OPPORTUNITIES AND CHALLENGES OF HARNESSING CLOUD COMPUTING OF E-GOVERNMENT IN MALAWI

MASTER OF SCIENCE (INFORMATICS) THESIS

By

HENRY ANDREWS KAPASUKA

BSc (Computer Science)- DMI St. John the Baptist University

Submitted to the School of Natural & Applied Sciences, in partial fulfillment of the requirements for the degree of Master of Science (Informatics)

UNIVERSITY OF MALAWI

AUGUST 2024

DECLARATION

I, the undersigned hereby, declare that the text of this thesis titled: OPPORTUNITIES AND CHALLENGES OF HARNESSING CLOUD COMPUTING OF E-GOVERNMENT IN MALAWI is my own original work which has not been submitted to any other institution for similar purposes. Where other people's work has been used acknowledgements have been made.

Henry Andrews Kapasuka

Student Name

Signature

5th August 2024

_____

Date

CERTIFICATE OF APPROVAL

I, the undersigned certify that this thesis represents the student's own work and effort and has been submitted with our approval. We recommend to the Postgraduate Studies and Research Committee and the Senate for acceptance of this thesis titled OPPORTUNITIES AND CHALLENGES OF HARNESSING CLOUD COMPUTING OF E-GOVERNMENT IN MALAWI submitted by HENRY ANDREWS KAPASUKA in partial fulfillment of the requirements for the degree of Master of Science in Informatics.

5th August 2024

Patrick Albert Chikumba, PhD (Senior Lecturer) Date

Main Supervisor

Malawi University of Business and Applied Sciences, School of Science and Technology, Department of Computer Science and Information Systems

DEDICATION

This thesis is dedicated to my beloved wife, Jacqueline Kapasuka, for her constant reminders and support during my school assignments and exam preparations. To my mother, sisters, and friends, thank you for your unwavering encouragement and support throughout my journey

ACKNOWLEDGEMENTS

I am grateful to the almighty God for the gift of life and wisdom bestowed upon me. I would like to express my deepest gratitude to Dr. Patrick Chikumba, Senior Lecturer at the Malawi University of Business and Applied Sciences (MUBAS), for his unwavering support and valuable advice during my studies.

Furthermore, I would also like to extend my sincere thanks to the Department of eGovernment, Immigration, Malawi Revenue Authority, and all government ministries and departments for their assistance during data collection and interviews.

Let me take also this opportunity to thank my beloved wife, Jacqueline Kapasuka, for her constant reminders and support during my school assignments and exam preparations. To my mother, sisters, and friends, thank you for your unwavering encouragement and support throughout my journey.

ABSTRACT

This study examines the opportunities and problems of adopting cloud computing technologies for e-government and in Malawi. The study intends to examine the possible benefits and challenges associated with harnessing these digital breakthroughs to improve governmental operations and service delivery in the country. The research investigates the current landscape of e-government projects and cloud computing adoption in Malawi using a mixed-methods approach that includes surveys, interviews, and a literature review.

According to the findings, using e-government platforms has the potential to dramatically increase administrative efficiency, transparency, and accessibility of public services. Additionally, cloud computing provides scalable, cost-effective solutions for data storage, processing, and collaboration among government departments. However, the report notes several constraints, such as insufficient internet infrastructure, data security concerns, capacity building requirements, and regulatory frameworks that must be addressed to fully realize the potential of these technologies.

The in-depth examination into the dynamics of e-government adoption and the integration of cloud computing technologies inside Malawi's governmental structure yielded crucial insights into the current condition and prospective future development routes such as Knowledge of e-Government Services, Economic Potential and Empowerment and Policy and Strategy Implications. Future research endeavors should encompass longitudinal studies to monitor the impact of implemented strategies over time, exploring innovative approaches to augment awareness and inclusivity in e-government services. Long-term assessments of economic impacts and the efficacy of implemented strategies would be beneficial for refining policies and strategies.

Keywords: E-government, cloud computing, technology adoption, administrative efficiency, transparency, data security, socio-economic growth

Table of Contents

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

GDPR	General Data Protection Regulation
ICT	Information and Communication Technology
IFMIS	Integrated Finance Management Information System
IMF	International Monetary Fund
IaaS	Infrastructure as a Service
IT	Information Technology
MRA	Malawi Revenue Authority
PaaS	Platform as a Service
PPDA	Public Procurement and Disposal of Assets
SaaS	Software as a Service
SMEs	Small and Medium-sized Enterprises
SLAs	Service Level Agreements
TOE	Technology-Organization-Environment
UTAUT	Unified Theory of Acceptance and Use of Technology

CHAPTER 1: INTRODUCTION

This chapter introduces the thesis titled Opportunities and Challenges of Harnessing Cloud Computing of E-Government in Malawi. The chapter presents the background information which is followed by the problem statement, aim and objectives of the study, research questions and significance of the study. The chapter ends with the structure of thesis.

1.1 Background

The field of Information and Communication Technology (ICT) is significantly impacted by the disruptive power of cloud computing (Müller et al., 2015). Through internet platforms, cloud computing offered a new way to approach computing by providing effective communication and storage resources in a safe environment (Almarabeh et al., 2016). According to Lahiri and Moseley (2013), cloud computing protects end users from the complexities of the underlying computing technology while enabling quick file and data storage and convenient access to information and software resources. As a dependable and effective cost-cutting tool, clouding computing has been widely adopted by both public and commercial institutions (Hassan et al., 2022).

Mina et al. (2019) highlighted how difficult it is to pinpoint the essential features of cloud computing. According to the National Institute of Standards and Technology, cloud computing is defined as "a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction," (Mell & Grance, 2011).

In this study, two key concepts are involved: cloud computing and e-government. According to Bannister and Connolly (2012), e-government is the application ICTs to support a range of public services, government administration, democratic processes, and relationships between citizens, civil society, the private sector, and the state. According to Mohammed et al. (2017), there were a number of potential advantages of cloud computing for e-government, including cost savings, scalability, simplicity of deployment, accessibility, large storage capacity, access to IT capabilities, and the removal of maintenance and procurement costs. However, public administration has been slow to adopt cloud computing compared to commercial enterprises, particularly in underdeveloped countries. Despite the obstacles presented by infrastructure limitations, limited

innovation, and bureaucracy, public administrations have begun investigating cloud computing services.

ICT was deemed a driving factor for the public sector when e-government efforts were implemented in Malawi in 2004 (Mwambiwa, 2016). However, there were still issues with e-government implementation in underdeveloped nations like Malawi, such as expensive infrastructure development costs and a lack of human resources with the necessary skills (Mtingwi & Van Belle, 2013). Even with international support from institutions like the World Bank and the International Monetary Fund, many developing nations experienced difficulty implementing e-government (Ziba & Kang, 2020).

The study context was Malawi which is a landlocked country in Southern Africa. Malawi is bordered by Zambia to the west, the United Republic of Tanzania to the north and northeast, and Mozambique to the east, south and southwest. Malawi spans over 118,484 km2 and has an estimated population of 21,000,000. Malawi has four cities namely Lilongwe (capital and largest city), Blantyre (the second largest), Mzuzu (the third largest), and Zomba (the fourth largest and former capital).

1.2 e-Government Department and Other Departments

In Malawi, there are government ministries, departments and agencies (MDAs) which have been using various ICT solutions to deliver government services. Some digital systems are being hosted on the cloud. Below are some MDAs which were involved in this study.

The e-Government Department: This Department was established to lead, coordinate and manage ICT development at all levels and MDAs, including the delivery of innovative and efficient e-government solutions and services for the improvement of delivery of public services and maximizing impact of ICTs on the achievement of Malawi 2063 goals. The e-Government Department consists of five sections namely; Government Network Infrastructure, Application Development Support, Policy Planning Research, ICT Training and Administration.

The Malawi Revenue Authority (MRA): The Malawi Revenue Authority (MRA) administers and collects taxes. Its principal purpose is to ensure compliance with tax laws and regulations

while also promoting economic development through revenue creation. MRA provides online services for taxpayers, including registration, return filing, payment processing, and access to tax information and resources. MRA uses cloud computing to safely host their web platforms and tax administration systems. Cloud technologies allow for scalability, flexibility, and cost-efficiency in managing huge volumes of taxpayer data and transactions.

Public Procurement and Disposal of Assets Authority (PPDA): The PPDA regulates public procurement and asset disposal to promote transparency, fairness, and efficiency in government transactions. It oversees public procurement laws and procedures. The PPDA offers online portals for procurement registration, tender notices, bid submissions, and contract management. These services make the procurement process more efficient and accessible to suppliers and government entities. PPDA may use cloud technologies to host procurement portals and manage data securely. Cloud solutions provide scalability and accessibility, enabling stakeholders to interact and access procurement data from anywhere.

Mlambe One-Stop Shop: Mlambe One-Stop Shops are centralized service centers that offer government services to individuals and companies. These services could include business registration, licensing, permit issuance, and information provision. Mlambe One-Stop Shops provide integrated e-Government services, enabling individuals and businesses to access various government services from a single platform. This technique streamlines service delivery and increases citizen convenience. Cloud computing infrastructure can host Mlambe One-Stop Shop platforms, providing efficient service delivery and data management. Cloud-based solutions promote collaboration across multiple government entities and assure data security and accessibility

District Commissioner's Offices: District Commissioners Offices are administrative institutions that represent the government and coordinate development programs and services in their areas. District Commissioners Offices can provide online services for citizen involvement, including reporting complaints, viewing local government information, and participating in community development projects. Cloud computing allows District Commissioners Offices to provide digital platforms for community interaction and administrative tasks. Cloud technologies facilitate data

storage, collaboration, and communication, increasing the efficiency and efficacy of district-level government.

Ministry's role: Government departments oversee certain sectors or areas of governance, including Agriculture, education, health, finance, and infrastructure. They create policies, implement programs, and oversee operations in their particular sectors. Ministries provide online services for their areas of responsibility, including information distribution, application processing, service delivery, and policy changes. Ministries use cloud computing to host departmental websites, manage data, and provide online services. Cloud solutions fulfill the scalability, dependability, and security requirements of ministry operations, enabling effective service delivery and information access for citizens and stakeholders.

1.3 Why e-Government and Cloud Computing in Malawi

Like many other developing nations, Malawi is working to close the digital divide and boost its technical development. Adoption of technology has the potential to fundamentally alter public service delivery, economic growth, and governance. With its scalable and affordable infrastructure, cloud computing has the power to completely transform the way government services are provided, increasing their effectiveness and accessibility—especially in underserved and remote locations. Improving the lives of residents requires effective government operations. Malawi can improve service delivery, minimize bureaucratic bottlenecks, and streamline its administrative procedures by implementing e-government technologies. To ensure that e-government and cloud computing are utilized to the fullest extent possible, it is essential to comprehend the policies, plans, and data protection measures associated with these technologies. Inclusive growth and development are crucial to lowering poverty and raising everyone's standard of living in a developing nation like Malawi. Cloud computing and e-government can encourage inclusive development by increasing service accessibility for isolated and neglected populations.

However, a trained workforce is necessary for the development and deployment of cloud computing and e-government technologies. Like many other poor countries, Malawi has difficulties because of a lack of technical know-how. Hence, development partners and international organizations are essential to this process for external expertise and other resources.

1.4 Problem Statement

A viable approach to e-government architecture implementation that improved service delivery, effectiveness, and user happiness was provided by cloud computing. The adoption of e-government was made necessary by the critical role it played in managing information for government operations. However, a number of obstacles, such as poor IT infrastructure, budgetary limitations, a lack of support from upper management, and worries about data security, made it difficult to successfully adopt e-government services in developing nations (Mtingwi & Van Belle, 2013). Hence, this study was to evaluate the potential and difficulties of using cloud computing for Malawian e-government. It specifically looked into whether Malawi's government regulations and policies around cloud computing in e-government established a favorable environment for success and suggested best practices for cloud computing deployment.

1.5 Aim and objectives of the Study

This study aims to perform a comprehensive analysis into the complex landscape surrounding the adoption of cloud computing technologies for e-government in Malawi.

To achieve this aim, the following were objectives.

1. Examine existing policies and regulatory frameworks related to e-government and cloud computing.
2. Identify policy opportunities and gaps that needed to be addressed for the successful adoption of cloud computing by the Malawi government.
3. Explore key strategies employed in the adoption of cloud computing in e-government.

1.6 Research Questions

This study addressed the following research question:

> How is the landscape surrounding the adoption of cloud computing technologies for e-government in Malawi?

1.7 Significance of the study

As a developing nation, Malawi has particular potential and problems as it works to improve the well-being of its citizens through e-government and technology projects. The research holds importance as it has provided insights into how e-government and cloud computing can contribute significantly to the socio-economic advancement of a country, especially when infrastructure is underdeveloped, resources are scarce, and service delivery needs are urgent as the situation in Malawi. In summary, this study is very important when considering Malawi's attempts to use technology to improve the lives of its people. It has the power to influence international cooperation, direct the distribution of resources, and inform policy decisions—all of which can support the country's sustainable development and raise the standard of living for its people.

1.8 Structure of Thesis

The rest of the thesis is as follows. Chapter 2 discusses the related literature and theoretical frameworks adapted in this study. Chapter 3 discusses the research methodology including data collection and analysis techniques. The research findings are presented in Chapter 4 which is followed by the research discussions in Chapter 5. The thesis ends with study conclusions and recommendations.

CHAPTER 2: RELATED LITERATURE AND CONCEPTUAL FRAMEWORK

The adoption of cloud computing in the public sector represents a paradigm change that goes beyond the traditional landscape of government service delivery and resource management. This disruptive evolution represents more than just a technology advancement; it represents a fundamental restructuring of governance, altering how individuals interact with public services and how government organizations optimize their operations as echoed by (Korinek et al., 2021). This chapter engages on a scholarly inquiry that goes beyond the surface-level evaluation of technical implementations and goes deep into the theoretical frameworks that delicately guide the strategic adoption of technical advancements within the complicated web of governmental structures and regulations. It further provides a comprehensive understanding of the opportunities, challenges, and implications that arise with the convergence of e-government initiatives and cloud computing technologies in the context of Malawi's socio-political and technological landscape.

2.1 Cloud Computing Models

Understanding the delicate relationship between cloud computing and e-governance necessitates a thorough investigation that digs deep into the rich tapestry of existing literature on the underlying principles of cloud computing. As a novel technology paradigm, cloud computing comprises a vast ecosystem that includes a plethora of concepts, models, architectures, and deployment methodologies. Cloud computing models are Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS) which are described in the subsequent sections including their distinct functionalities, benefits, and limitations in the context of e-governance.

Software as a Service (SaaS) is a cloud computing business model that offers internet-accessible software applications. Organizations in the public sector find this model especially appealing since it does away with the need for lengthy program installations and upgrades, which lowers the expense and complexity of software management. SaaS can be used by public sector organizations for a variety of tasks, including customer relationship management, office productivity tools, and collaboration platforms (Attaran & Woods, 2018). SaaS is an invaluable resource for government organizations looking to cut costs on IT and simplify operations due to its scalability and ease of use.

Developers can create, launch, and maintain applications with the help of Platform as a Service (PaaS), which offers a complete platform and environment. In the public sector, where specialized applications and solutions must frequently be developed to fulfill particular government duties, PaaS is quite pertinent. PaaS can be used by public sector enterprises to develop and implement applications for public safety, data analytics, and citizen engagement (Sackey, 2018). PaaS provides an organized development environment that makes it easier to create solutions that are specifically designed to meet the requirements of government organizations.

Cloud-delivered virtualized computer resources, such as servers, storage, and networking, are known as Infrastructure as a Service (IaaS). IaaS is advantageous to public sector businesses because it allows them to host vital services and infrastructure without making significant investments in physical hardware. With the help of this model, governments may adapt their infrastructure to changing demand and maintain economical resource management. To enhance efficiency and accessibility of data storage, public sector organizations can leverage IaaS to host databases, websites, and applications (George & Fernando, 2023). Because of its scalability and flexibility, IaaS can meet the resource needs of government organizations, particularly when handling large-scale projects or unexpected surges in service requests.

