healthcare systems, ultimately improving user confidence and competence.

### 4.4.7 Innovation Characteristics Associated with block chain technology

As shown in Figure 4.7, the analysis of responses regarding innovation characteristics associated with block chain technology in healthcare reveals several insights into the perceptions of healthcare professionals at Mulago National Referral Hospital.

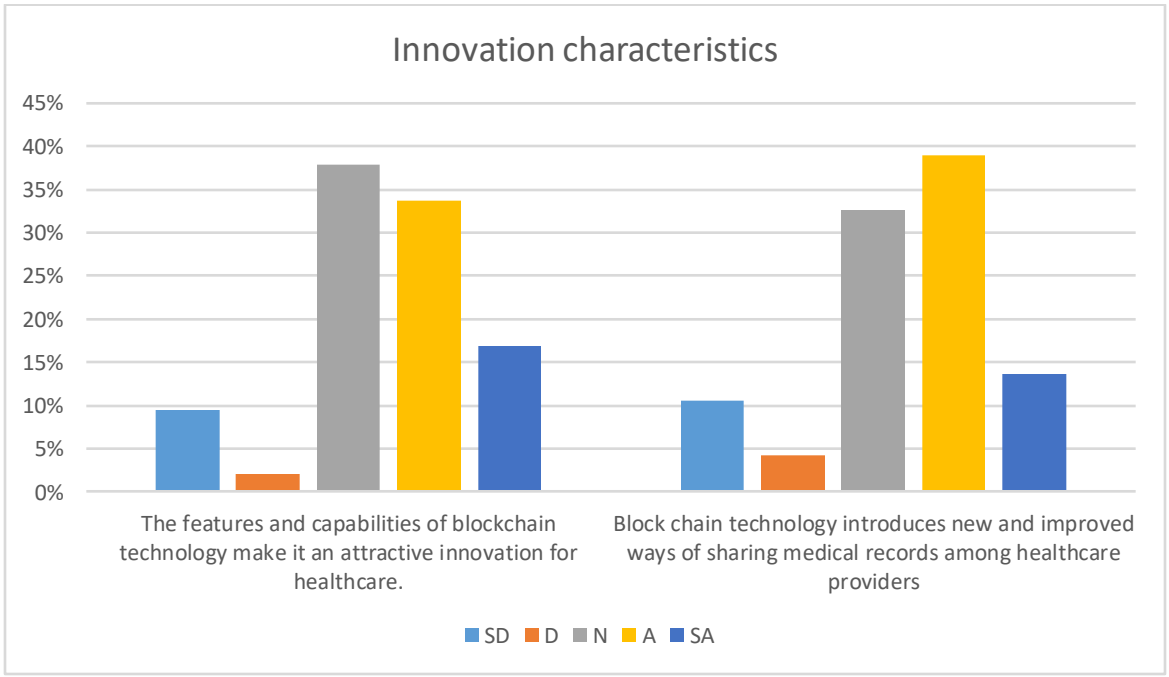



*Figure 0.7: Results on Characteristics associated with block chain technology*

Firstly, based on the results in Figure 4.7, a significant proportion of respondents (51%) express positive sentiments towards the features and capabilities of block chain technology, indicating that

they view block chain as an attractive innovation for healthcare. This suggests a recognition of the potential benefits that block chain offers in terms of enhancing data security, interoperability, and transparency within healthcare systems.

Furthermore, results in Figure 4.7 show that there is notable agreement among respondents (53%) regarding the notion that block chain technology introduces new and improved ways of sharing medical records among healthcare providers. This highlights a widespread acknowledgment of block chain's ability to streamline the exchange of medical information, facilitate data interoperability, and improve collaboration among different stakeholders within the healthcare ecosystem.

**Significance**

In Figure 4.7, the analysis of innovation characteristics associated with block chain technology provides valuable insights into the perceptions of healthcare professionals. The positive sentiments expressed towards block chain's features and capabilities highlight its potential to enhance data security, interoperability, and transparency within healthcare systems. Additionally, the widespread acknowledgment of block chain's ability to streamline medical data sharing underscores its significance in improving collaboration and efficiency across different healthcare entities. The implications suggest a promising future for block chain technology adoption in healthcare, with opportunities to drive innovation, improve healthcare outcomes, and transform traditional processes.

### 4.4.8 Trust in block chain technology

The analysis findings in Figure 4.8 regarding trust in technology, particularly block chain technology, provide valuable insights into the perceptions of healthcare professionals at Mulago National Referral Hospital.

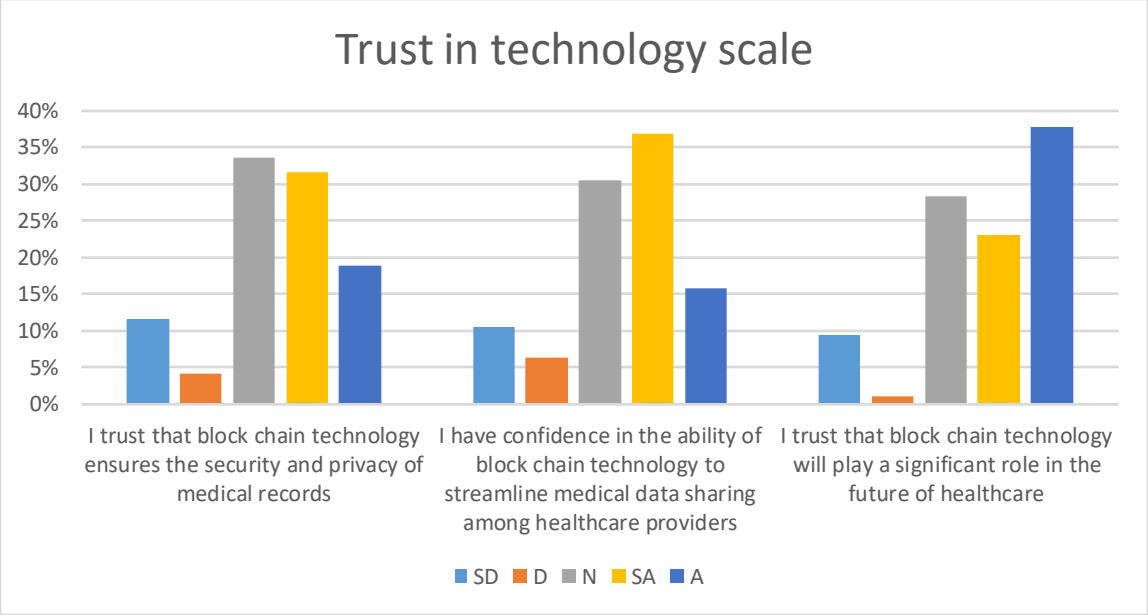



*Figure 0.8 Results on Trust in block chain technology*

Firstly, results in Figure 4.8 indicate that a majority of respondents (51%) express trust in block chain technology's ability to ensure the security and privacy of medical records. This suggests a level of confidence among healthcare professionals in block chain's capacity to safeguard sensitive patient information and uphold data privacy standards, which are paramount considerations in healthcare settings.

