

MAKERERE



UNIVERSITY

**COLLEGE OF ENGINEERING DESIGN ART AND TECHNOLOGY
SCHOOL OF BUILT ENVIRONMENT
DEPARTMENT OF CONSTRUCTION ECON AND MANAGEMENT**

**TOPIC: INVESTIGATE THE USE OF BLOCKCHAIN TECHNOLOGY FOR SECURE AND
TRANSPARENT PROPERTY RECORDS MANAGEMENT IN KAMPALA.**

BY;

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DATE: MAY 2024

*A RESEARCH PROJECT SUBMITTED TO THE SCHOOL OF BUILT ENVIRONMENT IN PARTIAL
FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF BACHELORS OF SCIENCE IN
LAND ECONOMI*

DECLARATION

I Oyesigye Mukama Hillary Reg No. 20/U/0627 a fourth-year student of Land Economics Makerere University, hereby declare that this report was prepared and compiled by myself. I strongly confirm that this report has never been presented by anyone not even submitted to any other institution for award.

Signature 

Date 16th May 2024

OYESIGYE MUKAMA HILLARY 20/U/0627

APPROVAL

This is to certify that Oyesigye Mukama Hillary under my supervision has completed the research Project titled "investigate the use of blockchain technology for secure and transparent property records management." and it is now prepared for submission for the award of a Bachelor of Science in Land Economics by the Department of Construction Economics and Management, Makerere University.

Signature:  Date: 18/5/2024

MR. KATONGOLE GEORGE MARK

ACKNOWLEDGEMENTS

First, I extend my sincere thanks to the almighty God who has enabled me go through the research period and the compilation of this report and the good health and knowledge he rendered me throughout this research project.

I am indeed indebted to a great number of people who have supported me throughout the research period most especially Mr. Katongole George Mark for the professional and informed discussions, training, and the wise counsel he rendered me while carrying out this research, he has imparted a lot of professionalism and knowledge as a result of training during this research study.

Special thanks also go to my lovely guardians who have brought me this far and I pray that the Almighty God continues to bless them.

Lastly, I honor the support of my classmates and colleagues. Your interactions, guidance and corrections gave me so much insight into the topic of study.

May the Almighty God Bless You All

DEDICATION

I dedicate the content of this work and report to my precious Parents Mr. and Mrs. Bakyengana Leo and my brothers and sisters who tirelessly rendered me their social, financial and spiritual support throughout my academic journey.

I also dedicate this work to my supervisor Mr. Katongole George Mark for the tireless efforts he put in to see that this work is a success; for withstanding frequent disturbances, the encouragement and guidance.

May the Almighty God reward you abundantly!

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LIST OF ACRONYMS.

ADA	Americans with Disabilities Act
ETA	Electronic Transactions Act
ESA	Electronic Signatures Act
SRE	Smart Real Estate
IBM	International Business Machines
RM	Relationship Management
PHI	Protected Health Information

ABSTRACT

The purpose of the study was to investigate the use of blockchain technology for secure and transparent property records management. The property records management is one of the most important departments in the real estate sector because it stores the records of ownership. There are a number of loopholes in the current system, which give rise to fraud and disputes. This has discouraged people especially foreign investors from investing in properties, which makes it hard for the government to plan and reduces revenue from properties. Blockchain has the potential to counter these loopholes and sort out issues like trading the same property to more than one buyer and tampering with its records. In this study, a framework for property records management system using Blockchain was proposed. The framework uses the concept of smart contracts at various stages. The study outlines the potential benefits of employing Blockchain technology in the property records management and presents a number of case studies.

The main objective of the study was achieved by answering the secondary objectives formulated to carry out the study and these include; To analyze the challenges faced in property records management in the Ugandan, to evaluate the technological infrastructure in Uganda and the readiness of systems to support blockchain implementation in property management and To develop recommendations for stakeholders to facilitate the effective integration of blockchain into Ugandan property management. The methodology applied on this research was done through qualitative and quantitative analytical framework.

Study findings indicated that the property records management system is plagued with a number of concerns like falsification of documents, delays in executing transactions, poor management of records and inability to access required information. For this reason, this study proposed a framework to offer reliable, safe and accurate means through which interested parties could store and access property related information.

CHAPTER ONE: INTRODUCTION

1.1 Background

Uganda is experiencing a surge in economic growth, urbanization, and foreign investment, with a parallel expansion in its real estate sector (Anonymous, 2013). The demand for residential, commercial, and industrial properties has been on the rise, transforming the country's urban and rural landscapes. However, this growth has been accompanied by challenges inherent in traditional property records management systems including manual record-keeping, bureaucratic inefficiencies, and a lack of transparency. (Government of Uganda, GoU, 2013)

Land transactions often involve extensive paperwork (Charlebois, 2012). The existing paper-based and centralized land registries in Uganda have often proven to be inefficient, leading to delays in property transactions, disputes, and difficulties in verifying land ownership, creating bottlenecks and delays. Moreover, the susceptibility to fraud, corruption, and disputes in property ownership has been a persistent concern, hindering the overall efficiency and reliability of the real estate sector, creating a pressing need for innovative solutions (Oryema, 2016). These issues have prompted a critical examination of technological solutions to modernize and streamline the property management landscape. One such promising technology that has garnered global attention is blockchain.

Property management involves a mountain of paperwork for lease agreements, rent receipts, maintenance records (Sprague, 1995). Inefficient communication, redundancy, and manual processing burden both landlords and tenants. Information exchange often lacks clarity and accessibility. Tenants struggle to verify property details, track payments, and hold landlords accountable. Tracking and maintaining real estate records accurately is a cumbersome process (Ali et al., 2020). Most of the developed countries have automated real-estate records of their lands as well as the process of buying/selling property.

According to (Lazuashvili, 2019) The digital roadmap of the twenty first century is constantly progressing as information and communication technologies (ICT) have become an inseparable part of every aspect of contemporary communities. Easy, transparent, accountable, secure and effective interaction among citizens and governments has been a trend of the latest decades

As one of the biggest achievements of the modern information society blockchain technology (Lazuashvili, 2019), best known as the underlying infrastructure for cryptocurrencies like Bitcoin, offers a decentralized and tamper-resistant ledger system can be deemed a disruptive innovation with the potential to revolutionize the way society, including governments and non-profit and for-profit organizations to handle themselves and communicate with the stakeholders. The chief hypothesis behind blockchain is the creation of a digital distributed consensus, ensuring that data is decentralized among several nodes that hold identical information and that no single actor holds the complete authority of the network (Nawari O., 2019.). This enables transparency of activity and enhancement of data security.

Blockchain's ability to execute smart contracts (self-executing agreements) with terms directly written into code holds the potential to streamline property transactions (Hughes, 2020). By automating processes and eliminating the need for intermediaries such as banks and brokers, blockchain can reduce the time and costs associated with buying and selling properties, making the market more accessible and efficient.

Integrating blockchain technology aligns with the government's vision to enhance transparency, reduce corruption, and create a more efficient land management infrastructure. (Aarvik, 2020)

The adoption of blockchain technology has the potential to transform Uganda's property management landscape, offering a more secure, transparent, and efficient system. As the country continues to embrace digital solutions, the impact of blockchain on property management may well be the catalyst for a resilient and modernized real estate sector in Uganda.

1.2 Problem statement

All authorized individuals, including owners, lenders, government agencies, property managers and tenants should have real-time access to accurate and up-to-date property information. This eliminates communication delays and improves efficiency.

The property management sector in Uganda faces significant challenges rooted in traditional practices, hindering its ability to keep pace with the dynamic growth and demands of the real estate market. Manual record-keeping, bureaucratic inefficiencies, susceptibility to fraud, and a lack of transparency create bottlenecks, delays, and erode confidence in property transactions. The existing property records management systems are susceptible to corruption, disputes, and inefficiencies, leading to increased legal complexities and transaction costs.

Most of the developed countries have automated real-estate records of their lands as well as the process of buying/selling property which offers a potential solution, promising enhanced security, transparency, and efficiency. However, successful integration requires overcoming technological, regulatory, and awareness-related hurdles. In light of this, there is a critical need to Integrate blockchain technology and modernize the property records management landscape.

1.3 Objectives

1.3.1 Main objective

To assess the potential of blockchain technology to address existing challenges in Ugandan property records management.