2.2 E-Government and Cloud Computing Adoption

In today's public administration scene, the integration of E-Government and cloud technology is a transformational force; changing how governmental services are delivered and administered. E-Government collides with cloud computing, resulting to a model that provides flexible and on-demand access to shared computing resources through the internet (Muda et al., 2020). They represent a new era of governance efficiency, accessibility, and creativity. This symbiotic relationship, in which E-Government harnesses cloud computing capabilities, has enormous promise for improving governmental processes, increasing transparency, and giving citizens with seamless access to services. This investigation delves into the nuances of this dynamic relationship, investigating the opportunities, challenges, and implications that arise from the adoption of E-Government and Cloud Computing, with a specific focus on Malawi context.

The potential of cloud computing to revolutionize a number of industries, including government, has attracted a lot of attention globally. Scholars have investigated the variables that affect cloud

adoption. Al-Jabri and Alabdulhadi (2017) has given thorough explanations of cloud computing and its main factors for acceptance such as cost, scalability, and security. Research from developed countries such as United States and Europe has frequently established the standard for cloud adoption methods, which can help emerging nations like Malawi to inform their strategies. As cloud technology evolves, its impact on governments and public service delivery worldwide is a dynamic area of study, with a wide range of policy, security, and economic considerations that cut across borders (OECD, 2014). The following are some key considerations when implementing the cloud computing.

Security and Privacy Concerns: When using cloud computing, security and privacy are the main considerations. Data security problems may arise from cloud systems' shared nature. The significance of data encryption and access control systems in addressing security concerns is emphasized by research conducted by (Sahin & Dogru, 2023). Furthermore, data stored in the cloud is affected by privacy laws and compliance standards, such as the GDPR in Europe (Mell & Grance, 2011). These issues are global in nature and require cautious handling in the public sector, particularly in developing nations like Malawi.

Data Sovereignty: Data sovereignty is a challenge that extends beyond national borders. Public organizations should consider where their data is stored and who has access to it. Research by (Hummel et al., 2021) underscores the importance of understanding data sovereignty implications when adopting cloud services. This challenge can be particularly relevant to nations like Malawi, which may want to keep sensitive government data within their borders.

Cost Management: Cost management is a significant challenge in cloud computing adoption, as the pay-as-you-go model can lead to unexpected expenses if not managed effectively. Jones et al. (2019) emphasize the need for public organizations to carefully plan and monitor their cloud spending. Malawi's public sector can draw insights from best practices in cost optimization.

Legacy Systems Integration: Public organizations often have legacy systems in place, making integration with modern cloud services a challenge. Opara-Martins et al. (2016) discuss the complexities of integrating cloud solutions with existing systems, highlighting the importance of compatibility and data migration strategies.

Skills and Training: Ensuring that government employees have the necessary skills to work with cloud technology is crucial. AMDOCS (2021) emphasizes the need for training and skill development programs to overcome this challenge. In the context of Malawi, investing in the technical capabilities of the workforce is paramount.

Governance and Compliance: Public organizations must adhere to various regulations and compliance standards. The dynamic nature of cloud computing can make it challenging to maintain compliance. Prasad et al. (2014) discuss the importance of governance frameworks and compliance monitoring. Developing effective governance models is essential for cloud adoption in the public sector.

2.3 Cloud Computing Adoption and Challenges in Developing Countries

While cloud computing is being used all across the world, its impact is most noticeable in developing countries (Kushida et al., 2011). These countries with resource restrictions are increasingly relying on cloud technologies to foster digital innovation, improve efficiency, and overcome traditional hurdles (Dafri & Al-Qaruty, 2023). That is, developing countries have a slew of obstacles, including restricted access to robust IT infrastructure, limited financial resources, and the requirement for rapid technical advancement (Kala, 2023). Hence, cloud computing provides a chance to address these difficulties by delivering scalable and economical solutions that do not require significant upfront hardware and software investments. Below are some examples in Indonesia, Brazil and Mexico.

Government Services in Indonesia: To improve the delivery of government services, Indonesia has embraced cloud computing. Ahmad and Hasibuan (2012) highlight that the Indonesian government hosts e-government applications on cloud platforms, to help in increasing accessibility and efficiency in service delivery.

Brazilian Education Initiatives: Brazil has embraced cloud-based solutions in the education sector (Mari, 2020). Cloud platforms allow for remote learning, access to educational resources, and cooperation between students and educators, overcoming gaps in traditional education delivery.

Mexico's Healthcare Solutions: Mexico has used cloud computing to improve healthcare services. Cloud-based electronic health record systems increase the overall efficiency of healthcare delivery in remote places by streamlining patient data management, facilitating telemedicine initiatives, and streamlining patient data administration (HarmoniMD, 2018).

In developing countries, cloud computing adoption offers a transformative journey toward digital innovation and inclusive progress. The examples provided show how cloud technologies can be used to solve specific problems in the government, education, and healthcare sectors. As these countries continue to leverage the power of the cloud, the potential for greater innovations and beneficial socioeconomic impact grows.

From the African perspective, literature on cloud adoption in Africa offers insights into common challenges and opportunities. Ampadu Sarfo and Ahenkorah (2023) have conducted a comparative analysis of cloud adoption in African countries, highlighting the varying levels of infrastructure readiness and government support. Ampadu Sarfo and Ahenkorah (2023) argue that a unified strategy at the continental level could facilitate more effective cloud adoption in Africa. Several case studies have contributed to the understanding of cloud adoption trends across the continent (Mosweu et al., 2019). E-government and cloud computing services have gained prominence in Africa as governments seek to enhance service delivery, improve efficiency, and promote digital transformation. Several African nations have taken significant steps toward adopting these technologies, showcasing the potential benefits and challenges they bring as summarised below.

Kenya's Digital Transformation: Kenya has emerged as a notable leader in e-government adoption. The Kenyan government's Digital Transformation program has focused on leveraging cloud computing technologies to enhance service delivery (Ogwel et al., 2022). The program has introduced e-citizen portals, enabling citizens to access government services online, and has incorporated cloud solutions to improve data storage and accessibility. This transformation aligns with Kenya's broader vision of becoming a technology hub in East Africa.

Rwanda's E-Government Initiatives: Rwanda's commitment to e-government is evident in its "Smart Rwanda" program. Research by Maluleka and Ruxwana (2016) discuss Rwanda's efforts to modernize government operations through the deployment of cloud services. The Rwandan government has established data centers and adopted cloud solutions to host government

applications, contributing to improved service delivery. The experience of Rwanda highlights the importance of a clear national vision and strategy for e-government and cloud adoption.

South Africa's E-Government Framework: South Africa has implemented an e-government framework to enhance citizen engagement and government efficiency. Maluleka and Ruxwana (2016) examine South Africa's use of cloud services to support e-government initiatives. Cloud solutions have enabled South African government agencies to streamline their operations, reduce costs, and provide services more efficiently to a diverse citizenry.

Nigeria's E-Government Journey: Nigeria has made significant strides in e-government adoption, aiming to improve public service delivery and transparency. Adeleke et al. (2020) discuss Nigeria's efforts to harness cloud computing technologies in the education sector. Initiatives like the Nigerian e-government Master Plan have emphasized the use of cloud infrastructure to enable efficient data management and service delivery. The study highlights that e-services are not only for the main stream civil services but the education sector also plays a crucial role in trying out new services and implementing innovative ideas.

Ghana's Digital Transformation: Ghana has undertaken a digital transformation journey that involves e-government and cloud computing. Adjei (2023) examines Ghana's experiences in adopting cloud technologies to enhance government operations and SMEs cloud adoption. The Ghanaian government's use of cloud services aligns with its goal of improving access to public services and data-driven decision-making and its approach is to bring on-board small businesses.

With reference to these studies, while cloud computing provides major benefits to public enterprises, it also introduces new issues that must be carefully considered with examples in Table 1 below.

Table 1: Challenges in Cloud Computing Adoption

Area	**Brief Description**
Network Connectivity and Reliability	Relying on the internet raises worries regarding reliability and potential disruptions. To ensure operational continuity, public sector entities must maintain a robust network infrastructure and contingency plans.

Legacy System Compatibility	It might be difficult to integrate cloud solutions with existing legacy systems. Compatibility concerns may develop, necessitating careful planning and, in certain cases, system changes in order to achieve smooth integration.
Performance and Latency	High performance and low latency are frequently required in applications. These requirements may provide issues for cloud implementations, demanding optimization and performance monitoring measures.
Dynamic Workload Management	Changes in workload demand can have an influence on performance and expenses. Workload management, including auto-scaling and resource optimization, is critical for effective cloud utilization.
Cultural and Organizational Change	Cloud adoption necessitates cultural and organizational adjustments. Change resistance and the requirement for new skill sets can be obstacles. To ensure a successful transition, organizations spend in training and change management.
Data Transfer and Bandwidth Charges	Transferring huge amounts of data to and from the cloud might result in high bandwidth charges. Government entities should consider these costs and investigate data transfer optimization solutions.
Service Level Agreements (SLAs)	It is critical to understand and negotiate SLAs with cloud providers. Service agreements must be aligned with performance expectations, security requirements, and compliance standards in the public sector.
Environmental Implications	The energy usage and environmental impact of cloud computing may generate sustainability concerns. To reduce their carbon footprint, public firms should analyze environmental implications and consider green cloud projects. They may improve their cloud adoption by tackling these obstacles with strategic planning and best practices, assuring a mix of efficiency, security, and cost-effectiveness

2.4 E-Government and Cloud Computing Adoption efforts in Malawi

Malawi has made concerted attempts to modernize its governance structures by implementing e-government programs (Malanga, 2017.). The incorporation of technology into government processes attempts to improve service delivery, boost transparency, and facilitate citizen participation. Malawi has shown a rising interest in harnessing information and communication technologies (ICTs) to improve administrative efficiency and public service accessibility over the last decade. Malawi's e-government growth began with projects focused mostly on fundamental

online service supply, such as information distribution and communication channels. Recent attempts, however, have expanded to include more complex applications, such as cloud-based solutions, aimed at improving government processes and encouraging innovation in service delivery.

Malawi has been gradually incorporating cloud computing technology into its infrastructure for the public sector. Numerous research works have looked into what influences Malawians' use of cloud computing. For example, studies by Phiri and Kanjo (2021) have shown how Malawi's cloud adoption environment is shaped by a lack of infrastructure and technology resources. Furthermore, the government of Malawi has implemented regulations aimed at encouraging the usage of cloud computing in the public sector (Makoza, 2016).

Cloud computing has emerged as a promising technology in Malawi's quest for efficient and cost-effective service delivery. The utilization of cloud services offers scalability, flexibility, and cost savings, enabling government agencies to enhance their technological infrastructure without significant upfront investments. This transition to cloud-based solutions presents an opportunity for the Malawian government to modernize its information systems and improve accessibility to services for citizens across the country. However, there are some gaps and limitations that need to be looked at for a smooth adoption and implementation as summarised below.

2.5 Theories and Conceptual Framework for the study

The intellectual underpinning of any study is formed by theories and conceptual frameworks, which provide an organized framework for comprehending and interpreting research findings (Adom et al, 2018). These frameworks help researchers develop hypotheses, devise techniques, and analyze data. Theories give broad principles for explaining occurrences, whereas conceptual frameworks provide a framework for organizing and integrating fundamental concepts. Choosing an appropriate theoretical or conceptual framework is critical for a study's coherence and validity, as it provides a prism through which researchers can understand their findings and contribute to the larger academic conversation. It acts as a framework for the research structure, increasing the depth of the study and facilitating the transmission of findings within the academic community.

2.5.1 Technology-Organization-Environment (TOE) Framework

The public sector is one of the many industries whose landscapes have continuously changed due to technological advancement. First put forth by Tornatzky and Fleischer in 1990 and referenced by Baker (2011), the Technology-Organization-Environment (TOE) framework has grown to be a key theoretical framework for comprehending the adoption of new technologies. The implementation of the TOE framework in the context of technology adoption has benefited greatly from the work of Jere and Ngidi (2020). This section examines the elements of the TOE framework and how they relate to the public sector's use of cloud computing.

According to Baker (2011), Tornatzky and Fleischer's 1990 TOE paradigm suggests that three interrelated domains – technological, organizational, and environmental context – have an impact on how technology is adopted. The technological context includes elements such as the innovation's complexity, compatibility with current systems, and technical qualities. The technology environment is crucial to the public sector's adoption of cloud computing since government organizations need to take data security, cloud service adaptation to their unique needs, and technical aspects of cloud infrastructure into account.

The structure, resources, and absorptive capacity of the organization are the main internal variables that make up the organizational context within the TOE framework. Government organizations range greatly in terms of size and capability, which also affects how prepared they are to use cloud computing. According to Teo et al. (2009), the size and structure of public organisations can affect how well they can use cloud technologies. Furthermore, an organization's preparedness to use cloud computing services is largely determined by the availability of trained staff and funding.

The external elements that influence the adoption process, such as government policies, industry standards, and regulatory requirements, are included in the environmental context. Cloud computing adoption in the public sector is heavily dependent on government policy and backing. Government programs and regulations that encourage the use of cloud computing can serve as catalysts, as shown by the experiences in China, South Korea, and the United Kingdom (Yoo & Kim 2018). On the other hand, the absence of legislation and policies that promote cloud usage

might impede its acceptance, highlighting the significance of government engagement (Ali & Osmanaj, 2020).

The theoretical framework for this research provides a solid foundation for examining the adoption of cloud computing in the public sector of Malawi. The Technology-Organization-Environment (TOE) framework (Baker, 2011; Jere and Ngidi, 2020; Teo et al., 2009) serves as the overarching theoretical foundation for this research as follows.

- **Technological Context (T):** This component of the TOE framework is integral to the adoption of cloud computing in Malawi. It considers the technical characteristics of cloud solutions, their compatibility with existing infrastructure, and the complexity of implementation. Technological readiness and the appropriateness of various cloud service models were explored.
- **Organizational Context (O):** The organizational context evaluates the internal factors within the Malawian public sector that influence cloud adoption. It includes the structure and resources of public sector organizations, along with their capacity to adapt to new technologies. Factors such as the size and structure of organizations, the availability of skilled personnel, and in-house management capabilities are considered.
- **Environmental Context (E):** The environmental context acknowledges the external factors affecting cloud adoption, particularly government initiatives and policies. Malawi's government plays a pivotal role in shaping the cloud adoption landscape through policies, regulations, and supportive initiatives. These external influences significantly impact the decision to adopt cloud computing in the public sector.

2.5.2 Diffusion of Innovation Theory

The diffusion of innovation theory provides a theoretical lens for understanding how innovations are adopted and diffused within a society or organization (Rodgers, 1962). In this study, innovations include e-government and cloud computing. This theory considers the innovation-decision process and the factors that influence its adoption.

The diffusion of innovation theory helps developing countries to have steps to ensure acceptable implementation and creation of innovations. Aizstrauta et al. (2014) highlight some of the steps in the theory as below: -

- **Innovations:** Cloud computing technologies are regarded as innovations. The theory identifies various adopter categories, including innovators, early adopters, early majority, late majority, and laggards. Different public sector organizations in Malawi may fall into distinct categories and understanding their adoption behavior is critical.
- **Communication channels:** The theory emphasizes the role of communication channels in disseminating information about innovations. The effectiveness of communication and information dissemination within the Malawian public sector can impact the adoption process.
- **Social system:** The social system in which the innovation is introduced, including government structures, policies, and social norms, plays a significant role in the adoption process. Malawi's unique social and governmental context will influence the diffusion of cloud innovations.

2.5.3 Unified Theory of Acceptance and Use of Technology (UTAUT)

The Unified Theory of Acceptance and Use of Technology (UTAUT), proposed by Venkatesh et al. (2003), offers insights into individuals' acceptance and usage of technology. In the context of the public sector, understanding the attitudes and behaviors of government employees is crucial. The following were considered.