Furthermore, a significant proportion of respondents (53%) indicate confidence in block chain technology's potential to streamline medical data sharing among healthcare providers. This reflects a recognition of block chain's ability to enhance interoperability, facilitate seamless data exchange, and improve collaboration across different healthcare entities, thereby potentially enhancing the quality and efficiency of patient care delivery. A notable finding is that a considerable number of respondents (61%) express trust in block chain technology's role in shaping the future of healthcare. This indicates a forward-looking perspective among healthcare professionals, who recognize block chain's potential to drive innovation, improve healthcare outcomes, and transform traditional healthcare processes.

**Significance**

The findings from Figure 4.8 on trust in block chain technology reveal a high level of confidence among healthcare professionals in its ability to ensure security, privacy, and interoperability in healthcare settings. The positive attitudes towards block chain’s potential to streamline medical

data sharing and shape the future of healthcare underscore its transformative impact. The implications highlight the importance of fostering trust and confidence among stakeholders to drive successful block chain initiatives, emphasizing the need for transparent communication, robust security measures, and ongoing collaboration to maximize the benefits of block chain technology in healthcare.

### 4.5 Reliability of the constructs

Reliability analysis is crucial to ensure the consistency and stability of measurement instruments used to operationalize theoretical constructs in a study. In this section, we assess the reliability of the constructs employed in our research model. Reliability measures the extent to which the items comprising each construct consistently capture the underlying concept they are intended to measure (Agenorwoth, 2014). The study employed Cronbach's alpha coefficient as the primary measure of internal consistency reliability. This statistic quantifies the degree of interrelatedness among the items within a construct. A high Cronbach's alpha value of 0.7 or more suggests strong internal consistency, indicating that the items are measuring the same underlying construct reliably (Tavakol & Dennick, 2011). The reliability results are shown in the table below 4.3;

***Table 4:0:3 Reliability of constructs***

| **Dimension** | **No of questions** | **Cronbach's Alpha Coefficient (CAC)** |
|---|---|---|
| Perceived usefulness | 5 | 0.789 |
| Perceived ease of use | 5 | 0.849 |
| Behavioral intention to use | 4 | 0.834 |
| Actual Usage | 8 | 0.852 |
| External variables | 9 | 0.752 |
| Training & Support | 3 | 0.790 |
| Innovation Characteristics | 2 | 0.823 |
| Trust in Technology | 3 | 0.763 |

Based on the findings in table Perceived usefulness and perceived ease of use garnered strong reliability with CAC values of 0.789 and 0.849 respectively, indicating their significance in influencing users' behavioral intention to use technology, which also demonstrated high reliability (CAC = 0.834). Actual usage, encompassing a broader spectrum with eight questions, maintained

a robust internal consistency (CAC = 0.852), suggesting a reliable measure of users' practical engagement. External variables, comprising nine questions, demonstrated acceptable reliability (CAC = 0.752), underscoring their role in shaping user behavior. Training & Support, Innovation Characteristics, and Trust in Technology exhibited good reliability with CAC values of 0.790, 0.823, and 0.763 respectively, emphasizing their importance in facilitating technology adoption and fostering trust among users.

### 4.6 Convergent validity findings

In this study, we assessed the convergent validity of the constructs. Convergent validity evaluates the degree to which different measures of the same construct produce similar results. Through statistical analysis, we scrutinize the consistency and coherence of the constructs under investigation. By examining correlations and factor loadings, we aim to ascertain the extent to which our measurement items align with the theoretical constructs they are intended to represent. The validity results are shown in the table 4.4 below;

***Table 4:0:4 Convergent validity results***

| **Dimension** | **No of questions** | **Content validity index (CVI)** |
|---|---|---|
| Perceived usefulness | 5 | 0.982 |
| Perceived ease of use | 5 | 0.891 |
| Behavioral intention to use | 4 | 0.840 |
| Actual Usage | 8 | 0.825 |
| External variables | 9 | 0.890 |
| Training & Support | 3 | 0.900 |
| Innovation Characteristics | 2 | 0.725 |
| Trust in Technology | 3 | 0.835 |

Based on the findings in table 4.4 Perceived usefulness attained the highest content validity with a score of 0.982, emphasizing its strong relevance in understanding users' perceptions. Perceived ease of use and external variables also demonstrated high content validity, scoring 0.891 and 0.890 respectively, underscoring their significance in shaping users' attitudes and behaviors. Behavioral intention to use and trust in technology followed suit with respectable CVI scores of 0.840 and 0.835, implying their importance in predicting users' future actions and fostering trust in

technological systems. However, innovation characteristics exhibited a comparatively lower content validity with a score of 0.725, suggesting a potential area for further refinement in conceptualization and measurement.

### 4.7 Path Coefficients

The study investigated the relationship between various variables influencing technology adoption using path coefficient analysis as shown in Table 4.5.

***Table 4:5 Path coefficient results***

| **Relationship between variables** | **Path coefficients** |
|---|---|
| Behavioral intention -> Actual usage | 0.302 |
| Ease of use -> Behavioral intention | -0.154 |
| External Variables -> Ease of use | 0.247 |
| External Variables -> Perceived usefulness | 0.362 |
| Innovation Characteristics -> Actual usage | -0.259 |
| Perceived usefulness -> Behavioral intention | 0.308 |
| Training and support ->Ease of use | 0.307 |
| Trust in Technology -> Actual usage | -0.268 |
| Innovation Characteristics x Behavioral intention ->Actual usage | -0.086 |
| Trust x Behavioral intention ->Actual usage | 0.102 |