1.3.2 Specific objectives

- 1 To analyze the challenges faced in property records management in the Ugandan.
- 2 To evaluate the features of blockchain and their ability to solve challenges in property records management.
- 3 To develop recommendations for stakeholders to facilitate the effective integration of blockchain into Ugandan property management

1.4 Research questions

- 1 What are the specific challenges associated with the current property records management systems in the Ugandan?
- 2 What are the key features of blockchain technology and how do they potentially mitigate the challenges faced in property records management?
- 3 What strategies can be recommended to enhance the readiness of Ugandan systems for the implementation of blockchain in property management?

1.5 Significance of the study

Uganda's land sector faces critical challenges, including widespread land grabbing, fraudulent transactions, and inefficient administration. These issues not only erode trust and social justice but also hamper economic development by discouraging investment and limiting access to credit.

Investigating the use of blockchain in Ugandan property records management is not just about technological innovation, it's about addressing fundamental social and economic inequalities. Its inherent security and transparency can provide immutable land records, minimizing fraud and protecting vulnerable landowners. This research contributes to a more secure, transparent, and prosperous future for Uganda.

1.6 Scope

This research investigates the use of blockchain technology to revolutionize property records management in Uganda, focusing on its potential to address existing challenges like Manual record-keeping, bureaucratic inefficiencies, susceptibility to fraud and a lack of transparency. We will analyze the technological, legal, and social aspects of blockchain implementation, assessing its feasibility, impact, and readiness within the Uganda. Ultimately, we aim to develop practical recommendations for stakeholders to facilitate an effective and inclusive integration of blockchain, paving the way for secure, transparent, and equitable property management in Uganda.

The research will be narrowed to examine the utilization of Blockchain Technology in property management within the Central Division of Kampala capital city.

The research will be conducted from January to May 2024.

1.7 Justification

Uganda's property management system faces inherent challenges such as manual record-keeping, bureaucratic inefficiencies, and susceptibility to fraud. Blockchain technology presents an opportunity to address these systemic issues and introduce transformative changes because of its cryptographic techniques which ensure that transactions and data stored on the blockchain are secure and tamper-proof.

Exploring blockchain technology in property management in Uganda lies in its potential to overcome challenges in legal disputes and uncertainties related to property ownership and transactions, improve efficiency, foster economic growth, and align with global technological trends. The adoption of blockchain is not just a technological upgrade, it is a strategic move towards building a more secure, transparent, and sustainable foundation for the real estate sector in Uganda.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

Managing property records, particularly land titles, is a complex and often inefficient process riddled with challenges like fraud, errors, and lack of transparency(L. M. Wabineno, M. Musinguzi, n.d.). Blockchain technology, with its distributed ledger and cryptographic functionalities, presents a promising solution for enhancing security, transparency, and efficiency in property records management.

Blockchain is a method of recording information that makes it impossible or difficult for the system to be changed, hacked, or manipulated(Crosby et al., 2016). A blockchain is a distributed ledger that duplicates and distributes transactions across the network of computers participating in the blockchain.

Blockchain technology is a structure that stores transactional records, also known as the block, of the public in several databases, known as the “chain,” in a network connected through peer-to-peer nodes(Lakkis & Issa, 2022). Typically, this storage is referred to as a digital ledger. Every transaction in this ledger is authorized by the digital signature of the owner, which authenticates the transaction and safeguards it from tampering. Hence, the information the digital ledger contains is highly secure.

A blockchain is a distributed, immutable, and decentralized ledger at its core that consists of a chain of blocks and each block contains a set of data(Crosby et al., 2016). The blocks are linked together using cryptographic techniques and form a chronological chain of information. The structure of a blockchain is designed to ensure the security of data through its consensus mechanism which has a network of nodes that agree on the validity of transactions before adding them to the blockchain.

Blockchain will mature in a number of areas as the body of research grows (Ahram et al., 2017). Researchers are working to apply a number of use cases included smart contracts, supply chain, and healthcare (PHI) as this paper demonstrates.

2.2 Property records management in Uganda

Records can be referred to as anything that contains information that was generated or acquired during the course of business and may be used as proof of a business transaction(Kaddu et al., 2023).

Property records management plays a pivotal role in the effective administration and governance of real estate, providing a systematic framework for recording, organizing, and preserving critical information related to land and property(Luyombya, 2010). In Uganda, a country with a rich cultural and historical context, traditional property records management practices have long been ingrained in the societal fabric. Managing records is one of the cornerstones for effective delivery of public services. Sound records management delivers transparency by documenting and providing evidence of an activity, a decision or an agreement

2.2.1 Types of records in property management

Tenant Records. Includes lease agreements, tenant applications, contact information, payment history, security deposit records, and communication logs.

Property Records. Encompasses property deeds, floor plans, inspection reports, maintenance and repair records, property tax records, and insurance documents.

Financial Records. Involves income and expense statements, receipts, invoices, bank statements, budgets, financial projections, tax records, and utility bills.

Maintenance Records. Comprises work orders, repair and maintenance invoices, service contracts, inspection reports, equipment manuals, and pest control records.

Legal Records. Involves eviction notices, legal correspondence, court documents, compliance records, licenses, and permits, as well as insurance policies.

Communication Records. Encompasses emails, letters, notices to tenants, meeting minutes, phone call logs, text messages, and correspondence with contractors and vendors.

Vendor and Contractor Records. Includes contracts, insurance certificates, W-9 forms, performance evaluations, invoices, and contact information for vendors and contractors.

Safety and Compliance Records. Involves emergency plans, inspection certificates, fire safety records, ADA (Americans with Disabilities Act) compliance documentation, environmental compliance records, and building code compliance records.

Utilities and Services Records. Encompasses utility bills, service contracts, energy efficiency records, utility consumption data, and payment records.

Resident and Community Records. Involves community rules and policies, resident newsletters, event logs, complaints and resolutions, and community meeting minutes.

2.2.2 Challenges faced in record management in Uganda

Information Overload. This poses a significant challenge in records management as organizations struggle with an ever-expanding volume of data (MALAK, 2022.). The sheer volume of information, both in physical and digital formats, can lead to difficulties in identifying and managing records. With the rise of big data and the constant flow of information from different sources, businesses should create a RM plan to mitigate the risk of death by data. The challenge is not only where and how we store data but it is also with the ability to keep these records safe through all these data breaches happening.

Data accuracy is an important aspect of any business process. It is crucial for businesses to have accurate data that can be used for decision-making processes. It also plays a significant role in maintaining records and data integrity by ensuring that all information is accurately recorded, stored, retrieved, analyzed and shared. If a business does not have accurate data, then it cannot make informed decisions or take advantage of the information.

Maintaining Compliance with Regulations. Organizational policies are written to help protect the company in the long run (Kane, 2022). They cover many topics, such as security and privacy. In order to comply with these policies, it is important for companies to understand what they are, know how they can be used, and who is responsible for RM implementation. The compliance process involves a lot of work that is time-consuming and tedious for companies. It is also very important for them to be able to track data and information about their employees and customers in order to maintain compliance with organizational policies.

Managing Information Across Multiple Locations. RM is one of the most important functions of any business. It requires the ability to keep digital assets and processes in control across multiple locations, in order to ensure that they are accessible from anywhere and that they are protected from unauthorized access. The challenge with records management is finding the right balance between security and accessibility.

Cultural Resistance to Change (Halil Aksu, 2023). Often, employees may be accustomed to traditional record-keeping methods and introducing a shift towards digital solutions or updated processes may be met with hesitation. This cultural resistance can delay the seamless adoption of records classification which is a crucial aspect of efficient RM.

Poor Records Retrieval. According to a study by IBM, more than 90% of organizations struggle with their records retrieval process. This is due to the lack of a well-defined and documented records management strategy, which leads to poor retrieval rates and increased costs. Poor records retrieval also leads to poor customer service experience for customers who might have a hard time finding their desired information or reaching out to the people they need help from. To get the most out of your records, organizations need to apply these tips for effective RM.

Missing Records Retention Schedule. The schedule is a document that helps organizations understand what they need to do with their documents and other records over time. It provides a timeline for when certain types of documents should be destroyed or transferred, as well as when they should be kept in storage or placed on file for reference purposes.