- **Performance Expectancy:** This component tested people's belief that employing cloud computing would improve their ability to do jobs efficiently. The impact that cloud adoption was perceived to have on government employees' work was taken into consideration.
- **Effort Expectancy:** Key elements in the adoption process include perceived simplicity and convenience of use when integrating cloud services into current workflows. An assessment was conducted on Malawian government employees' perceptions of the necessary effort.

- **Social Influence:** Considering the social context of Malawi's public sector, the impact of peers, superiors, and government policies on the choice to adopt cloud computing was investigated.
- **Facilitating Conditions:** Since the ease of adoption within Malawi's public sector is directly impacted by the availability of resources, training, and support for cloud adoption, these factors were evaluated.

In order to provide a thorough foundation for examining the adoption of cloud computing in the Malawian public sector, the theoretical framework combined the Diffusion of Innovations theory, the Unified Theory of Acceptance and Use of Technology (UTAUT), and the Technology-Organization-Environment (TOE) framework. By addressing cloud computing adoption from an organizational, individual, and technological standpoint, these theories provide a comprehensive understanding of the process. The research and analysis were driven by the framework, which allowed for a comprehensive investigation of Malawi's adoption of cloud computing.

2.5.4 Conceptualizing Cloud Computing Adoption in the Malawian Public Sector

The conceptual framework for this research provides a structured approach to understanding the adoption of cloud computing in the public sector in Malawi. It takes into consideration the unique context and challenges faced by Malawi while aligning with broader principles of e-government and cloud adoption. Figure 1 illustrates the variables applied in this study.

- **Level of cloud computing and e-governance:** The level of cloud computing and adoption is the variable that you, as the researcher, can manipulate or control. It represents the extent to which public sector organizations in Malawi have adopted cloud computing technologies and services.
- **Technological readiness within public organizations:** Technological readiness serves as an intervening variable, mediating the relationship between the level of cloud computing adoption and its impact on public services. Technological readiness represents the organizations' ability to effectively implement and utilize cloud computing. It includes factors such as infrastructure, training, and resource availability.

- **Efficiency and quality of public services:** The dependent variable is the outcome or result being studied, which is the efficiency and quality of public services provided by the public organizations in Malawi. This variable is influenced by the level of cloud computing adoption and is mediated by the intervening variable of technological readiness.

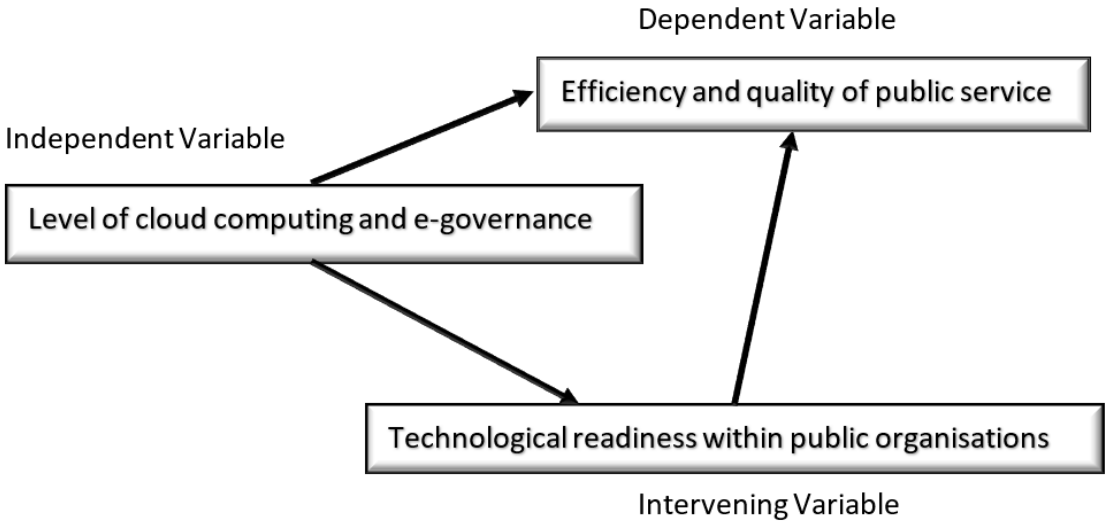

Figure 1: Conceptual Framework applied in this study (Source: Author)

In this connection, it is anticipated that: -

- the independent variable, "Level of Cloud Computing Adoption," will affect the intervening variable, "Technological Readiness." Higher cloud adoption rates may indicate a company's greater technical readiness, which in turn influences the effectiveness and caliber of its public services (Yoo & Kim, 2019).
- "Technological Readiness," mediates the relationship between the dependent and independent variables. It describes how the use of cloud computing affects an organization's technological capabilities, which in turn affects the effectiveness and quality of public services.
- Both the independent variable and the intervening variable have an impact on the dependent variable, "Efficiency and Quality of Public Services," which is the final result. Public service quality is directly impacted by the degree of cloud computing use, yet this influence.

To assess these variables, the study focuses on the technological fit, organisational readiness, and government support. The technological fit focuses on assessing the technological context within which cloud computing adoption occurs. It encompasses the technical characteristics of cloud solutions, their compatibility with existing infrastructure, and the complexity of implementation. It was important to (a) assess the readiness of Malawi's existing technology infrastructure for cloud integration, including network capabilities and data center facilities, and (b) evaluate cloud service models (SaaS, PaaS, IaaS) that align with the specific needs and goals of the Malawian public sector.

Organizational readiness emphasizes the internal factors within the Malawian public sector that influence cloud adoption. It includes the organization's structure, resources, and ability to adapt to new technologies (Ziba & Kang, 2020). It involves (a) an assessment of the size and structure of Malawi's public organizations and their readiness for cloud adoption, and (b) the availability of skilled personnel, training programs, and the capacity for in-house management of cloud solutions.

Government support acknowledges the external factors affecting cloud adoption, especially government initiatives and policies that either facilitate or hinder the transition. It involves (a) the role of Malawi's government in formulating policies that promote cloud adoption in the public sector, and (b) the impact of regulatory compliance, data privacy laws, and international standards on the adoption of cloud services in Malawi.

2.6 Chapter Summary

The chapter began with a thorough assessment of relevant literature, concentrating on the relationship of technology adoption, particularly cloud computing, in the public sector. This review also focused on the technology framework (Technology-Organization-Environment – TOE), which is well-known for their usefulness in understanding technology adoption processes. In addition, the suitability of cloud computing service models for public sector businesses, such as SaaS, PaaS, and IaaS, were discussed. The variables influencing cloud computing adoption in the public sector. In the next chapter, research methods adopted in this thesis were described.

CHAPTER 3: RESEARCH METHODOLOGY

Any research study must include research methodology (Patel & Patel, 2019). The chapter describes the approaches and methods adopted in this research covering the sample selection, techniques for data collection and analysis, and any study constraints. Ensuring the validity and reliability of study outcomes necessitates a thorough and precise description of the research technique. In order to determine the appropriate approach, it is necessary to consider the framework that underpins this research.

3.1 Research Approach

Mixed-method research was employed for this study, combining both qualitative and quantitative research approaches to gain a comprehensive understanding of the opportunities and challenges associated with e-government and cloud computing in Malawi. The research methodology used an abductive approach, acknowledging the importance of a flexible and iterative process for developing viable explanations for observable events. The abductive reasoning attempted to bridge theory and empirical evidence, allowing insights and explanations to arise from the data acquired during the investigation.

The theoretical framework and abductive approach guided the research in a synergistic way, allowing for a nuanced examination of e-government uptake and cloud computing impact. The interaction of known theories and the flexibility of abduction laid the groundwork for a thorough knowledge of Malawi's governmental sphere's dynamic and growing landscape.

3.2 Research Strategy

The study adopted a single case study with emphasis on government departments, ministries and core users of e-government and cloud computing services. In a case study, the researcher investigates a contemporary phenomenon within its real-life context, particular there is no clear evidence between phenomenon and context (Yin, 2003). This strategy allowed for in-depth exploration of the subject matter and the collection of large-scale data for analysis (Cavaye, 1996). The research strategy for investigating the benefits and constraints of leveraging cloud computing in e-government in Malawi takes a broad approach, integrating qualitative and quantitative approaches. This mixed-methods technique seeks to provide a comprehensive knowledge of the

complexities involved in the adoption and exploitation of cloud computing technologies within Malawi's governmental landscape.

3.3 Sampling Techniques

The sample selection approach for this study includes a deliberate combination of purposive and convenience sampling methods. The goal was to collect a varied and representative sample of various stakeholder groups involved in the adoption and exploitation of cloud computing technologies within Malawi's e-government ecosystem. The final sample group included 50 people recruited from government ministries, government departments, IT experts, and individual users. Purposive sampling was used to select participants from government ministries and departments, and IT experts while convenience sampling was for selecting individual users.

Key members from various government ministries and departments were purposefully selected based on their roles and responsibilities in the development and management of e-government programs. This focused approach meant that insights were acquired from people who were directly involved in policy formation, strategy implementation, and operational execution inside the governmental structure.

IT professionals are critical to the successful implementation and integration of cloud computing technologies. A purposive sampling strategy was used to pick individuals with knowledge in cloud computing, information technology, and data management in order to capture their specialized perspectives**.** As a result, the study benefited from the perspectives of individuals directly involved in the technical aspects of the e-government and cloud computing scene.

A convenience sampling method was used to acquire insights into end-user experiences and attitudes. Reaching out to individual users who interact with e-government services and cloud computing technologies was part of this. While accessibility and willingness to participate were factors in the selection, efforts were made to include a diverse spectrum of users from various demographic and occupational backgrounds.

Maintaining diversity in the sample population was observed. The sample population was purposefully diversified to include people in a variety of roles throughout the government system.

Officials from the Ministries of Health, Finance, Agriculture, Justice, and other important departments were present. Individual users were included in the sample to capture a wide range of demographic traits. This guaranteed that people of all ages, educational backgrounds, and professional experiences were represented.

3.4 Data Collection

Data was collected from the sample population using multiple techniques as Rose et al. (2015) point out that one strength of the case study is its ability to employ multiple sources of evidence, which allow triangulation of findings. Hence, in this study, questionnaires, interviews, observation and artefact examination were adopted. The combination of these data collection methods ensured a comprehensive and multifaceted approach, capturing the complexity of e-government and cloud computing adoption in Malawi's unique governmental setting.

3.4.1 Questionnaires

Questionnaires were useful in gathering organized quantitative data from a diverse group of participants. The questionnaires were designed to elicit precise responses linked to the study's aims and were disseminated online, ensuring efficiency and wide coverage. The questions were designed to assess participants' perspectives, experiences, and attitudes concerning e-government and cloud computing in Malawi. The standardized format made it easier to compile quantitative data, allowing for statistical analysis and pattern recognition. The questionnaire method was especially helpful in reaching out to a varied group of respondents, including government ministries, departments, IT professionals, and individual users. Detailed questionnaire is on Appendix 2. Fifty (50) questionnaires were distributed from which 32 were responded to, representing 64% response rate.

3.4.2 Interviews

In-depth interviews were an important part of the data gathering technique, adding a qualitative dimension to the research. Participants from diverse stakeholder groups were interviewed one-on-one to gain nuanced insights, experiences, and opinions. The interviews' semi-structured nature allowed for flexibility, allowing for the study of emergent themes. These interviews provided

valuable contextual information, allowing for a more in-depth knowledge of the complexities of e-government and cloud computing adoption in Malawi. Key members from government ministries, IT specialists, and individual users were all actively involved, ensuring a thorough examination of many points of view (see Table 2). Detailed Interview guide is on Appendix 3.

Table 2: Number of Face-to-Face Interviews

Level	**Interviewees**	**Number of Participants**	**Number of Interviews**
National Level	e-Government Department	4	5
	IFMIS users	5	6
	Statutory Corporations	4	4
	Ministries	5	7
District Level	Mlambe One Stop Centre	4	6
	MRA Officers	6	6
	District Commissioners	4	4
	Total	**32**	**38**

3.4.3 Observation

Observation was useful in recording real-time behaviors, practices, and interactions in the context of e-government and cloud computing usage with the aim of getting excellent insights into the practical issues of technology adoption within the governmental landscape through direct observation. This strategy enabled the identification of unspoken difficulties, user behaviors, and organizational dynamics that would not have been adequately captured by interviews or questionnaires. The observation was especially useful in determining real consumption patterns and identifying potential gaps between policy and practice. Some of the observations carried out included:

1. Observations of user interactions with e-government platforms, including navigation, search, and overall experience.

2. Cloud Computing Adoption Practices: Researchers examined how government agencies and departments use cloud computing services in daily operations. These covered tasks including data storage, application deployment, and cooperation via cloud-based technologies.
3. Policy Compliance: Observations assessed whether observed actions followed established e-government and cloud computing policies and standards. This included reviewing compliance with data security protocols, privacy regulations, and governance frameworks.
4. Training and Capacity Building Sessions: Researchers observed training sessions to improve staff skills and knowledge of e-government platforms and cloud computing technologies. This involved observing participants' engagement and learning results.
5. The study found that cloud-based solutions, such as document sharing, version control, and remote team collaboration, promote collaborative work behaviors. This gave information about the usefulness of cloud-based collaboration tools in increasing productivity and teamwork.
6. Observations on IT infrastructure usage and performance for e-government and cloud computing services. This involved monitoring network traffic, server utilization, and system response times to identify potential bottlenecks or performance issues.
7. Change Management Processes: Researchers observed the adoption of e-government and cloud computing technologies. This entailed evaluating how organizational changes, like workflow adjustments and policy revisions, were communicated and implemented across departments.
8. Observations on user feedback and support interactions for e-government platforms and cloud services. This includes monitoring users' questions, complaints, and ideas, as well as the responsiveness and efficacy of support methods in meeting user demands.

Overall, these observations gave useful insights into the practical aspects of e-government and cloud computing adoption within the governmental landscape, enabling a deeper understanding of user behaviour, organizational dynamics, and implementation issues.

3.4.4 Artefact Examination

Artefact investigation entailed the evaluation of tangible items associated to e-government and cloud computing, such as documents, policies, and other artifacts. Artefacts are “things that societies and cultures make for their own use” such as documents, diaries, memos, letters, archival records, film, television, and music (Norum, 2008, p. 25). This method supplemented existing ways to data collecting by offering a more in-depth understanding of the policy environment, regulatory frameworks, and actual artifacts used in the adoption process. The research gathered insights into the formal structures and material manifestations of Malawi's e-government projects by scrutinizing official documents, strategic policies, and technology artifacts. The inspection of artifacts helped to a full understanding by connecting theoretical frameworks with actual, real-world manifestations. Table 3 lists the artefacts that were examined.

Table 3: List of Examined Artefacts

#	**Examined Artefacts**
1	Government National ICT Policy 2020
2	E-government implementation reports 2023
3	Cloud service provider contracts and agreements- e-Government archive 2023
4	IT infrastructure inventory and documentation
5	Data security and privacy policies and guidelines
6	Malawi ICT Digitalization Roadmap 2022

3.5 Data Analysis

Since the study involved the mixed-methods, both qualitative and quantitative data analysis methods were applied. The tools and approaches used in this research were suited to the data's heterogeneous nature, ensuring a thorough examination of the opportunities and problems connected with utilizing e-government and cloud computing in Malawi.

The quantitative data collected through questionnaires was analyzed using statistical methods. To summarize and understand the numerical data, descriptive statistics such as frequencies, percentages, and averages were used. This method allowed for a quantitative comprehension of

the perspectives of the participants, allowing for the identification of trends, patterns, and statistical significance. Descriptive statistics were applied to quantitative data, offering a picture of the participants' responses. This entailed:

1. Data Cleaning: Ensuring correctness and dependability by detecting and correcting any flaws or inconsistencies in the quantitative dataset.
2. Frequency Analysis: Calculating the frequency of responses in order to determine the predominance of various points of view or experiences.
3. Percentage Calculation: Calculating frequencies as percentages to provide a standardized depiction of answer distribution.
4. Mean and Median Calculation: Calculating the average and median values to gain insight into the core trend of numerical data.