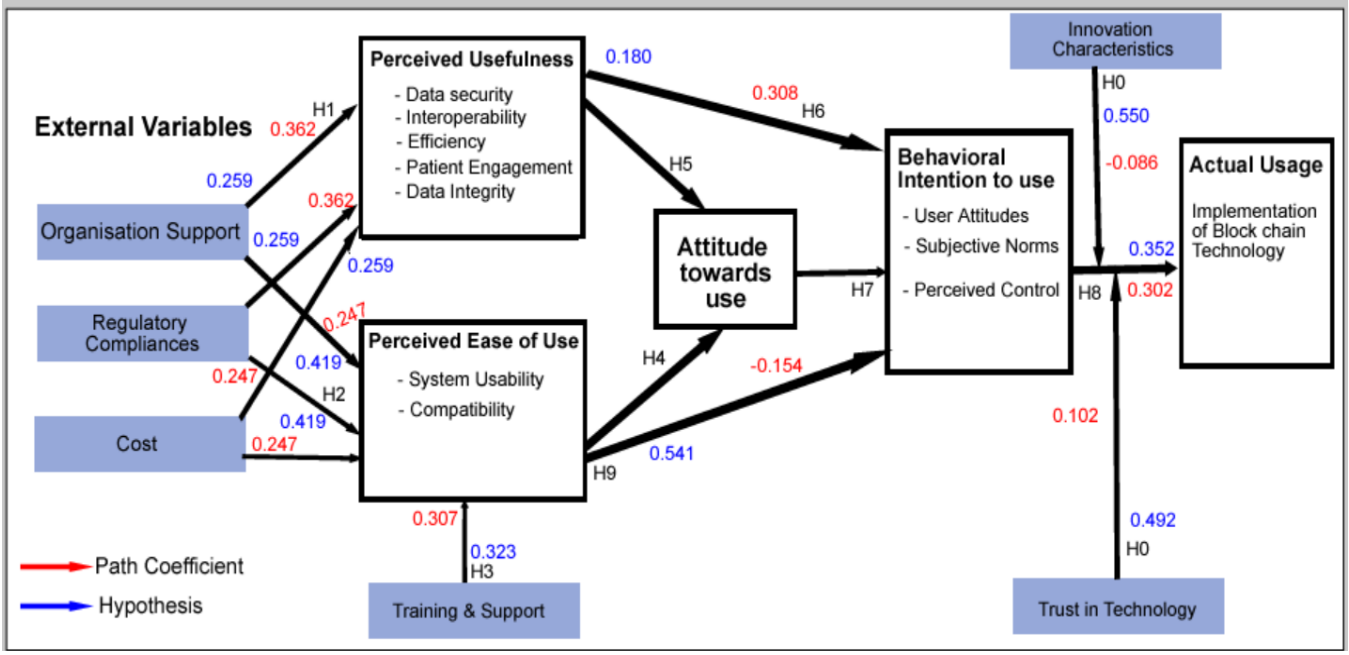
Based on the findings in Table 4.5, Behavioral intention exhibited a significant positive relationship with actual usage (path coefficient = 0.302), suggesting that users' intention to use technology positively influences their actual usage behavior. However, ease of use had a negative impact on behavioral intention (path coefficient = -0.154), indicating that when a technology is perceived as easier to use, it might not necessarily translate into stronger intentions to use it. External variables positively influenced ease of use (path coefficient = 0.247) and perceived usefulness (path coefficient = 0.362), highlighting their role in shaping users' perceptions. Innovation characteristics negatively impacted actual usage (path coefficient = -0.259), implying that certain characteristics of innovation might hinder its adoption. Perceived usefulness positively influenced behavioral intention (path coefficient = 0.308), indicating that the perceived utility of technology enhances users' intentions to use it. Training and support positively affected ease of use (path coefficient = 0.307), emphasizing the importance of adequate support in facilitating

technology adoption. Trust in technology negatively influenced actual usage (path coefficient = -0.268), suggesting that lower levels of trust might deter users from engaging with the technology. Interaction effects such as innovation characteristics x behavioral intention and trust x behavioral intention had relatively smaller path coefficients, indicating less pronounced direct effects on actual usage.

### 4.8 Hypothesis Testing Results

| **Hypothesis** | **T statistics (I0/STDEV)** | **P values** |
|---|---|---|
| $H_a8$: Behavioral Intention positively influences the actual use of block chain technology. | 1.010 | 0.312 |
| Ease of use -> Behavioral Intention | 0.611 | 0.541 |
| External variables -> Ease of use | 0.808 | 0.419 |
| External variables -> Perceived Usefulness | 1.129 | 0.259 |
| Innovation characteristics -> Actual Usage | 0.844 | 0.399 |
| $H_a11$: innovation characteristics have a moderating effect on the relationship between behavioral intention and actual use of technology. | 0.598 | 0.550 |
| $H_a6$: Perceived usefulness positively influences behavioral intention to use block chain technology | 1.342 | 0.180 |
| $H_a3$: Training and support positively influence perceived ease of use | 0.989 | 0.323 |
| Trust -> Actual usage | 1.091 | 0.275 |
| $H_a10$: Trust in a technology moderates the relationship between behavioral intention and actual usage of block chain technology | 0.687 | 0.492 |

## 4.9 Research model



# 4. CHAPTER FIVE

# DISCUSSION OF FINDINGS, RECOMMENDATION, LIMITATIONS, STUDY CONTRIBUTION, FUTURE WORK AND CONCLUSION

## *5.1 Chapter Overview*

This section is the foundation for discussion of findings from the study on the use of block chain technology in healthcare, specifically at Mulago National Referral Hospital. This section explores a comprehensive examination of the gathered data, extracts conclusions from the research, suggests recommendations based on the study's findings, and concludes with a summary.

## 5.2 Discussion of Findings

By combining the empirical findings with ideas from the literature, the discussion that follows clarifies the relationships between factors influencing the use of block chain technology in healthcare. Through the integration of theoretical models and empirical evidence, we provide a comprehensive understanding of the potential benefits and drawbacks of utilizing block chain technology to improve patient record management in the health sector.

### Perceived Utility of Block chain Technology

The study's findings regarding the perceived usefulness of block chain technology for record management carry significant implications. The overwhelmingly positive responses, with a majority of participants agreeing on various aspects, indicate a favorable perception of block chain's utility in enhancing record management processes. As perceived usefulness is a key component of the proposed model, the high level of agreement among respondents strengthens the foundation for the successful adoption and implementation of block chain technology.

Our study aligns with prior research indicating a positive perception of the utility of block chain in patient record management. A previous study by Taherdoost (2023) emphasized the potential benefits of block chain in streamlining data sharing and enhancing security, aligning with our respondents' positive perceptions. Respondents acknowledged the potential advantages, such as streamlined data sharing and enhanced security. This consistency with existing literature strengthens the argument for the transformative potential of block chain in healthcare.

**Perceived Ease of Use**

Contrary to some optimistic literature, the study findings highlighted concerns about the perceived ease of use of block chain technology. Respondents expressed concerns regarding the learning curve, indicating a potential gap between the perceived simplicity in the literature and the practical challenges faced by healthcare professionals. This contradiction highlights the need for a more thorough analysis of training methods and user experience.

**Organizational Dynamics and External Factors**

The study findings reveal a mixed sentiment among respondents regarding organizational support for adopting new technologies like block chain, with 71% expressing neutrality or disagreement. This underscores the necessity for enhanced organizational encouragement to create an environment conducive to technology adoption. Additionally, concerns about resource allocation are prevalent, with 60% expressing dissatisfaction or uncertainty, highlighting the importance of adequate resource provision for successful block chain integration. Respondents also emphasize the significance of valuing and promoting innovations in healthcare systems (52%), underscoring the need for organizational policies that prioritize innovation. Regulatory compliance is deemed crucial by the majority (56%), emphasizing the importance of adhering to healthcare regulations and data privacy laws for secure block chain implementation. Despite concerns about costs, 58% of respondents acknowledge the potential benefits of block chain, indicating a recognition of its long-term value.