2.2.3 Emerging Technologies for property Records Management

Property records management is an important operational function that needs to be managed because it brings large cost implications to the organization. Real estate is evolving day by day due to advancements in the sector in terms of new and innovative technologies changing its phase from traditional to smart real estate (SRE) (Treleaven *et al.*, 2021)

Real property management is vital all over the world. In practice, failures in property management result into land related conflicts. (Othieno, L., & Shinyekwa, 2011) While African countries are rapidly urbanizing, property management practices both in rural and urban areas dwindle over time. Open data, as a quickly growing new technology in this era, has made scholars, professionals and practitioners devise multiple understandings and different point of views on open government data. (Ruijter et al., 2020).

Information professionals are no strangers to changes in technologies used to create and keep records. In the past few decades, there have been several such changes, leading both to new forms of records, such as web or social media records, and recordkeeping solutions, such as electronic records management systems and cloud-based software services.

Blockchains, which may be defined as ledgers with entries organized in an append-only, sequential chain using cryptographic links and distributed out and stored on a peer-to-peer computer network, are an emerging recordkeeping technology producing new forms of records, and new modalities of recordkeeping with which records and information professionals will need to engage. As blockchain technology is still emerging, and technical changes to how it operates can be expected, we remain humble about our knowledge of this complex technology and its implications for records and information professionals

2.3 An Overview of Blockchain Technology

Blockchain technology has been advanced as a solution to the global crisis of trust. Blockchain technology really does not obviate the need for trust. (Lemieux et al., 2019) Instead, it offers a new way to substitute the information one does not have from other sources in order to place confidence in something or someone and, by extension, take action on the basis of having that trust. It purportedly serves to replace more traditional, and often very inefficient or flawed means of obtaining this information and establishing trust (e.g., long-term social ties, traditional legal contracts, or information supplied by “trusted” intermediaries) with a new, more efficient source of information as a basis for trust.

Blockchain technology is one of the key technological breakthroughs of the last decade. It has the ability to revolutionize numerous aspects of society, including financial systems, healthcare, e-government and many others. One such area that is able to reap the benefits of blockchain technology is the real estate industry. Like many other industries, real estate faces major administrative problems such as high transaction fees, a lack of transparency, fraud and the effects of a middleman including undue influence and commissions. (Ahmad et al., 2020) Blockchain enables supporting technologies to overcome the obstacles inherent within the real estate investment market. These technologies include smart contracts, immutable record management and time-stamped storage.

2.3.1 How the blockchain works.

A blockchain is a chain of blocks that contain data or information. The information being digital. Each block in a blockchain network stores a set of information along with the hash of its previous block. Hashing is one of the

most important features of the blockchain that give it the feature of immutability. A hash is a unique mathematical

code which belongs to a specific block and it is designed such that if the information inside the block is modified, the hash of the block will be modified too(Ravikiran A S, 2023).

The connection of blocks through unique hash keys is what makes a blockchain secure (Spielman, 2017). The hash function of a blockchain gives the technology ability to track the changes made to the input because even the smallest change to the input generates a new hash changing the existing one(Scaling Parrots, 2023) .Hashes are therefore the basis of security and immutability for the blockchain, which make it impossible to modify an entry without noticeably affecting all of the entries in the ledger (Bigelow, 2021) .

Hashing transforms all transactions into a code to make an algorithm on which a blockchain runs. Each transaction is an input to the blockchain and will always generate a hash. The hashing function will run any length of input and convert it into an output of a specific length (Lemieux et al., 2019) .While transactions take place on a blockchain, nodes on the network validate them to ensure they are authentic. For a transaction to be valid, each block must refer to the hash of its preceding block. The transaction will take place only and only if the hash is correct (Ravikiran A S, 2023). This property is what most authors are convinced is the solution for all public systems that are posed with the trust issue.

There are four core components comprising the blockchain network setup and they are asymmetric key cryptography, transactions, consensus mechanisms and distributed ledgers. Asymmetric key cryptography is what allows the blockchain network to utilize public and private key cryptography for secure operation of the blockchain (Direct Therapy Counselling & Coaching Experts, n.d.).

2.3.2 Challenges in implementing Blockchain technology in developing countries

Blockchain offers faster, simple and hassle-free process of registering property and keeps the data tamper-proof. As every technology has some drawbacks, Blockchain also has a few limitations(Thakur et al., 2020)

Implementing Blockchain technology in developing countries presents several challenges. These challenges include lack of infrastructure, limited technical expertise, and insufficient regulatory frameworks. (Konashevych, 2020)

Developing countries may also face issues related to access to reliable internet and electricity, which are essential for running Blockchain systems.

Additionally, there may be resistance to adopting new technologies and skepticism about the benefits of Blockchain. Overcoming these challenges will require collaboration between governments, businesses, and international organizations to provide the necessary support and resources for successful implementation of Blockchain technology in developing countries.

2.3.3 Benefits of implementing Blockchain technology in property records management in Uganda.

One of the most popular uses of blockchain technology in real estate is asset tokenization (Sakharchuk, 2023.). Tokens are usually a particular number of shares for some real estate assets that can be bought, issued, and transferred through blockchain platforms with cryptocurrencies. Blockchain technology here helps to speed up property sales and lowers crowdfunding barriers.

It is worth mentioning that this system allows for reducing the barrier for ordinary property investors. It also allows overseas investment in commercial real estate to become more manageable. To put it simply, real estate properties can now be traded like a stock on exchanges. It is believed that blockchain will revolutionize the entire commercial property market since it can increase real estate liquidity.

Smart Contracts

The blockchain technology used in the real estate industry can also benefit companies to smart contracts (ACCA, n.d.). Smart contracts, which are already used by financial and banking domains, are one of the leading and most profitable blockchain innovations. Since real estate should constantly handle numerous transactions, smart contracts can also benefit this space.

Thanks to blockchain technology, a property transaction that has long involved nearly endless paperwork can now be done digitally and quickly, where only buyers and sellers participate. And this transaction will have higher transparency and security than ever before.

Security and Control Over Transactions

Blockchain use in real estate leads to reduced chances of fraud. It is a common practice where you are selling a property to an unknown person or trying to buy a property from someone you don't know, so there is no reason for you to trust them blindly. Luckily, blockchain technology real estate reduces the need for third parties to participate in the process and ensures all transactions are done securely.

Property Management Automation

The use of blockchain technology in real estate will also reduce paperwork and manual work by property management automation. All tools and software products that have long been used now can be replaced with betterment and up-gradation. One decentralized application containing blockchain-based smart contracts for real estate will improve the property management process, bringing efficiency and automation. It will also allow for cost reduction and less time needed for administrative tasks.

Transparent Data Tracking and Analysis

Blockchain uses ledger technology that lasts as the network is running. As a result, all data on the property, transactions, or the history of the building is recorded, making it readily available for future owners and investors. Blockchain allows both parties to agree on terms based on data.

Fractional Ownership

Blockchain enables fractional ownership, meaning multiple parties share a property's expenses and ownership. In this way, several investors can pool their resources and buy a share of a property they wouldn't have been able to buy independently. Blockchain technology contributes to decentralizing and democratizing the real estate investment process. Blockchain facilitates transparency and accountability for all parties involved.

2.3.4 Regulatory framework of blockchain technology in Uganda

The Internet continues to spawn new technologies that change the way people interact with their environment in significant ways, in areas as diverse as social relations, the way business is done, and economies (Castells, 2014). One such change is "blockchain", a revolutionary technology that allows parties to transact directly with each other without the need for intermediaries, as central trusted third parties.

Uganda is experiencing a new technological tidal wave of new business models and novel legal questions (Guterres, 2021). By far the most significant headline-grabbing development in 2017 and 2018 relates to the stunning rise of Blockchain technology. The technology has the potential to dramatically transform practices in significant segments of the Ugandan economy.

Ugandan President Yoweri Museveni has spoken positively about blockchain technology. At the Africa Blockchain conference held in May he said that there is a need "to look for a new technology of enabling things to move faster and new systems that go with it."