Thematic analysis was performed on qualitative data obtained through interviews, observations, and artifact examination. This entailed systematically detecting, organizing, and interpreting meaning patterns in a qualitative dataset. Themes and sub-themes arose through an iterative process, resulting in a rich story that conveyed clear thoughts, opinions, and experiences of the participants. The procedure entailed:

1. Familiarization with material: Immersion in the material through multiple readings to get a thorough comprehension of the content.
2. Creating Initial Codes: Coding the data in a systematic manner to find essential concepts, ideas, and recurrent aspects.
3. Theme Search: Sorting codes into probable themes and sub-themes, highlighting patterns and variations.
4. Themes Review: Examining the discovered themes to ensure they appropriately reflected the facts and provided significant insights.
5. Defining and Naming Themes: Define the themes clearly and provide descriptive titles that capture the spirit of each subject.
6. Analysis Writing: Creating a coherent narrative that linked together the highlighted topics, reinforced by illustrated quotes and extracts.

3.6 Ethical Considerations

Ethical concerns were crucial throughout the whole research process, emphasizing the commitment to protecting the rights and well-being of the study participants. The approved ethical framework followed established rules and principles to ensure participant integrity, confidentiality, and protection. The consent form is on Appendix 4.

Prior to participation in the study, all subjects were given thorough information about the study's goal, scope, and objectives. Each subject was asked for informed consent, stressing their choice participation in the research. Participants were informed of their ability to withdraw from the study at any time without penalty. This ensured that participants were fully aware of their participation and given express agreement for their data to be used for research purposes.

To protect participants' privacy and confidentiality, all data obtained was handled with the utmost care. Individual comments could not be linked back to specific participants since participants' identities were anonymised and any personally identifiable information was coded. The use of anonymous identifiers not only preserved participants' privacy, but also created an environment in which people felt more at ease giving their opinions openly.

Strict safeguards were put in place to protect the obtained data. The research team had exclusive access to the research data, which was securely secured using encryption procedures. These safeguards were put in place to prevent unauthorized access, data breaches, or misuse of any kind. Furthermore, the data was only utilized for research purposes and was not shared with any third parties.

The research strictly followed the legal and ethical criteria that govern academic research. The study was carried out in line with relevant local and international standards, ensuring that the participants' rights and welfare were protected. The research team was steadfast in preserving ethical norms, promoting transparency, and building confidence between researchers and participants.

Ethical considerations did not remain constant throughout the research process. To address any developing challenges or concerns, the study team reviewed and re-evaluated ethical protocols on a regular basis. This iterative method guaranteed that ethical norms were not only established at

the start, but were actively maintained and altered as needed to reflect the research's dynamic character.

The ethical framework chosen for this study indicates a commitment to performing responsible and respectful research. The research intended to uphold the greatest levels of honesty and respect for the persons who provided their insights to the study by prioritizing informed permission, confidentiality, data protection, and adherence to ethical principles.

3.7 Limitations of the Study

The study has identified seven limitations as summarised below.

1. **Sample Size and Representation:** Like many other African countries, Malawi has a wide range of ministries and departments within its government. However, obtaining a thorough representation across all sectors proved difficult because of the intricacy of administrative entities and logistical limitations. The narrow range of insights may have resulted from the limited involvement of specific ministries due to logistical challenges or divergent interests in the political environment. Furthermore, due to sample limits, it's possible that some administrative systems in African countries were left out, as each has its own distinct obstacles and strategies for adopting new technologies.
2. **Response Rate and Bias:** Studies carried out in African contexts may find that different degrees of technology literacy, access to internet services, or time constraints on the part of government officials affect the response rate. This may lead to response bias, whereby individuals who are more accustomed to or exposed to technology may be overrepresented, hence skewing the results. Furthermore, the viewpoints obtained may have been skewed by resistance or selective participation as a result of workload or priorities inside government departments, which could have an impact on how broadly the study's findings can be applied to the larger governmental system.
3. **Resource Constraints:** Research is frequently constrained by resources and schedule in Malawi and other African nations. Financial limitations could restrict the scope of fieldwork, making it more difficult to provide a more thorough representation across different governmental levels. This limitation may have limited the study's ability to

conduct more in-depth research in specific industries or involve a larger group of participants, which could have limited the analysis's depth and richness.

4. **Data Collection Method:** While surveys and interviews are useful for obtaining both qualitative and quantitative data, their use may be hindered by linguistic difficulties, cultural differences, or different interpretations of the questions, particularly in the diverse African contexts. This could lead to certain comments being misconstrued or not properly recorded, which could have an effect on the completeness or accuracy of the data that was gathered.
5. **Contextual Specificity:** The study's conclusions and suggestions are mostly grounded in the context of Malawi, a developing country in Africa with a distinct sociopolitical and economic environment. Because of regional variations in government systems, technology infrastructure, and socioeconomic dynamics, these lessons may not be applicable to other African nations.
6. **Temporal Constraints:** It's possible that the study's restricted time range made it more difficult to document long-term changes or developing trends in the uptake of cloud computing and e-government. The study's capacity to present a complete long-term perspective may have been limited by the failure to properly incorporate long-term ramifications or shifts in policy and technology adoption over time.
7. **Technology and Infrastructure Challenges:** African nations, including Malawi, often face challenges related to technology infrastructure and internet penetration. Limited access to stable internet connections, varying levels of technological advancements, and infrastructure disparities across regions might have influenced participants' experiences and perceptions of e-government and cloud computing. These challenges could have impacted the depth and breadth of insights gathered, potentially limiting the holistic understanding of technology adoption in the **governmental landscape.**

3.8 Chapter Summary

Chapter 3 precisely delineates the study technique that guided the path of this study. The approach was meticulously devised to collect data while also ensuring its validity and dependability, all while adhering to the greatest ethical standards. The methodology's essence, recognizing its benefits, resolving drawbacks, and emphasizing its fit with Malawi's unique e-government and

cloud computing scenario were considered. It is clear that the research approach chosen was not merely a means to an end, but a deliberate and careful strategy to traverse the difficulties of the research issues. The approach worked as a guidepost, directing the study toward its goals while protecting participants' rights and trust. With a focus on validity, dependability, and ethics, this technique establishes a solid framework for the following chapters, which delve into the core of e-government and cloud computing in Malawi. The next chapter presents the outcomes from this study.

CHAPTER 4: RESEARCH FINDINGS

This chapter presents the findings of the study derived from interviews and questionnaires with the participants. The findings from observation and artefact examinations are also presented.

4.1 Descriptive Statistics

4.1.1 Response Rate to the Study

Assessing the response rate to the study is crucial in understanding the engagement and participation levels of the targeted participants. Out of the initially approached individuals for participation, a response rate of 64% was achieved (32 questionnaires were submitted out of 50 distributed). This response rate indicates the level of interest and willingness of stakeholders within the government ministries and departments to contribute their perspectives and insights to this research endeavor. It is not easy to get a person from government or other users to be part of a research.

The response rate does not only signify the engagement level but also underlines the representativeness of the collected data. A higher response rate enhances the reliability and validity of the findings, ensuring a more comprehensive understanding of the prevailing sentiments, challenges, and opportunities surrounding e-government and cloud computing adoption within the Malawian governmental landscape

4.1.2 Participant Demographics and Internet Usage

The demographics of the participants offer important information about the diverse range of people participating in this research. A total of thirty-two participants shared their viewpoints, providing a varied perspective that reflected the political climate in Malawi. As presented in Table 4, of these individuals, 28.1% were female and 71.9% were male. The gender distribution of the participant pool indicates a higher representation of males, which is consistent with a wider trend seen in some professional sectors in Malawi.

Table 4: Gender Distribution among Participants

Gender	Frequency	Percentage
Female	9	28.1%
Male	23	71.9%
Total	32	100%

Furthermore, examining internet usage patterns among the participants revealed a prevalent trend of frequent usage. With reference to Figure 2, a substantial majority, accounting for 87.5% of the respondents, reported using the internet on a daily basis. Only a small percentage, 6.3%, indicated using the internet monthly or weekly. This robust daily internet usage showcases a consistent reliance on online resources and technologies among the participants. Key to e-government and cloud computing is familiarity with internet and also an overall usage.

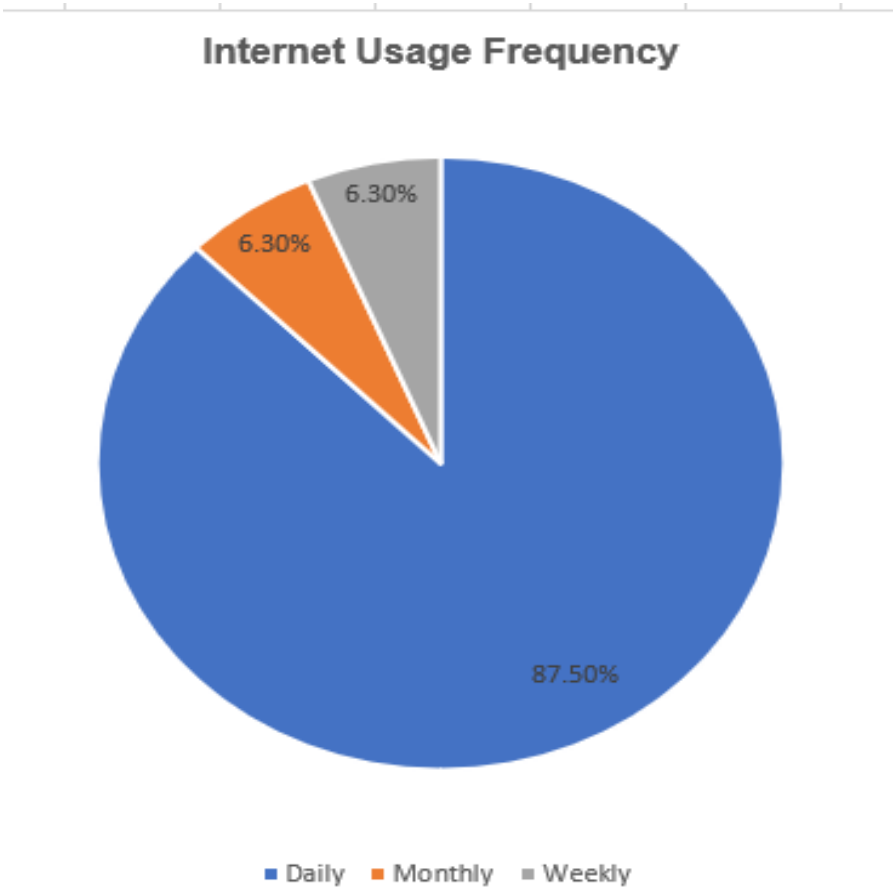

Figure 2: Internet Usage Frequency

4.1.3 Participant Diversity and Its Implications

The wide range of backgrounds and government agencies represented among the participants emphasizes how comprehensive the ideas were. Participants with senior management, IT, and administrative jobs provided unique insights based on their particular roles and responsibilities in the government. This diversity allows for a more nuanced knowledge of the possibilities and problems experienced across multiple functional domains and organizational levels, enriching the analysis with multifaceted viewpoints. It also makes it easier to conduct a thorough analysis of the effects of adopting cloud computing and e-government techniques across various government agencies and regulatory bodies.

Participation from regulators and technology regulators fortifies the analysis further and guarantees a comprehensive look at the regulatory environment and compliance considerations influencing technological developments in the public domain. Their participation makes a substantial contribution to placing the regulatory limitations and specifications that affect the adoption of cloud-based services and e-government systems in perspective.

In summary, the wide range of participant demographics, along with frequent and heavy internet use and a strong response rate, provide a strong basis for an extensive and representative study. This diversity guarantees a comprehensive analysis that considers many points of view, thereby improving the validity and applicability of the research findings in the context of Malawi's adoption of cloud computing and e-government.

4.1.4 E-Government Service Usage and Perception

Remarkably, 68.8% of research participants said they had used different e-government services in the past (see Table 5). This high proportion indicates that respondents are quite familiar with and use digital government platforms. It suggests that the Malawian government has a significant interest in and dependence on these services.

Table 5: Usage of E-Government Services

Ever Used E-Government Services	Frequency	Percentage
No	10	31.3%
Yes	22	68.8%
Total	32	100%

Among the participants who had utilized e-government services (68.8% of respondents), 53.1% found these services convenient (see Figure 3). This percentage reflects a substantial portion of users who perceive e-government services as accessible and easy to use, implying a positive user experience in navigating and utilizing these digital platforms.

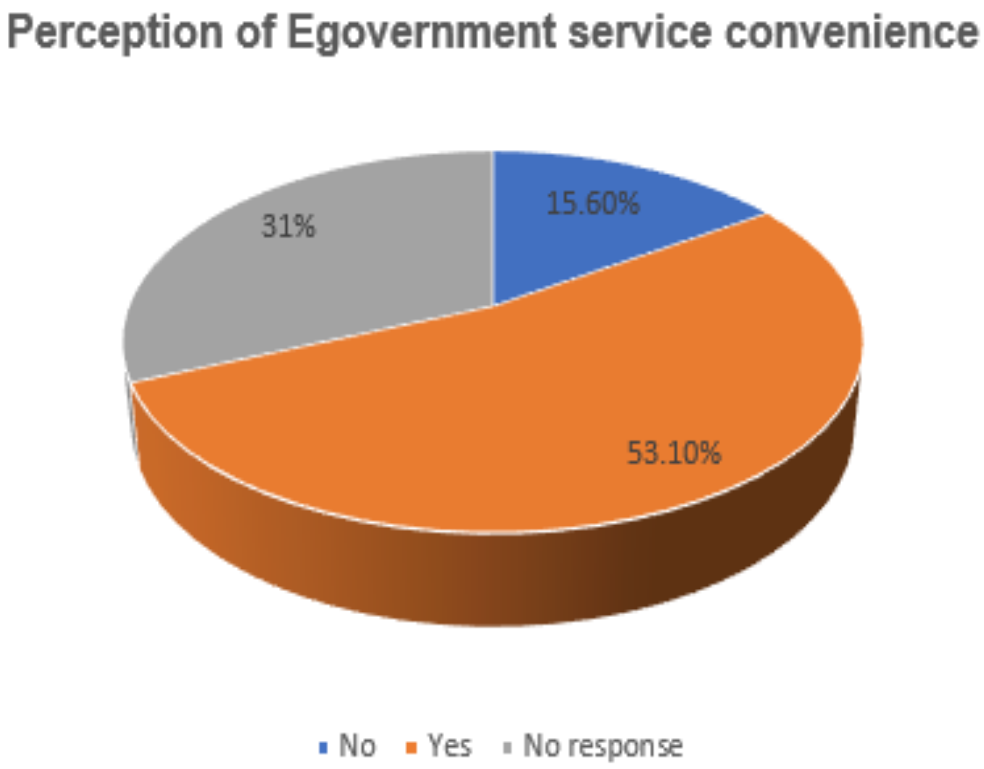

Figure 3: Perception of E-services Convenience

In the same cohort of participants who engaged with e-government services, 46.9% perceived the government e-systems as user-friendly (see Table 6). This metric reveals a slightly lower but still

significant proportion of users who find the systems accommodating and manageable, suggesting an overall favorable sentiment towards the user interface and usability of the digital platforms.

Table 6: Perception of E-Government System User-Friendliness

E-System User-Friendly	**Frequency**	**Percentage**
No	7	21.9%
Yes	15	46.9%
Total	22	68.8%

The frequency of e-services usage demonstrated a varied pattern among participants. While 31.3% used these services on a monthly basis, only 3.1% utilized them weekly (see Table 7). The distribution suggests that a significant proportion of users access these services periodically rather than on a daily or weekly basis.