Literature extensively discusses the pivotal role of organizational support and regulatory compliance in facilitating block chain adoption (Marengo & Pagano, 2023). The significance of organizational support, regulatory compliance, and resource allocation in our findings echoes established literature. However, the depth of these determinants in influencing the readiness of healthcare institutions to adopt block chain technology provides a nuanced perspective. Our study emphasizes the need to consider these structural factors comprehensively in the context of each healthcare setting.

**Innovation Characteristics and Technological Trust**

Findings revealed a portion of respondents (51%) holds positive views regarding the features and capabilities of block chain technology, indicating its perceived attractiveness as an innovation in healthcare. This recognition suggests an understanding of the potential benefits such as enhanced

data security, interoperability, and transparency within healthcare systems. Moreover, a notable agreement (53%) among respondents regarding block chain's ability to introduce new and improved ways of sharing medical records underscores its potential to streamline information exchange, enhance data interoperability, and foster collaboration among healthcare stakeholders.

Research by Giuliano et al. (2023) underscores stakeholder confidence in the transformative potential of block chain, paralleling our findings on innovation characteristics and technological trust. The findings on innovation characteristics and technological trust echo existing literature, highlighting stakeholder confidence in block chain's transformative potential. Nevertheless, the persistent concerns about interoperability, data security, and regulatory compliance suggest that the healthcare sector demands more robust solutions. This underscores the importance of addressing specific challenges associated with the integration of block chain in healthcare.

### 5.3 Contributions of the study to the body of knowledge

The study aimed to address the challenges associated with electronic health records (EHR) management at Mulago Hospital, Uganda. These challenges included a lack of skilled personnel, inadequate training initiatives, suboptimal record management practices, and deficiencies in storage resources and policies. The overarching goal was to enhance patient record management through the adoption of block chain technology. The study's contribution to the body of knowledge is through;

i. Identification of Key Challenges. This contribution adds to the understanding of the practical obstacles and complexities in healthcare data management, which is valuable knowledge for researchers, practitioners, and policymakers aiming to improve healthcare systems and improve adoption levels.
ii. Innovative Model Development. Developing a tailored model for supporting block chain technology adoption in healthcare enhances the body of knowledge by providing a practical framework for implementing block chain technology in healthcare settings.
iii. Empirical Validation and Insights. Empirical testing and validation of the proposed model offer valuable empirical evidence on the feasibility, effectiveness, and challenges of block chain adoption in healthcare. This contributes to evidence-based decision-making and advances the understanding of block chain technology's real-world applications.

iv. Practical Implications and Recommendations. Offering actionable recommendations and implications based on the study's findings bridges the gap between theory and practice. This contributes practical guidance for stakeholders involved in healthcare information management and technology adoption, ultimately improving healthcare delivery and patient outcomes.

## 5.4 Recommendations of the study

Several important recommendations for the adoption and application of block chain technology for improved patient record management at Mulago Hospital and elsewhere emerge from the thorough analysis of the study's findings and the insights gained from this study.

i. Investment in Comprehensive Training Programs

Mulago Hospital should prioritize the development and implementation of comprehensive training programs aimed at equipping healthcare professionals with the requisite skills and knowledge to effectively utilize block chain technology. These programs should encompass technical training, workflow integration, data management best practices, and security protocols to empower staff members across diverse roles and departments.

ii. Facilitation of Organizational Support

Leadership at Mulago Hospital should actively champion the adoption of block chain technology by providing robust organizational support and fostering a culture of innovation. This entails allocating adequate resources, promoting cross-functional collaboration, and incentivizing staff engagement to facilitate seamless integration and sustained usage of block chain solutions.

iii. Enhancement of Regulatory Compliance Measures

Mulago Hospital must prioritize adherence to healthcare regulations and data privacy laws governing the adoption and utilization of block chain technology. This necessitates the establishment of robust governance models, compliance protocols, and audit mechanisms to ensure alignment with regulatory requirements and safeguard patient confidentiality and data integrity.

iv. Investment in Technological Infrastructure

Mulago Hospital should prioritize investment in robust technological infrastructure to support the seamless integration and scalability of block chain solutions. This includes the deployment of secure data storage systems, interoperable platforms, and scalable architectures capable of accommodating evolving healthcare needs and technological advancements.

v. Collaboration and Knowledge Sharing

Mulago Hospital should actively engage with industry partners, academic institutions, and regulatory bodies to foster collaboration, knowledge sharing, and best practice dissemination in block chain adoption and implementation. By leveraging collective expertise and fostering collaborative networks, Mulago Hospital can accelerate innovation, mitigate implementation challenges, and drive sustainable adoption of block chain technology.

vi. Continuous Evaluation and Iterative Improvement

Mulago Hospital should adopt a culture of continuous evaluation and iterative improvement to monitor the effectiveness, usability, and impact of block chain solutions in patient record management. This entails soliciting feedback from end-users, conducting regular assessments, and leveraging data analytics to identify areas for optimization, refinement, and innovation.

vii. Promotion of User-Centric Design Principles

Mulago Hospital should prioritize the adoption of user-centric design principles to ensure that block chain solutions are intuitive, user-friendly, and aligned with the needs and preferences of healthcare professionals and stakeholders. By placing a premium on usability, accessibility, and user experience, Mulago Hospital can enhance user satisfaction, drive user adoption, and maximize the utility of block chain technology in patient record management.

In summary, the successful adoption and implementation of block chain technology at Mulago Hospital require a holistic approach encompassing technological innovation, organizational readiness, regulatory compliance, and stakeholder engagement. By embracing these recommendations and leveraging the transformative potential of block chain technology, Mulago Hospital can catalyze positive change, enhance operational efficiency, and deliver superior patient care in the evolving landscape of healthcare digitization.

## 5.5 Future work

Future work in the field of block chain technology and healthcare, particularly in the context of patient records management, holds significant promise for advancing research, practice, and innovation. Several avenues for future exploration and development emerge from the findings and insights generated by this study as follows;

- Longitudinal Studies. Conducting longitudinal studies to track the adoption and implementation of block chain technology over time can provide valuable insights into the long-term impact and sustainability of block chain solutions in healthcare settings. Longitudinal research can help uncover trends, patterns, and challenges that may emerge as block chain technology matures and evolves.

- Exploration of Emerging Technologies. As block chain technology continues to evolve, future research can explore the integration of emerging technologies such as artificial intelligence, Internet of Things (IoT), and big data analytics with block chain solutions in healthcare. Investigating synergies between block chain and other cutting-edge technologies can unlock new opportunities for improving patient care, enhancing data security, and optimizing healthcare processes.

- User-Centered Design and Evaluation. Future research should prioritize user-centered design and evaluation methodologies to ensure that block chain solutions in healthcare are intuitive, user-friendly, and aligned with the needs and preferences of healthcare professionals and patients. Incorporating user feedback and conducting usability studies can inform the development of user-centric block chain applications and interfaces.