The government of Uganda is also considering the use of blockchain in various ministries like the Ministry of Lands. (Alice Namuli Blazevic (KATS Law), n.d.) Where all properties in Uganda will be registered on the blockchain. This project is being fore fronted by Bitland Uganda in partnership with Bitland Global a land registry application on the blockchain that maintains tamper proof, immutable land records. We believe this process will spark a lot of growth in the real estate industry as it will get rid the major ills that the industry has grappled with for a long time, like fraud. Land title registration on the blockchain will mean transparent, tamper proof, fast and inexpensive transactions.

Regulation

The biggest challenge is the absence of a regulatory regime (Alice Namuli Blazevic (KATS Law), n.d.). Regulators and lawyers are still grappling with how to navigate the new technology.

The market situations require the coexistence of both traditional and digital players side by side, for some time, in order to build bridges from the old to the new regulatory environment.

The statement by the Governor, warned that One Coin's dealings in Cryptocurrency like Bitcoin, falls outside the regulatory Purview of the Central Bank.(Alice Namuli Blazevic(KATS), n.d.) Since the press release, the interest in Blockchain & Cryptocurrency has tripled. Although Uganda does not regulate Blockchain & cryptos, the general consensus is that regulators (like the Central Bank) need to clarify the place for Cryptocurrency and Blockchain in Uganda's emerging Fin-tech economy.

This need is ever-so amplified, by the necessity to carefully reconcile Uganda's laws on foreign currency with the Central Bank's need to safeguard the stability and integrity of the financial sector.

Luckily , Uganda is one of the few countries on the African continent whose government has shown willingness to embrace the technology. Most of the blockchain technologies and cryptocurrencies are not facing much resistance from regulators in Uganda, unlike in most countries across the continent, majorly because most governments feel threatened or don't understand the benefits of these new technologies.

2.3.5 Current status of Policy and Regulation

The Ugandan government is in the process of developing policy guidelines and encouraging industries to utilise the technology(Muhangi(KTA Advocates), n.d.). Further, there is a need to review the existing Data Protection Bill in the context of emerging new technologies.

Regulatory vetting and development of industry standards are necessary but are still in the very early development phases in Uganda.(Alice Namuli Blazevic(KATS Law), n.d.) Our government is in the process of introducing tax mechanisms and incentives that encourage the private sector to invest in blockchain. This would open up new opportunities for public-private partnership.

The Electronic Transactions Act 2011(ETA), the Computer Misuse Act & the Electronic Signatures Act, 2011(ESA), also provide a seemingly comprehensive legal framework for e-commerce.

Although Uganda does not officially recognize Bitcoin as a form of currency, Section 3 of the Foreign Exchange act 2004 (the Act), defines "foreign currency" to mean a currency other than the legal tender of Uganda. It further defines "foreign exchange" to include banknotes, coins or electronic units of payment in any currency other than the currency of Uganda which are or have been legal tender outside Uganda.(The Freeman Law Project, n.d.)

This would mean, that if Bitcoin became officially recognized as legal tender in Japan, it may then be classified as foreign exchange in Uganda as envisaged under the Act. There is still debate in Japan as to whether the Japan Payment Services Act, that was amended in 2016 to include virtual currencies, actually gives cryptocurrencies the status of a currency.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter discusses methods and techniques that I used in carrying out the study to achieve the specific objectives of the study. These include the research strategy, research design, data sources, data collection techniques, and data analysis techniques.

3.2 Research Classification

The research has been a quantitative study. It has involved building on an existing literature and relying on in-depth understanding of the existing literature to identify precise aims and objectives and questions to be answered which has yielded statistical information.

3.3 Research Strategy

A quantitative approach has been employed to comprehensively investigate the use of blockchain technology for secure and transparent property records management in Uganda.

This approach combined quantitative data collection and analysis techniques to gain a holistic understanding of the topic.

3.4 Research Design

The research design consisted of three phases:

1. **Exploratory Phase:** This phase involved a comprehensive review of existing literature on Blockchain technology and property records management. It helped in gaining a theoretical understanding of the potential role of Blockchain technology for secure and transparent property records management in Uganda
2. **Quantitative Phase:** This phase involved the collection and analysis of quantitative data which provided empirical insights into specific aspects of the topic such as the current level of technological infrastructure readiness, the prevalence of regulatory challenges, and stakeholders' perceptions towards adopting blockchain in property management.

3.5 Sample design

Sampling is related with the selection of a subset of individuals from within a population to estimate the characteristics of the whole population. Purposive sampling is applied where the researcher handpicks subjects based on specific characteristics and it was used in selecting valuers, real estate developers and property managers around Kampala capital city. Given the nature of the study, all of the respondents were required to have technical knowledge pertaining to both the property records management and Blockchain technology.

3.6 Sample size

A total sample size of 70 respondents was selected including Valuers, property managers and real estate developers.

3.7 Data Collection

Data has been collected from a variety of sources, including:

- Secondary data sources: Existing literature, government reports, and statistical databases
- Primary data sources: Interviews with key stakeholders and case studies of successful use of Blockchain technology in other countries.

3.7.1 Data Collection Techniques

A variety of data collection techniques have been used to collect quantitative data. These techniques include:

- Literature review: To identify and review relevant academic and professional literature
- Questionnaires and Interviews: To collect quantitative data from property managers and other stakeholders
- Case studies: To examine the experiences of successful use of blockchain technology in other countries

3.8 Data Analysis

The data collected has been examined by Microsoft Excel in order to provide a clear statistical picture through graphs that will show the trend and relationship. This data has been presented in Microsoft world to provide a brief analysis of the results found concerning the topic being researched.

3.9 Study Area:

The research focuses on the Central Division of Kampala capital city.

3.10 Research Ethics

Research ethics refer to norms for conduct that distinguish between acceptable and unacceptable behavior in the process of carrying out research. The study aimed at ensuring informed consent of all participants in the study, confidentiality and anonymity of the participants and data protection.

CHAPTER FOUR: RESEARCH FINDINGS, ANALYSIS AND PRESENTATION

4.1 Introduction

This chapter comprises the findings of this research, clearly laying out how the data obtained was analyzed, the methods used and finally the presentation of the discoveries. The research methodology enabled the researcher to collect practical information and analyze it in order to determine whether the objectives of the study had been achieved.

4.2 Analysis and Presentation

Respondents filled in information relating to various aspects of blockchain and the property records management. The information collected reviews some of the challenges faced in the property records management, important features of the blockchain and applicability of the blockchain in the property records management and current technological infrastructure for property management in Uganda. This information was discussed here below.

4.2.1 Background Characteristics of the Respondents

The background information pertaining to the respondents includes their gender and their highest level of education.

Gender of the Respondents

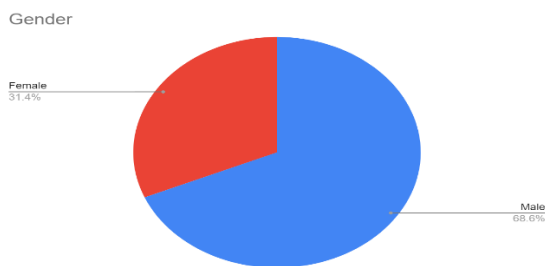


Figure 1: a pie chart showing gender statistics

Source: Primary Data

The findings show that the majority of the respondents were male taking up 68.6% of the total respondents and women took up 31.4% of the total respondents. This shows that the study considered both genders in making inferences.

Highest level of Education

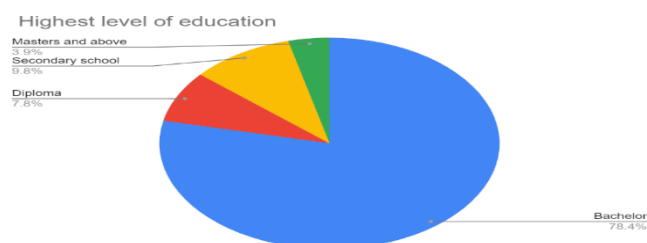


Figure 2: showing level of Education analysis

Source: Primary Data

The findings from the research indicated that the minimum level of education for all the respondents was secondary level. All respondents at least completed secondary level and out of those, the majority attained a Bachelor's degree (78.4%) while 9.8% attained secondary level, 7.8% attained a Diploma and the remaining 3.9% completed Masters and above.

4.2.2 Uganda's Property Records Management

Records can be referred to as anything that contains information that was generated or acquired during the course of business and may be used as proof of a business transaction(Kaddu et al., 2023).