Table 7: Frequency of E-Government Services Usage

Frequency of E-Services Usage	**Frequency**	**Percentage**
Every Month	10	31.3%
Every Week	1	3.1%
Every Year	7	21.9%
Everyday	4	12.5%
Total	32	100%

The noteworthy proportion of participants utilizing e-government services indicates a positive trend in Malawi's use of digital services. Users' positive opinions of the ease of use and convenience of the services further suggest that they are satisfied with the features that these platforms offer. On the other hand, the different frequency of service utilization indicates that although a considerable percentage uses these services on a monthly basis, daily or weekly usage is not that high.

This analysis emphasizes how crucial it is to keep making improvements to the functionality and design of services in order to improve user convenience and promote more frequent usage. It also emphasizes the necessity of ongoing initiatives to encourage the frequent use of these services

with the goal of further integrating them into the day-to-day activities of governmental bodies and citizen interactions.

4.1.5 Perception Patterns

The majority of users (53.1%) have a positive opinion of the convenience of e-government services, according to the analysis, suggesting that using these digital platforms is easy and accessible. Concurrently, a significant percentage (46.9%) expressed satisfaction with the government e-systems' use, indicating a favorable opinion of the systems' interface and usability.

But there is still potential for development, especially when it comes to making e-government systems more user-friendly so they better meet the expectations of their users. This emphasizes how important it is to keep working to improve user interfaces, streamline features, and enhance user experiences in order to guarantee a flawless user experience with e-government platforms. One ICT expertise commented: “Increasing customer happiness and promoting wider and more frequent use of these services can both be achieved by strengthening these elements.”

Respondents displayed varying levels of awareness with specific government e-services. Notably, the familiarity percentages varied among different services. As presented in Table 8, notably, a significant portion of respondents (65.6%) reported awareness with Road Traffic e-Services, indicating a substantial level of engagement or interaction with this particular government service. A majority of respondents (56.3%) indicated awareness with Malawi Revenue Authority (MRA) e-Services, showcasing a considerable degree of awareness or utilization of these specific government offerings. While still notable, the awareness with the Integrated Financial Management Information System (IFMIS) was comparatively lower at 40.6%, indicating a moderate level of awareness or usage among respondents. One user emphasised: “IFMIS has various components for various operations such as procurement, accounting, payments.” The awareness with Public Procurement and Disposal of Assets (PPDA) e-Services stood at 25.0%, suggesting a relatively lower engagement or knowledge level compared to other listed services. Only a small fraction (12.5%) of respondents reported awareness with the Mlambe One Stop Delivery Centre, suggesting limited exposure or interaction with this service among the surveyed individuals. A mere 6.3% of respondents indicated awareness with unspecified 'Other' government services, highlighting a low level of recognition or engagement with these unmentioned offerings.

Table 8: Awareness with Government E-services

Government E-Services	Awareness	Percentage
Road Traffic e-Services	21	65.6%
MRA e-Services	18	56.3%
IFMIS	13	40.6%
PPDA e-Services	8	25.0%
Mlambe One Stop Delivery Centre	4	12.5%
Other	2	6.3%

The survey demonstrated the overwhelming support for the continuation of e-services in Malawi. All participants (100%) advocated for the perpetuation and advancement of these digital government services, highlighting their perceived importance and necessity in enhancing administrative processes and citizen engagement (see Table 9).

Table 9: Necessity of E-services Continuation

Perception	Count	Percentage
Yes (Necessity of E-Services)	32	100%
No (Against E-Services Continuation)	0	0%

While the overall support for e-services was unanimous, a nuanced viewpoint emerged regarding the comfort levels in sharing personal information on government e-platforms. With reference to Table 10, a substantial majority (78.1%) of respondents expressed a high level of comfort in providing their personal information on government e-platforms. This group displayed trust or confidence in the security measures and handling of their data within these digital systems. However, a notable minority (15.6%) of respondents indicated discomfort when it came to sharing personal information on government e-platforms. This group voiced concerns or reservations about the confidentiality and security of their data, which might affect their willingness to engage fully with these digital services. Another user commented: “Some of us we are sure whether our data security since we are coming from paper-based system.” This data underscores the crucial aspect of trust and confidence in data handling practices within government digital platforms,

highlighting the need for robust data protection measures to alleviate concerns and promote wider acceptance and engagement with e-services.

Table 10: Perception in providing Personal Information

Perception	**Count**	**Percentage**
No (Discomfort in Sharing Info)	5	15.6%
Yes (Comfortable Sharing Info)	25	78.1%
Total	**32**	**100%**

4.1.6 Awareness and Non-Utilization

Despite a notable proportion of participants reporting previous usage of e-government services, a segment remains largely unaware of these platforms. The 31.3% of respondents who have not utilized e-government services that are part of their duty might lack of awareness with these digital offerings. This unawareness might result from insufficient promotional activities or limited exposure to these services, hindering their engagement. The impact of e-services on users who remain unaware of these platforms is two-fold. Firstly, the lack of exposure to these services potentially deprives individuals of accessing and benefiting from the convenience and efficiency that e-government platforms can offer. Secondly, for the government, this indicates a missed opportunity to reach and cater to a significant segment of the population, hindering the broad implementation and effectiveness of digital governance initiatives.

Efforts to enhance awareness among individuals unaware of these services are pivotal. Implementing targeted awareness campaigns, educational initiatives, and user-focused training programs can significantly contribute to bridging this gap. By promoting these services through various communication channels and conducting user-friendly training sessions, the government can empower citizens with the knowledge and skills needed to navigate and utilize e-government platforms effectively.

Ensuring inclusive access to e-government services is crucial for equitable service delivery. It is imperative to address the disparity between those familiar with and utilizing these services and those unaware or underexposed. Emphasizing inclusive strategies to reach a broader audience can

amplify the democratization of access to government services, fostering an environment of digital inclusivity and equal opportunity for all citizens.

4.1.7 E-Services and Cloud Offerings as Catalysts for Economic Empowerment

A significant percentage of participants, constituting 75% of those familiar with e-government services and cloud offerings, expressed a positive perception regarding the potential economic impact of these digital initiatives (see Table 11). Their outlook emphasized the transformative role of these technologies in stimulating economic growth and empowerment. Among those perceiving a positive economic impact, 62.5% acknowledged the significant role of e-services in fostering economic growth. They highlighted the streamlined processes and improved service delivery as factors contributing to the potential for economic expansion.

Furthermore, within the positively inclined respondents, 54.2% recognized cloud computing as a crucial enabler for economic advancement. They emphasized its role in optimizing resource allocation, data accessibility, and fostering innovation to drive economic growth. The majority of respondents expressing positive perceptions (79.2%) acknowledged e-services and cloud offerings as tools that empower citizens and businesses. They highlighted these technologies' capacity to provide equal access to information, promote entrepreneurship, and create opportunities for growth.

Table 11: Perception of E-services on economic empowerment

Perception of Economic Impact	**Respondents**	**Percentage**
Positive	18	75%
Neutral	4	16.7%
Negative	2	8.3%
Total	**24**	**100%**

In summary, the majority of participants familiar with e-services and cloud offerings perceive these technologies positively as catalysts for economic empowerment. Emphasizing strategic implementation aligned with policies and continuous enhancements is crucial to fully harness the economic benefits and drive comprehensive economic empowerment in Malawi.

4.2 Recap of Insights

The study diligently dissected existing policies, regulatory frameworks, adoption strategies, and data protection measures associated with e-government and cloud computing. Engaging diverse stakeholders from various ministries provided a comprehensive understanding of the landscape. Among the key findings, a significant percentage of participants exhibited familiarity with e-government services. However, a notable segment remained unaware, signaling the need for targeted awareness campaigns.

4.2.1 Economic Empowerment Perspectives

Notably, the insights obtained from participants were consistent with a positive impression of the enormous economic potential inherent in e-services and cloud computing solutions in the Malawian environment. Their perspectives mirrored a shared perception of these technologies as revolutionary catalysts for economic progress, viewing them as enablers capable of empowering both individuals and corporations. This opinion is consistent with global trends in which the digital economy is increasingly viewed as a driver of socioeconomic advancement, stimulating innovation, and increasing productivity (Zhang et al., 2022).

Participants from many industries and backgrounds passionately expressed their belief in the revolutionary power of e-services and cloud computing. They all agreed that these technologies play a critical role in boosting economic activity, streamlining processes, and sparking entrepreneurial ventures. These technological advancements arose in their narratives as vehicles capable of democratizing access to information, services, and markets, thus leveling the playing field for firms of various sizes and individuals from many walks of life (Alberts & Papp, 1997).

Nonetheless, amid the optimism and awareness of economic potential, a repeating theme emerged: the importance of strategic implementations matched with effective policies. Participants stressed that, while the inherent promise of e-services and cloud products cannot be denied, their full economic impact is dependent on deliberate and consistent legislative frameworks. Participants emphasized that these frameworks should be customized to Malawi's particular socioeconomic situation, addressing major challenges such as infrastructure development, regulatory frameworks, digital literacy, and data security.

The findings highlighted the importance of aggressive government actions targeted at creating an environment conducive to exploiting new technologies for economic growth. Strategic initiatives such as digital skills development programs, infrastructure enhancement, and the creation of rigorous data protection rules were identified as critical conditions. Furthermore, the importance of collaboration between the government, corporate sector, and civil society in developing and executing these policies was underlined as critical to their efficacy and relevance.

The viewpoints of the participants, founded in practical experiences and futuristic outlooks, emphasized a shared desire for a digitally empowered Malawi, where the use of e-services and cloud computing becomes synonymous with economic prosperity and societal growth. They saw the necessity for a concerted effort to harness new technologies not only for technological modernization's sake, but as strategic tools for inclusive economic development and equitable growth across diverse sectors of the economy.

The participants' optimistic view of the economic possibilities of e-services and cloud solutions is a light of hope and opportunity. However, it is abundantly clear that maximizing the economic impact of these technologies requires concerted efforts in policy formulation, infrastructure development, and collaborative endeavors—an endeavor that holds enormous promise for Malawi's journey toward a digitally resilient and economically vibrant future.

4.2.2 Fulfillment of Aim and Future Trajectories

The study successfully met its aim of elucidating the technological landscape of e-government and cloud computing in Malawi. The comprehensive analysis provides a foundation for informed decision-making, fostering future advancements in digital governance. Future research endeavors could delve deeper into longitudinal impact assessments and innovative strategies to address the identified challenges.

In conclusion, this chapter's analysis has provided valuable insights, laying a robust groundwork for enhancing e-government strategies, promoting inclusivity, and leveraging cloud technologies for economic empowerment within Malawi's governmental framework. The journey continues toward a digitally empowered and inclusive governance landscape, setting the stage for further advancements and improvements in the realm of e-government and cloud computing.

4.3 Chapter Summary

Chapter 4 presents the findings as outcomes from interviews, questionnaires, observations, and artefact examinations. The descriptive statistics focuses on the response rate, participant demographics, internet usage patterns, diversity implications, e-government service use, and participant perceptions. Challenges to e-government and cloud computing adoption are explored, including poor internet penetration, a lack of government commitment, policy implementation gaps, insufficient regulatory monitoring, and resource limits. The chapter finishes with insights on economic empowerment ideas related to e-services and cloud offerings, underlining these technologies' transformative potential. These findings are being discussed in the next chapter.

CHAPTER 5: DISCUSSIONS

The investigations on the use of cloud computing and e-government in Malawi's administrative structure are extremely important for clarifying important details, figuring out common problems, and explaining possible solutions. This empirical study navigates the complex terrain of technology integration in a developing country, providing critical insights into the transformative power of digitalization and its consequences for socioeconomic development. This thorough conversation provides a means of investigating, evaluating, and placing the research findings in relation to the stated goals and basic questions, highlighting the critical role that this study plays in directing socioeconomic development, particularly in environments with limited resources.

As a developing country, Malawi has numerous obstacles that restrict the advancement of technology (Phiri & Kanjo, 2021). With a focus on cloud computing and e-government, the study offers a fascinating look at how technology may be used to advance such situations. The information gathered is not just a list of figures or facts; rather, it is a compass that directs stakeholders and policymakers in the direction of strategic planning and well-informed decision-making. The goals, research questions, theoretical and conceptual frameworks, and research questions drive the insights.

5.1 Challenges in E-Government and Cloud Computing Adoption

5.1.1 Limited Internet Penetration and Infrastructure

Malawi grapples with significant hurdles due to its limited internet penetration, standing at a meager 13.8% within the population. This stark reality poses formidable challenges for the effective utilization of cloud services, hindering the seamless adoption of e-government initiatives. With such low internet accessibility, the country faces an uphill battle in leveraging the potential benefits that cloud computing offers.

Expanding internet infrastructure across the nation is imperative for enabling comprehensive access to cloud services. Establishing robust internet connectivity, especially in remote areas, is essential to ensure equitable access for all citizens. Additionally, bolstering IT infrastructure within government institutions is crucial. Strengthening these foundations is pivotal to support the

successful implementation of e-government systems and optimize the use of cloud computing technologies (Almarabeh et al., 2016).

Expanding internet infrastructure across the nation is imperative for enabling comprehensive access to cloud services. Establishing robust internet connectivity, especially in remote areas, is essential to ensure equitable access for all citizens. Additionally, bolstering IT infrastructure within government institutions is crucial. Strengthening these foundations is pivotal to support the successful implementation of e-government systems and optimize the use of cloud computing technologies (Almarabeh et al., 2016).

5.1.2 Lack of Government Commitment and Enforcement Strategies

Participants' expressions of concern highlighted a fundamental issue: the lack of sustained commitment from the government to drive effective e-government and cloud computing initiatives forward. Despite the formulation of policies, many participants noted a conspicuous absence of active enforcement strategies. This gap often leads to a disconnect between policy creation and execution, resulting in an ineffective adoption rate.

Addressing this challenge requires a paradigm shift in governmental approach – a steadfast commitment to not only formulating policies but also ensuring their active implementation and compliance. Establishing comprehensive enforcement mechanisms and strategies aligned with policy formulation is critical. Governmental bodies should prioritize continuous monitoring, evaluation, and adherence to established policies to foster an environment conducive to successful e-government and cloud computing integration.

5.1.3 Development of Policies Without Effective Implementation Strategies

A prevalent trend highlighted by participants was the development of policies without corresponding strategies for implementation. This discord between policy formulation and practical execution poses a significant obstacle to successful e-government and cloud computing adoption. Participants emphasized that policies, though existent on paper, often lack tangible implementation strategies, resulting in ineffective adoption rates.

To mitigate this challenge, a fundamental shift is needed in the policy-making process. Policies should be formulated with a holistic approach, encompassing practical and executable implementation strategies right from their inception. Inclusivity in the policy development process, engaging stakeholders, and considering real-world scenarios are imperative. A synchronized approach between policymakers and implementers is essential to bridge the gap between policy formulation and execution.

5.1.4 Inadequate Supportive Framework and Regulatory Oversight

Participants stressed the need for a more supportive framework and robust regulatory oversight to navigate the complexities of cloud adoption effectively. The absence of a comprehensive supportive framework and stringent regulatory oversight exacerbates challenges in successfully integrating cloud computing technologies.

Establishing a robust regulatory oversight mechanism is pivotal to monitor and support the adoption of cloud computing within the governmental landscape. Regulatory bodies need to proactively facilitate compliance with established policies and standards. Furthermore, fostering an environment that encourages innovation while ensuring compliance with data protection and security measures is essential. An adaptive regulatory framework aligned with technological advancements is necessary to guide and support the adoption of cloud computing in Malawi effectively.

5.1.5 Limited Resources and Capacity Building

Scarce resources and inadequate capacity building efforts emerged as substantial barriers hindering the effective utilization of e-services and cloud computing technologies within government entities. The shortage of resources and inadequate skill development programs pose significant challenges in optimizing the benefits of technological advancements.

Addressing this challenge necessitates substantial investment in capacity building programs tailored to enhance the technological skills of government employees. Comprehensive training initiatives focused on cloud computing adoption, data security, and e-government systems management are imperative. Adequate resource allocation for skill development and technological

infrastructure is vital to bridge the existing capacity gaps and foster a workforce adept at leveraging technological advancements for efficient e-government service delivery.