- Regulatory and Policy Considerations. Given the regulatory complexities and privacy concerns associated with healthcare data, future research should explore the regulatory and policy implications of block chain adoption in healthcare. Investigating regulatory models,

compliance requirements, and data governance practices can help address legal and ethical challenges and ensure the responsible and ethical use of block chain technology in healthcare settings.

- Interoperability and Standards. Interoperability remains a critical challenge in healthcare, and future research efforts should focus on developing interoperable block chain solutions that facilitate seamless data exchange and integration across disparate systems and stakeholders. Standardization efforts aimed at defining common data formats, protocols, and interoperability standards can accelerate the adoption and scalability of block chain technology in healthcare.

- Real-World Implementation and Case Studies. Real-world implementation studies and case analyses are essential for validating the efficacy, scalability, and sustainability of block chain solutions in diverse healthcare settings. Collaborative partnerships between academia, industry, and healthcare providers can facilitate pilot implementations, case studies, and field trials to evaluate the real-world impact of block chain technology on patient outcomes, operational efficiency, and data security.

### 5.6 Study limitations

Despite the valuable insights gained from this study, it is important to acknowledge several limitations that may impact the interpretation and generalization of the findings;

Sample Size and Generalizability: The study's sample size may limit the generalizability of the findings to broader populations within the entire healthcare sector. The sample may not fully represent the diverse perspectives and experiences of healthcare professionals, patients, and other stakeholders across different healthcare settings and regions.

Case study limitations: The research took place within a hospital environment characterized by busy nursing staff and stringent confidentiality requirements, posing significant challenges in accessing essential data pertinent to the study.

## 5.7 Conclusion

By addressing the problem statement and objectives of the study, the research makes significant strides towards enhancing patient record management at Mulago Hospital. The developed model, informed by empirical findings and aligned with the study's objectives, serves as a valuable resource for healthcare institutions seeking to leverage block chain technology for improved EHRs management. The purpose of this study was to explore the adoption of block chain technology for enhanced patient record management at Mulago Hospital. The journey through the exploration has unveiled significant insights, challenges, and opportunities. In conclusion, several key observations emerge, underscoring the transformative potential and complexities associated with the adoption of block chain solutions in healthcare settings.

Transformational Potential: The study underscores the transformational potential of block chain technology in revolutionizing patient record management, enhancing data security, interoperability, and accessibility, and fostering greater transparency and trust within the healthcare ecosystem. The immutable nature of block chain ledgers offers unparalleled opportunities for secure, decentralized data management, and streamlined information exchange, promising to revolutionize traditional healthcare systems and practices.

Challenges and Barriers: Despite its promise, the adoption of block chain technology in healthcare faces multifaceted challenges and barriers. These include technical complexities, interoperability issues, regulatory uncertainties, privacy & security concerns, and cultural resistance to change. Addressing these challenges requires a concerted effort from healthcare institutions, policymakers, industry stakeholders, and regulatory bodies to foster an enabling environment conducive to block chain adoption and innovation.

Need for Comprehensive Strategies: The successful adoption and implementation of block chain technology necessitate the development and implementation of comprehensive strategies encompassing technological infrastructure investments, organizational readiness assessments, regulatory compliance models, capacity-building initiatives, and stakeholder engagement programs. By adopting a holistic approach and leveraging multidisciplinary expertise, healthcare institutions can navigate the complexities of block chain adoption and harness its transformative potential to drive meaningful change and improve patient outcomes.

In conclusion, the journey towards block chain-enabled healthcare represents a paradigm shift towards a more secure, transparent, and patient-centric healthcare ecosystem. While challenges and uncertainties abound, the transformative potential of block chain technology offers a beacon of hope for revolutionizing patient record management, enhancing data security, and improving healthcare outcomes. As we embark on this transformative journey, let us embrace innovation, collaboration, and resilience to realize the promise of block chain technology in shaping the future of healthcare delivery and advancing the well-being of patients worldwide.

Overall, the findings underscore the importance of trust as a critical factor influencing the adoption and acceptance of block chain technology in healthcare. As healthcare organizations continue to explore block chain solutions, fostering trust among stakeholders and ensuring transparent communication about the benefits and capabilities of block chain technology will be essential for successful implementation and integration into existing healthcare systems. In summary, the findings above underscore the multifaceted nature of organizational factors influencing block chain adoption, emphasizing the importance of proactive organizational support, resource allocation, innovation culture, regulatory compliance, and cost justification in fostering successful technology integration in healthcare environments.

The results above underscore the importance of prioritizing the development and implementation of comprehensive training programs and efficient technical support systems to facilitate the successful integration of block chain technology into healthcare workflows. By addressing these key areas, healthcare organizations can empower their staff with the knowledge and skills needed to leverage block chain technology effectively, thereby enhancing the quality and efficiency of patient care delivery.

The findings underscore the perceived value of block chain technology as an innovative solution for addressing longstanding challenges in healthcare data management and exchange. By leveraging the unique features and capabilities of block chain, healthcare organizations can enhance data security, streamline workflows, and improve patient outcomes.

Overall, the results suggest a growing recognition of block chain technology as a transformative innovation with the potential to revolutionize healthcare delivery. By embracing block chain and exploring its applications in various healthcare domains, organizations can position themselves at the forefront of innovation and drive positive change in the healthcare landscape.

In conclusion, the findings suggest a diverse range of views within the workforce at Mulago Hospital. These varying perspectives highlight the importance of targeted strategies, such as comprehensive training and support programs, to address the specific concerns and needs of different staff members during the implementation of block chain technology.

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## APPENDICES

### APPENDIX I: Research timeline

| Duration | Research activity | Description |
|---|---|---|
| Week 1-2 | Literature Review | A comprehensive review will be conducted on existing literature on block chain technology and its potential applications in healthcare settings |
| Week 3-4 | Research Design | This will be developed including specific research questions, research methods, and a timeline for the project |
| Week 5-6 | Data collection | This will be done by using a chosen research method to collect data which is structured questionnaires, and observations, and organizing data for analysis. |
| Week 7-8 | Data Analysis | This will be done by analyzing the data using appropriate statistical or qualitative methods depending on questions and methods and identifying key findings and patterns in the data. |
| Week 8-10 | Interpretation of findings | This is where will be able to interpret the findings in light of the research questions and existing literature and draw conclusions and implications for the adoption of block chain technology in Mulago referral hospital. |
| Week 11-12 | Writing research findings | writing and presentation were a write-up of the research findings and conclusions in a formal paper and a presentation to communicate the findings to stakeholders at Mulago referral hospital |
| Week 13-14 | Revision of the research report | Review and Revision of the research report based on feedback from stakeholders and reviewers and ensure reports meet required formatting and citation guidelines |
| Week 15 | Report Submission | This will involve finalization and submission to the relevant authorities |

