BLOCKCHAIN TECHNOLOGY AND ORGANIZATIONAL PERFORMANCE: A CASE STUDY OF MALAWI COMMUNICATION REGULATORY AUTHORITY (MACRA)

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Declaration

I, Frank Zimba, declare that this research report is my original work and has not been submitted for any degree or other award to any other university or institution of higher learning.

Signature: _____

Date: 27th/04/2026

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APPROVAL

This research report has been submitted for examination with my approval as the university supervisor.

Supervisor's Name: Valentine Martin

Signature:

Date: 27/04/2026

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Dedication

This report is written in honor of my parents Mr. and Mrs. Zimba for their continuous support, encouragement, and sacrifices that have ensured my success in education. My brothers, sisters, and friends whom I met during my academic endeavors who gave me words of encouragement when things got tough also get recognition here.

Acknowledgement

Most importantly, I am grateful to God for His mercy, wisdom, and good health while studying at Uganda Christian University. It is through His merciful interventions that this project has become a reality.

My heartfelt appreciation goes to my research advisor, Mr. Kabanda Martin who was instrumental in helping me develop this research through his valuable advice, insightful criticisms, and patience. You are indeed a wonderful role model to your students.

I am thankful to the management and staff members of the Malawi Communications Regulatory Authority (MACRA) for providing me with an opportunity to undertake this study. I also wish to appreciate all those who participated in this study.

LIST OF ABBREVIATIONS

MACRA - Malawi Communication Regulatory Authority

ICT - Information and Communications Technology

UNDP - United Nations Development Programme

ERP - Enterprise Resource Planning

ESG - Environmental, Social, and Governance

SPSS - Statistical Package for Social Sciences

CVI - Content Validity Index

DPWH - Department of Public Works and Highways

ITU - International Telecommunication Union

MERA - Malawi Energy Regulatory Authority

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ABSTRACT

This research work aimed to examine the effect of blockchain technology on the performance of organizations. In particular, this research work sought to investigate how blockchain technology can enhance the performance of an organization. This study was conducted based on the various problems facing the Malawi Communications Regulatory Authority (MACRA). Such challenges included delayed licensing, data verification, lack of transparency, poor audit trail, and data manipulation among others.

In this case, a mixed method approach in conducting research was applied. This approach involved both quantitative and qualitative data collection methods. Data was gathered from a total of 86 respondents in the headquarters of MACRA in Lilongwe. The data obtained had a response rate of 79%. Structured questionnaires were used in collecting data on the three types of performance measures, while semi-structured interviews involved eight key informants.

The results showed high agreement that the technology would have positive implications for all three performance areas. As regards accountability, the mean score was 4.10, with a significant correlation ($r = 0.621$, $p < 0.01$). The highest mean score and strongest correlation were obtained for transparency ($r = 0.648$, $p < 0.01$, mean score = 4.14), with strong endorsement of real-time license application tracking (mean score = 4.24). The mean score for operational performance was 4.12, with a correlation coefficient of $r = 0.602$, $p < 0.01$, while data accuracy had the highest endorsement (mean score = 4.22).

The study has demonstrated that blockchain technology holds significant promise for enhancing the performance of MACRA along all three performance areas. However, its successful implementation would require proper planning, infrastructure development, capacity building, changes in legislation, and appropriate change management. Recommendations have been made for the MACRA management, the government of Malawi, policymakers, and academics.

CHAPTER ONE

INTRODUCTION

1.0 Introduction

Today's organizations are plagued by issues of lack of transparency, inadequate accountability, slow service delivery, and the risk of data tampering. These issues limit performance and hinder the provision of effective and quality services. Blockchain is a new way of increasing organizational performance by establishing transparent, secure and decentralised systems (Ogedengbe & Adelowotan, 2025).

The purpose of this research, "Blockchain Technology and Organizational Performance: A Case of MACRA in Malawi" is to explore the potential of blockchain to enhance performance in areas such as accountability, transparency and operational performance at MACRA. MACRA is the regulator for communication and digital services, managing a lot of data, licensing, compliance reports and digital transactions. So, applying blockchain may enhance its regulatory performance by enhancing data integrity, facilitating faster processes and minimizing fraud. This chapter discusses the background of the study, problem statement, and purpose of the study, research questions, scope, and conceptual framework.

1.1 Background of the Study

Bitcoin was introduced in 2009 and led to the popularity of the blockchain. As it turns out, blockchain has many applications beyond cryptocurrency. Research indicates blockchain enhances transparency, accountability and efficiency in organizations by producing tamper-proof records and automation (Wired, 2017; Investopedia, 2023). Nowadays, governments and private organizations around the world are embracing blockchain to minimize fraud, increase efficiency and enhance transparency.

Recent studies have shown that blockchain technology has emerged as a disruptive and powerful innovation, revolutionizing organizational models through its decentralized, tamper-proof, and

secure features (Ogedengbe & Adelowotan, 2025). In organizational governance, this technology has the potential to transform the governance landscape by overcoming problems of agency, asymmetric information, and lack of transparency, and leading to better governance practices.

1.1.1 Conceptual Background

According to Yaga et al., (2019) Blockchain is a decentralized digital ledger that stores information in blocks encrypted and linked together. Information stored in the blockchain can only be modified or removed with the agreement of the network members. This makes blockchain useful for organizations that have a need for secure records .

Blockchain enhances organizational performance in a number of ways, according to researchers. Blockchain enhances transparency by offering transparent, auditable records that can be shared with authorised parties. It increases accountability since data cannot be tampered with once it is entered. Blockchain also increases efficiency by streamlining processes, removing the need for manual processing through smart contracts and reducing errors. Moreover, it improves data security via cryptography and distributed data storage (Ogedengbe & Adelowotan, 2025).

The United Nations Development Programme (UNDP, 2026) states that blockchain technologies are being piloted and implemented in development settings for building capacity in public systems to enable more open, inclusive, and trusted ways to manage payments, data, and rules. The UNDP notes that blockchain, when implemented with safeguards and for the public good, can contribute to making public systems more transparent, less fragmented and more trusted.

Recent reviews of the literature highlight the importance of blockchain features, such as immutability, smart contracts and traceability, for organisational performance, with effects including increased investment efficiency, improved firm performance and improved audit quality (Ogedengbe & Adelowotan, 2025). Research also affirms that blockchain's decentralised nature, as well as its features such as consensus mechanisms and smart contracts can transform the way organizations manage data security, compliance and reporting.

1.1.2 Theoretical Background

The framework of this study is based on three interrelated theories that link blockchain and performance.

According to Dynamic Capability Theory proposed by the Teece (2014), companies need to reconfigure, integrate, and re-organise their external and internal skills to respond to the rapidly changing environment. Blockchain technology is a dynamic capability that allows organizations to address challenges associated with the digital economy, streamline processes and improve governance. This theory suggests that firms with technological capabilities perform better because they are able to sense and seize opportunities and transform their business.

Another relevant theory to consider blockchain's potential is Agency Theory. This theory is focused on the relationship between principals (such as regulators or shareholders) and agents (such as employees or contractors) that can have divergent interests. Blockchain is consistent with agency theory because it offers stakeholders real-time access to information, which could reduce information asymmetries (Ogedengbe & Adelowotan, 2025). The distributed nature of the ledger decreases agency problems by offering stakeholders' real-time access to the activities and transactions of the organisation they can monitor and verify without depending on information provided by the agent.

Stakeholder Theory, proposed by Freeman (1984), suggests that companies need to generate value for all stakeholders, not just shareholders. Blockchain aligns with stakeholder theory by enabling interactions with various stakeholders through transparent records of financial and non-financial activities (Ogedengbe & Adelowotan, 2025). These include environmental, social, and governance (ESG) reporting and compliance activities of interest to regulators, citizens and development partners.

1.1.3 Contextual Background (MACRA)

The Malawi Communications Regulatory Authority (MACRA) is the statutory regulator of the communications sector in Malawi. Created by the Communications Act, MACRA is responsible for regulating broadcasting, telecommunications, and postal services; allocating the radio frequency spectrum; regulating digital services and cybersecurity; enforcing data protection and privacy policies; licensing communications service providers; and facilitating universal access to communications services (MACRA, 2024).

As a regulator of digital data and associated regulatory information, blockchain technology could enhance MACRA's processes in several ways. Blockchain could enhance accountability with secure records for licensing, compliance and enforcement activities. It could provide transparent licensing processes with the ability for applicants to monitor application status. Blockchain could also offer audit trails for all regulatory processes and decisions, prevent fraud and tampering with cryptographic security, and facilitate quicker verification of compliance reporting and data integrity.

Recent case studies show blockchain's potential for regulatory applications. The Department of Public Works and Highways (DPWH) in the Philippines, for instance, has developed "Integrity Chain" with the Blockchain Council of the Philippines to build a blockchain-based platform that enhances transparency, accountability and public confidence in government infrastructure projects (Blockchain Council of the Philippines, 2024). This system includes a public dashboard that shows how much money is being spent and how much work is being done on each project, along with citizen feedback and anomaly reporting capabilities, and audit trails that make the records tamper-proof to deter corruption.