The journey through the exploration of e-government adoption and the integration of cloud computing technologies within Malawi's governmental landscape has been insightful and illuminating. This analysis sought to unravel the complexities, opportunities, and challenges inherent in these technological realms, aligning with the study's objectives and research questions.

5.2 Summary of Research Objectives

As stated in Chapter 1, this research addresses three objectives as presented below.

Objective 1: The primary objective of this study revolved around assessing the existing policies and regulatory frameworks related to e-government and cloud computing within Malawi's governmental landscape.

Objective 2: The secondary objective aims to identify policy opportunities and gaps crucial for the successful adoption of cloud computing by the Malawi government.

Objective 3: Another objective was to explore the key strategies employed in the adoption of cloud computing within Malawi's e-government initiatives.

These objectives align with the fundamental inquiries that guide this research: *How do existing policies and regulatory frameworks support the successful implementation of e-government and cloud computing in Malawi?*

Through a critical examination of the results in light of these goals and research questions, this conversation distills a plethora of data into useful understandings and outlines avenues for practical interventions and policy changes. It highlights how technology may change Malawi and lead the country to a future of equitable prosperity, sustainable development, and better governance.

This study's critical importance resonates with the pressing need for inclusive development and revolutionary change, reaching beyond the confines of academic investigation. In locations with limited resources, such as Malawi, where infrastructure is not as developed as it could be, the

consequences of adopting new technologies go beyond traditional thinking. The research highlights the capacity of cloud computing and e-government to act as engines of inclusive growth and societal change, going beyond the domains of technological application to become cornerstones of socioeconomic development.

Essentially, this thorough analysis acts as a link between empirical discoveries and practical solutions. It captures the heart of the research's importance in clarifying the difficulties as well as the opportunities that come with technical developments in contexts with limited resources. It advances the conversation by highlighting the necessity of well-informed choices, calculated risks, and cooperative endeavors to fully utilize technology's transformative potential in advancing Malawi toward a future marked by equitable development, sustainable growth, and enhanced governance.

5.2.1 Examining Existing Policies and Regulatory Frameworks

The investigation of current regulations and policies concerning cloud computing and e-government in Malawi revealed a patchwork of laws with differing levels of significance to these technological fields. A range of application was found among the strategies that were examined, indicating a combination of efficacy and constraints in relation to the changing technological environment. Although several policies demonstrated congruence with the dynamic domains of e-government and cloud computing, notable deficiencies persisted, impeding their efficacy and pertinence.

In particular, the investigation revealed the complex web of policies that, although existing, lacked the necessary precision and depth to enable efficient execution. These limitations created complications and difficulties for the real-world implementation of regulations in the context of cloud computing and e-government projects. The legislative frameworks' lack of clarity and comprehensive guidance presented major obstacles to the smooth adoption and integration of modern technology in government operations.

The results of this study have a profound impact on the participants' experiences and interactions inside the governmental system. Study participants expressed worries about the obstacles caused by unclear policies. They represented a variety of ministries and roles. They described the

difficulties in navigating the regulatory framework, wherein the fast-moving and dynamic field of technology—especially in the e-government and cloud computing domains—often left current policies unsatisfactorily behind.

The study's conclusions highlight the critical need for extensive policy changes and act as a mirror reflecting the participants' actual experiences. The need for policy improvement was emphasized by the participants, who also emphasized the significance of customized regulations that consider the rapidly changing nature of technology breakthroughs. Their comments clarified the concrete effects of vague regulations, reinforcing the need for more relevant and clear regulations to better align with the rapidly evolving technological environment.

The study's conclusions serve as a catalyst for significant change by drawing attention to the shortcomings and restrictions in the current regulations. As far as the participants are concerned, these results provide a springboard for promoting policy changes intended to improve current legislation. The participants foresee flexible, agile policy frameworks that are specifically designed to fit the changing needs of cloud computing and e-government. The congruence between study results and participant viewpoints functions as a guide for stakeholders and policymakers, assisting them in making well-informed decisions and implementing extensive policy changes. It helps to clarify the way forward for developing strong, well-defined regulatory frameworks that are also adaptable and flexible enough to meet Malawi's changing technology demands (Burritt, 2006).

5.2.2 Identifying Policy Opportunities and Gaps

According to the second objective of the study, one of the most important things that was revealed was the presence of key policy gaps that required to be balanced with occasions that would allow cloud computing to be fruitfully incorporated into Malawian government systems. The gaps that were found included critical aspects including currency, accessibility, and policy adaptability, which presented significant obstacles to the smooth integration of cloud technologies into government processes.

As an example, accessibility was found to be the main obstacle preventing cloud computing from being widely used. The discrepancy in accessibility was caused by infrastructural constraints, internet penetration, and cloud service affordability. The study demonstrated how these obstacles

prevented cloud technologies from reaching their full potential and prevented governmental organizations from widely adopting them.

Nevertheless, among these voids, a number of auspicious prospects emerged. Building strategic alliances with businesses that provide information and communication technology (ICT) was one such potential. The government may bridge the accessibility gap and ensure inclusivity in technological access by forming symbiotic relationships with these businesses and leveraging their expertise and resources to provide cloud services even in rural places.

The study also highlighted how the government may improve cloud service accessibility by looking into procedures for fair pricing. The government can democratize access to cloud computing services by putting in place affordable mechanisms, including subsidization or incentive strategies, that make them more affordable for a larger range of governmental departments and stakeholders this is echoed by (Seads, 2021).

Analyzing international models that solve comparable policy gaps offers Malawi useful insights for its efforts. Proactive policy changes and partnerships have proven to be a successful way to close policy gaps in nations like Estonia, which is well-known for its pioneering e-governance models. Estonia maintains an environment that is favorable to innovation and digital transformation by updating its policy framework on a regular basis to consider improvements in technology.

Another notable example is Singapore, which has actively sought public-private partnerships to support initiatives aimed at encouraging cloud use. By working with private sector companies, Singapore has successfully addressed accessibility challenges and ensured broad cloud service coverage across several governmental sectors (Erh, 2023).

Malawi can reap advantages from early policy revisions, regular updates, and strong partnerships between governmental entities and technological stakeholders, as verified by these instances. The breaks that have been recognized offer a strategic roadmap that supports creative solutions and teamwork to change policy settings. By combining these chances with coordinated efforts, it will be possible to close current gaps and accelerate the smooth incorporation of cloud computing into Malawi's political system. These strategies serve as controlling philosophies, signifying how

strategic relationships and policy refinements can catalyze robust cloud computing adoption, thus fostering technical progress and inclusive growth within the country.

5.2.3 Exploration of Key Adoption Strategies

The third objective's pursuit uncovered a wide range of tactics that were crucial to Malawi's e-government projects' use of cloud computing. These policies covered a wide range of tactics, from encouraging symbiotic public-private partnerships to enhancing infrastructure and launching capacity building projects. Interestingly, the focus on capacity building became clear as a critical tactic to provide government employees with the necessary knowledge and abilities necessary for the successful adoption and application of cloud technology.

It is impossible to overestimate the importance of capacity building programs in relation to the adoption of cloud computing. Research from a variety of fields supports the effectiveness of capacity building in promoting technology integration that works. Research has demonstrated, for example, how capacity development initiatives aimed at filling particular skill gaps in government officials have improved their technology literacy and cloud-computing skills. Targeted capacity building projects have been conducted by nations like Rwanda and Kenya to provide their workforce with the necessary skills for successful cloud adoption, ultimately strengthening their e-governance frameworks this is echoed by (ITU, 2018).

Moreover, the deliberate focus on cultivating public-private partnerships has proven to have concrete advantages in promoting effective cloud adoption programs across the globe. The literature is full with cases of how relationships between public and private sector organizations have fast-tracked technical progress. In other for example, public-private partnerships have been essential in removing infrastructure bottlenecks and making it easier to integrate cloud services into government processes (IMF, 2021).

Furthermore, the critical function of technology infrastructure development emerged as a strategic necessity for permitting the smooth adoption of cloud technologies in the public sphere. Significant expenditures have been made by nations like Ghana and Nigeria to strengthen their technology infrastructure, which has created a solid basis for the effective adoption of cloud-based e-government services.

The techniques that have been outlined, including capacity building, public-private partnerships, and infrastructure enhancement, function as fundamental components that facilitate the effective incorporation of cloud technology into e-government endeavors. These tactics are validated not only by empirical data but also by research that shows how effective they are in a variety of socioeconomic settings. By utilizing these tactics, Malawi can strengthen its framework for e-governance and promote a more sustainable and inclusive environment that capitalizes on the transformative potential of cloud computing technology for the growth of the country (Mosweu et al., 2019).

In terms of data protection measures, the results showed a varied picture, with some respondents voicing worries about the security of their data stored on the cloud. More severe data handling policies and strong encryption techniques were clearly needed in order to meet the growing need for enhanced data security measures. Strengthening the security of customer and government data stored in the cloud requires improving data protection protocols. Fostering trust in cloud-based e-government services require enacting cutting-edge security protocols and strengthening rules.

5.2.4 Addressing Research Question

The research question is: How is the landscape surrounding the adoption of cloud computing technologies for e-government in Malawi? The landscape involves the policies and regulatory frameworks and techniques for cloud computing adoption that have been discussed below.

Policies and Regulatory Frameworks: An examination of Malawi's current policies and regulatory frameworks pertaining to cloud computing and e-government revealed a varied environment that included several significant shortcomings. Although the study confirmed the existence of policies, it also revealed glaring weaknesses that compromise their efficacy and flexibility. Malawi, for example, may have data protection regulations in place, but they may not be as specific as is required to deal with contemporary cloud-based data storage, which could lead to risks. Rwanda is demonstrating a proactive attitude in its digital transformation by updating its rules to correspond with technology changes and promoting a smooth integration of cloud services (*The World Bank, 2020*). This pattern reflects global tendencies seen in nations undergoing

digitalization and highlights a glaring divergence between the creation of policies and the adaptability required to take advantage of technological advancements.

Policy Opportunities and Gaps: The regulatory landscape's possible routes and roadblocks were identified through the identification of opportunities and gaps that are essential to the successful adoption of cloud computing. The study brought to light several avenues for improving cloud service accessibility and pricing, including strategic partnerships with ICT firms. On the other hand, these chances were hampered by significant gaps, most notably the antiquated and inaccessible policies in place. With a focus on policy currency, South Africa is making a deliberate effort to update its e-government service policies to better meet the demands of modern technology. This pattern resonates with worldwide patterns seen in comparable developing countries and highlights the intrinsic link between policy gaps and the possibility of strategic opportunities. It also signals the necessity for focused policy reforms in line with technological improvements (Naidoo, 2012).

Important Techniques for Cloud Computing Adoption: Research on important techniques for cloud computing adoption showed a variety of methods, with a focus on public-private partnerships, infrastructure improvement, and capacity building. The crucial significance that capacity building plays in the adoption of technology is reflected in Rwanda's investment in public official training programs that match their abilities with contemporary technological demands. Collaboration between South Africa and private companies to strengthen infrastructure is evidence of the effectiveness of public-private partnerships in cloud adoption. Writings from nations such as Estonia, which are known for having strong cybersecurity laws, emphasize how important it is to have strict data protection guidelines and policies that match in order to secure private information online. These trends are prevalent around the world and show how policy alignment, technical advancement, and strategy execution work hand in hand.

To sum up, the research has revealed trends that highlight the complex interplay among policy development, strategic execution, and technology advancement. By drawing comparisons with international models such as Rwanda, South Africa, and Estonia, the results highlight the imperative need for flexible, up-to-date, and adaptable regulations to enable the effective integration of cloud computing into Malawi's political system.

5.3 Significance of the Study

The research holds significance as it sheds light on the critical role that cloud computing and e-government efforts play in advancing socio-economic development in places with limited resources, such as Malawi. The results highlight how important it is to change policies, develop strategic alliances, and strengthen data security protocols in order to facilitate effective service delivery and technological progress.

The study emphasizes the revolutionary potential of utilizing cloud computing and e-government projects in the context of poor countries, where resources are scarce, infrastructure is undeveloped, and efficient service delivery is crucial. This importance goes beyond the use of new technologies to include inclusive growth and societal betterment.

The research holds significance as it sheds light on the critical role that cloud computing and e-government efforts play in advancing socio-economic development in places with limited resources, such as Malawi. The results highlight how important it is to change policies, develop strategic alliances, and strengthen data security protocols in order to facilitate effective service delivery and technological progress.

The study emphasizes the revolutionary potential of utilizing cloud computing and e-government projects in the context of poor countries, where resources are scarce, infrastructure is undeveloped, and efficient service delivery is crucial. This importance goes beyond the use of new technologies to include inclusive growth and societal betterment.

The thorough discussion in this chapter summarizes the research's findings and ties them in line with the aims and research questions that were outlined. It also highlights the importance of the study in determining Malawi's technological landscape and trajectory for socioeconomic development.

5.4 Chapter Summary

The investigation of e-government and cloud computing in Malawi highlighted the significant importance of technology in fostering socioeconomic prosperity. This study exposed essential

aspects of technological integration within resource-constrained situations by aligning with the research aims and resolving fundamental inquiries.

Policy Reforms and Enhancements: The findings underscored the critical importance of policy clarifications, reforms, and frequent apprises to keep up with the rate of technological innovation. Stakeholder involvement, frequent policy audits, and capacity building emerge as essential stages toward policy alignment with modern technological demands.

Bridging Gaps and Leveraging Opportunities: Known policy plan and gaps pose extensive hitches in cloud infrastructure adoption. Yet, strategic alliances with business in the ICT sector and subsidization strategies present viable pathways to bridge accessibility gaps and leverage untapped opportunities.

Implementation Strategies: Capacity building, public-private partnerships, and stringent data protection measures emerge as strategic pillars in cloud computing adoption. Initiatives mirroring successful models from countries like Rwanda, South Africa, and Estonia provide guiding principles for Malawi's technological journey.

Despite limitations in sample representation, response rates, and resource constraints, this study serves as a compass guiding policymakers and stakeholders towards informed decision-making. By leveraging recommendations and implementing robust strategies, Malawi can harness technology's transformative potential, fostering inclusive growth, improved governance, and sustainable socio-economic development.

The research's outcomes resonate with global trends, highlighting the imperative for agile policies, strategic collaborations, and fortified data security measures. The chapter's synthesis emphasizes the transformative role of technology within resource-constrained environments, paving the way for a more technologically integrated and inclusive future for Malawi

CHAPTER 6: STUDY RECOMMENDATIONS, LIMITATIONS AND CONCLUSION

This chapter serves as a culmination of our extensive research, encompassing critical findings, addressing research objectives and questions, highlighting study contributions, acknowledging limitations, and providing comprehensive recommendations for future research endeavors. Additionally, it proposes a structured policy framework to facilitate effective adoption strategies for e-government and cloud computing within Malawi's governmental landscape.

6.1 Recommendations

6.1.1 Key Findings and Insights

The in-depth examination into the dynamics of e-government adoption and the integration of cloud computing technologies inside Malawi's governmental structure yielded crucial insights into the current condition and prospective future development routes. The study, which included participants from several ministries, government departments, and IT professionals, aimed to unearth the complexities and nuances involved in the adoption of these disruptive technologies.

Knowledge of E-Government Services: A striking finding from the study is the high level of familiarity with e-government services among participants. A large majority of respondents reported some level of contact with these programs within the governmental system. This highlights the integration and use of e-government platforms across many ministries, indicating a strong trend toward digital transformation.

However, the study revealed a significant gap, with participants admitting a lack of understanding about e-government services. This study highlights the importance of increased awareness campaigns, underlining the need to bridge the information gap and guarantee fair access to these services across all government sectors.

Economic Potential and Empowerment: A prominent trend emerged from participants' thoughts on the economic potential of e-services and cloud solutions, with a resounding expressing an extremely positive perception. This demonstrates widespread understanding among key

stakeholders within the government structure of the critical role these technologies play in promoting economic growth and empowerment.