**APPENDIX II: BUDGET**

| No | Item Description | **Objective** | Amount (UGX) |
|---|---|---|---|
| 1 | Laptop | To write the proposal, analyze data, and report writing | 2,500,000 |
| 2 | Printing & Stationery | To print questionnaires, proposals and report for submission | 500,000 |
| 3 | Data collection travel expenses | To visit Mulago National Referral Hospital for data collection | 4,000,000 |
| 4 | Internet (Data bundles) | To research online for literature | 500,000 |
| 5 | Miscellaneous | To cater for any extra items on the budget | 750,000 |
| | **Total** | | **8,250,000** |

## APPENDIX III: QUESTIONNAIRE

## A QUESTIONNAIRE SURVEY FOR THE STUDY ON ADOPTION OF BLOCK CHAIN TECHNOLOGY TO ENHANCE PATIENT RECORDS MANAGEMENT: A CASE OF MULAGO NATIONAL REFERRAL HOSPITAL

Dear Participant,

The use of Information and Communication Technologies (ICTs) in managing health records has significantly enhanced the healthcare landscape. These technologies have the potential to streamline patient data management, improve healthcare delivery, and enhance data security. However, the security of electronic health records in public hospitals remains a critical concern. In light of this, this study seeks to explore the factors affecting the adoption of innovative solutions to address these challenges. Specifically, we aim to investigate the current state of Electronic Health Records (EHR) implementation at Mulago National Referral Hospital, examining their functionality and the challenges faced within the hospital's healthcare system. Subsequently, we aim to design a model for the successful adoption of block chain technology within the context of Mulago National Referral Hospital, focusing on enhancing patient records management. The study also aims to evaluate the effectiveness of the proposed block chain model in addressing the identified challenges and improving patient records management at Mulago National Referral Hospital, providing valuable insights for future healthcare technology initiatives. Your valuable input as a participant will contribute significantly to this research, and we greatly appreciate your participation

You have been selected to participate in this study. This questionnaire is designed to gather your thoughts, opinions, and perceptions regarding the adoption of block chain technology to enhance patient records management, by investigating the factors influencing the current state of Electronic Health Records (EHR) implementation by examining their functionality and challenges faced within the hospital's healthcare system.

Your responses will remain confidential and used solely for research purposes.

Thank you for your time and participation in this study.

**Section A: Profile of participants (please tick where appropriate)**

1. Select your age category

18-25 ☐ 26-30 ☐ 31-40 ☐ 41-50 ☐ 50 and above ☐

2. What is your Gender?

Male ☐ Female ☐

3. Highest level of formal education attained: Certificate ☐ Diploma ☐

Bachelors ☐ Masters ☐ PhD ☐ Others ☐ ……

4. What is your role? Please tick where applicable below;

Doctor ☐ Specialist ☐ Clinical Officer IT Specialist ☐

Other categories of staff ☐ ……

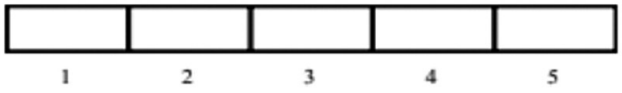
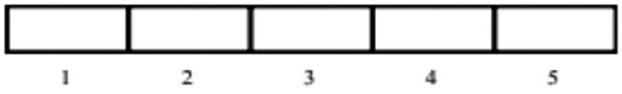
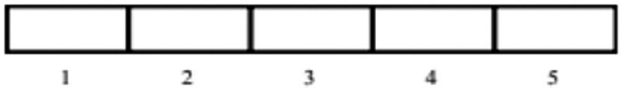
5. For how long have you worked in the position selected in question 5 above?

Less than 2 years ☐ 2-5 years ☐ 5-10 years ☐ 10 and above years ☐

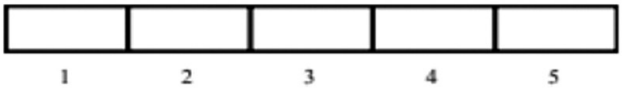
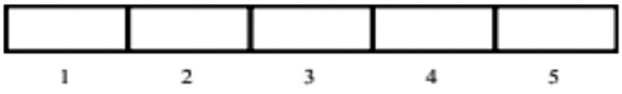
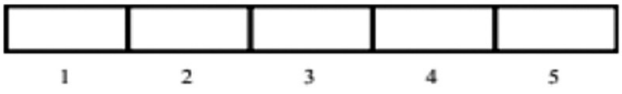
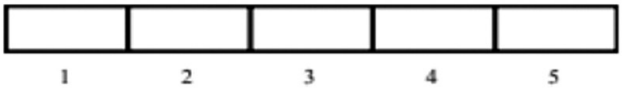
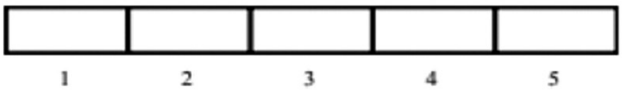
**Section B: Designing a Block Chain Implementation Model**

1. **Item scale for perceived usefulness toward the adoption of block chain technology**

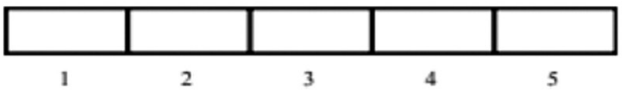
| **Item no.** | **Candidate item for a measure of perceived usefulness** | **Strongly Disagree** **Strongly Agree** |
|---|---|---|
| 1 | Using block chain technology in records management would enable me to accomplish tasks more quickly | ☐ ☐ ☐ ☐ ☐<br>1 2 3 4 5 |
| 2 | Using block chain technology would improve performance in records management | ☐ ☐ ☐ ☐ ☐<br>1 2 3 4 5 |
| 3 | Using block chain technology in records management would increase productivity | ☐ ☐ ☐ ☐ ☐<br>1 2 3 4 5 |

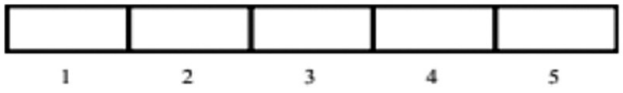
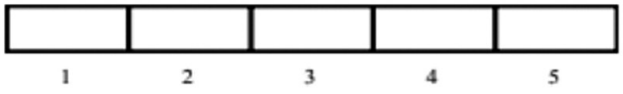
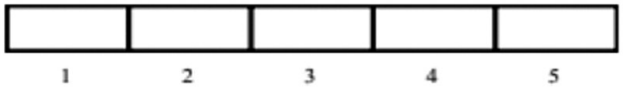
| | | |
|---|---|---|
| 4 | Using block chain technology in records management would enhance the effectiveness |  |
| 5 | Using block chain technology would make it easy to manage patient records |  |
| 6 | |  |