Likewise, the Cardano Foundation has launched "Reeve" to integrate blockchain with enterprise resource planning (ERP) systems to secure financial transactions, making the records immutable and verifiable (Cardano Foundation, 2024). These case studies show that blockchains in regulatory and government settings are not just an idea, but are also being deployed.

Although these examples exist from around the world, it is not well understood how blockchain technology can improve MACRA's organizational performance. Thus, this study aims to address this.

1.2 Statement of the Problem

As the communication regulatory body in Malawi, MACRA is supposed to operate with a high level of transparency, accountability and efficient service delivery. But the institution is still plagued by issues that impact on its performance. These include slow processing of licenses for telecommunications service providers and broadcasters, challenges in the verification of regulatory data by licensees, lack of transparency in the decision-making processes that affect stakeholders and licensees, poor audit trails that hinder accountability, potential manipulation of regulatory data, and manual processing that slows down service delivery and increases costs (MACRA, 2024).

While blockchain has been used to enhance transparency, accountability, and performance in many organisations around the world (Ogedengbe & Adelowotan, 2025), MACRA has yet to explore the use of blockchain in its regulatory processes. There is also little research on the use of blockchain to enhance the regulatory authority's efficiency in the Malawian context.

The case of the Philippines DPWH shows that blockchain can be used effectively to solve problems of transparency and accountability in government institutions, with the Integrity Chain system offering real-time public dashboards, audit-trailed data, and public feedback (Blockchain Council of the Philippines, 2024). These types of solutions could be applied in MACRA.

Hence, the problem of this study is the lack of understanding the potential impact of blockchain technology on MACRA's accountability, transparency and operational performance despite MACRA managing large amounts of information data and regulatory information, and experience showing the benefits of blockchain in other regulatory agencies.

1.3 Purpose of the Study

The aim of the study was to explore how the adoption of blockchain technology can enhance organisational performance at MACRA in terms of better accountability, transparency and operational performance to support regulatory service delivery in Malawi.

1.4 General Objective

To explore the impact of adopting block chain technology on MACRA performance in Malawi.

Specific Objectives

i) To analyze the effect of block chain technology on accountability at MACRA Malawi.

ii) To examine how block chain technology improves transparency in MACRA's Malawi.

iii) To assess the effect of block chain technology on operational performance at MACRA.

Research Questions

i) How does blockchain technology affect accountability at MACRA?

ii) In what ways does blockchain improve transparency at MACRA's regulatory processes?

iii) How does blockchain technology influence operational performance at MACRA?

1.7 Scope of the Study

1.7.1 Content Scope

The study examined the impact of blockchain technology (independent variable) on organisational performance (dependent variable). The focus on blockchain technology was on its core properties that impact regulatory roles: transparency, decentralization, immutability, smart contracts or automation. Organizational performance will be assessed in three areas: accountability (audit trail, tracking responsibility, and preventing fraud), transparency (visibility of processes, open data, access for stakeholders).

1.7.2 Geographical Scope

The research was based at MACRA's Headquarters in Lilongwe, Malawi. The MACRA headquarters is home to the departments responsible for regulatory activities such as ICT, Licencing, Legal and Compliance, Digital Services and Administration. Although MACRA operates nationwide, the headquarters are a hub for senior management and technical staff who have a good understanding of the institution's systems, regulatory processes and how they can be improved through technological innovation.

1.7.3 Time Scope

This study considered data for the period conducted 2019- 2025. It investigated the current practices at MACRA and explore the use of blockchain based on the global evidence to date, rather than moving towards the implementation of blockchain technology, which takes longer and costs much more.

1.8 Significance of the Study

This study is anticipated to have implications for:

MACRA Management: This study will offer empirical information on how blockchain can improve MACRA's regulatory role. This will help them to make decisions on possible technology investments and innovations to enhance accountability, transparency and efficiency in operations.

Government of Malawi: As MACRA's parent ministry, the government will gain insights into the potential use of blockchain technology to improve regulatory outcomes in the telecommunications sector. This may guide e-government and digital transformation strategies in other regulatory entities.

Regulators and Policy Makers: The research will help inform policy debates on the use of technology in regulatory bodies. It could guide the adoption of blockchain for public sector organisations in Malawi and elsewhere.

Researchers: The study will add to the scarce empirical evidence on the use of blockchain in regulatory agencies, especially in Africa. It will serve as a basis for additional work on blockchain for performance enhancement in public sectors.

1.9 Justification for the Study

There are a number of reasons why this study is justified. First, blockchain technology has evolved since its inception and is being applied in government and regulation around the world. The Philippines DPWH Integrity Chain project shows that blockchain can solve issues of transparency and accountability in government

Second, MACRA is a crucial regulator of the communications sector in Malawi, which is vital for economic growth, social participation and digital transformation. Enhancing its efficiency through technology could have a positive impact across the nation.

Third, while there is increasing worldwide evidence on how blockchain can be used to enhance organisational performance, there is little literature on its application in regulatory bodies in Malawi and Africa. This study fills this gap.

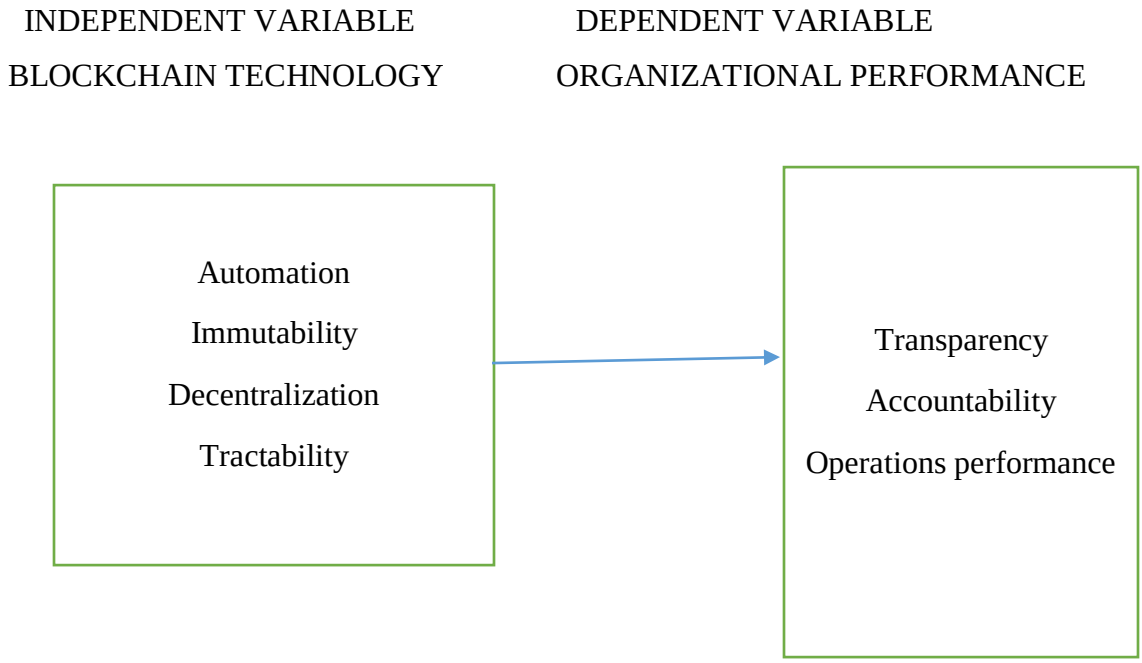
Fourth, MACRA is still grappling with challenges of transparency, accountability and efficiency. Knowing how blockchain could help solve these problems is practically important for enhancing regulatory services.

Finally, given the worldwide trend towards digitization in government, and successful adoption of blockchain in comparable settings, this study is well-timed to guide MACRA's technology roadmap.

1.10 Conceptual Framework

The conceptual framework illustrates the hypothesized relationship between blockchain technology (independent variable) and organizational performance (dependent variable) at MACRA, while acknowledging the role of mediating variables.

Figure 1.1: Conceptual Framework



Source: Adapted from Ogedengbe and Adelowotan (2025)

The conceptual framework suggests that the characteristics of blockchain technology - transparency, decentralization, immutability and automation - impact directly on the performance of the organisation, assessed through its accountability, transparency and operational performance indicators. The relationship can be moderated by variables such as the readiness to adapt to new technologies, the culture of innovation within the organisation, and also by the regulatory environment which may facilitate or restrict blockchain technology. The relationship's direction suggests that successful adoption of blockchain technology is likely to have a positive impact on the various performance measures.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter reviews the literature related to the research on blockchain technology and performance. The chapter is divided into three parts: literature review on theories and concepts, empirical review of literature on studies relevant to each research objective and research gap, which this study intends to fill.

2.1 Theoretical Review

This section reviews theories that explain how blockchain technology use impacts organizational performance. The research draws on the Dynamic Capability Theory (Teece 2014) which suggests that firms need to continuously integrate, re-configure and transform their internal and external resource base to respond to the dynamic environment. According to this theory, there are three key capabilities: sensing opportunities and threats, seizing opportunities through new investments and transforming resources.