Property records management plays a pivotal role in the effective administration and governance of real estate, providing a systematic framework for recording, organizing, and preserving critical information related to land and property(Luyombya, 2010). In Uganda, a country with a rich cultural and historical context, traditional property records management practices have long been ingrained in the societal fabric. Managing records is one of the cornerstones for effective delivery of public services. Sound records management delivers transparency by documenting and providing evidence of an activity, a decision or an agreement

Information Overload. This poses a significant challenge in records management as organizations struggle with an ever-expanding volume of data(MALAK, 2022.). The sheer volume of information, both in physical and digital formats, can lead to difficulties in identifying and managing records. With the rise of big data and the constant flow of information from different sources, businesses should create a RM plan to mitigate the risk of death by data. The challenge is not only where and how we store data but it is also with the ability to keep these records safe through all these data breaches happening.

4.2.3 Challenges in Property Records Management

To analyze the challenges faced in property records management in the Ugandan, respondents were asked to provide insights on different challenges faced in the industry and whether they have encountered any form of fraud in their systems. This was to provide knowledge on the most faced challenges in the property records management.

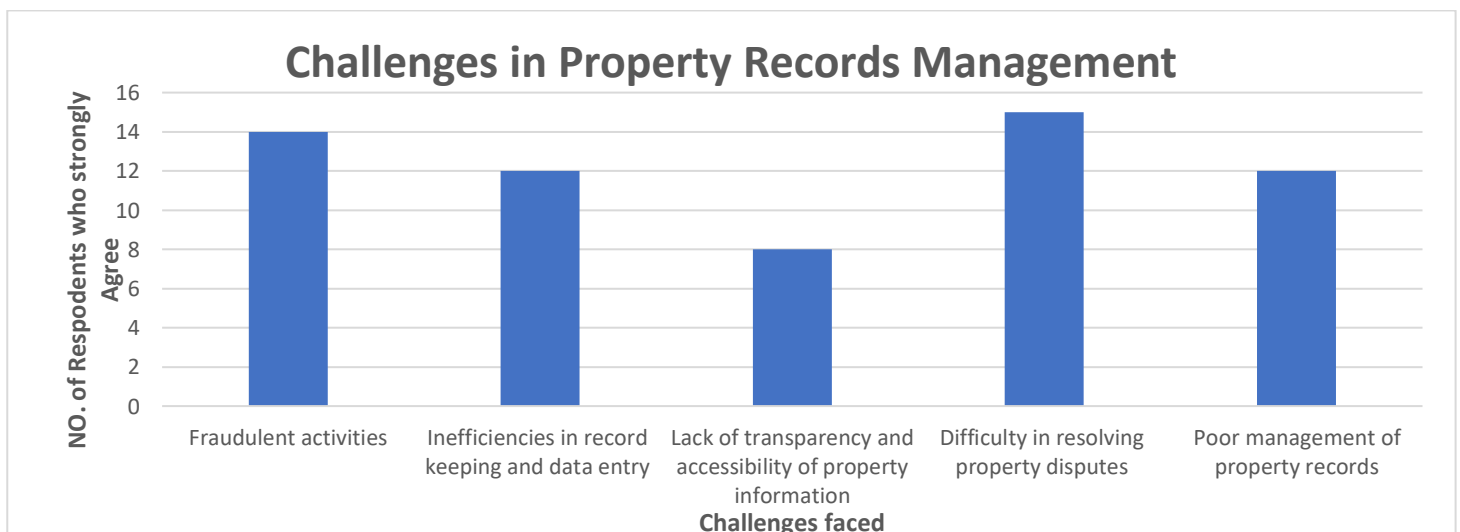


Figure 3: a graph showing challenges statistics

Source: Primary Data

From the above figure,

Difficulty in resolving property disputes is ranked as the most severe challenge according to the survey participants, Fraudulent activities, such as forgery as the second most severe challenge, Poor management of property records and Inefficiencies in record keeping and data entry are ranked as the third most severe challenge, Lack of transparency and accessibility of property information is ranked as the least severe challenge, although it is still a challenge according to the survey participants. This implied that there are several challenges to be solved in the property records management in Uganda.

Have you encountered any instances of property fraud in your work?

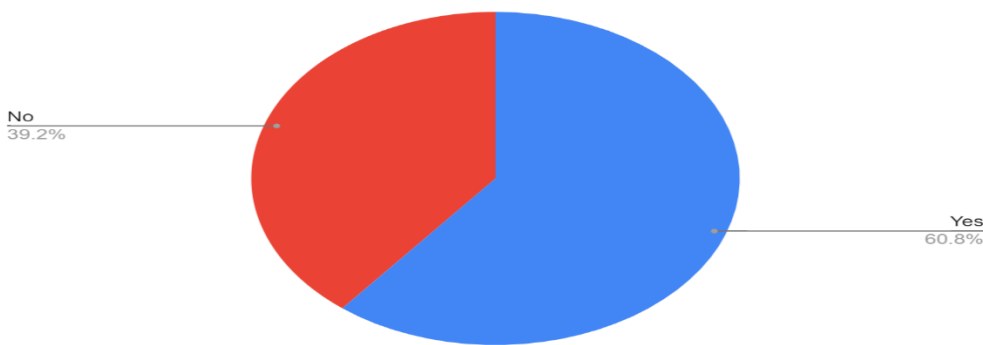


Figure 4: a chart showing Fraud statistics

Source: Primary Data

From the research findings, 60.8% of the respondents have encountered instances of fraud in their work and 39.2 of the respondents have not encountered any instances of fraud in their work. This is enough evidence that the property records management faces challenges.

4.2.4 Digital integration

To evaluate the features of blockchain and their ability to solve challenges in property records management, respondents were asked whether they are currently utilizing any digital system and their level of satisfaction with the technology being used in their companies. They were also asked to rate different features of Blockchain and their capabilities to solve the challenges.

Does your organization currently utilize any digital systems for property management?

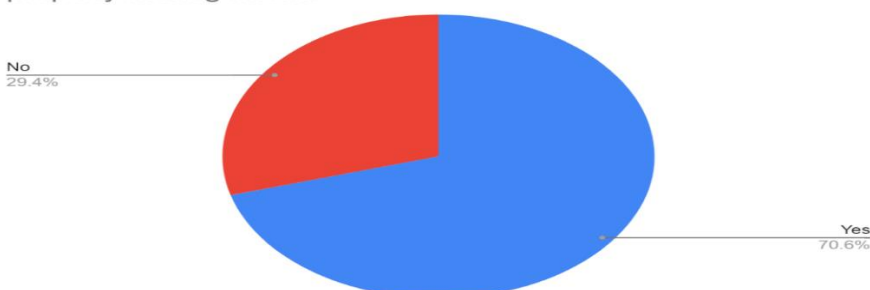


Figure 5: showing utilization of digital analysis statistics

Source: Primary Data

From the research findings, 70.6% of the respondents are utilizing some digital platforms which included database, Ms Excel, Axiom Pro, Buildium, Inventory management software and Online booking for rent premises in managing property records and 29.4% of the respondents are not utilizing any digital platform in managing their property records. This shows that some are still using traditional methods in managing property records.

Level of satisfaction with the current technology

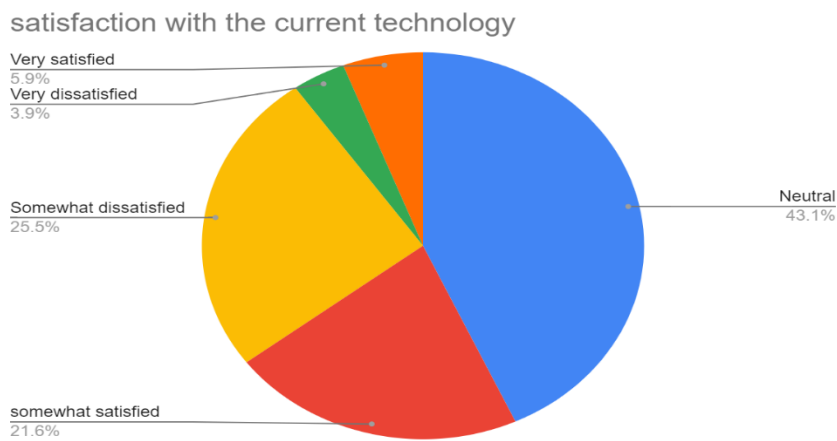


Figure 6: showing satisfaction with level of technology

Source: Primary Data

From the research findings, the largest segment, at 43.1%, is neutral. Only 21.6% of people are somewhat satisfied, and a very small, 5.9%, are very satisfied. A significant number, 3.9%, are very dissatisfied. This shows that there is room for improvement in how technology is designed and used. It's important to note that there are a number of reasons why people are dissatisfied, and include Limited accessibility to all stakeholders, Ignorance, Lack of technical knowledge, privacy issues, poor network in some areas, Cybersecurity Concerns and Digital Inequality.