**2. Item scale for perceived ease of use towards block chain technology.**

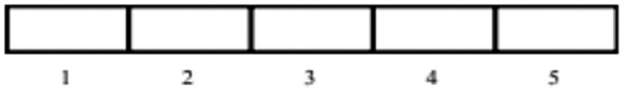
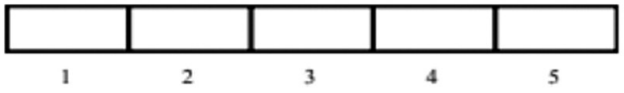
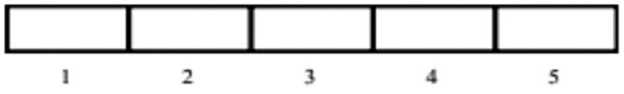
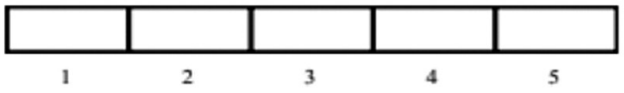
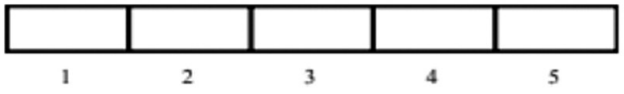
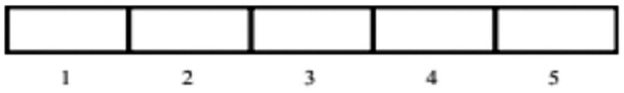
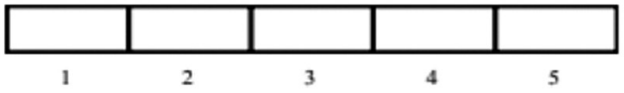
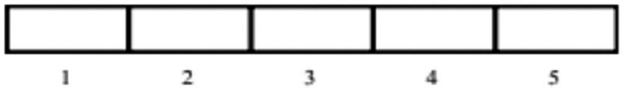
| **Item no.** | **Candidate item for the measure of perceived ease of use** | **Strongly Disagree Strongly Agree** |
|---|---|---|
| 1 | Learning to operate block chain technology would be easy for staff |  |
| 2 | Staff would find it easy to get block chain technology to do what they need it to do |  |
| 3 | The interaction with block chain would be clear and understandable |  |
| 4 | Staff would find block chain technology to be flexible in interacting with |  |
| 5 | It would be easy for staff to become skillful at using block chain |  |

**3. Item scale for behavioral intention to use**

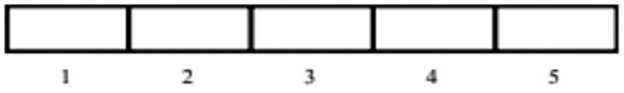
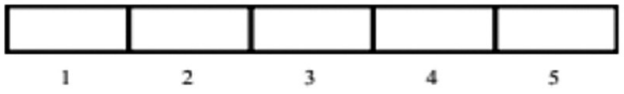
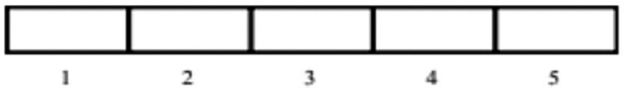
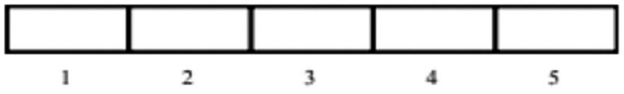
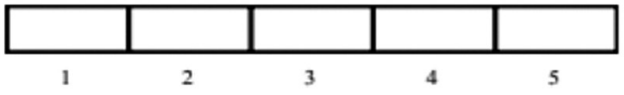
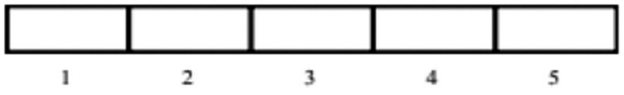
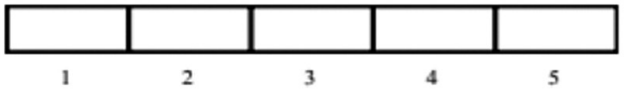
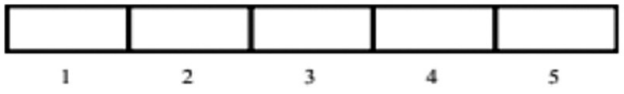
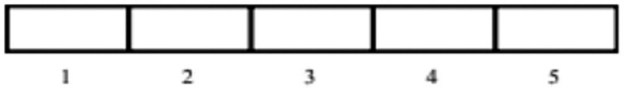
| **Item no.** | **Candidate item for a measure of behavioral intention to use** | **Strongly Disagree Strongly Agree** |
|---|---|---|
| 1 | Staff will consider using this service |  |

| | | |
|---|---|---|
| 2 | I plan to use this service |   |
| 3 | I will continue to use this service |   |
| 4 | I will inform others of the goodness of this service |   |

**4. Item Scale for Actual Usage**

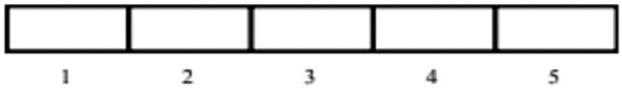
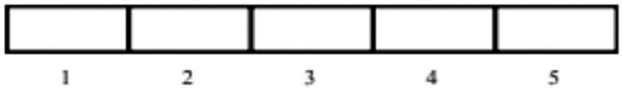
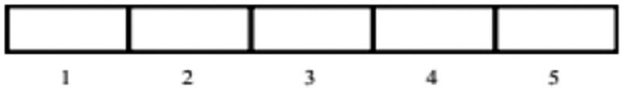
| **No** | | **Strongly Disagree** **Strongly Agree** |
|---|---|---|
| 1. | I think I would like to use this system frequently |   |
| 2. | I will need technical support to be able to use the system. |   |
| 3. | I think the system will be very easy to use |   |
| 4. | I felt very confident using the system |   |
| 5. | I feel confident in the security and privacy of the adopted system |   |
| 6. | I think the use of block chain technology has streamlined the sharing of medical records among healthcare providers |   |
| 7. | I think block chain technology will play a significant role in the future of healthcare. |   |
| 8. | I am concerned with potential risks and challenges associated with the use of block chain technology in healthcare |   |

**5. Item Scale for external variables**

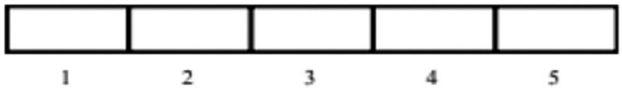
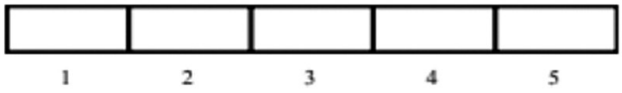
| No | | Strongly Disagree Strongly Agree |
|---|---|---|
| 1. | The organization support encourages and supports the adoption of new technologies like block chain |   |
| 2. | The organization provides the necessary resources for the implementation of block chain technology. |   |
| 3. | The organization should value and promote innovations in healthcare systems. |   |
| 4. | The organization should adhere to all healthcare regulations and data privacy laws. |   |
| 5. | The organization should implement legal models to support block chain adoption. |   |
| 6. | The organization should actively maintain compliance with relevant healthcare laws. |   |
| 7. | The cost associated with implementing block chain technology is justified by the potential benefits. |   |
| 8. | The organization should allocate a reasonable budget for the adoption of block chain. |   |
| 9. | The costs associated with block chain implementation are reasonable for the organization. |   |