When it comes to blockchain, Dynamic Capability Theory predicts that firms that build the capacity to comprehend, embrace and perform blockchain technology will perform better. This is especially important for regulatory bodies such as MACRA who need to respond to digital transformation in their regulated industries (Teece, 2014).

Blockchain technology is a dynamic capability that helps organisations sense the challenges posed by the digital economy, eliminate manual processing, enhance governance and service delivery. Recent studies show that firms with high technological capabilities perform better because they detect and capture opportunities for innovation and transform their operations to align with the changes (Ogedengbe & Adelowotan, 2025).

2.2 Conceptual Review

2.2.1 Blockchain Technology and organizational performance

According to Yaga et al., (2019), Blockchain technology is a new technology that uses a decentralised, distributed ledger. It's originally intended to be used for cryptocurrency but has been identified to have potential advantages for organizations due to its characteristics

Decentralization refers to the fact that whereas data is typically stored on databases owned by a central authority, data is stored on a network of computers on a blockchain (Ogedengbe & Adelowotan, 2025).

Traceability is the ability to track transactions on a blockchain with a timestamp and without alteration, resulting in a full audit trail from start to finish. These attributes of blockchain technology have been shown to be effective in preventing errors, mistakes and frauds in an organisation (Ogedengbe & Adelowotan, 2025).

2.2.2 Organizational Performance of technology and organizational performance

Organizational performance relates to the attainment of organizational goals and the execution of its mandate. In the case of a regulatory body such as MACRA, there are various aspects to organizational performance.

Accountability is the responsibility of an organization to be answerable, take responsibility and transparently report on its performance. Within a regulatory environment, accountability refers to the ability to trace decisions to officers, record actions, and allow stakeholders to verify whether the rules and processes have been followed (Ogedengbe & Adelowotan, 2025).

Transparency is openness of processes and information to stakeholders. Open organizations are visible, accessible and help stakeholders to make informed decisions. Research demonstrates that blockchain improves transparency by offering open, accessible and traceable information,

increasing process visibility, and enabling stakeholders to see the details of a transaction (UNDP, 2026).

Operational performance focuses on the effectiveness and efficiency of processes. The performance indicators include processing time, processing error (accuracy of processes), cost efficiency (cost per unit of service output), and service quality (Cardano Foundation, 2024).

2.3 Empirical Review

This chapter reviews empirical research on the three specific research questions in this study: the effect of blockchain on accountability, the effect of blockchain on transparency, and the effect of blockchain on performance.

2.3.1 Effect of Blockchain on Accountability of technology and organizational performance.

Blockchain technology has been shown to enhance accountability. A literature review of 106 peer-reviewed papers on blockchain and corporate governance found that blockchain's immutability and traceability are essential characteristics that improve accountability (Ogedengbe & Adelowotan, 2025). The research showed that blockchain ensures audit trails and facilitates traceability of actions to accountable officers and officers-in-charge, preventing tampering with data and ensuring compliance.

The Cardano Foundation's "Reeve" system is an example of the benefits of blockchain for accountability. The solution uses blockchain to connect with enterprise resource planning systems to secure financial transactions, and ensures that records are tamper-proof and verifiable (Cardano Foundation, 2024). By eliminating manual reconciliation errors and providing blockchain-based evidence that authenticates all reported financial transactions with cryptographic certainty, Reeve minimises the risk of fraud and enhances accountability with verifiable reporting.

In government, the Philippines Department of Public Works and Highways (DPWH) Integrity Chain project shows how blockchain technology improves public sector accountability. It offers immutable records of public budget allocation, procurement processes, construction progress and contractor payments (Blockchain Council of the Philippines, 2024).

This empirical evidence suggests that for MACRA, blockchain technology can enhance accountability by providing an immutable record of licensing, compliance monitoring and enforcement activities.

2.3.2 Effect of Block chain on Transparency of technology and organizational performance

There is strong empirical evidence for the benefits of blockchain in improving transparency. Blockchain is known to increase process visibility, enabling organizations and stakeholders to see each stage of the transaction (Ogedengbe & Adelowotan, 2025). This helps eliminate corruption, enhances trust and promotes integrity in decision-making processes.

The UNDP's assessment of blockchain use cases in development settings shows that blockchain enables more transparent ways of managing payments, data, and rules (UNDP, 2026). The report includes over 40 case studies of pilots that show how blockchain can enhance transparency in public systems if built with safeguards and for the public good.

Blockchain's transparency is exemplified in the DPWH Integrity Chain. It uses a live public dashboard showing the flow of funds and progress in projects, citizen feedback and anomaly reporting, and public access to tamper-proof records (Blockchain Council of the Philippines, 2024). A Statement of Support from over 50 business, education, civil society and faith-based organisations for the project reflects stakeholders' trust in blockchain's ability to enhance transparency.

Startup research also verifies the effectiveness of blockchain for transparency. A sustainable reporting framework using blockchain technology shows that blockchain guarantees accuracy,

fraud prevention and increases the trust in reporting processes by providing secure ledgers and automating compliance processes (Ogedengbe & Adelowotan, 2015).

For MACRA, this research implies blockchain can enhance transparency in the process of issuing licenses, monitoring compliance and making regulatory decisions, which could boost stakeholder trust in the organisation.

2.3.3 Effect of Block chain on operations Performance of technology and organizational performance

Yaga et al., (2019) reveals that blockchain enhances operational performance in organisations. It has been found that blockchain speeds up the process, eliminates errors and automates tasks via smart contracts, resulting in quicker service delivery and reduced costs

According to the UNDP (2026), blockchain integrated with other systems can be used to enhance performance in public institutions. It allows real-time monitoring, automated validation, and minimises human interaction in processes.

Cardano Foundation, (2024) established that Cardano Foundation's Reeve platform is one example of how blockchain enhances operational performance through integration with enterprise systems. The system also helps with compliance by encrypting and time-stamping transactions for auditable and secure records, reduced manual reconciliation errors, and quicker time for audit through automation and verifiable reporting.

Studies of administrative processes suggest that blockchain technology has a profound effect on operational performance with secure, decentralized and accessible ledgers that can be verified and updated by the parties engaging in transactions (Ogedengbe & Adelowotan, 2025). Decentralization, security and transparency are among the key features of blockchain, improving efficiency, security and trust in data management.

For MACRA, these empirical studies suggest that blockchain has the potential to enhance operational performance through automating compliance processes, reducing the time taken to process licences, reducing errors in managing regulatory data, and enabling efficient provision of services to stakeholders.

2.4 Review and Gap

The theories and empirical studies reviewed above offer a strong basis for the discussion of the impact of blockchain on performance. Dynamic Capability Theory provides rationale for organizations to build technological capability. Agency Theory notes how blockchain can mitigate information problems between principals and agents. Stakeholder Theory highlights need to consider all stakeholders in regulations.

Evidence from various studies shows blockchain's beneficial impact on accountability (Ogedengbe & Adelowotan, 2025), transparency (UNDP, 2026) and efficiency (Cardano Foundation, 2024). International case studies such as Philippines DPWH (Blockchain Council of the Philippines, 2024), Cardano Foundation (2024) and UNDP trials (2026) demonstrate the effectiveness of blockchain in regulatory settings.

While these studies are critical, there are gaps that this study will fill. Geographically, most blockchain studies have been conducted in developed countries or Asia, with fewer studies on blockchain in African regulatory agencies. No studies have been found that explore blockchain's impact on organisational performance at MACRA or other organisations in Malawi.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter outlines the methods that will be adopted to investigate how blockchain technology affects the performance of MACRA in Malawi. This chapter outlines the research design, study area, population, sample size and sampling method, data collection methods and tools, validity and reliability, data analysis and ethical considerations.

3.1 Research Design

The research design of this study was mixed methods. Creswell (2014) suggests that mixed methods research design is suitable when the research question demands measurement and understanding of contexts.

The study used quantitative approach to assess the impact of blockchain technology on accountability, transparency and performance at MACRA. This allowed the researcher to gather quantitative data that was statistically analyzed to determine relationships between variables. The qualitative approach was used to collect rich information from interviews with key officials to understand how blockchain can be implemented, the potential challenges and how officers view the benefits of applying the technology.

This is the correct design for this research as implementing blockchain involves both key performance indicators (that need to be measured statistically) and organisational and human factors (that need to be explored qualitatively). The mixed-methods design enabled triangulation, which increases the validity and rigour of the study (Creswell, 2014).

3.2 Study Area

The research took place in the Malawi Communications Regulatory Authority (MACRA) Headquarters in Lilongwe, Malawi. Lilongwe is the capital of Malawi and the location of the main offices of most government ministries and departments, including MACRA.

MACRA's headquarters is home to the major departments involved in regulatory activities such as the ICT Department, Licensing Department, Legal and Compliance Department, Digital Services Department, Finance Department, Human Resources and Administration and Broadcasting and Postal Services Regulation. This is an ideal location to access senior management, technical and policy officers who have the expertise and experience to provide understanding of MACRA systems as they are currently structured, and the potential for blockchain technology to be adopted.