4.2.5 The current property records management process

For the current system, the buyer first pays the money to the seller and then pays the stamp duty charges to the government which can be done online. Then they have to schedule an appointment with the local registry office where they need to go with all the documents and the payment proof. Their documents are verified and this process takes so much time and there are loopholes that can be used by criminals. After this process, the buyer also needs to manually go and change owner details in the municipal records. The electric board and water board also have owner details that need to be changed manually. This process is explained in figure below.

There are Increasing numbers of fraud cases because of the non-availability of genuine data records to property buyers so a lack of transparency is there in the system. It is all because the data is not available in the public domain and there is no way to know how many properties are owned by any person because the records are

distributed. This problem is addressed by the government in the near past but the non-availability of genuine data in the public domain is still a problem that needs to be addressed.

It is a very time-consuming process and involving many middlemen who sometimes charge illegal fees to do the work. This process takes about 10-15 days which should be done rapidly in this fast-moving world.

The government has moved towards digitalization and keeping digital records in a centralized database but there are also issues with the centralized database some of the issues are data security and fraudulent data changes which is a very important problem to focus upon. Loss of records in any disaster situation if present in traditional offices or in a centralized system is another issue.

Also, the cost of this system is very high and the system is involving so many peoples which are not required in this digital world where most of the work can be automated by technology.

Apart from all these problems, there is another problem with the transfer of property by heredity or will. In this case, one has to go to the land registry office with the death certificate of the person to transfer the property and so many procedures are needed to be followed in this case which is a very tiring procedure. There is no way to automatically transfer the property which should be implemented.

One other problem is with financial institutions that they can't verify easily the property status in case of property to be mortgaged for the loan. Even if the property is on lien being mortgaged there is no way for other persons to know that.

The problems are important as so many peoples are facing troubles related to this.

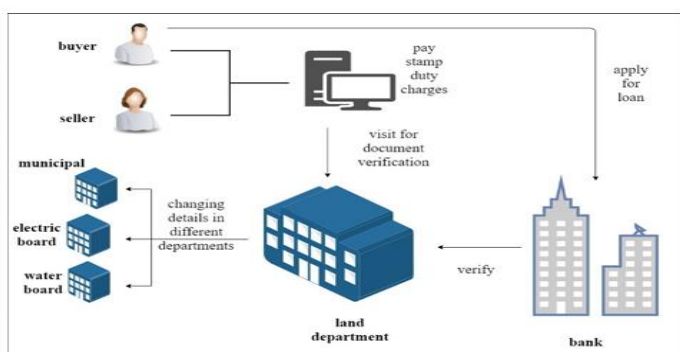


Figure 7: showing current property records management process

4.2.6 Potential of Blockchain Technology

To evaluate the technological infrastructure in Uganda and the readiness of systems to support blockchain implementation in property management. The respondents were asked about their awareness of blockchain, its features and their ability to mitigate challenges in property management.

Knowledge of Blockchain

blockchain technology awareness

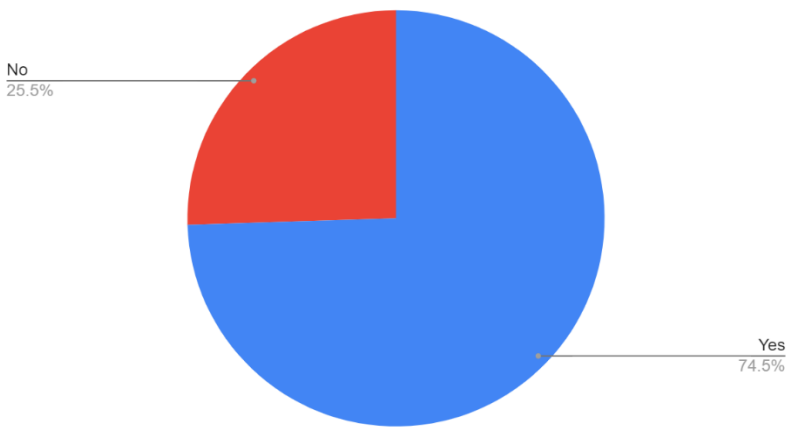


Figure 8: chart showing blockchain awareness

Source: Primary Data

Out of all the respondents, 74.5% of them are knowledgeable about the blockchain while 25.5% do not have any idea about the blockchain which made the results credible and can therefore give the stakeholders a starting point for the implementation.

Features of the blockchain which make it applicable in the property records management.

Proportion of respondents who Agree that the following features of the blockchain make it applicable to the property records management.

Please rate your agreement with the following statements about blockchain (1=strongly agree, 5=strongly disagree):

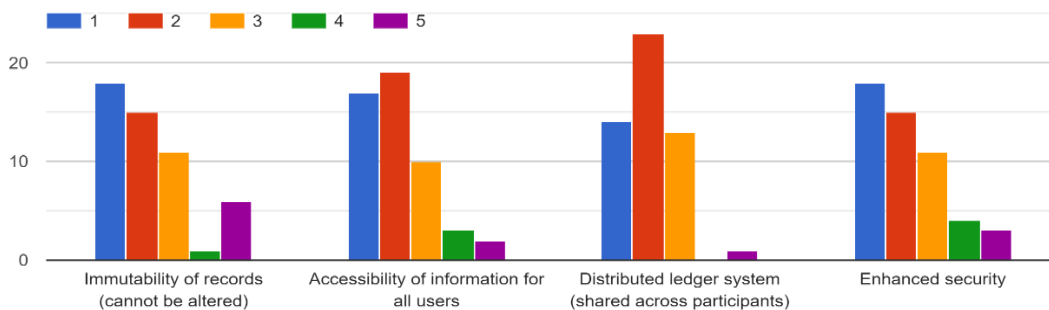


Figure 9: showing a comparison of Blockchain features

Source: Primary Data

According to the respondents, a big percentage agree to the features of blockchain technology which makes it applicable in the property records management in Uganda

Capability of the Blockchain to mitigate particular challenges associated with the property records management.

In your opinion and basing on the features of the blockchain, do you think it can mitigate the following challenges associated with the property r...agement? (1=strongly agree, 5=strongly disagree):

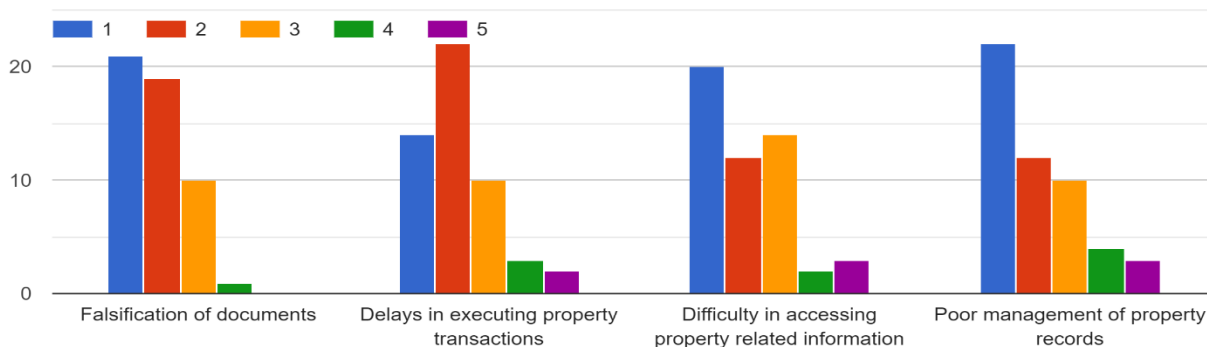


Figure 10: showing capability of blockchain

Source: Primary Data

From the research, a big percentage of the respondents agreed that the features of the blockchain have the ability to mitigate the challenges associated with property records management. A relatively small percentage disagreed. This implies that the features of the blockchain of transparency, immutability and enhanced security can rectify the challenges faced at the registry

4.2.7 Effective integration of Blockchain technology.

To develop recommendations for stakeholders to facilitate the effective integration of blockchain into Ugandan property management, respondents were asked about incentives and required support that can encourage the use of Blockchain Technology in the management of their property records.