Recognizing economic potential includes a variety of aspects, such as the facilitation of streamlined processes, increased efficiency, and the creation of new prospects for economic advancement. Participants' favorable emotion is an important indicator of the perceived value and impact of e-services and cloud computing technologies on Malawi's economic environment.

Policy and Strategy Implications: These findings have major implications for the development of policies and strategies controlling e-government activities and the adoption of cloud computing in Malawi. The found awareness gap recommends that focused interventions, such as extensive training programs and information dissemination campaigns, are required to guarantee that all stakeholders are well-informed and equipped to effectively leverage e-government services, this is also highlighted (MGDS, 2017).

Furthermore, the overwhelming positive impression of these technologies' economic potential necessitates strategic alignment between policy frameworks and the dynamic demands of government ministries. It emphasizes the significance of creating an atmosphere that encourages creativity, cooperation, and the ongoing evolution of digital initiatives.

The findings of the study give a basic understanding of the current situation, setting the way for informed decision-making, policy improvements, and strategic alignments targeted at propelling Malawi deeper into the realms of digital governance and economic empowerment when utilising cloud and e-governance offerings.

6.1.2 Study Contributions: Proposed Policy Framework for Adoption

As a significant contribution, the research proposes a structured policy framework to facilitate effective adoption strategies for e-government and cloud computing within Malawi's governmental landscape:

1. **Inclusivity and Awareness Initiatives:** Implement comprehensive awareness campaigns targeting government officials, stakeholders, and the public to ensure widespread understanding and utilization of e-government services.
2. **Accessible Policies:** Formulate and maintain easily accessible policies and regulatory frameworks related to e-government and cloud computing.
3. **Capacity Building and Training:** Initiate comprehensive training programs for government employees to enhance their digital literacy and proficiency in utilizing cloud-based technologies.
4. **Partnerships with ICT Companies:** Foster collaborations and partnerships with reputable ICT companies to leverage their expertise in providing cloud computing services.
5. **Security and Data Protection Measures:** Establish robust data protection protocols and security measures to safeguard sensitive governmental information stored on cloud platforms.
6. **Continuity Planning:** Develop a comprehensive continuity plan to ensure seamless adoption and transition across government changes.
7. **Feedback Mechanisms and Evaluation:** Implement mechanisms for regular feedback collection from users and stakeholders to assess the effectiveness of adopted strategies.

6.1.2 Recommendations for Future Research

Future research endeavors should encompass longitudinal studies to monitor the impact of implemented strategies over time, exploring innovative approaches to augment awareness and inclusivity in e-government services. Long-term assessments of economic impacts and the efficacy of implemented strategies would be beneficial for refining policies and strategies.

6.2 Conclusion

This chapter captures an important trip across the complex landscape where e-government activities connect with the world of cloud computing within Malawi's governance framework. Our endeavor was not only to comprehend the current status, but also to envisage a roadmap for an efficient, technology-driven governance model.

At its core, this research makes critical contributions that go beyond a simple examination of present conditions. A comprehensive and pragmatic policy framework emerges as a beacon, revealing the critical stages required for Malawi's seamless adoption of e-government and cloud computing solutions this was echoed by (Malanga, 2017). This framework acts as a roadmap, outlining ways for addressing existing difficulties and capitalizing on emerging opportunities. Its essence is to guide governmental bodies toward embracing technological innovations to improve service delivery, administrative efficiency, and public involvement.

Recognizing the cyclical nature of research, we also acknowledge the inherent limitations of our study. The continuous evolution of technology and governance constantly reveals new obstacles and opportunities. As a result, the constraints highlighted serve as catalysts for additional investigation, inviting scholars and practitioners to go further into unknown avenues. Future research efforts will develop and improve the suggested regulatory framework, taking into consideration emerging trends, technology advancements, and changing user needs.

In the future, the prospects for further investigation in this subject appear favorable. The dynamic nature of e-government and cloud computing begs for further scholarly investigation. Future research projects could look into improving data security measures in cloud-based systems, optimizing user interfaces for greater accessibility, and hardening policy frameworks to keep up with the quickly changing technological scene.

In essence, this chapter does not represent the end of a trip, but rather the beginning of a new one. It demonstrates the enormous possibilities of the convergence of technology and government. The suggested policy framework serves as a guidepost, setting the way for future research and policy development efforts. It proposes an environment whereby technological advances and governance interact collaboratively, bringing in an age of evolving, adaptable and human centered governance for everyone's benefit and the society as a whole.

REFERENCES

Adeleke, I., Muraina, I., & Adegbuyi, K. (2020). *Adoption of cloud computing technology for effective university administration in Nigeria*. *Current Journal of Applied Science and Technology*, 1–8. https://doi.org/10.9734/cjast/2020/v39i4031106

Adjei, E. (2023). Internal audit functions and sustainability audits: Insights from manufacturing firms. *Cogent Business & Management, 10*(1), 2192313. https://doi.org/10.1080/23311975.2023.2192313

African Development Bank. (2023). *Inclusive growth and development through e-government and cloud computing in Africa*. African Development Bank Group. Available at: https://www.afdb.org/en/documents/inclusive-growth-and-development-through-e-government-and-cloud-computing-in-africa (Accessed: 31 July 2024).

Ahmad, N., & Hasibuan, M. (2012). The role of cloud computing in improving healthcare services. *International Journal of Cloud Computing and Services Science, 1*(2), 56-66. https://doi.org/10.11591/ijccs.v1i2.464

Ali, O., & Osmanaj, V. (2020). *The role of government regulations in the adoption of cloud computing: A case study of local government*. *Computer Law & Security Review, 36*, 105396. https://doi.org/10.1016/j.clsr.2020.105396

Al-Jabri, I., & Alabdulhadi, M. (2017). *Factors affecting cloud computing adoption: Perspectives of IT professionals* (SSRN Scholarly Paper No. 2939925). https://papers.ssrn.com/abstract=2939925

Almarabeh, T., Majdalawi, Y. Kh., & Mohammad, H. (2016). *Cloud computing of e-government.* Communications and Network, *8*(1), 1–8. https://doi.org/10.4236/cn.2016.81001

Amdocs. (2021). *The state of digital transformation in telecommunications*. Amdocs. https://www.amdocs.com/sites/default/files/2021-02/Amdocs%20State%20of%20Digital%20Transformation%202021.pdf

Ampadu Sarfo, M., & Ahenkorah, I. (2023). *Assessing the adoption and impact of cloud computing services on operational efficiency in SMEs*: A case study from Africa. https://doi.org/10.13140/RG.2.2.32488.24320

Attaran, M., & Woods, J. (2018). Cloud *computing technology: Improving small business performance using the Internet*. *Journal of Small Business & Entrepreneurship*, *13*, 94–106. https://doi.org/10.1080/08276331.2018.1466850

Baker, J. (2011). *The technology–organization–environment framework*. In *Information systems theory* (pp. 231–245). https://doi.org/10.1007/978-1-4419-6108-2_12

Bannister, F., & Connolly, R. (2012). *Defining e-governance*. E-Service Journal, *8*, 3–25. https://doi.org/10.2979/eservicej.8.2.3

Cavaye, A. L. M. (1996). Case Study Research: A Multi-faceted Research. *Information Systems Journal*, *6*, 227-242.

Cloud computing: *The concept, impacts and the role of government policy* (OECD Digital Economy Papers No. 240). (2014). https://doi.org/10.1787/5jxzf4lcc7f5-en

Dafri, H., & Al-Qaruty, B. (2023). Digital banking transformation: A case study of UAE banks. *Journal of Financial Services Marketing, 28*(2), 145-160. https://doi.org/10.1057/s41264-023-00112-3

Fouad, M., Matsumoto, C., Monteiro, R., Rial, I., & Sakrak, O. A. (2021). *Mastering the risky business of public-private partnerships in infrastructure*. Departmental Papers Volume 2021 Issue 010. International Monetary Fund. Available at: https://www.elibrary.imf.org/view/journals/087/2021/010/article-A001-en.xml (Accessed: 3 January 2024).

George, A. S., & Fernando, S. (2023). *Securing cloud application infrastructure: Understanding the penetration testing challenges of IaaS, PaaS, and SaaS environments*. *02*, 24–34. https://doi.org/10.5281/zenodo.7723187

Hammack, C. M., Brelsford, K. M., & Beskow, L. M. (2019). *Thought leader perspectives on participant protections in precision medicine research*. The Journal of Law, Medicine & Ethics, *47*(1), 134–148. https://doi.org/10.1177/1073110519840493

Hassan, A., Bhatti, S. H., Shujaat, S., & Hwang, Y. (2022). *To adopt or not to adopt? The determinants of cloud computing adoption in information technology sector*. Decision Analytics Journal, *5*, 100138. https://doi.org/10.1016/j.dajour.2022.100138

HarmoniMD. (2018). *HarmoniMD electronic medical record system overview*. HarmoniMD. https://www.harmonimd.com/wp-content/uploads/2018/01/HarmoniMD-Overview.pdf

Hummel, P., Braun, M., Tretter, M., & Dabrock, P. (2021). *Data sovereignty: A review*. Big Data & Society, *8*, 205395172098201. https://doi.org/10.1177/2053951720982012

International Monetary Fund. (2023). *Developing technical expertise for e-government in developing nations*. IMF Publications. Available at: https://www.imf.org/en/Publications/WP/Issues/2023/05/01/Developing-Technical-Expertise-for-E-Government-in-Developing-Nations-502203 (Accessed: 31 January 2024).

International Monetary Fund. (2023). *World Economic Outlook, April 2023: A rocky recovery*. https://www.imf.org/en/Publications/WEO/Issues/2023/04/11/world-economic-outlook-april-2023

Jere, J. N., & Ngidi, N. (2020). *A technology, organisation and environment framework analysis of information and communication technology adoption by small and medium enterprises in Pietermaritzburg*. *South African Journal of Information Management*, *22*(1), 1–9. https://doi.org/10.4102/sajim.v22i1.1166

Jones, S., Irani, Z., & Sivarajah, U. (2019). Risks and rewards of cloud computing in the UK public sector: A reflection on three organisational case studies. *Information Systems Frontiers, 21*. https://doi.org/10.1007/s10796-017-9756-0

Kushida, K. E., Murray, J., & Zysman, J. (2011). Cloud computing: From scarcity to abundance. *Journal of Industry, Competition and Trade, 11*(3), 229-244. https://doi.org/10.1007/s10842-011-0102-0

Lahiri, M., & Moseley, J. L. (2013). Migrating educational data and services to cloud computing: Exploring benefits and challenges. *Educational Technology*, *53*(1), 20–30.

Malanga, D. F. (2016). E-government adoption, implementation, benefits and challenges: The Malawian experience. Presented at the SCECSAL Conference. Available at: http://www.scecsal.org/publications/papers2016/048_malanga2016.pdf (Accessed: 31 December 2023).

Malanga, T. (2017). ICT policy in Malawi: A critical analysis. *African Journal of Information and Communication Technology, 13*(2), 121-136. https://doi.org/10.4236/ajict.2017.132008

Maluleka, S., & Ruxwana, N. (2016). Cloud computing as an alternative solution for South African public sector: A case for Department of Social Development. https://doi.org/10.1007/978-3-319-31232-3_45

Makoza, F. (2016). Cloud computing adoption in higher education institutions of Malawi: An exploratory study. *9*, 36–53.

Mari, A. (2020). The impact of digitalization on the financial sector. *Journal of Financial Services Research, 57*(1), 1-19. https://doi.org/10.1007/s10693-020-00312-x

Mell, P., & Grance, T. (2011). The NIST definition of cloud computing (Special Publication NIST SP 800-145). National Institute of Standards and Technology, Gaithersburg, MD. Available at: https://doi.org/10.6028/NIST.SP.800-145 (Accessed: 31 January 2024).

Mina, M., Kady, E., Eid Ahmed Mohamed, M., A. Mawgoud, A., & Taha, M. (2019). Cloud migration strategy for legacy systems using AWS platform. https://doi.org/10.13140/RG.2.2.12301.28649/2

Mohammed, F., Ibrahim, O., Nilashi, M., & Alzurqa, E. (2017). Cloud computing adoption model for e-government implementation. *Information Development*, *33*(3), 303–323. https://doi.org/10.1177/0266666916656033

Mosweu, T., Luthuli, L., & Mosweu, O. (2019). Implications of cloud-computing services in records management in Africa: Achilles heels of the digital era? *South African Journal of Information Management, 21*(1), 1–12. https://doi.org/10.4102/sajim.v21i1.1069

Mtingwi, A., & Van Belle, J. (2013). Adoption of e-Government services in Malawi. *The Electronic Journal of Information Systems in Developing Countries, 59*(1), 1-15. https://doi.org/10.1002/j.1681-4835.2013.tb00393.x

Muda, I., Rafiki, A., & Harahap, M. R. (2020). The role of information technology in enhancing performance of government employees. *Journal of Information Systems and Technology Management, 17*(2), e2020139. https://doi.org/10.4301/S1807-1775202017002

Müller, S., Holm, S., & Søndergaard, J. (2015). Benefits of cloud computing: Literature review in a maturity model perspective. *Communications of the Association for Information Systems, 37*. https://doi.org/10.17705/1CAIS.03742

Mwambiwa, S. I. (2016). Implementation of e-government in Malawi [Thesis, KDI School]. https://archives.kdischool.ac.kr/handle/11125/31842

Norum, K. E. (2008). Artifacts. In L. M. Given (Ed.), *The SAGE Encyclopedia of Qualitative Research Methods* (Vol. 1 & 2, pp. 25-26). London: SAGE Publications.

OECD. (2014). *OECD Digital Economy Outlook 2014*. OECD Publishing. https://doi.org/10.1787/9789264232440-en

Ogwel, B., Odhiambo-Otieno, G., Otieno, G., Abila, J., & Omore, R. (2022). Leveraging cloud computing for improved health service delivery: Findings from public health facilities in Kisumu County, Western Kenya-2019. *Learning Health Systems, 6*(1), e10276. https://doi.org/10.1002/lrh2.10276

Opara-Martins, J., Sahandi, R., & Tian, F. (2016). Implications of integration and interoperability for enterprise cloud-based applications. In Y. Zhang, L. Peng, & C.-H. Youn (Eds.), *Cloud computing* (Vol. 167, pp. 213–223). Springer International Publishing. https://doi.org/10.1007/978-3-319-38904-2_22

Patel, M., & Patel, N. (2019). Exploring research methodology: Review article. *International Journal of Research and Review, 6*(3), 48–55.

Phiri, D. A., & Kanjo, C. (2021). Policy–practice contradiction: Case of cloud computing adoption in the Malawi health sector.

Prasad, A., Green, P., & Heales, J. (2014). On governance structures for the cloud computing services and assessing their effectiveness. *International Journal of Accounting Information Systems, 15*. https://doi.org/10.1016/j.accinf.2014.05.005

Sackey, F. G. (2018). E-commerce adoption in SMEs: The case of Ghana. *Journal of Enterprise Information Management, 31*(4), 606-624. https://doi.org/10.1108/JEIM-12-2016-0216

ŞahiN, Y., & Dogru, İ. (2023). An enterprise data privacy governance model: Security-centric multi-model data anonymization. *Uluslararası Muhendislik Arastirma ve Gelistirme Dergisi*. https://doi.org/10.29137/umagd.1272085

Shah, V. (2014, July 15). Cloud computing models. *TatvaSoft Blog*. https://www.tatvasoft.com/blog/cloud-computing-models/

Teo, T., Srivastava, S. C., & Li, J. (2009). Trust and e-government success: An empirical study. *Journal of Management Information Systems, 25*, 103–137.

United Nations. (2021). E-government survey 2021: Digital government in the decade of action for sustainable development. United Nations E-Government Survey. Available at: https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2021 (Accessed: 31 July 2024).