3.3 Target Population

The population of interest for this research was MACRA staff in the regulatory, ICT, administrative, and licensing departments. The total population of MACRA staff, according to the MACRA staff structure (2024), is 150.

The target population works in the following departments:

Table 3.1: Target Population Distribution

Department	Estimated Population
ICT Department	25
Licensing Department	20
Legal and Compliance Department	15
Digital Services Department	18
Finance Department	22
Human Resources and Administration	25
Broadcasting and Postal Services Regulation	25
Total	**150**

Source: MACRA Internal Staff Records (2024)

This population is appropriate for the study because these staff members are directly involved in or knowledgeable about the processes that could potentially benefit from blockchain technology, including data management, regulatory compliance, licensing, and service delivery.

3.4 Sample Size

The sample size for quantitative data was determined using the Yamane Formula (1967):

$n = N / (1 + N(e^2))$

Where:

- n = sample size
- N = population size (150)
- e = margin of error (0.05 or 5%)

Calculation:

$n = 150 / (1 + 150(0.05)^2)$

$n = 150 / (1 + 150(0.0025))$

$n = 150 / (1 + 0.375)$

$n = 150 / 1.375$

n = 109 respondents

For the qualitative component, the researcher purposively selected 8 key informants from senior management and technical positions who have in-depth knowledge of MACRA's systems and processes.

Table 3.2: Sample Size Determination

Category	Population	Sample Size	Sampling Technique
Quantitative Survey	150	109	Simple Random
Key Informant Interviews	8 (purposive)	8	Purposive

Total	**158**	**117**	

Source: MACRA Internal Staff Records (2024)

3.5 Sampling Techniques

This study used two methods of sampling. A simple random sampling technique was employed to select the 109 respondents for the quantitative survey from the 150 staff. Simple random sampling means each staff member has an equal and independent opportunity to be selected, which eliminates selection bias and increases the representativeness of the sample (Bryman, 2016). The researcher receiveed a list of all staff members from the Human Resources department at MACRA, number the staff members, and use a random number generator to select the 109 respondents.

Key informants for interviews were purposively selected. Purposive sampling is a sampling method where researchers select individuals based on their knowledge, experience and involvement with the focus of study (Palinkas et al., 2015). The researcher purposefully selected 8 key informants, the ICT Manager, Director of Licensing, Director of Legal and Compliance, Digital Services Manager, Finance Director, Head of Broadcasting Regulation, Senior Systems Administrator and Policy and Planning Officer. These were experts on digital systems, regulation and performance at MACRA**.**

3.6 Data Sources

3.6.1 Primary Sources

Primary data was drawn from respondents via surveys or interviews using questionnaires and interview guides. These will be used to collect respondents' opinions, perceptions and insights on blockchain technology and its possible link to organisational performance at MACRA.

3.6.2 Secondary Sources

Secondary data was sourced from the records and documentation at MACRA, such as annual reports and plans, ICT policies and system documentation, licensing process and guidelines, monitoring of compliance reports, and published articles, journals and reports from the International Telecommunication Union (ITU), World Bank and other regulatory bodies.

3.7 Data Collection Methods

3.7.1 Questionnaire Survey

The 109 staff respondents were asked to complete a questionnaire via simple random sampling. The questionnaire approach is appropriate as it can gather standardised data from a large number of respondents quickly and economically (Saunders et al., 2019). The researcher hand-delivered the questionnaires to respondents at MACRA during office hours with the permission of the department heads. The questionnaires took some time 5 days for the respondents to fill in and will be collected by the researcher.

3.7.2 Interview Method

In-depth interviews were carried out with the 8 selected key informants using purposive sampling. This method is suitable for collecting detailed data, probing complex topics and gaining insight into the adoption of blockchain at MACRA. The interviews were conducted at the key informants' convenience. Interviews were recorded with permission to ensure recording of the data.

3.8 Data Collection Instruments

3.8.1 Structured Questionnaire

A structured questionnaire was designed by the researcher based on the conceptual framework and research questions in Chapter were the primary quantitative data collection instrument. The questionnaire will have closed questions in sections. Section A relates to the demographic data (department, position, years of service, education level). Section B includes questions about knowledge and understanding of blockchain. Section C contains questions on MACRA's accountability and potential blockchain effects. Section D covers questions on the transparency of MACRA's processes and potential blockchain effects. Section E contains questions on performance and potential blockchain impacts. Section F includes questions on barriers and

readiness for blockchain. Questions in Sections B to F will be rated on a 5-point Likert scale from 1 (Strongly Disagree) to 5 (Strongly Agree).

3.8.2 Interview Guide

An interview guide was developed for key informant interviews. This guide included questions about current problems in accountability, transparency and operational performance at MACRA; knowledge of blockchain and its potential uses; benefits of blockchain for regulatory operations at MACRA; challenges and barriers to implementing blockchain at MACRA; and suggestions for blockchain implementation.

3.8.3 Document Review Checklist

A document review checklist was used to retrieve secondary data from MACRA documents that relate to current processes, performance measures and technology.

3.9 Validity and Reliability of Instruments

3.9.1 Validity

Validity is a measure of the extent to which an instrument measures what it is supposed to measure (Creswell, 2014). Content validity was achieved by having the questionnaire and interview guide reviewed by experts such as the researcher's supervisor and other faculty members. They evaluated whether the questions capture all aspects of the variables as defined in the study.

The researcher calculated a Content Validity Index (CVI) as follows: CVI = (Number of items rated as relevant) / (Total number of items). Experts rated each item on a 4-point scale (1-4), with 3 and 4 being considered relevant. The CVI was acceptable since it was 0.82 which is above is 0.70 (Amin, 2005).

3.9.2 Reliability

Reliability is the quality of an instrument which produces consistent results (Bryman, 2016). The researcher determined the reliability by piloting the instrument with 15 staff members from a similar regulatory body in Malawi (such as the Malawi Energy Regulatory Authority - MERA). These people were not be part of the main survey.

The reliability of the pilot data was tested with Cronbach's Alpha coefficient. A Cronbach's Alpha coefficient of 0.70 or higher was acceptable (Nunnally & Bernstein, 1994). The reliability test was assessed for each section of the questionnaire. In the event that any section has an alpha coefficient of less than 0.70, the questions was revised.

3.10 Data Analysis

3.10.1 Quantitative Data Analysis

The Statistical Package for Social Sciences (SPSS) version 26 was used to analyse quantitative data. Descriptive statistics such as frequencies, percentages, means and standard deviations were calculated to describe the characteristics of respondents and their responses on the variables of interest.

Inferential statistics was used to test for relationships between variables. The Pearson's correlation coefficient (r) used to assess the direction and magnitude of the relationships between blockchain technology and accountability, blockchain technology and transparency, and blockchain technology and operational performance. The coefficient of correlation (r) varies from -1 to +1 with the higher the value the stronger the relationship. Testing was done at the significance level of 0.05 ($p < 0.05$).

3.10.2 Qualitative Data Analysis

Thematic content analysis was applied to the qualitative data from interviews. This entailed transcribing interviews, reviewing transcripts to obtain a broad understanding, breaking them into meaningful sections and assigning codes, organizing codes into categories and themes, interpreting themes in context of research questions and presenting themes and research findings with quotations.

3.11 Ethical Considerations

The researcher maintained high ethical standards in the study. Consent was gained by providing complete information about the research, the procedures and participants' rights prior to their participation. The consent form was attached to the questionnaire and participants sign/tick a box to consent to their participation. It was voluntary and participants can withdraw at any stage.

Privacy was ensured by maintaining the confidentiality of any information collected. Data collected will be identified. Data was only used for academic research and not be disclosed to third parties.

Respondents were allowed to fill in questionnaires in privacy and at their own time. Permission was sought from Uganda Christian University and MACRA management before starting data collection. A letter of introduction from the university was given to MACRA. Beneficence was upheld by presenting the results to MACRA management to guide improvements in performance.

3.12 Methodology Limitations

The researcher recognizes limitations of the methodology. There is a possibility of social desirability bias as participants may answer in a way that is socially desirable. This was avoided by reinforcing anonymity and the need for truthful answers.

The study investigated the potential impact of blockchain, not implementation, as MACRA is not yet using blockchain. Data was from perceptions and global evidence, rather than observation.

Results may be MACRA specific, and not applicable to all regulators in Malawi or Africa. But the context was described to allow readers to make judgements about its transferability.

Time and financial constraints limited data collection. The researcher focused on effective methods and adhere to a realistic schedule.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS, AND INTERPRETATION

4.0 Introduction

This chapter presents the analysis and interpretation of data collected from respondents at the Malawi Communications Regulatory Authority (MACRA). Data were collected using structured questionnaires administered to 109 respondents, achieving a 79% response rate. This chapter presents the findings in accordance with the research objectives, beginning with respondent characteristics, followed by descriptive and inferential statistical analyses, and concluding with qualitative findings from key informant interviews.