Incentives

What incentives would encourage you to adopt blockchain technology for property management? (Please select all that apply)

51 responses

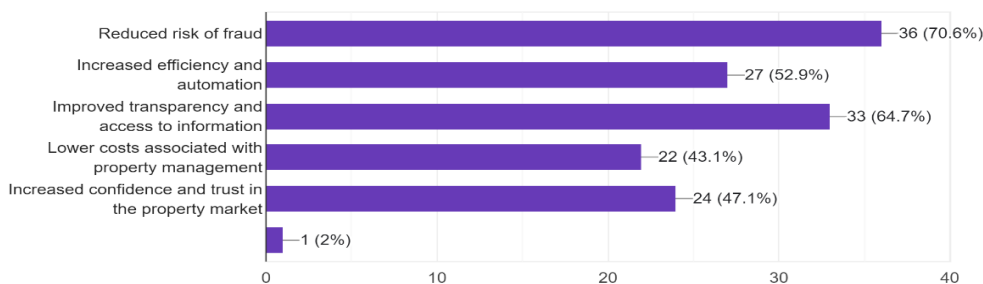


Figure 11: showing require incentives to adopt blockchain

Source: Primary Data

From the research, the top 3 incentives for adopting blockchain technology in property management are:

- Reduced risk of fraud (70.6%)
- Improved transparency and access to information (64.7%)
- Increased confidence and trust in the property market (47.1%)

This shows that property managers are most interested in blockchain’s potential to improve security and transparency in their operations. This is because blockchain can create a secure and tamper-proof record of all property transactions, making it more difficult for fraud to occur. Additionally, blockchain can provide all authorized parties with a single view of the latest information on a property, which could improve communication and efficiency.

Additional support for efficient use of Blockchain in Uganda

What additional resources or support would be necessary for you to adopt blockchain technology?
(Select all that apply)
51 responses

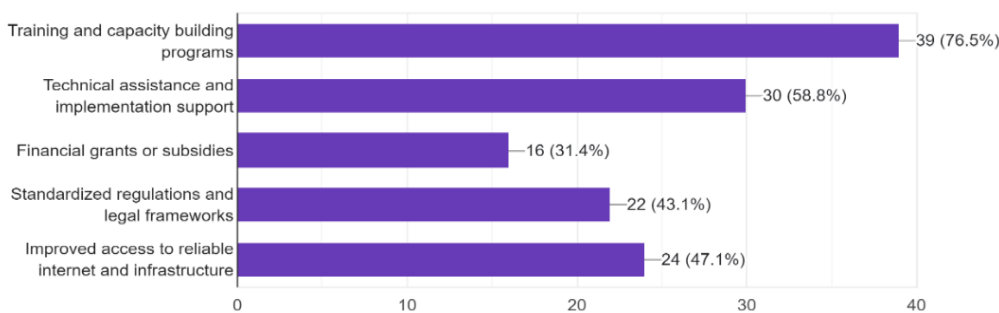


Figure 12: additional support analysis for the adoption of blockchain

Primary Data

From the research, Training and capacity building programs, technical assistance and Implementation support are the highly required incentives in ensuring the use of Blockchain technology in property records management in Uganda.

4.3 How the blockchain works

The figure below shows in general how a blockchain works. For a money transaction, party A would initiate a money transfer through either a computer or a phone. A transaction block is created and it provides all details pertaining to that transaction for example the time, date, amount to be transferred. The block is then broadcast to all the other parties on the network and this could include the bank, a mobile network responsible for the transfer or any other stakeholders (Nino, 2019).

The parties on the network then approve the transaction and if any of them do not, the transaction cannot be completed. On approval of the transaction, a permanent record of the transaction is added to the blockchain and finally party B receives the money through a computer or phone. Important to note is that transactions are not valid until they are added onto the blockchain and all the parties on the network have a copy of the transactions. Additionally, if any information is changed, it is immediately visible to all the parties on the network.

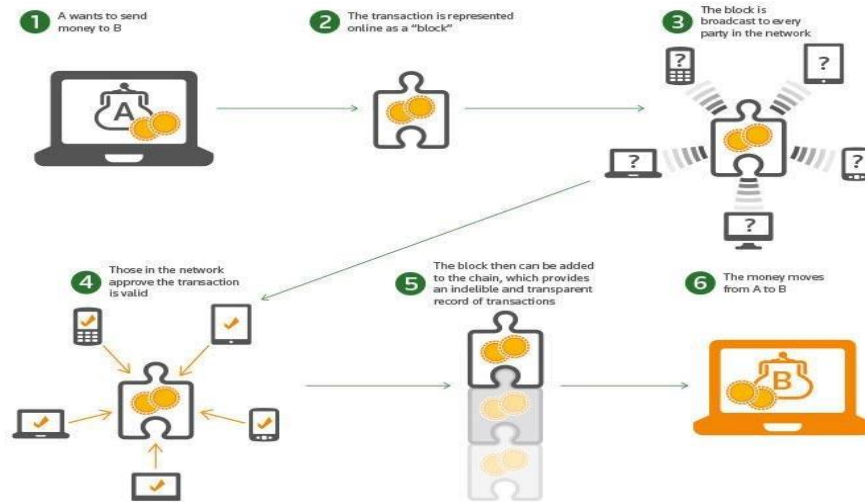


Figure 13: showing how blockchain works in finance

For the purposes of the property records management, the idea remains the same that for all transactions, the blockchain would maintain a permanent record and present it in the form of a digital ledger that would be distributed among all the stakeholders in the property management. In case of any tampering, all the parties on the network would be notified immediately. For purposes of illustration, this network shows the property owner, the broker, government official, property manager and the revenue office. Otherwise, the blockchain network can have as many parties as required by the designers.

4.3.1 Proposed Framework for the property records management on a blockchain

The proposed solution is a centralized system with a distributed blockchain network for secured and immutable data storage. It will be synchronized with the different departments for the real-time and efficient property transfer system. The data of the property will be in the public domain through a channel in the system and will be easily accessible to the people and all the departments for the trustworthy system. It can also be extended to have the details of the property on lease. The transfer of the property will be cryptographically secured with the public key-private key cryptography and will be blockchain secured for the immutable data records. The security and consistency of the data is the primary aim which is possible by the blockchain technology.

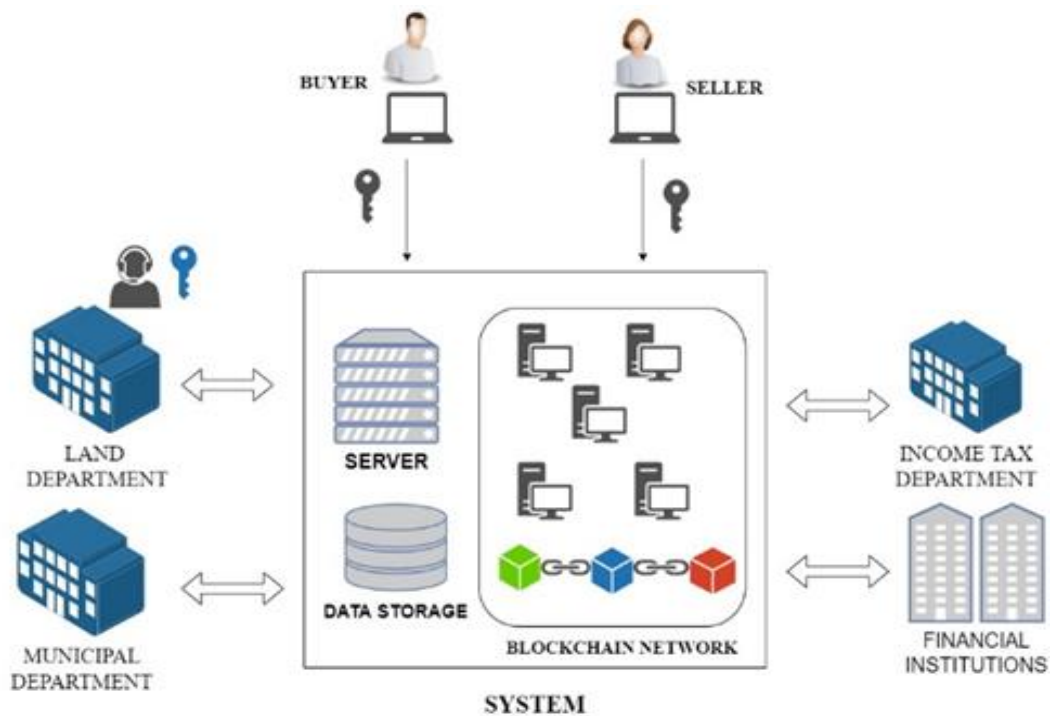


Figure 14: Proposed Framework for the property records management on a blockchain

CHAPTER FIVE: RECOMMENDATIONS AND CONCLUSIONS

5.1 Introduction

In this chapter, conclusions were made about the study in reference to the findings from chapter four as well as recommendations by the researcher on the issues found lacking and deserving more work for further study.