**Item Scale for Training & Support**

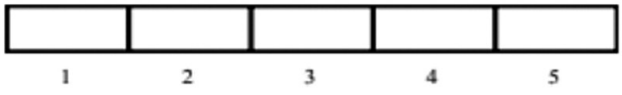
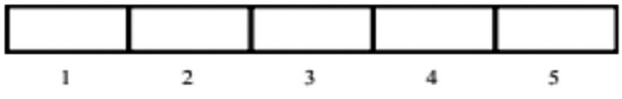
| No | | Strongly Disagree Strongly Agree |
|---|---|---|

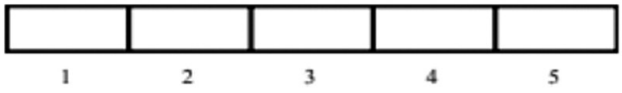
| | | |
|---|---|---|
| 1. | Adequate training programs are available for healthcare professionals to understand and use block chain technology. |  |
| 2. | The organization should offer efficient technical support for any issues related to block chain technology. |  |
| 3. | Training and support mechanisms enhance the confidence of healthcare professionals in using block chain. |  |

**Item Scale for Innovation Characteristics**

| **No** | | **Strongly Disagree** **Strongly Agree** |
|---|---|---|
| 1. | The features and capabilities of block chain technology make it an attractive innovation for healthcare. |  |
| 2. | Block chain technology introduces new and improved ways of sharing medical records among healthcare providers. |  |

**Item Scale for Trust in Technology**

| **No** | | **Strongly Disagree** **Strongly Agree** |
|---|---|---|
| 1. | I trust that block chain technology ensures the security and privacy of medical records. |  |
| 2. | I have confidence in the ability of block chain technology to streamline medical data sharing among healthcare providers. |  |

| | | |
|---|---|---|
| 3. | I trust that block chain technology will play a significant role in the future of healthcare. |  |

UGANDA CHRISTIAN UNIVERSITY
A Centre of Excellence in the Heart of Africa

**SCHOOL OF RESEARCH & POSTGRADUATE STUDIES**
**DISSERTATION CORRECTION COMPLIANCE FORM (POST VIVA FORM)**

Date:
Name of Candidate: **SSEGGUJJA RONALD** Reg.No: **KS22M10/003**

Title of Dissertation: **ADOPTION OF BLOCKCHAIN TECHNOLOGY TO ENHANCE PATIENT RECORDS MANAGEMENT: A CASE OF MULAGO NATIONAL REFERRAL HOSPITAL**

| S/N | COMMENTS BY EXTERNAL EXAMINER | ACTION TAKEN | INDICATOR |
|---|---|---|---|
| 1 | It is better for the candidate to structure the background under:<br>i. Global perspective: How is your problem area on a global scale?<br>ii. Regional perspective: How is it regionally speaking<br>iii. National perspective: How is the situation from a national point of view? | The background was edited and structured in 3 perspectives that are Global perspective, Regional perspective, and National perspective as indicated on pages 3 and 4 based on the problem area. | Background Pages 3 and 4 corrected. |
| 2 | It is clear that the candidate understands the problem at hand. However, the in-text citation is missing. Most of the claims don't belong to the writer/candidate and should therefore be referenced. | More Citations were added in the problem statement on each sentence as required on page 5 | Page 5: Problem statement corrected |
| 3 | The literature review section is lacking. The literature should be linked at all times to the purpose and rationale of the study. I encourage the candidate to revise all sections and develop a more thoughtful review. Use the summary section to clearly articulate how the literature described extends our knowledge. For example, describe how your work contributes to block chain technology and/or patient records management | A literature review section on pages 10, 13, 14, 15, 16, 17, and 18 was edited, and the literature linked to the purpose rationale of the study as required and also showed how work contributes to block chain technology to enhance patient records management on page 57 | Chapter 2: Literature Review. pages 10, 13, 14, 15, 16, 17, 18 were edited<br><br>contributions added on page 57 |

| | | | |
|---|---|---|---|
| 4 | The candidate needs to explain all his results in Chapter 4. Remember, this is a presentation, analysis, and discussion of results. The candidate presents his results without explaining the significance of the figures/tables presented. | The results were explained in Chapter 4 on pages 41, 42, 43, 44, 45, 46, 47,48, 49, 50 | Chapter 4: Significance explained. presented well on pages 41, 42, 43, 44, 45, 46, 47,48, 49, 50 |
| 5 | The candidate should clearly present the recap of the problem and objectives of the study, and then discuss his major contribution(s) in relation to the objectives stated. This should be done in the last chapter of your work. | The recap was added in the conclusion section on page 52 | Chapter 5: Conclusion, Recap added on page 52 |

| S/N | COMMENTS BY INTERNAL EXAMINER | ACTION TAKEN | INDICATOR |
|---|---|---|---|
| 1 | The candidate is to change the research question to clearly show what you're trying to implement that is from How can a comprehensive model be designed for the successful implementation of blockchain technology at Mulago National Referral Hospital?<br><br>To<br><br>How can block chain technology be effectively implemented at Mulago National Referral Hospital? | The research questions were edited and changed to How can block chain technology be effectively implemented at Mulago National Referral Hospital? On page 6 | Research Objective on page 6 |
| 2 | The candidate should consider also the challenges of implementing blockchain technology before implementing and also consider the security of blockchain technology because it also has security issues that need to be addressed. | These are considered on pages 15, 16, and 17. | Pages 15, 16, and 17 corrected |
| 3 | The candidate should consider testing the model based on data corrected. | The model was tested using spss/Excel having results of Path Coefficient and testing hypotheses results presented in the report on pages 53 and 54. | Presentation and Interpretation stage on pages 53 and 54 |

| S/N | COMMENTS BY VIVA VOCE PANNEL | ACTION TAKEN | INDICATOR |
|---|---|---|---|
| 1 | Clearly show your contribution of the research to the body of knowledge. | Contribution has been modified on page 57 and page 58 | Chapter 5: Discussion of Findings and |

| | | | |
|---|---|---|---|
| | | | Recommendations pages 57 and 58. |
| 2 | Clearly represent variables in the model, state the specifications of your model, and indicate the changes that your model offers/brings. | The variables have been clearly shown drawn from the designed model and specifications of the model have been clearly shown as well as changes that the study model offers on pages 23, 24 and 25 | The conceptual model on Pages 23, 24, and 25 is well represented. |
| 3 | | | |

Candidate's Name

SSEGGUJJA RONALD

Signature 

Supervisor's Name/ Signature

DR. IRENE ARINAITWE

**NB: Post Viva compliance form is designed to capture all the corrections recommended by the internal examiner (supervisor), external examiner and viva panel.**