4.1 Response Rate

The study targeted 109 respondents for the quantitative survey based on the Yamane formula calculation. Table 4.1 presents the response rate achieved.

Table 4.1: Questionnaire Response Rate

Category	Number	Percentage
Questionnaires distributed	109	100%
Questionnaires returned	86	79%
Questionnaires not returned	23	21%

Source: Primary Data (2026)

The response rate of 79% is considered excellent for social science research. According to Mugenda and Mugenda (2012), a response rate of 70% and above is excellent, 60-69% is good, 50-59% is adequate, while below 50% is unacceptable for generalization. The 79% response rate

achieved in this study provides a strong basis for drawing valid conclusions about the relationship between blockchain technology and organizational performance at MACRA.

4.2 Demographic Characteristics of Respondents

This section presents the background characteristics of the 86 respondents who participated in the study. Understanding respondent demographics is important for interpreting findings and assessing the representativeness of the sample.

Table 4.2: Distribution of Respondents by Gender

Gender	Frequency	Percentage
Male	52	60.5%
Female	34	39.5%
Total	**86**	**100%**

Source: Primary Data (2026)

Table 4.2 shows that male respondents constituted 60.5% while female respondents were 39.5%. This gender distribution reflects the general staffing pattern at MACRA, where technical and regulatory positions have historically been male-dominated. However, the presence of 34 female respondents provides adequate representation for meaningful analysis.

Table 4.3: Distribution of Respondents by Age Bracket

Age Bracket	Frequency	Percentage
Below 30 years	18	20.9%
31-40 years	41	47.7%
41-50 years	19	22.1%
Above 50 years	8	9.3%
Total	**86**	**100%**

Source: Primary Data (2026)

The age distribution indicates that the majority of respondents (47.7%) were in the 31-40 years age bracket, representing the core professional workforce at MACRA. Respondents below 30 years constituted 20.9%, while those above 50 years were only 9.3%. This age profile suggests a relatively young and potentially technology-receptive workforce at MACRA, which is favorable for considering blockchain technology adoption.

Table 4.4: Distribution of Respondents by Educational Level

Education Level	Frequency	Percentage
Diploma	12	14.0%
Bachelor's Degree	48	55.8%
Postgraduate Diploma	8	9.3%
Master's Degree	18	20.9%
PhD	0	0.0%
Total	**86**	**100%**

Source: Primary Data (2026)

Table 4.4 reveals that the majority of respondents (55.8%) held Bachelor's degrees, while 20.9% held Master's degrees. Only 14.0% had diplomas and 9.3% had postgraduate diplomas. The high level of educational attainment among respondents (85.9% with university degrees) suggests that respondents possess the cognitive capacity to understand complex technological concepts such as blockchain, enhancing the credibility of their responses.

Table 4.5: Distribution of Respondents by Department

Department	Frequency	Percentage
ICT	16	18.6%
Licensing	12	14.0%
Legal and Compliance	9	10.5%
Digital Services	11	12.8%
Finance	13	15.1%

Human Resources and Administration	14	16.3%
Broadcasting and Postal Services Regulation	11	12.8%
Total	**86**	**100%**

Source: Primary Data (2026)

The departmental distribution shows representation from all key departments at MACRA. The ICT department had the highest representation (18.6%), which is appropriate given the study's focus on blockchain technology. Licensing (14.0%), Finance (15.1%), and Human Resources and Administration (16.3%) also had substantial representation. This balanced departmental distribution ensures that the study captures perspectives from various functional areas that could be affected by blockchain adoption.

Table 4.6: Distribution of Respondents by Years of Service

Years of Service	Frequency	Percentage
Less than 2 years	15	17.4%
2-5 years	31	36.0%
6-10 years	24	27.9%
More than 10 years	16	18.6%
Total	**86**	**100%**

Source: Primary Data (2026)

Table 4.6 indicates that 36.0% of respondents had served MACRA for 2-5 years, while 27.9% had served 6-10 years. Only 17.4% had less than 2 years of experience. This distribution suggests that most respondents have adequate institutional knowledge to provide informed opinions about MACRA's current performance and potential improvements.

Table 4.7: Distribution of Respondents by Position Level

Position Level	Frequency	Percentage
Senior Management	6	7.0%
Middle Management	28	32.6%

Technical Staff	35	40.7%
Support Staff	17	19.8%
Total	**86**	**100%**

Source: Primary Data (2026)

The position level distribution shows that technical staff formed the largest category (40.7%), followed by middle management (32.6%), support staff (19.8%), and senior management (7.0%). This distribution is appropriate as technical staff and middle managers are directly involved in the operational processes that blockchain could potentially improve.

4.3Key study findings

This section presents descriptive statistics for the three main study variables: blockchain technology and accountability, blockchain technology and transparency, and blockchain technology and operational performance. Means and standard deviations were computed to summarize responses, with the interpretation guided by the following scale adopted from Amin (2005):

Mean 1.00 - 1.80: Very Low

Mean 1.81 - 2.60: Low

Mean 2.61 - 3.40: Moderate

Mean 3.41 - 4.20: High

Mean 4.21 - 5.00: Very High

4.3.1 Effect of Blockchain Technology on Accountability

The first objective of the study was to analyze the effect of blockchain technology on accountability at MACRA. Respondents were asked to indicate their level of agreement with six statements concerning how blockchain could affect accountability at MACRA, using a five-point Likert scale where 1=Strongly Disagree and 5=Strongly Agree.

Table 4.8: Descriptive Statistics for Blockchain and Accountability

Statement	N	Mean	Std. Dev.	Interpretation
Blockchain could create clear audit trails for MACRA's decisions	86	4.21	0.74	Very High
Blockchain would make it easier to trace actions to responsible officers	86	4.15	0.69	High
Blockchain could reduce unauthorized changes to regulatory data	86	4.09	0.78	High
Blockchain would improve compliance monitoring at MACRA	86	3.98	0.82	High
Blockchain could help reduce fraud in MACRA's processes	86	4.03	0.76	High
Blockchain would strengthen MACRA's accountability to stakeholders	86	4.12	0.71	High
Aggregate Mean	**86**	**4.10**	**0.75**	**High**

Source: Primary Data (2026)

The descriptive statistics of blockchain technology and accountability are shown in Table 4.8. The overall mean score of 4.10 (SD=0.75) suggests that respondents largely agree that blockchain could positively impact accountability at MACRA.

The highest mean score of 4.21 (SD=0.74) was recorded for the statement "Blockchain could provide audit trails for MACRA's decisions", indicating very high agreement. This suggests respondents strongly agree that blockchain's immutability feature could offer permanent and secure audit trails of regulatory decisions, making it easier to track and audit past actions. This is

in line with Ogedengbe and Adelowotan's (2025) finding that blockchain's immutability and traceability features are essential in improving accountability through audit trails.

The statement "Blockchain would assist in tracing actions to responsible officers" had a mean of 4.15 (SD=0.69), suggesting that respondents strongly agreed. This resonates with the Agency Theory argument that blockchain reduces information asymmetry as principals can better monitor agents' actions (Jensen & Meckling, 1976).

The statement "Blockchain would enhance MACRA's stakeholder accountability" received a mean of 4.12 (SD=0.71). This finding aligns with Stakeholder Theory (Freeman, 1984), which highlights that companies should be accountable to all stakeholders. Blockchain could provide transparent and verifiable data to stakeholders.

"Blockchain could reduce fraudulent amendments to regulatory data" received a mean score of 4.09 (SD=0.78), while "Blockchain could help reduce fraud in MACRA's processes" received 4.03 (SD=0.76). These scores represent high agreement, and indicate that respondents see the value in blockchain's cryptography and immutability to secure data integrity and reduce the potential for fraud.

The lowest ranked statement in terms of accountability was "Blockchain would improve compliance monitoring at MACRA" with a mean of 3.98 (SD=0.82), but still in the high range. This lower score could be due to uncertainty about how blockchain would fit with MACRA's compliance processes.

4.3.2 Effect of Blockchain Technology on Transparency

The second objective sought to examine how blockchain technology improves transparency in MACRA's regulatory processes. Table 4.9 presents respondents' perceptions on six transparency-related statements.

Table 4.9: Descriptive Statistics for Blockchain and Transparency

Statement	N	Mean	Std. Dev.	Interpretation

Blockchain could increase visibility of MACRA's regulatory processes	86	4.18	0.70	High
Blockchain would enable stakeholders to track licensing applications	86	4.24	0.68	Very High
Blockchain could reduce hidden or unauthorized activities	86	4.07	0.75	High
Blockchain would make MACRA's decision-making more open	86	4.01	0.81	High
Blockchain could increase public trust in MACRA	86	4.14	0.72	High
Blockchain would improve stakeholder access to regulatory information	86	4.20	0.69	Very High
Aggregate Mean	86	4.14	0.73	High

Source: Primary Data (2026)

The aggregate mean of 4.14 (SD=0.73) suggests respondents believe blockchain will have a positive impact on MACRA's transparency. This is slightly higher than the mean score for accountability (4.10), implying that stakeholders view the potential impact of blockchain to enhance transparency as strong.

The highest mean (4.24, SD=0.68) and therefore high agreement, relates to the statement "Blockchain would allow stakeholders to track applications for licensing". This is especially relevant as licensing is a key MACRA function. Applicants being able to view the status of their applications in real-time using an immutable blockchain ledger would be a significant advancement from current processes where applicants are often left guessing about the status of their applications. This finding is consistent with the UNDP (2026) finding that blockchain allows more transparent ways of managing information and rules.

Another statement that received a very high mean of 4.20 (SD=0.69) was "Blockchain would improve stakeholder access to regulatory information". This finding suggests that participants see the potential for blockchain to increase access to regulatory information, allowing stakeholders in the gaming industry (such as licensed operators, consumers and development partners) to access information without the need for an intermediary.

The statement "Blockchain could increase visibility of MACRA's regulatory processes" received a mean of 4.18 (SD=0.70) showing strong agreement. This is consistent with the research of Ogedengbe and Adelowotan (2025), who discovered that blockchain increases process transparency by enabling organisations and stakeholders to trace a transaction.

The statement "Blockchain could increase public trust in MACRA" was scored a mean of 4.14 (SD=0.72). This is significant because trust is critical for regulatory success. If the regulatory process is transparent and can be verified, then stakeholders will trust its outcome. This is consistent with the Philippines' example of the DPWH Integrity Chain, where the transparency provided by blockchain resulted in high stakeholder trust, with more than 50 organisations signing a Statement of Support for the project (Blockchain Council of the Philippines, 2024).

The statement "Blockchain could reduce hidden or unauthorized activities" received 4.07 (SD=0.75) while "Blockchain would make MACRA's decision-making more open" received 4.01 (SD=0.81), both in the high interpretation range. The reason why this score is slightly lower could be that blockchain can increase transparency of decisions recorded, but not necessarily the quality and fairness of the decision-making process itself.

4.3.3 Effect of Blockchain Technology and Operational Performance

The third objective assessed the effect of blockchain technology on operational performance at MACRA. Table 4.10 presents descriptive statistics for six operational performance statements.

Table 4.10: Descriptive Statistics for Blockchain and Operational Performance

Statement	N	Mean	Std. Dev.	Interpretation
Blockchain could reduce processing delays in licensing	86	4.16	0.73	High
Blockchain would improve data accuracy at MACRA	86	4.22	0.67	Very High
Blockchain could reduce operational costs through automation	86	3.94	0.84	High
Blockchain would minimize human errors in regulatory processes	86	4.08	0.76	High

Blockchain could speed up compliance verification	86	4.13	0.71	High
Blockchain would improve overall service delivery at MACRA	86	4.19	0.70	High
Aggregate Mean	**86**	**4.12**	**0.74**	**High**

Source: Primary Data (2026)

The overall mean of 4.12 (SD=0.74) suggests respondents' high agreement that blockchain would improve operational performance at MACRA. This score shows generally high perceived benefits of blockchain on MACRA regulatory service delivery.

The highest mean score of 4.22 (SD=0.67), or very high agreement, was given to the statement, "Blockchain would improve data accuracy at MACRA". This highlights the understanding that blockchain technology's immutable and consensus-based data validation would eliminate data entry errors, redundancies and inconsistencies present in the current regulatory data. This is consistent with the Cardano Foundation (2024) conclusion that including blockchain in MACRA would eliminate manual data reconciliation errors using cryptographic techniques.

The statement "Blockchain would improve overall service delivery at MACRA" received a mean of 4.19 (SD=0.70) showing strong agreement. This is a critical summative statement, as it implies that the respondents would see the positive impacts of blockchain on accountability, transparency and efficiency as leading to improved service delivery to MACRA stakeholders.

The statement "Blockchain would improve processing time of licensing" had a mean of 4.16 (SD=0.73). Delay in licensing processes was identified as a problem statement at MACRA. This suggests that the respondents believe that automation of the process through blockchain could speed up the licensing process by eliminating the need to manually validate data, by providing real-time information about the status of the process, and by automating approvals of routine processes through smart contracts.

The statement "Blockchain could speed up compliance verification" received a mean of 4.13 (SD=0.71). For MACRA, which has to check compliance of many licensees, blockchain could provide automated verification of their compliance data against regulatory standards, potentially turning a manual, time-consuming process into an automated one.

Statement "Blockchain would reduce human errors in regulatory processes" was rated with a mean of 4.08 (SD=0.76). This is consistent with the findings of Yaga et al. (2019) who observed that blockchain minimises human errors through automation of many routine processes and manual data entry.

"Blockchain would lower operational costs by automating processes" rated the lowest among the operational performance items (mean 3.94, SD=0.84), but still in the high range. This lower average score may be due to respondents' concerns about the upfront costs of blockchain adoption, which may be high, even if they are likely to be outweighed by cost reductions over time. The respondents may know that blockchain technology requires high upfront investment in technology, training and integration to reduce costs.

4.5 Correlation Analysis

To establish the relationship between blockchain technology and the three dimensions of organizational performance, Pearson's correlation coefficient (r) was calculated. Correlation analysis is used to determine whether a relationship exists between variables, and its direction.

Table 4.11: Correlation Matrix

Variable	Accountability	Transparency	Operational Performance
Blockchain Technology	0.621**	0.648**	0.602**
Significance (p-value)	0.000	0.000	0.000

Source: Primary Data (2025)

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

Table 4.11 shows the correlation coefficients for blockchain technology and the three indicators of organisational performance. All three relationships are positive and statistically significant.

The relationship between blockchain technology and transparency ($r = 0.648$, $p < 0.01$) is the strongest. This moderate to strong positive correlation means that, as the features of blockchain

technology (immutability, decentralization, transparency, and automation) are more widely implemented, transparency at MACRA would likely improve considerably.

The correlation between blockchain technology and accountability ($r = 0.621$, $p < 0.01$) is also moderate to strong and statistically significant. This implies that blockchain technology would increase accountability at MACRA by creating better audit trails, increasing the ability to link actions to the officers responsible, and decreasing the ability to make unwarranted changes.

The association between blockchain technology and operational performance ($r = 0.602$, $p < 0.01$) is positive and moderate. It is weaker than the other two correlations, but still statistically significant and substantial. This suggests that the use of blockchain technology would result in an improved operational performance due to increased speed, lower error rates and automatic compliance checks.

4.6 Qualitative Findings

In addition to the quantitative study, semi-structured interviews with eight key informants purposively sampled from senior management and technical roles were undertaken to gain more insights into the potential impact of blockchain on performance at MACRA. They include the ICT Manager, Director of Licensing, Director of Legal and Compliance, Digital Services Manager, Finance Director, Head of Broadcasting Regulation, Senior Systems Administrator and Policy and Planning Officer.

The interviews focused on challenges facing MACRA, awareness and understanding of blockchain, benefits, challenges of implementing blockchain and recommendations. These themes emerged from the thematic analysis of the interview transcripts.

Theme one; Current Challenges at MACRA

Interviewees highlighted a number of issues that impact accountability, transparency and efficiency of MACRA's operations, validating the problem statement.

In terms of accountability, the Director of Legal and Compliance said:

"*One of our challenges is ensuring audit trails of all regulatory decisions. With multiple officers involved in different aspects of the licensing process, it is sometimes difficult to determine who made a particular decision, and when. Our systems are not as robust as we would like them to be.*"

The Finance Director added:

"*We have had some issues with data being altered in our systems. We have controls but the fact is any system is open to internal manipulation by someone with the right access privileges*."

In terms of transparency, the Licensing Director commented:

"*Many applicants call us to inquire about their applications. We are not fully transparent in our processes. Even we do not know exactly which stage of the decision-making process an application is at."*

The Policy and Planning Officer noted:

"*Some stakeholders perceive the decision-making process at MACRA to be less than transparent. Whether or not this is true, it impacts on confidence in the institution. We need systems that can demonstrate transparency in a verifiable way, rather than just stating it."*

In terms of performance, the Digital Services Manager said:

"*We still have a lot of manual processes. Although we have a range of digital systems, we still have to manually check documents provided by licensees to verify compliance. This takes a lot of time and can be inaccurate*."

The Senior Systems Administrator added:

"*We have multiple databases. Each department has its own database which means we have data inconsistencies and double entry. When the licensing department and finance department have different information about the same licensee, it creates inefficiency*."

Theme two; Understanding of Blockchain Technology

The knowledge of blockchain technology differs between key informants. The ICT Manager had the most advanced understanding:

"*Blockchain is basically a distributed ledger where transactions are stored in blocks that are cryptographically linked together. You can't alter information in a blockchain without network consensus. People often think of blockchain in terms of cryptocurrencies but there are many other uses for record-keeping and automation.*"

The Digital Services Manager added:

"*I have been keeping an eye on the development of blockchain worldwide. Smart contracts are very interesting from a regulatory perspective. You can program rules into the blockchain that trigger certain actions when certain conditions are met - you don't have to do it manually*."

But others had lesser knowledge. The Head of Broadcasting Regulation said:

"I must be honest, I have a limited understanding of blockchain. I do know it is used with Bitcoin, but can't say exactly how it would work for regulatory processes such as broadcasting licensing. I would like to learn more."

This difference in understanding suggests the need for awareness raising and capacity building prior to the introduction of blockchain at MACRA.

Theme three; View on the Blockchain Advantages for Accountability

Our key informants provided a number of ways they saw blockchain improving accountability at MACRA.

The Director of Legal and Compliance said:

"*The most important feature of blockchain for accountability is the fact that it is immutable. If every regulatory decision that is made, every data submission that a licensee makes, every compliance determination that is made is logged on a blockchain, then you have an indisputable record that can't be contended with. That would certainly enhance regulatory enforcement."*

The Senior Systems Administrator added:

"Blockchain includes a timestamp and the identity of the user that initiated the transaction. There is a full chain of custody for data. If someone were to come back after the fact and alter the data, it would be noticeable because the cryptographic hash would not align."

The Finance Director noted:

"Blockchain could be used in financial processes to ensure that records relating to payments cannot be changed subsequently. Once a licensee has paid a license fee or fine, that payment is fixed. This will prevent fraud and facilitate audit of financial payments."

Theme four ; Blockchain's Potential Transparency Benefits

Key informants were excited about perceived blockchain benefits for transparency.

The Licensing Director stated:

"*Imagine a portal for applying for a licence, where the applications are identified and the review steps are logged on the blockchain. You could log into the blockchain system and see the status of your application: whether it is in the queue, being reviewed, awaiting more information from the applicant, approved or rejected. You would see the time-stamp for each step and who did what. This would be a game-changer for transparency*."

The ICT Manager added:

"Blockchain can offer 'verifiable transparency.' You don't have to rely on MACRA being transparent; you can see it for yourself because it is on the blockchain and you can see it, and it can't be changed. This is not how it works today where we have transparency by trusting the institution."

The Policy and Planning Officer noted:

"*In terms of compliance reporting, blockchain could enable licensees to submit their reports to a system where the data is captured but cannot be modified. MACRA officers could then view this data and even the public could view aggregate compliance data while not accessing business proprietary information. This would provide transparency and confidentiality."*

Theme five; Operational performance benefits of blockchain

Perceived benefits of blockchain for operational performance were identified by key informants.

The Digital Services Manager said:

"*Smart contracts could automate many of the mundane regulatory processes. For instance, if a licensee complies with regulations and submits compliance reports on time, a smart contract could automatically issue a new license without manual intervention. This would expedite the process and free up valuable resources for more complex activities*."

The Senior Systems Administrator added:

"*Blockchain could be a single source of truth, replacing the data silos we have today. Rather than having separate databases for licensing, compliance, payments, and enforcement, we could store all the necessary data on a single blockchain with suitable access controls. This would remove the need for data matching and reduce errors."*

The Finance Director observed:

"*There are initial costs, but blockchain could potentially lower costs in the long run. Automation reduces the need for human resources. Reducing errors eliminates rework. Faster processing allows us to handle more licensees without increasing staff. We need to factor in these longer-term cost savings in our cost-benefit analysis*."

CHAPTER FIVE

DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

5.0 Introduction

This chapter includes a discussion of the findings from Chapter Four, conclusions derived from the data, and policy and practice recommendations. The chapter is divided into four sections: discussion of findings in relation to each objective and the literature, conclusions, recommendations for MACRA and other stakeholders, limitations and future research.

5.1 Discussion of Findings

This section covers the discussion of findings for each objective, in relation to the theoretical and empirical literature reviewed in Chapter Two.

5.1.1 Blockchain Technology's Impact on Accountability at MACRA

The results showed that the respondents strongly agreed (overall mean=4.10) that blockchain technology could have a positive impact on accountability. The Pearson correlation analysis showed a moderate to strong positive correlation between blockchain technology and accountability ($r=0.621$, $p<0.01$), which is statistically significant.

The highest agreement was with the statement that "Blockchain could provide audit trails for MACRA" (mean=4.21). Our finding is consistent with Ogedengbe and Adelowotan (2025), who conducted a systematic review of 106 peer-reviewed articles and found that immutability and traceability are important attributes of blockchain technology that increase accountability. They found that blockchain creates audit trails and enhances the ability to trace decisions to responsible officers, minimising data manipulation.

This finding also matches the experience of the Cardano Foundation's "Reeve" platform, which uses blockchain to secure financial transactions and enterprise resource planning systems to make information immutable and verifiable by interested parties (Cardano Foundation, 2024). For MACRA, this could be applied to licensing, compliance, and other financial transactions.

The strong agreement that blockchain "would make it easier to trace actions to responsible officers" (mean=4.15) supports the use of Agency Theory in the adoption of blockchain. Agency Theory, which describes the relationship between principals and agents that may not share the same interests, argues that blockchain offers real-time access to transparent data to reduce information asymmetry (Jensen & Meckling, 1976; Ogedengbe & Adelowotan, 2025). At MACRA, where senior management (principals) need officers (agents) to carry out regulatory processes correctly and responsibly, blockchain can offer reliable data to decrease monitoring costs and opportunism.

The respondents' agreement that blockchain "would increase MACRA's accountability to stakeholders" (mean=4.12) is supported by Stakeholder Theory, which holds that a corporation should create value for all stakeholders, not simply shareholders (Freeman, 1984). The stakeholders of MACRA are the government, licensees, users of communications services, and development partners. Blockchain could allow each stakeholder group to validate that MACRA is operating in line with its charter, and to improve accountability to all stakeholders.

5.1.2 Blockchain Technology's Impact on MACRA's Transparency

The results showed the greatest level of agreement among the three objectives (mean=4.14) with a strong positive association between blockchain technology and transparency ($r=0.648$, $p<0.01$).

"Blockchain would allow stakeholders to monitor applications for licensing" had the highest mean (4.24) of all items in all three objectives. This is a major finding as licensing is a central function of MACRA and the problem statement highlighted delays and lack of transparency in licensing. Ability to track applications is a clear, visible improvement that meets stakeholder concerns.

This is consistent with the UNDP (2026) review of blockchain applications for development that found that blockchain enables more transparent ways of managing payments, data and rulesets. The UNDP found over 40 pilots showcasing the value of blockchain for enhancing transparency. For MACRA, tracking applications would show transparency in a way that is easily verified by applicants.

We found that the strongest relationship between blockchain and the three dimensions is with transparency (r=0.648). This appears to reflect that of the three dimensions of organisational performance, blockchain is most closely linked with transparency, according to respondents. This result aligns with how blockchain is commonly described in the literature with transparency being a significant potential benefit (Yaga et al., 2019; UNDP, 2026).

Qualitative results added insight to these quantitative findings. The Licensing Director envisaged a future where "every step of the review process is recorded on the ledger" and applicants could "see exactly where their application stands." The ICT Manager coined the term "verifiable transparency" to describe the transparency enabled through blockchain as opposed to the transparency enabled through trust in the institution itself. This is important because blockchain does not require stakeholders to trust MACRA's claims of transparency; they can see it for themselves by accessing the blockchain.

5.1.3 Impact of Blockchain Technology on MACRA's Performance

The third research question focused on the impact of blockchain technology on MACRA's operational performance. This study showed high agreement (overall mean=4.12) and a statistically significant moderate positive correlation ($r=0.602$, $p<0.01$).

"The use of blockchain would enhance data accuracy at MACRA" had the highest mean (4.22) of the operational performance items. This is because data accuracy is a core operational performance issue at MACRA. Data errors result in poor decision-making, wasted time and resources on corrections, and a lack of stakeholder trust. The verification processes used by blockchain, which requires multiple participants in the network to agree on the data before it is

recorded, could dramatically reduce the error rate compared to traditional databases where only a single user can input data which may be inaccurate.

This is in line with the Cardano Foundation (2024) study that Reeve eliminates manual reconciliation errors and offers blockchain-based evidence that every activity is verified as reported with cryptographic certainty. At MACRA, this type of verification could confirm that licensee compliance data, financial information and regulatory actions are correct before being added to the blockchain.

The high level of agreement for "Blockchain would improve overall service delivery at MACRA" (mean=4.19) is a critical summative finding as this suggests participants believe the overall impact of blockchain on accountability, transparency and efficiency would see improved service delivery. To stakeholders, service delivery represents the "face" of MACRA. Efficient licensing, reliable data, transparency and accountability of decision-making lead to quality service delivery.

But the qualitative results give a different insight. The Finance Director highlighted that "although there are initial costs, blockchain could lower the costs in the long run" by eliminating manual work, reducing time spent on rework due to errors, and speeding up processes. The Senior Systems Administrator noted that the need to reconcile data would disappear with a single source of truth. These comments indicate that respondents appreciate the long-term cost benefits, but are realistic about the upfront costs.

5.2 Conclusions

The findings in Chapter Four and discussion in the previous section lead to the following conclusions:

5.2.1 Blockchain's Impact on Accountability

The research finds blockchain would have a substantial impact on improving accountability at MACRA, evidenced by a high level of agreement (mean=4.10) among respondents and a strong

positive correlation (r=0.621, p<0.01). The blockchain's immutability will produce audit trails that cannot be altered and actions more easily traced to individual officers, reducing data tampering. Key informants referred to an "unbreakable chain of custody for data" enhancing enforcement. These results support Agency Theory in that blockchain increases information symmetry between management and employees. In all, blockchain would have a positive effect on MACRA's accountability.

5.2.2 Blockchain's Impact on Transparency

The research indicates that blockchain will have a very strong impact on transparency at MACRA, backed by the highest overall mean (4.14) and highest correlation (r=0.648, p<0.01). Survey participants strongly agreed blockchain would allow real-time monitoring of license applications (4.24), enhance information access for stakeholders (4.20) and increase trust (4.14). Qualitative findings introduced the concept of "verifiable transparency" - stakeholders verify information themselves, not MACRA's assertions. This is a major departure from current practices. In summary, blockchain would enhance transparency, particularly for licensing, access to information, and trust.

5.2.3 Impact of Blockchain on Efficiency

The paper finds blockchain would enhance MACRA's performance. This is indicated by strong respondent agreement (mean=4.12) and a strong positive correlation (r=0.602, p<0.01). Highest agreement was found for improving data quality (mean=4.22), service quality (4.19), reduced licensing times (4.16) and faster compliance checking (4.13). Respondent agreement on reduced costs was slightly weaker (3.94) - presumably because up-front costs are necessary. But qualitative comments indicated long-term cost savings due to reduced manual effort and errors. In general, blockchain will have a positive impact on performance, but financial considerations require attention.

5.3 Recommendations

The following recommendations are made for MACRA, the Government of Malawi and other stakeholders, based on the results and insights of this study.

For MACRA Management: Create a blockchain strategy and plan that aligns to digital transformation. Begin with a pilot project around the tracking of licensing applications, the highest rated use case. Provide training for staff at all levels, engage with UNDP and other regulators, answer legal questions about admissibility of records and data protection, and design a change-management program to address staff concerns.

For the Government of Malawi: Develop a national blockchain policy framework for use cases, technical standards and security. Update legislation to admit blockchain records as evidence and clarify the impact of immutability on data protection. Prioritise secure digital infrastructure and promote blockchain education in universities and technical colleges.

For Policymakers and Regulators: Promote knowledge exchange between regulators such as MACRA and MERA to prevent reinventing the wheel and learn fast. Create industry specific guidelines to address specific needs like spectrum management for communications.

For Academia: Focus on ex-post studies after blockchain is operationalised to confirm or refute these benefits. Design cost-benefit analysis (economic and social). Benchmark blockchain with other solutions to identify the most effective solution in various regulatory environments.

5.4 Study limitations

These results have a number of limitations. First, the research examines the perceived potential, not actual use of blockchain. MACRA hasn't implemented blockchain yet, so we gathered perceptions about the potential of blockchain rather than experiences with existing systems. Expectations aren't always aligned with reality, so it's possible there will be different results.

Second, the study addressed only MACRA, so its results will be limited to other regulators. MACRA has its own unique mandate, staff (approximately 150 staff), and resources, and regulatory environment. The lessons might not be applicable without modifications.

Third, a social desirability effect might have occurred. Participants may have answered in a way that they believe would be favourable to the researcher. Although we tried to establish trust and confidentiality, and emphasise the importance of honesty, this bias is difficult to eradicate entirely in survey research.

5.5 Areas for Future Studies

There are a number of areas that require research. Multiple case studies of adoption in various Malawian regulators (MACRA, MERA, etc.) will answer questions about success factors. Additionally, research should include external stakeholders (licensed operators, consumers, development partners) to explore their perspectives and adoption. Technical feasibility studies should look at integration, architecture and security. Cost-benefit analysis, with both financial and social returns, would inform investments. Lastly, there needs to be legal and technical approaches to overcoming immutability and data rights to be erased.

5.6 Contribution to Knowledge

Our research adds to the body of knowledge about blockchain technology and its impact on performance.

First, it provides empirical insights from an African regulator, in this case, MACRA in Malawi. The bulk of research is from developed countries or Asia, so this work provides a geographical contribution. Second, it considers three performance areas simultaneously: accountability, transparency and efficiency. This helps to understand their relationships and potential synergies.

Third, the study demonstrates that Dynamic Capability Theory, Agency Theory, and Stakeholder Theory all have relevance when it comes to blockchain and regulation. This synthesis will be helpful for future research. Fourth, the actionable findings on things such as application management, audit trail, data integrity and service delivery provide MACRA and other institutions with a roadmap on priorities. Finally, this study provides a baseline. As MACRA and other Malawian organisations pursue blockchain, they now have a baseline to compare against in the future.

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APPENDICES

APPENDIX I: QUESTIONNAIRE FOR MACRA STAFF

INTRODUCTION AND CONSENT

Dear Respondent,

I am Frank Zimba, a student at Uganda Christian University conducting a research study on "Blockchain Technology and Organizational Performance: A Case Study of MACRA." This study is being carried out as part of the requirements for my Bachelor's Degree in Procurement and Logistics Management.

You have been selected to participate because of your role at MACRA. Your views are valuable in understanding how blockchain technology could improve organizational performance.

SECTION A: BACKGROUND INFORMATION

Please tick (√) or fill in the appropriate response.

A1. Gender:

Male ☐

Female ☐

A2. Age bracket:

Below 30 years ☐

31-40 years ☐

41-50 years ☐

Above 50 years ☐

A3. Highest level of education:

Diploma ☐

Bachelor's Degree ☐

Postgraduate Diploma ☐

Master's Degree ☐

PhD ☐

A4. Department:

ICT ☐

Licensing ☐

Legal and Compliance ☐

Digital Services ☐

Finance ☐

Human Resources and Administration ☐

Broadcasting and Postal Services Regulation ☐

A5. Years of service at MACRA:

Less than 2 years ☐

2-5 years ☐

6-10 years ☐

More than 10 years ☐

A6. Position level:

Senior Management ☐

Middle Management ☐

Technical Staff ☐

Support Staff ☐

SECTION B: BLOCKCHAIN AND ACCOUNTABILITY

Please indicate your level of agreement with the following statements about how blockchain could affect accountability at MACRA.

No.	Statement	1	2	3	4	5
C1	Blockchain could create clear audit trails for MACRA's decisions					
C2	Blockchain would make it easier to trace actions to responsible officers					
C3	Blockchain could reduce unauthorized changes to regulatory data					
C4	Blockchain would improve compliance monitoring at MACRA					
C5	Blockchain could help reduce fraud in MACRA's processes					
C6	Blockchain would strengthen MACRA's accountability to stakeholders					

SECTION C: BLOCKCHAIN AND TRANSPARENCY

Please indicate your level of agreement with the following statements about how blockchain could affect transparency at MACRA.

No.	Statement	1	2	3	4	5
D1	Blockchain could increase visibility of MACRA's regulatory processes					
D2	Blockchain would enable stakeholders to track licensing applications					
D3	Blockchain could reduce hidden or unauthorized activities					
D4	Blockchain would make MACRA's decision-making more open					
D5	Blockchain could increase public trust in MACRA					
D6	Blockchain would improve stakeholder access to regulatory information					

SECTION D: BLOCKCHAIN AND OPERATIONAL PERFORMANCE

Please indicate your level of agreement with the following statements about how blockchain could affect operational performance at MACRA.

No.	Statement	1	2	3	4	5
E1	Blockchain could reduce processing delays in licensing					
E2	Blockchain would improve data accuracy at MACRA					
E3	Blockchain could reduce operational costs through automation					
E4	Blockchain would minimize human errors in regulatory processes					
E5	Blockchain could speed up compliance verification					
E6	Blockchain would improve overall service delivery at MACRA					

THANK YOU FOR YOUR PARTICIPATION

APPENDIX II: INTERVIEW GUIDE FOR KEY INFORMANTS

INTRODUCTION

Thank you for agreeing to participate in this interview. The purpose of this study is to understand how blockchain technology could improve organizational performance at MACRA in terms of accountability, transparency, and operational performance.

Your responses will be treated with strict confidentiality and used only for academic purposes. With your permission, I would like to audio-record this interview to ensure accurate capture of your valuable insights.

INTERVIEW QUESTIONS

Section 1: Current Situation

1. What are the main challenges MACRA currently faces regarding accountability in its regulatory processes?
2. How would you describe the level of transparency in MACRA's licensing and compliance processes?
3. What operational performance challenges does MACRA currently experience?

Section 2: Blockchain Understanding

4. What is your understanding of blockchain technology and its potential applications in regulatory contexts?
5. Are you aware of any organizations that have successfully adopted blockchain for similar functions?

Section 3: Potential Blockchain Benefits

6. In what ways do you think blockchain could help strengthen accountability at MACRA?
7. How could blockchain improve transparency in MACRA's regulatory processes?
8. What operational performance improvements might blockchain bring to MACRA?

THANK YOU FOR YOUR TIME AND INSIGHTS