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly, 27*(3), 425–478. https://doi.org/10.2307/30036540

World Bank. (2020). Rwanda economic update: Leveraging digital transformation for sustainable growth. [online] Available at:

https://www.worldbank.org/en/country/rwanda/publication/rwanda-economic-update-leveraging-digital-transformation-for-sustainable-growth (Accessed 12 January 2024).

World Bank. (2022). Closing the digital divide: Opportunities and challenges in Malawi. World Bank. Available at: https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099354001072302/closing-the-digital-divide-opportunities-and-challenges-in-malawi (Accessed: 31 July 2024).

Yin, R. K. (2003). *Case Study Research: Design and Methods* (Third ed.). Thousand Oaks: Sage Publications.

Yoo, S.-K., & Kim, B.-Y. (2018). A decision-making model for adopting a cloud computing system. *Sustainability*, *10*(8), Article 8. https://doi.org/10.3390/su10082952

Ziba, P. W., & Kang, J. (2020). Factors affecting the intention to adopt e-government services in Malawi and the role played by donors. *Information Development*, *36*(3), 369–389. https://doi.org/10.1177/0266666919855427

APPENDIX

Appendix 1: Letter of Introduction

ACTING VICE-CHANCELLOR
Prof. Alfred D. Mtenje, BEd Mlw, MA S. Illinois, PhD London.

UNIVERSITY OF MALAWI
P.O. Box 280, Zomba, Malawi

Telephone: (265) 526 622
Fax: (265) 524 031
E-mail: vc@unima.mw

TO WHOM IT MAY CONCERN
21st March, 2022

REFERENCE FOR MR. HENRY KAPASUKA (MSC-INF-22-20)

As per the subject matter, Mr. Henry Kapasuka, registration number MSC-INF-22-20 is a student at the University of Malawi pursuing an MSc in Informatics under the Computer Science Department. He seeks to collect data for his research at your organisation. The collected data will only be used for academic purposes. At the end of his study, Mr. Henry Kapasuka will share the results of his findings. Any assistance rendered to him for the same will be greatly appreciated.

Yours faithfully,

Lawrence Fatsani Byson
Programme Coordinator, MSc Informatics
lbyson@unima.ac.mw – +265 881 051 359

Appendix 2a: E-Government End-User Questionnaire

INFORMED CONSENT

Dear Participant,

My name is Henry Andrews Kapasuka (student id: MSc/Inf/22/20), I am a graduate student with the University of Malawi studying towards a Master's Degree in Informatics and carrying out a study on "opportunities and challenges of harnessing cloud computing of e-government in Malawi."

The purpose of the study is to establish the opportunities and challenges of harnessing cloud computing of e-government in Malawi. You and your office were purposively selected.

I am kindly asking you to participate in this study by ticking in boxes or by filling in the spaces provided. Your participation in the study will help me come up with relevant information and meet the core objective of the study and research questions.

The data that you will provide will solely be used for this dissertation and scholarly purposes, and will not be disclosed to any third party, except as part of the dissertation findings, or as part of the supervisory or assessment processes of the University of Malawi. Further, be assured that the data will be treated with utmost privacy and confidentiality. Adding to that, names and any other identification will not be asked for in the questionnaire.

Personal Information

1. What is your gender?

   Male ☐

   Female ☐

   Other ☐

2. Explain your Internet usage frequency?

   Daily ☐

   Weekly ☐

   Monthly ☐

   Yearly ☐

   None ☐

End-User experiences

3. Have you ever used e-government services before? Service like, online Immigration services like passport application, MRA duty calculator, Road traffic e-services, PPDA e-services etc.

   Yes ☐

   No ☐

   a. If Yes, were the services convenient?

      Yes ☐

      No ☐

   b. Were the government e-system user-friendly?

      Yes ☐

No ☐

i. If No, what were the challenges you encountered in using the system?.....
.....
.....
.....
.....

ii. If No, what do you suggest should be done in order to improve the system
?.....
.....
.....
.....

c. How frequently do you use existing Malawi government e-Services?

Everyday ☐

Every Week ☐
Every Month ☐
Every Year ☐

4. Which of the following government e-services are you familiar with?

Road traffic e-services ☐
IFMIS ☐
PPDA e-services ☐
MRA e-services ☐
Mlambe One Stop Public Service Delivery Centre ☐

Other, please indicate……

5. Do you think it is necessary for government to continue offering e-services in Malawi?

   Yes ☐

   No. ☐

   a. If No, why not?.....
   .....
   .....
   .....
   .....

6. According to your test what is the most convenient e-government platform that you have used?
   .....
   .....
   .....
   .....
   .....

7. Are you comfortable to provide your personal information into these government e-platforms?

   Yes ☐

   No ☐

   a. If No, why not?
   .....
   .....
   .....

Thank you

Appendix 2b: E-Government Ministries/Departments Questionnaire

INFORMED CONSENT

Dear Participant,

My name is Henry Andrews Kapasuka (student id: MSc/Inf/22/20), I am a graduate student with the University of Malawi studying towards a Master's Degree in Informatics and carrying out a study on "opportunities and challenges of harnessing cloud computing of e-government in Malawi."

The purpose of the study is to establish the opportunities and challenges of harnessing cloud computing of e-government in Malawi. You and your office were purposively selected.

I am kindly asking you to participate in this study by ticking in boxes or by filling in the spaces provided. Your participation in the study will help me come up with relevant information and meet the core objective of the study and research questions.

The data that you will provide will solely be used for this dissertation and scholarly purposes, and will not be disclosed to any third party, except as part of the dissertation findings, or as part of the supervisory or assessment processes of the University of Malawi. Further, be assured that the data will be treated with utmost privacy and confidentiality. Adding to that, names and any other identification will not be asked for in the questionnaire.

A. Personal Information

1. What is your gender?

   Male ☐

   Female ☐

   Other ☐

2. Are you a government employee?

   Yes ☐

   No ☐

3. Which government ministry or department do you work for?

   ……

   ……

   ……

   ……

B. Cloud computing Policies and Regulations

4. Are you aware of the e-government services offered by the government of Malawi?

   Yes ☐

   No ☐

5. Have you ever heard of Mlambe One Stop Public Service Delivery Centre offered by the government of Malawi?

   Yes ☐

   No ☐

6. Are there policies and regulations that guide e-government and cloud computing in Malawi?

   Yes ☐

   No ☐

a. If Yes, are the policies and regulations exhaustive?

Yes ☐

No ☐

i. If No, what do you suggest should be done?

.....

.....

.....

.....

7. Are the available policies and regulatory frameworks on cloud computing of e-government providing an enabling environment?

Yes ☐

No ☐

a. If No, what you think is lacking?

.....

.....

.....

.....

8. As a public institution, government department or ministry do you use e-services in offering services?

Yes ☐

No ☐

9. If yes, do you think e-services are user friendly?

Yes ☐

No ☐

ii. If No, what challenges do you think users encounter?

.....

.....

.....

.....

.....

.....

10. Is there a national digital vision that may stimulate digital growth and e-government?

Yes ☐

No ☐

11. At the change of government are the adopted policies continued?

Yes ☐

No ☐

12. How can the policy opportunities and gaps be addressed if the Malawi government is to fully go for cloud computing?

……

……

……

a. Are there efficient monitoring, evaluation and feedback tools for ICT activities?

Yes ☐

No ☐

b. Are you motivated offering e-government services?

Yes ☐

No ☐

13. What should government do in order to fully adopt cloud computing of its services?

……

……

Data Protection Measures

14. Are there any data protection measures e-government employ in order to protect its information and data?

Yes ☐

No ☐

15. Do you think clients and governments data information in cloud is safe?

Yes ☐

No ☐

16. Are laws and regulations about data protection updated that they conform with the rapid pace of technological progress?

Yes ☐

No ☐

17. Are the officers managing e-government systems properly trained in ICT roles to effectively support the process?

Yes ☐

No ☐

18. If your ministry or department store data and information on Cloud please indicate the service provider

Microsoft ☐

Amazon ☐

Google ☐

Other, please indicate

……

……

19. How do you keep information and data?

Institutional server ☐

Cloud computing services ☐

Hybrid ☐

Other, please indicate

……

……

Thank you

Appendix 3: Interview Guide for E-Government End-User

INFORMED CONSENT

Dear Participant,

My name is Henry Andrews Kapasuka (student id: MSc/Inf/22/20), I am a graduate student with the University of Malawi studying towards a Master's Degree in Informatics and carrying out a study on "opportunities and challenges of harnessing cloud computing of e-government in Malawi."

The purpose of the study is to establish the opportunities and challenges of harnessing cloud computing of e-government in Malawi. You and your office were purposively selected.

I am kindly asking you to participate in this study by ticking in boxes or by filling in the spaces provided. Your participation in the study will help me come up with relevant information and meet the core objective of the study and research questions.

The data that you will provide will solely be used for this dissertation and scholarly purposes, and will not be disclosed to any third party, except as part of the dissertation findings, or as part of the supervisory or assessment processes of the University of Malawi. Further, be assured that the data will be treated with utmost privacy and confidentiality. Adding to that, names and any other identification will not be asked for in the questionnaire.

Interview Guide: Exploring E-Government, Cloud Computing, and Ministry Operations in Malawi

Introduction and Warm-Up Questions

1. Can you briefly introduce yourself and your role within the ministry?
2. How familiar are you with the concepts of e-government and cloud computing?

Section 1: Understanding Cloud Adoption

3. In your experience, what do you perceive as the primary benefits of implementing cloud computing within the ministry's operations?
4. Can you share any specific instances or examples where cloud computing has significantly impacted service delivery or efficiency within the ministry?
5. From your perspective, what challenges or barriers hinder the effective adoption of cloud computing in the context of government operations?

Section 2: E-Government and Policy Frameworks

6. Are you aware of the existing policies and regulatory frameworks related to e-government within the ministry? If yes, could you elaborate on them?
7. Do you think the current policies and regulations adequately support or hinder the adoption of cloud computing for e-government initiatives? Why?

Section 3: Data Protection and Security

8. How is data protection addressed within the ministry's cloud computing infrastructure? Are there any specific measures in place to safeguard sensitive information?
9. What concerns or risks do you associate with storing government data on cloud platforms, especially regarding data security and privacy?

Section 4: Ministry-Specific Implementations

10. Could you share insights into specific functionalities or services within the ministry that have been migrated to the cloud? What were the motivations behind these migrations?
11. Have there been any noteworthy challenges or limitations encountered during the implementation of cloud solutions within the ministry's operations?

Section 5: Stakeholder Involvement and Support

12. How would you describe the level of support or resistance among key stakeholders, including top management, toward adopting cloud technologies for ministry operations?
13. What role do you think leadership plays in shaping the successful implementation of cloud solutions within government departments?

Section 6: Future Outlook and Recommendations

14. In your opinion, what improvements or strategies could enhance the effectiveness of cloud computing within the ministry in the future?
15. What do you foresee as the potential long-term impacts of increased cloud adoption on the efficiency and quality of services provided by the ministry?

Section 7: Reflection and Closing Thoughts

16. Looking back, what has been the most significant takeaway or lesson learned from the ministry's journey in adopting cloud computing for e-government initiatives?
17. Is there any aspect related to e-government or cloud computing that you believe was not adequately covered in our discussion? If yes, could you provide additional insights?

Section 8: Feedback and Final Comments

18. Do you have any feedback or suggestions regarding how the ministry could further improve its approach to e-government initiatives or cloud adoption?
19. Finally, is there anything else you would like to share, any additional thoughts or comments that you believe are essential for our understanding?

Conclusion

20. Thank the participant(s) for their time and valuable insights.

Appendix 4: Project Plan

Time Frame Schedule (Months)								
Activities	1	2	3	4	5	6	7	8
Planning, designing of interview schedules and resources								
Recruitment and training of project personal								
Interviews/data collection								
Data entry, processing, validation and analysis								
Preparation of draft report for key results								
Finalization of the report								
Report Writing								

Appendix 5: Study Budget

No.	Description	Amount (MWK)
1	Transport and Accommodation	600,000.00
2	Stationery and accessories (e.g Recoders etc)	200,000.00
3	Allowances	200,000.00
4	Contingence	100,000.00
	Total	**1,100,000.00**

Appendix 6: Malawi National ICT Policy Snippet

4. IMPLEMENTATION STRATEGY

4.1. INSTUTIONAL ARRANGEMENTS

The following institutions or agencies will play a central role in the coordination of implementing the ICT Policy:

1. The Department of E-Government should be restructured into Malawi Information Technology Agency (MITA) that will be a quasi-autonomous organization under the ministry responsible for ICT. The organization should be charged with responsibility of accelerating a robust ICT development and utilization in Malawi;

2. The Ministry responsible for Information should be responsible for ICT Policy formulation, monitoring and evaluation;

3. The mandate of the Cabinet Committee on Media and Communications should be enhanced to include provision of ICT strategic direction and oversight for Malawi's ICT sector and ensure that ICT is integrated in national development;

4. A National ICT Steering Committee with membership from Principal Secretaries and Heads of public institutions and Chamber of Commerce shall be established to provide oversight and leadership on Sector ICT Strategy formulation and implementation. The committee shall report to the Cabinet Committee through the Ministry responsible for information;

5. District ICT Committees shall be established to be responsible for determination of ICT utilization for rural development and service delivery and monitoring of ICT utilization among sectors and communities;

3.3. E-GOVERNMENT SERVICES

Electronic government is the utilisation of ICTs in provision of public services. Use of ICTs enhances accountability and promotes equitable allocation and distribution of public resources. ICT plays a crucial role in improving the efficiency of the operations of the public service; particularly in improving the delivery of quality service to the general public and the provision of national security. Malawi is currently ranked 159 out of 190 countries due to its low utilisation of ICTs for public service provision.

Policy Statement 1: Government shall deploy ICTs to facilitate effective and efficient public service delivery and interaction between the public service and citizens of Malawi, companies, government institutions, cooperating partners and other stakeholders of the Government of Malawi;

Policy Statement 2: Government shall deploy ICTs in order to enhance oversight functions in Government.

3.4. ICT IN INDUSTRIES

Malawi is currently promoting the production of export-quality products and services through its local industry sector. However, the country still depends on imported goods as the local industry is unable to meet even the internal demands. The ICT industry in Malawi is under-developed. The growth of the ICT industry, if properly harnessed, will influence the rapid development of all industries in Malawi.

Policy Statement 1: The policy shall promote the use of ICT in the private sector's service delivery and in research and development of goods and services;

Appendix 7: Supplementary Data

Key Findings Summary

Key Finding	Insights
Familiarity with E-Government	- 68.8% of participants reported familiarity with e-government services. - 31.3% of participants admitted a lack of understanding about e-government services.
Economic Potential and Empowerment	- 75% of participants expressed an extremely positive perception of the economic potential of e-services and cloud solutions.
Policy and Strategy Implications	- Increased awareness campaigns and training programs are required. - Strategic alignment between policy frameworks and dynamic demands of government ministries.

Summarised Recommendations

Recommendation	Description
Longitudinal Studies	Monitor the impact of implemented strategies over time through longitudinal studies.
Augment Awareness and Inclusivity	Explore innovative approaches to augment awareness and inclusivity in e-government services.
Long-term Economic Impact Assessment	Conduct long-term assessments of economic impacts and the efficacy of implemented strategies.
Refining Policies and Strategies	Continuously refine policies and strategies based on assessment findings and emerging trends.
Improving Data Security Measures	Investigate and improve data security measures in cloud-based systems for enhanced protection.

Limitations

Limitation	Description
Evolving Nature of Technology and Governance	Continuous evolution of technology and governance reveals new obstacles and opportunities over time.
Scope of Research	The study's scope may limit the generalizability of findings beyond the specific context of Malawi's governance landscape.

Future Research Prospects

Future Research Prospects	Description
Data Security in Cloud-Based Systems	Investigate methods to enhance data security measures in cloud-based systems for improved protection.
Optimizing User Interfaces	Explore strategies to optimize user interfaces for greater accessibility and usability of e-government platforms.
Hardening Policy Frameworks	Strengthen policy frameworks to keep pace with rapidly changing technological advancements and user needs.