The main objective of the study was to assess the potential of implementing blockchain technology to address existing challenges in Ugandan property records management. The study proposed a framework based on the blockchain that would be used in the place of the current systems being used. Basing on the framework, it could be seen that the blockchain-based system would counteract the most pressing issues of the current property records management systems for example double spending, delays in executing transactions, Inefficiencies in recordkeeping and data entry and fraud.

5.2 Conclusions

The blockchain based system would be a decentralized standard system for the property records management, which will reduce the role of intermediaries, decrease the time and cost of the process and fraud. The system will also strengthen the registration process and will build the trust between the transacting parties. Recording rights of property through the blockchain will generally reduce in registration costs and will also enable the government to administer taxes easily. Recording property records under a blockchain-based system will provide tamper-proof record of all transactions.

The study reviewed the existing procedures and issues in the current property records management systems. From the findings, the system is susceptible to a number of alterations at every stage which affect the costing in one way or another. The systems in place are very time consuming and open to fraud because it involves many intermediaries at the different stages.

These issues have a negative impact on the economy. People are skeptical about investing in properties especially external investors and yet this excludes money from the economy cycle which is a detriment to the country. Additionally, the government's tax revenue is also adversely affected because many properties' records aren't clear and can't be traced.

Blockchain technology has the capacity to counter all these issues. From the findings, a number of states have integrated blockchain into property records management and this has greatly improved efficiency and reduced fraud. The study proposes a framework for using blockchain in order to have a secure and reliable property records.

Blockchain gives the security advantage since it relies on encryption to validate transactions by verifying the parties to the transaction. False transactions cannot be added to the chain in any case without consent of all the involved parties. This would automatically solve the issue of fraud. Additionally, since each hash depends on transactional data, the identity of parties involved and the hash of the previous block, it ensures that past

transactions cannot be altered. An attempt to alter a hash would trigger a red flag on all the other nodes connected to the network.

Transparency is yet another distinction for the blockchain. By nature, a blockchain is a distributed database which is maintained across a network of other computers. Multiple parties can access the data stored on the node thus increasing the level of transparency. This proves the blockchain to be an efficient way to not only store land records but also to run the land registry.

The proposed structure would therefore counter the significant issues of tampering, double spending and it would provide an update of property records at all times. The records are kept in a decentralized way by nodes and are easily accessible by users of the registry. The proposed system is also economical and it requires less human intervention.

5.3 Recommendations

The study recommends that there is indeed a need to create a system of trust within the property records management in Uganda. This system is the blockchain technology which would have all records stored on it as a distributed ledger of records and maintained by many nodes.

Even though the blockchain promises to cure the frailties of the current property records management systems, the system is only as good as, what is put into it. Therefore, all the information should be accurate and thoroughly checked before it is entered onto the blockchain.

The adoption of a blockchain-based registry would require high tech skills in developing a system that actually portrays all the benefits and advantages that blockchain has over other traditional databases. This would require the government to collaborate with a blockchain company in order to set up this system.

More research should be done on which one of the types of blockchain would be appropriate for the property records management. A blockchain may be public, hybrid or permissioned. For the case of property records management, the hybrid blockchain, which incorporates both the public and permissioned blockchain characteristics, would be advisable. More research is however needed to determine which of the types would be the best option.

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APPENDICES

Appendix 1. Research Questionnaire guide

RESEARCH QUESTIONNAIRE GUIDE

Dear Participant,

My name is Oyesigye Mukama Hillary, a student at Makerere University - College of Engineering, Design, Art and Technology pursuing a Bachelor of Science in Land Economics.

This questionnaire is strictly for academic work prepared as part of a research project **"INVESTIGATE THE USE OF BLOCKCHAIN TECHNOLOGY FOR SECURE AND TRANSPARENT PROPERTY RECORDS MANAGEMENT"**. Your responses will be crucial in understanding the current landscape, challenges, and opportunities for implementing this technology. I request your input by answering this questionnaire which will be beneficial for my study and technological enhancement in the property sector.

Please be assured that all responses will be kept confidential and used solely for research purposes.

Your cooperation is highly appreciated.

(Blockchain is essentially a distributed database of records or public ledger of all transactions/digital events that have been executed and shared among participating parties. At the most basic level, a blockchain is literally a chain of blocks. The words block and chain are used in the context of digital information where the block is the information stored in a public database, and the chain is the chronological order of the blocks. Data on a blockchain is recorded in files known as blocks, which are organized into a sequence to form a chain of blocks, hence the name blockchain.)

Section A

Background Information

1. Gender

Male

Female

2. Age of the respondent

20 - 25

25 - 30

30 - 35

35 and above

3. What is the highest level of education you have attained?

Secondary school

Diploma

Bachelor

Masters and above

Other: _____

4. What is your primary role in the property management sector of Uganda?

Property owner

Property manager

Real estate agent

Tenant

Other: _____

Section B

Challenges in Property Management

5. Please rank the following challenges in order of severity you face in managing property records in Uganda, with 1 being the most severe and 5 being the least severe.

Mark only one oval per row.

	1	2	3	4	5
Fraudulent activities e.g. forgery	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Inefficiencies in record keeping and data entry	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of transparency and accessibility of property information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Difficulty in resolving property disputes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Poor management of property records	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

6. Have you encountered any instances of property fraud in your work?

Yes

No

Section C

Technological Infrastructure

7. Does your organization currently utilize any digital systems for property management?

Yes

No

8. If you answered "Yes" to question 1, what type of software or platform do you use?
(Please specify)

9. How satisfied are you with the current technological infrastructure for property management in Uganda?

Very satisfied

somewhat satisfied

Neutral

Somewhat dissatisfied

Very dissatisfied

10. What are the major limitations of the current technological infrastructure in your *
opinion?

Section D

Blockchain Awareness and Perception

11. Have you heard of blockchain technology?

Yes

No

12. Please rate your agreement with the following statements about blockchain (1=strongly agree, 5=strongly disagree):

Mark only one oval per row.

	1	2	3	4	5
Immutability of records (Cannot be altered)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Accessibility of information for all users	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Distributed ledger system (Shared across participants)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Enhanced security	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

13. In your opinion and basing on the features of the blockchain, do you think it can mitigate the following challenges associated with the property records management? (1=strongly agree, 5=strongly disagree):

Mark only one oval per row.

	1	2	3	4	5
Falsification of documents	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Delays in executing property transactions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Difculty in accessing property related information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Poor management of property records	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Section E

Recommendations for Stakeholders

14. What incentives would encourage you to adopt blockchain technology for property management? (Please select all that apply)

Check all that apply.

- Reduced risk of fraud
- Increased efficiency and automation
- Improved transparency and access to information
- Lower costs associated with property management
- Increased confidence and trust in the property market
- Other: _____

15. What additional resources or support would be necessary for you to adopt blockchain technology? (Select all that apply)

Check all that apply.

- Training and capacity building programs
- Technical assistance and implementation support
- Financial grants or subsidies
- Standardized regulations and legal frameworks
- Improved access to reliable internet and infrastructure
- Other: _____

16. Do you think the government should incorporate blockchain technology into the property records management?

Check all that apply.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree