# APPLICABILITY OF BLOCKCHAIN TECHNOLOGY IN CRYPTOCURRENCY AND RETURN ON INVESTMENT FOR ONLINE COMPANIES OPERATING IN KENYA

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## DECLARATION

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## DEDICATION

I dedicate this research project to my parents; David Kaunga and Alice Karimi, my husband Mr. Jotham Gitonga and my children Rophine, Asher, Tehilla and Emmanuel whose tremendous sacrifices were instrumental in the completion of this paper.

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## OPERATIONAL DEFINITION OF TERMS

| | |
|---|---|
| **Blockchain** | A type of ledger or database shared among a computer networks' nodes and which stores information in blocks that cannot be altered. |
| **Cryptocurrency** | Refers to digital currency that utilizes encryption and relies on the blockchain technology |
| **Block Chain Digital Ledger** | A digital system of recording transactions of assets whereby those transactions and their corresponding details are entered in multiple places simultaneously |
| **Permissioned blockchain** | refers to a closed blockchain that is only accessible by authorized users. |
| **Return on Investment** | This refers to the tangible and intangible benefits that accrue to a firm from a particular investment. |
| **Block Chain Smart Contracts** | Refers to a self-executed computer program that automatically executes the terms of an agreement without the involvement of those parties |

## ABBREVIATION AND ACRONYMS

| | |
|---|---|
| **ICT** | Information Communication Technology |
| **RBV** | Resource-Based View |
| **ROI** | Return on Investment |
| **SPSS** | Statistical Package for Social Science |
| **TAM** | Technology Acceptance Model |

## ABSTRACT

When it comes to the use of blockchain technology and cryptocurrencies, Kenya is one of the world's leading nations. Numerous businesses have integrated blockchain technology as a result of the growing acceptance and awareness of cryptocurrencies. However, it is unclear from the literature how blockchain technology in cryptocurrencies and return on investment are related. Therefore, this study assessed the impact of blockchain technology on cryptocurrencies and ROI for Kenyan internet businesses. The independent variables of the study are blockchain digital ledger, blockchain smart contracts, and permissioned block chains, while the return on investment is the dependent variable. The study was premised on the resource-based view theory, the disruptive innovation theory and the diffusion of innovation theory. The study used a correlational design. The study include1664 online companies operating in Kenya. The sampling frame was 322 companies which had used blockchain technology for at least three years. The sample size was 178 online companies, and the unit of analysis was the top managers of the companies. Stratified sampling was employed to select the participants. Questionnaires were used to gather data. The SPSS version 21 was applied for inferential and descriptive statistical analysis. Regression and correlation analyses were done to exhume the relations between variables. The researcher adhered to the necessary ethical guidelines. The findings showed that blockchain technology adoption was positively and significantly correlated with return on investment of online companies operating in Kenya. Each of the three independent variables was discovered to have a statistically significant effect on return on investment. Blockchain digital ledger was found to have the biggest impact (0.065 units) on return on investment while permissioned block chains were found to have the least impact (0.056 units). The outcomes were significant at $p<0.05$. The findings underscored the need to online companies to prioritize blockchain technology adoption to maximize return on investment. The research concluded that blockchain digital ledger, block chain smart contracts, and permissioned block chains significantly influenced return on investment of online companies operating in Kenya. The study exhorted future studies on the effects of blockchain adoption on return on investment while considering the indirect mediating roles of blockchain project's purpose and company characteristics. The study recommends top leadership or proprietors of online companies operating in Kenya to expedite the integration of blockchain digital ledger in their systems. The study also recommends companies to integrate permissioned block chains to strengthen data security and integrity levels, improve the levels of transparency in transacting, detect and prevent vulnerabilities and fraud.

# CHAPTER ONE

# INTRODUCTION

## 1.1 Background of the Study

Return on Investment (ROI) is often used to quantify the material and immaterial advantages of investments and inform investment decisions. While the uptake of blockchain technology by online companies has increased, the use of ROI to evaluate the technology's benefits remains limited. Consequently, the full potential of blockchain technology and cryptocurrency is yet to be realized. Cryptocurrency is a digital currency that utilizes encryption and relies on the blockchain technology (Justinia, 2019). Unlike physical currencies, cryptocurrency does not pass through middlemen making it difficult for the government to regulate or tax crypto business transactions. The first cryptocurrency referred to as Bitcoin was created in 2008 but other digital currencies have since been developed including Ethereum, Binance coin, Ripple coin and Doge coin. Cryptocurrencies came to the fore after the 2007/2008 financial recession and was mediated by declined public confidence in the mainstream financial sector (Khan et al., 2021).

Today, Cryptocurrency has gained popularity worldwide, especially in industrialized nations. Cryptocurrencies also continue to be mainstreamed in the financial sectors of developing countries. South Africa and Nigeria have recorded considerable increase in the adoption of digital currencies. Similarly, the Chainalysis 2021 Global Crypto Adoption Index ranks Kenya as sixth worldwide with respect to cryptocurrency adoption, surpassed only by Nigeria in Africa. In 2020, Kenya's volume of bitcoin trades totaled to 64 billion Kenya shillings, which was the second largest volume in Africa.

Cryptocurrency differs from fiat money to the extent that it does not have a central authority, such as central or reserve bank to regulate its use. Instead, cryptocurrency is formed via a method known as mining, whereby diverse computers are linked to a peer-to-peer network and access all the businesses in the blockchain. The system automatically confirms if new transactions can be added to the blockchain once it ascertains that cryptographic rules have been met (Mhlanga, 2023). Every machine on the peer-to-peer network has a community address that is applied in transmission of the funds to other cryptocurrency users.

The transaction for every transfer is kept in blocks in a digital ledger referred to as a blockchain which is imposed or regulated by cryptography. Thus, every transfer is original and stored in an orderly manner within the blockchain and allows for tracking or verification. Every user retains a private key when completing a particular transaction (Lineros, 2020). The private key is in the form of mathematical evidence as it entails signing the transactions and safeguarding them from being altered. Thus, the blockchain technology is the backbone of cryptocurrency. The idea of blockchain technology has attracted significant interest in research in the past decade as the adoption of cryptocurrency expands. However, there is a paucity of information on the link between blockchain technology in cryptocurrency and return on investment for companies.

### 1.1.1 Measuring Return on Investment

Return on investment is a powerful metric that is commonly used by businesses to measure the financial benefits of a particular investment. It is a popular metric particularly when comparing the merits of one investment to another. Andru and Botchkarev (2011) conceptualize return on investment as the net gain from an

investment articulated as a percentage of the total cost of that investment. In other words, a cost-benefit analysis of a particular investment can give the return on investment of that particular investment. Andru and Botchkarev (2011) further underscore the complexity of return on investment particularly as applied to different fields. It is hard to calculate reappearance on investment in monetary aspects in other industries. For instance, when measuring return on investment of social media, it may be difficult to show the financial returns on the same. Thus, it is imperative to also consider the intangible benefits that accrue to a particular investment when determining its return on investment.

Some of the intangible benefits may include level of customer satisfaction, employee morale, improved efficiency, improved productivity, and reduced costs among others. An earlier study by Wang et al. (2002) analyzed the systems technique to ROI measurement and supported the inclusion of both monetary and non-monetary actions. The fiscal measures may be in the form of improved profitability of the firm after adopting a particular investment.

The non-financial measures may include improved efficiency and service/product quality (Wang et al., 2002). Similarly, Schroeder-Strong et al. (2022) contends that it is hard to evaluate or quantify the worth of the most important benefits when measuring return on investment particularly of a technological adoption. Thus, the study supports return on investment models that include both tangible and intangible benefits of an investment. This study is awake to the challenge of quantifying the financial benefits of the blockchain technology and thus focus on the intangible benefits of adopting the blockchain technology among online companies operating in Kenya.

### 1.1.2 Blockchain Technology in Cryptocurrency

Blockchains, according to Yaga et al. (2019), are digital ledgers that cannot be altered without leaving a trace of the change. The structure of blockchain is designed with smart contracts that automate the execution of agreement terms among parties; permissioned blockchains that administer user identity; and digital ledgers that record inflows and outflows of transactions. The ledgers are organized in a distributed manner and require no central authority to regulate them. Users can use the shared ledger to monitor and track the transactions in a blockchain. A blockchain network can be utilized to exchange any valuable asset or commodity thereby lowering the costs and risks for parties in that arrangement (Saberi et al., 2019).

The advent of Bitcoin network in 2008 was the genesis of heightened public awareness of blockchain technology. Bitcoin works on the assumption that the transfer of digital data signifies a form of digital payment that is made via a distributed network. Blockchain technology is appropriate for the transfer of data because it avails data which is directly shared with others, accessible to all, and kept in a register that can only be seen or retrieved by those in the network. The blockchain network is able to preserve tabs on payments, production, inventory orders and accounts among others. The affiliates of the blockchain network can track the particulars of every transaction at all stages.

There are four key features of blockchain networks that help to foster trust among parties and eliminate the necessity of trusting middlemen or third parties. According to Mhlanga (2023), these range from private blockchain networks to permissioned blockchain networks to public blockchain networks. These characteristics illustrate the many methods used to construct a blockchain network. The network may be made

public or accessible to the public, reserved private, be formally authorized or be the work of a cooperative effort of the members of that network. Blockchain networks that are available to the public, such as Bitcoins are public blockchains and have their downsides including limited transactional confidentiality, limited levels of security and high amount of computer power.

Smart contracts help to fasten transactions by storing a set of pre-determined rules which are implemented. Private blockchain networks are also peer to peer dispersed computer networks but are governed by a single entity which also develops and executes a consent protocol and management of the shared ledger. Companies that build private blockchains also create networks on blockchains with permits which restrict the type of transactions that can take place. Participants either require invitation or authorization before making a particular transaction. In consortium blockchain networks, the multiple companies in that network share the responsibility of updating the ledger (Mhlanga, 2023).

The pre-selected organizations determine who is permitted to make transactions on the network. Blockchain technology was originally designed for cryptocurrency but has since found applications in other areas. Many earlier studies have dwelt on the applications of the blockchain technology in cryptocurrencies but little is known about the return on investment of the same in online companies operating in Kenya that have adopted the technology.

### 1.1.3 Online Companies Operating in Kenya

Online companies are ventures whose processes or modes of operation are wholly conducted on the web, internet, extranet or a combination thereof. Kenya has a vibrant blockchain landscape with numerous companies developing innovative solutions on the

blockchain concept. A case in point is Pezesha, a lending digital marketplace that links Small and Medium Enterprises with providers of affordable working capital. The company utilizes the blockchain technology to democratize loans and create a global network effect for the borrowers to make their loans more competitive. Another example is Pesabase which uses blockchain to transfer money faster and more effectively without the bureaucracy of bank settlements in Kenya (The Kenya Wallstreet, 2021). Similarly, play bobby is an online platform that leverages the blockchain technology to connect SMES to virtual workers to improve service delivery.

The adoption of blockchain technology is also revolutionizing access and ownership of data in Kenya. Decentralized infrastructure and application forms are gradually replacing technology giants which enjoyed monopoly of data control. Many Kenyans and companies often face the challenge of obtaining APIs when starting enterprises and are forced to partner with established information technology companies to process payments and other financial services. However, companies are now becoming integrated with blockchain and produce wallets on detailed blockchain platforms to ease money businesses (Kirwa, 2022). Besides, there are many companies operating in Kenya in various aspects of the cryptocurrency industry and which utilize the blockchain technology. Notably, no study has been done to determine the effect of blockchain technology in cryptocurrency and the return on investment for online companies operating in Kenya.

### 1.2 Statement of the Problem

Cryptocurrency Blockchain technology in many online companies in Kenya have adopted blockchain and distributed ledger technology applications in various aspects of their operations to keep up with the quickly developing technological landscape (Chainalysis, 2021). The adoption of cryptocurrency has also accelerated the

integration of many companies with blockchain to effectively provide their services (Kirwa,2022).

Since many companies cannot quantify the unseen benefits of blockchain, they might easily feel that they do not see the ROI in the blockchain technology they adopted, thereby impeding future investments (Atinda, 2022). Thus, utilizing multi-factorial decision analysis to determine the ROI in blockchain is necessary for companies to appreciate the tangible and intangible benefits of blockchain and distributed ledger technology applications. Further, the present study seeks to cover contextual gaps in literature. A number of studies including Bonnet &Teuteberg (2023); Varfolomeev et al. (2021) and Justinia (2019); have been carried out on the adoption of blockchain technology around the world but none has been performed on the Kenyan environment. The uniqueness of the Kenyan context makes it difficult to generalize the findings of those past studies to the context of Kenya. This study sought to seal the contextual gap by studying the impact of blockchain technology in cryptocurrency and the return on investment for online companies operating in Kenya.

Lastly, there were clear conceptual gaps in research which this study sought to cover. A case in point is Vigliotti et al. (2021) who only focused on the aspect of certainties when analyzing the benefits of smart contracts. This study included more aspects of smart contracts. Another conceptual gap emerged in Grietzmann & Grossetti (2021) who only used accounting as a measure of return on investment. This study used both tangible and intangible measures of return on investment. Further, many studies explored the applications of the blockchain technology but did not show the nexus of blockchain technology and return on investment. Such studies include Punathumkandi et al. (2021); Lineros (2020); Anter et al. (2020); Khan et al. (2020); and Polge et al.

(2020). This study showed the association among blockchain technology adoption and return on investment for online companies operating in Kenya.

## 1.3 Objectives of Study

The study was based on both the general and specific objectives.

### 1.3.1 General Objective

The general objective of this study was to investigate the application of blockchain technology in cryptocurrency and its influence on the return on investment for online companies operating in Kenya.

### 1.3.2 Specific Objectives

1) To determine the effect of digital ledger on return on investment for online companies operating in Kenya
2) To find out the effect of smart contracts on return on investment for online companies operating in Kenya
3) To establish the effect of permission block chains on return on investment for online companies operating in Kenya

## 1.4 Research Hypotheses

1) $H_{01}$. Use of digital ledger has no effect on return on investment for online companies operating in Kenya
2) $H_{01}$. Use of block chain smart contracts has no effect on return on investment for online companies operating in Kenya
3) $H_{01}$. Use of permission block chains has no effect on return on investment for online companies operating in Kenya

## 1.5 Significance of the Study

The study could yield voluminous information on the wide range of applications of blockchain technologies which may enable online companies operating in Kenya to pursue innovative strategies, and build sustainable competitive advantage. The findings of the study may benefit the following:

1. Online companies operating in Kenya

Companies operating in different economic sectors in Kenya could incorporate blockchain technologies in their operations so as to increase security and transparency in the storage and sharing of data, processing of payments, fraud detection and prevention, and cut costs. Additionally, this study may act as a reference fact for other studies interested in exploring other aspects of blockchain technology in future.

2. Future Researchers

The findings of this study may generate new hypothesis which may constitute objects for further research. This study may deepen the understanding of the blockchain technology and the cryptocurrency industry and accelerate the blockchain adoption in Kenya. In other words, it may bolster blockchain awareness including the benefits and risks of investing in cryptocurrency in Kenya.

## 1.6 Scope of the Study

The study's geographic scope was online companies presently operating in Kenya and which have used blockchain technologies for the last 3 years. The period scope of the study was the year 2024. That is, the impact of blockchain technology on the return on investment of online companies operating in Kenya as at 2024. The content scope of the study was the influence of digital ledger, blockchain smart contracts, and permissioned block chains on return on investment for the selected cryptocurrency companies. Additionally, the resource-based opinion model, the diffusion innovation

model, and the disruptive innovation theory served as the study's foundations. Lastly, the population scope of the study was both local and foreign online companies operating in Kenya.

### 1.8 Organization of the project

There are five key sections of this project. The first chapter offers the preliminary information, research objectives, study questions, statement of the problem, justifications and limitations. The second chapter provides an overview of the gaps in the theoretical and empirical literature. Chapter 3 of the proposal provides detailed information on the research design, study population, sample size and design, data collection method and process, validity and reliability, data analysis techniques, and ethical considerations. The results are shown in Chapter 4, and the debate is shown in Chapter 5.

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1 Introduction

The second chapter presents a thorough review of both theoretical and empirical literature, identifies emerging gaps, and establishes the conceptual framework.

## 2.2 Theoretical Review

The study's guiding theories are detailed in the theoretical review. The project's pillars were the theories of disruptive innovation, resource-based theory, and diffusion of innovation.

### 2.2.1 Disruptive Innovation Theory

The disruptive innovation theory was developed by Clayton Christense in the 1990s to explain the effect of revolutionary innovations or technologies that enter already established markets and displaces the existing technologies therein (Zeng et al., 2023). Such revolutionary technologies alter models of business in that particular industry and create new market or value networks for organizations that adopt them (McCausland, 2023). Disruptive technologies are often created by entrepreneurs and outsiders as opposed to the established brands in a particular industry because such established brands often do not have time to pursue disruptive innovations but rather protect the status quo. When disruptive innovations enter the market, they significantly impact existing markets and penetrate the market much more quickly.

In this study, the disruptive innovation theory was employed to explain the disruptive effect of blockchain technology on existing markets and commercial models used by online companies. Particularly, the theory was used to explain how this enabling

technology has allowed online companies to create broader markets for their products and services. Equally, Atinda (2022) used the disruptive innovation theory to show how blockchain technology had revolutionized systems and processes among firms in Kenya's power sector. This was also true for Aketch et al. (2021) who used the disruptive innovation theory to show how financial firms had curbed cybercrime and fraud using blockchain technology. Lastly, using the disruptive innovation theory helped to understand how blockchain technology has enabled online companies to create coherent value networks and change their models to align with the demands of blockchain technology.

### 2.2.2 Resource-Based View Theory

The RBV theory was placed forward by Barney (1991). The theory's vital argument is that an organization's touchable and untouchable resources are the core generators of competitive advantage. Firms can leverage a wide range of resources to yield high returns on investment and build sustainable competitive advantage. According to James (2017), some of the resources that firms could use include the knowledge-based assets, human capital, technological assets and physical assets. The theory is mainly applied in circumstances when an organization wants to use its available asset base to gain competitive advantage (Barney, 1991).

It is imperative for the management of the firm to develop a proper asset mix to lower operational costs, improve efficiency, bolster innovation and maximize returns. Critiques of the resource-based view model posit that different resources might offer the same rate to organizations, thereby making it difficult to create competitive advantage (Kraaijenbrink et al., 2009). It is significant to note that while a resource may

fail to offer any competitive advantage to a firm, it can still yield a high ROI. Thus, a proper asset mix can significantly improve the firm's ROI and overall performance.

The study utilized the resource-based view to show how the blockchain technology in cryptocurrency has enabled online companies operating in Kenya to develop core organizational capabilities from their asset mixes and maximized returns on investment. In particular, the resource-based view theory helped to establish the connection between digital ledger, smart contracts, transaction validation, permission block chains and return on investment for online companies operating in Kenya. This mirrored the study by Muena (2013) who used the resource-based view to explain how Safaricom Limited had developed a proper asset mix to boost competitive advantage and emerge as the most profitable company in East Africa. Nzioka (2012) also used the resource-based view theory to show how commercial banks in Kenya transformed their resources into sources of competitive advantage.

### 2.2.3 Diffusion of Innovation Theory

The DOI theory explains how technologies develop, evolve and gain momentum in a particular system or population. The Theory was proposed by Rodgers (1962) and shows that adoption of new technologies in a population does not occur instantaneously but rather as a process where some people are more willing to embrace the disruptive technology than others (Dearing, 2009). Individuals or entities that adopt a technology early possess distinct features from those that adopt the technology later.

DOI offers crucial explanations on the enablers of the spread of new technologies in social systems or populations. The theory establishes five adopter categories and how they influence the spread of the technology, depending on the category that has the majority of entities or individuals. According to Dearing (2009), there are five types of

adopters: innovators who want to be the first to try the technology; early adopters who represent the opinion leaders; early majority who want to see proof that the technology works before adopting it; later majority who will adopt the technology only after the majority has tried it; and laggards who are extremely conservative. The stages by which a technology is adopted and whereby diffusion is accomplished relies on aspects, such as compatibility, relative advantage, trialability, complexity, and observability.

In this study, DOI was used to dissect the stages by which online companies have adopted the blockchain technology, and where diffusion has been accomplished. Notably, blockchain technology was initially used in the financial industry particularly cryptocurrency but has since diffused to other sectors. Understanding the stages of adoption and diffusion of blockchain technology set the basis for enumerating the potential benefits of the technology among online companies.

### 2.3 Empirical Literature Review

This section is separated into four main sub-sections in accordance with the research objectives. The aim of the study was to inspect the impact of blockchain technology on return on investment for online companies operating in Kenya. The factors that influence the return on investment for this study included digital ledger, smart contracts and permission block chains.

#### 2.3.1 Digital Ledger and Return on Investment

A digital ledger is a system of recording transactions of assets including Bitcoin whereby those transactions and their corresponding details are entered in multiple places simultaneously. The achievement of Bitcoin and the invention of new practices of blockchain technology has catalyzed study on the applications of the distributed ledger technology particularly among internet-based firms. A case in point is Sotani et

al. (2022) who conducted research on the difficulties and applications of blockchain technology the applications of the digital ledger technologies. The findings suggested that ledger records influence return on investments for companies that adopt the technology. Blockchain technology was initially associated with the financial industry but is increasingly gaining relevance in other industries. Many firms are now adopting the distributed ledger technology to record data in an orderly and secure fashion. The system is planned to foster confidence among parties that are unfamiliar with or distrustful of one another, whereby many copies of every transaction made are connected together by a cryptographic algorithm. It is impossible for one to alter one copy without leaving evidence of the alteration. Sotani et al. (2022) posits that the digital ledger technology can now be applied in the energy sector to help trade energy among customers in a safe means. It can also be used in the insurance industry to record and preserve medical insurance statistics. For instance, the Hyperledger Composer can be incorporated in any part of the insurance process to improve accuracy, cost-efficiency and transparency. The digital ledger technology can also be applied in voting by permitting voters to cast their ballots remotely by simply snapping a limited button. The study has shown numerous applications of the digital ledger technology but the linkage between digital ledger and return on investment for online companies operating in Kenya is not firmly established in literature, thereby justifying the undertaking of this study.

Additionally, Justinia (2019) studied the opportunities for solving practical problems in healthcare using the digital ledger technologies and showed that the digital ledger is no longer a preserve of the financial industry. The digital ledger's unique characteristics and strong functionality have the potential to significantly enhance medical research, life sciences, and healthcare delivery. Integrity in healthcare is promoted by the

possibility that each patient record will be able to automatically submit updates across an open-source ledger that is still trusted by everyone thanks to digital ledger technology. Using the digital ledger in healthcare has several benefits, such as increased productivity, lower healthcare costs, and better patient outcomes. Justinia (2019). However, a gap inherent in the study was its limit to the implementation of the digital ledger in the healthcare sector, revealing a gap in online companies. Further, Xu et al. (2019) used a systematic review design to explore the applications and opportunities created by blockchain technology in cryptocurrency. The study discovered that the digital ledger technology has transformed the music industry by improving integrity in the management of copyright data, and fostering transparency across the value chain. Using the digital ledger technology has also centralized research data in healthcare, minimized prescription fraud, and reduced administrative overheads. However, the study did not explore the ROI in blockchain technology among online companies operating in Kenya, thereby rationalizing the research.

A study by Grietzmann and Grossetti (2021) shed more light on the economic benefits of the digital ledger technology particularly the aspect of accounting. The use of the blockchain technology in cryptocurrency has improved accountability since it is impossible to alter one transaction without leaving evidence of that alteration. This has significantly minimized cases of fraud and enhanced accountability among firms that utilize blockchain technology. The research only focused on the economic benefits of the digital ledger technology which is only a single aspect of blockchain technology. A gap inherent in the study is other aspects of blockchain, such as smart contracts and permissioned blockchains. Besides, the study did not show the ROI in blockchain among online companies operating in Kenya. Lastly, Bonnet and Teuteberg (2023) examined the application of the digital ledger technology to solve problems related to

intellectual property in the contemporary era of digitization. The researchers adopted a case study method focusing on 20 cases. The investigation affirmed that the distributed ledger technology can be used to advance the management of the intelligent property value chain. Specifically, integrating blockchain technology in the organization of intellectually property can guarantee technological security, decentralization, immutability and disintermediation. Clearly, the study explored the applications and economic benefits of the digital ledger technology but did not examine the association between the digital ledger technology and return on investment for online companies operating in Kenya. Therefore, this study aimed to fill that gap.

### 2.3.2 Smart Contracts and Return on Investment

Smart contracts play a vital role in blockchain technology as they automate the enforcement of the terms of contracts between parties so that all can be sure about the outcome. Blockchain technology was originally designed for cryptocurrency but has since evolved to new uses (Mhlanga, 2023). Today, entrepreneurs can use blockchain technology to form agreements that are then coded and uploaded back to the blockchain. The agreement is referred to as a “smart contract” and is executed after the parties have honored their obligations. The use of smart contracts guarantees certainty in the negotiation process.

Studies have examined the applications of blockchain smart contracts. Khan et al. (2021) studied the applications, encounters and future trends of blockchain smart contracts. The researchers adopted a systematic review design and showed that the paybacks of smart contracts include decentralization, the possibility of auto-enforcing the agreement between contractual parties, and the verifiability features. The study also pointed out some challenges inherent in the application of the smart contracts including

legal issues, dependence on off-chain resources, consensus mechanism issue, scalability and immutability matters. The study pointed out the future of smart contracts particularly in the health, energy and education sectors. However, the impact of smart contracts on return on investments for online-based companies operating in Kenya is not studied, thereby informing this study.

Similarly, Varfolomeev et al. (2021) studied the applications of blockchain smart contracts in the smart cities' environment. The researchers noted that smart cities operated in a high-level security environment and required to harness the benefits of smart contracts. Importantly, smart contracts could be used to enhance data reliability and security in smart cities thereby guaranteeing continuity of operations therein. Vigliotti et al. (2021) also provided an interdisciplinary application of smart contracts and observed that smart contracts eliminate the uncertainties that are generally associated with contractual processes. There are contextual gaps in the two studies above because they did not calculate the ROI in blockchain technology particularly among online companies operating in Kenya.

The contemporary business environment is heavily dependent on electronic commercial platforms. Many merchants conduct their transactions online and smart contracts have created the possibility of traders who do not trust each other to do so. Anter et al. (2020) did a bibliometric examination of 468 peer reviewed articles to offer a clearer image of the applications, challenges and upcoming perspectives of smart contracts. The study found that smart contracts have accelerated disruptive innovation in many sectors by replacing traditional approaches or entering contracts. It is possible for parties to enter and enforce contracts using blockchain smart contracts thereby minimizing the legal costs, time costs and other material costs associated with the

traditional approaches (Kirwa, 2022). While many studies have discussed the benefits of smart contracts, the nexus of smart contracts and return on investment for online companies operating in Kenya is not clear thereby informing this research.

### 2.3.3 Permissioned Block Chains and Return on Investment

Anyone using Bitcoin can virtually access the distributed ledger and communicate with other users. However, there are certain instances when parties may want their transactions to be kept private due to their sensitive or personal nature. Permissioned block chains assess the availability of a particular participant in the network so that the information may be kept private. Amiri et al. (2021) studied the properties, techniques and applications of permissioned block chains and noted that they guarantee confidentiality, verifiability, performance and scalability. In permissioned block chains, the network automatically invites new participants if they meet a set of pre-determined requirements. However, the study did not show the ROI in permissioned block chains particularly among online companies. There is also a contextual gap in the research as it was not done in Kenyan context.

Firms using permissioned block chains have an advantage as they can guarantee the confidentiality of their data. Polge et al. (2021) also examined the permissioned block chains in the industry. The researchers compared the features of the five major frameworks including Quorum, Fabric, R3 Corda, Ethereum, and Multichain. Some of the features assessed included their performance, privacy, scalability, adoption and community activities. The study found that each framework has their own strengths that make it suitable for application in a particular field. It is difficult to compare two frameworks in the same environment. Importantly, the latest frameworks were found to be superior to older versions in terms of performance, scalability, and security.

Notably, there is an emerging gap in the study as it did not show the ROI in each of the five frameworks as utilized by online companies, hence justifying the current study. Amiri et al. (2021), and Polga et al. (2021) provide crucial information on the application of permissioned block chains but do not show the connection between permissioned block chains and return on investment for online companies operating in Kenya. Lineros (2020) also agrees that permissioned block chains use ledgers that foster collaboration among users, privacy of information, immutability and verification of information. However, the study does not show the ROI in permissioned block chains particularly in the context of online companies.

Punathumkandi et al. (2021) also contributed to the existing literature on the applications of permissioned block chains. The researchers concurred with other studies that permissioned block chains provide decentralization, confidentiality, transparency and immutability, and have an extensive range of applications in many industries. However, the study observed that permissioned block chains fail in interoperability. There are many permissioned block chain frameworks but each one is entirely different and works in its own way. Thus, firms using permissioned block chains ought to conduct a thorough system needs analysis to determine the appropriate permissioned block chain. There is a contextual gap in the research as it was not done in the context of online companies in Kenya. There is also a conceptual gap in the research since it did not show the ROI in permissioned block chains.

An earlier study by Novotny et al. (2018) investigated the application of permissioned block chain in academic publishing and found that academic publishers could harness the potential of permissioned block chains for sustainable performance. Permissioned block chains have the potential to address some of the problems in academic publishing

including predatory publishing, productivity, reputation management, and transparent peer-review procedures. Using permissioned block chains, publishers can design new solutions to help address the weaknesses of the present technologies. However, it is noteworthy that the relationship between permissioned block chains and return on investment for online companies operating in Kenya was not addressed in the study; hence this study seeks to address the gap.

### 2.4 Review Brief and Study Gaps

This section provides a summary of the reviewed studies including their key objectives, key findings, research gaps and how they were filled. The gaps in the review are summarized in the table 2.1;

**Table 2.1: Literature Review Summary and Research Gaps**

| Researchers | Key Objective | Key Findings | Research Gap | How the study aims to fill the Gap |
|---|---|---|---|---|
| Sotani et al. (2022) | Studied the distributed ledger technologies and their applications | The digital ledger can be applied in the energy sector, insurance sector, voting and healthcare sectors | Conceptual gap: Relationship between digital ledger industry adoption and return on investment is unclear<br>Contextual gap: The study focused on insurance and health sectors but not among online companies | The current research will study the impact of digital ledger in cryptocurrency on return on investment for online companies |

| | | | | |
|---|---|---|---|---|
| Justinia (2019) | To find out the opportunities for solving practical problems in healthcare using the digital ledger technologies | The robust functionality and distinct features of the digital ledger have the tremendous potential to improve the delivery of healthcare, life sciences, and medical research | Conceptual gap: Only focused on the digital ledger, which is a single aspect of blockchain technology. Contextual gap: Limited to the application of the digital ledger in the healthcare sector | This study will focus on several online companies operating in different sectors in Kenya |
| Xu et al. (2019) | To explore the applications and opportunities created by blockchain technology in cryptocurrency | Digital ledger has improved integrity in the management of copyright data, and fostering transparency across the value chain in music industry; improved quality of performance outcomes in healthcare sector | Conceptual gap: Connection between digital ledger use and return on investment not addressed Contextual gap: focused on Asian context | This research will study the impact of digital ledger in cryptocurrency on return on investment for online companies in Kenya |
| Grietzmann& Grossetti (2021) | To show the economic benefits of the digital ledger technology particularly the aspect of accounting | The use of the blockchain technology in cryptocurrency has improved accountability since it is impossible to alter one transaction without leaving evidence of that alteration. | Conceptual gap: Only focused on accounting as an indicator of return on investment | This study will cover more indicators of return on investment including profitability, data security, and scalability |
| Bonnet &Teuteberg (2023) | To investigate the application of the digital | Integrating blockchain technology in | There is Contextual gap as the study used | This research study will focus on the Kenyan context, |

| | | | | |
|---|---|---|---|---|
| | ledger technology to solve problems related to intellectual property | the management of intellectually property can guarantee technological security, decentralization, immutability and disintermediation. | companies outside the context of Kenya | particularly online companies in the country |
| Khan et al. (2021) | To determine the applications, challenges and future trends of blockchain smart contracts. | The benefits of smart contracts include decentralization, the likelihood of auto-enforcing the agreement between contractual parties, and the verifiability features. | Conceptual gap: Connection between smart contracts and return on investment not studied | This study will determine the association between smart contracts in cryptocurrency and return on investment for online companies operating in Kenya |
| Varfolomeev et al. (2021) | To show the applications of blockchain smart contracts in the smart cities environment. | Smart contracts could be used to enhance data reliability and security in smart cities thereby guaranteeing continuity of operations therein. | Contextual gap: Restricted to smart cities environment hence findings may not necessarily be generalized to other environments/contexts | This study will focus on online companies operating in Kenya |
| Vigliotti et al. (2021) | To offer an interdisciplinary application of smart contracts | Smart contracts eliminate the uncertainties that are generally associated with contractual processes. | Conceptual gap: Focused on one aspect of smart contracts | The study will cover multiple aspects of smart contracts including security, decentralization, and auto-enforceability |
| Anter et al. (2020) | To provide a clearer image of the applications, challenges and | Smart contracts have accelerated disruptive innovation in | Contextual gap: The nexus of smart contracts and return on | The current research will study the impact of smart contracts in cryptocurrency on |

| | | | | |
|---|---|---|---|---|
| | future perspectives of block chain smart contracts | many sectors by replacing traditional approaches or entering contracts | investment for online companies operating in Kenya is not clear | return on investment for online companies |
| Amiri et al. (2021) | To show the properties, techniques and applications of permissioned block chains | Permissioned block chains guarantee confidentiality, verifiability, performance and scalability | Conceptual gap: Link between permissioned block chains and return on investment not clear | This study will show the link between permissioned block chains and return on investment |
| Polge et al. (2021) | To compare the features of five permissioned block chain frameworks | Each framework is unique and suited to a particular environment; newer versions are better | Did not show the permissioned block chain framework that would yield high returns on investment | This Research will show the impact of permissioned block chains on return on investment |
| Lineros (2020) | To show the properties, techniques and applications of permissioned block chains | Permissioned block chains use ledgers that foster collaboration among users, privacy of information, immutability and verification of information. | Conceptual gap: No connection between permissioned block chains and return on investment | This study will establish a clear relationship between permissioned block chains and return on investment |
| Punathumkandi et al. (2021) | To determine the interoperable application of block chains with sustainable performance | Permissioned block chains provide decentralization, confidentiality, transparency and immutability, and have extensive range of applications | Conceptual gap: Failed to link interoperability of block chain technology and return on investment | This study will link interoperability and return on investment |

| | | | | |
|---|---|---|---|---|
| | | in many industries | | |
| Novotny et al. (2018) | To show application of permissioned block chain in academic publishing | Permissioned block chains have the potential to address some of the problems in academic publishing including predatory publishing, productivity, reputation management, and transparent peer-review procedures | Conceptual gap: The relationship between permissioned block chains and return on investment is not clear | This research will clarify the relationship between permissioned block chains and return on investment |

**Sources: Researcher (2024)**

### 2.5 Conceptual Framework

It displays the connection among blockchain in cryptocurrency and return on investment for online companies operating in Kenya.

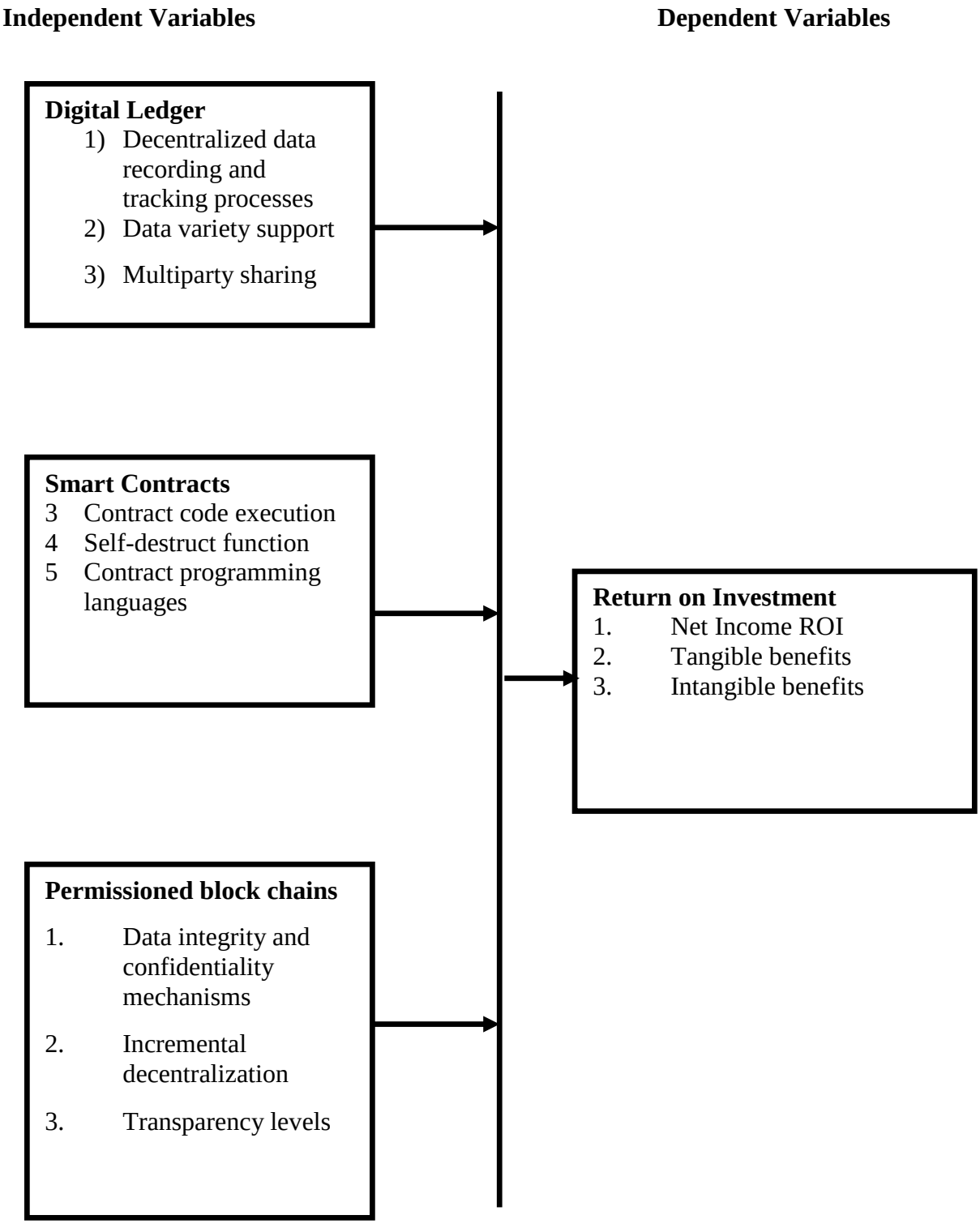


**Figure 2.1: Conceptual Framework**

**Source: Researcher (2024).**

# CHAPTER THREE

# RESEARCH METHODOLOGY

## 3.1 Introduction

The methodological framework that helped the study accomplish its goals is described in depth in this portion of the project. The research design, target population, sampling strategy and sample size, data collection tools, data collection procedures, validity and reliability measurements, data analysis techniques, and ethical issues are some of the important subsections into which it is divided.

## 3.2 Research Design

The research design serves as the framework that guides the researcher's approach to data gathering and analysis. This study employed a correlational research design, to help identify and analyze the relationships between the variables. The choice of a correlational design is particularly suitable when the goal is to explore how certain variables influence changes in others (Mugenda & Mugenda, 2003). Specifically, this design facilitated the examination of how digital ledgers, smart contracts, and permissioned blockchains impact return on investment, without relying on any pre-established hypotheses or assumptions. A case in point was Bonnet &Teuteberg (2023) who used correlational design to show the relationship between distributed ledger technology and technology security.

## 3.3 Target Population

Banerjee and Chaudhary (2010) define population as the whole group of subjects or respondents with shared features from which a sample can be chosen for information-gathering purposes and then applying the findings to the rest of the group. The target population of this study included the 1664 online companies operating in Kenya

(Business Registration Service, 2023). Kenya is one of the most active countries in Africa with respect to cryptocurrency and the blockchain technology. The estimated number of cryptocurrency companies, and blockchain startups and companies in Kenya is 1664 (Business Registration Service, 2023). The top managerial staff of the selected online companies operating in Kenya were selected as the respondents because of their familiarity with the associations between blockchain technology in cryptocurrency and return on investment in their companies. The unit of examination were the companies whereas the unit of observation was the information collected from the companies concerning smart contracts, digital ledger and permissioned block chains. The sampling frame comprised of 322 companies which have used blockchain technology for at least 3 years (Appendix II).

### 3.4 Sampling and Sample Size

Sampling is the process of selecting a portion from the broader population to be involved in the investigation (Andrade, 2020). This subset should have similar observable traits, ensuring it accurately represents the broader group under investigation. Simple random technique was used to select the online companies operating in Kenya. The choice of simple random sampling was to specifically to minimize potential biases and reduce errors during the sampling process (Mugenda & Mugenda, 2003). The sample size was determined using Yamane's (1967) formula, which involved calculating the number of observations needed based on the total number of individuals in the group and the error margin. Specifically, n represented the sample size to be calculated, N denoted the total number of individuals in the target population, and indicated the margin of error acceptable for the study:

$$n = \frac{N}{1 + N (e) 2}$$

$$n = \frac{322}{1 + 322\,(0.05)^2}$$

n= 178

A sample refers to a smaller group chosen from the overall population to represent the entire population in a study (Andrade, 2020). For this research, the sample size is 178 online companies operating in Kenya that have implemented blockchain technology for at least three years. These 178 companies were selected from the sampling frame (refer to Appendix II).

### 3.5 Data Collection Instrument

This study utilized online questionnaires as the data collection instruments (see Appendix I). Primary data was more suitable in this study because it is more accurate, reliable and from the direct source (Kwok et al., 2022). Besides, it was easier to collect primary data than secondary data for all the 322 companies. Specifically, closed-ended self-completion questionnaires were used to guide the respondents to provide the information required. Closed-ended questionnaires were advantageous in the sense that they ensured the respondents did not lose track of the topic under investigation. Besides, questionnaires are convenient for most respondents with busy schedules as they can complete and return them at their own spare time (Cooper et al. 1995). The questionnaire items were developed consistent with the study variables. A five-point Likert scale was used in the questionnaire to standardize the respondents' feedback.

The data gathering instrument comprised of 5 main sections. Section A showed the respondents' baseline characteristics. Section B showed the research inquiries on blockchain digital ledger and return on investment; Section C showed survey queries

on blockchain smart contracts and return on investment. Section D showed survey items on permissioned block chains on return on investment, and Section E showed survey items on return on investment for the cryptocurrency companies.

### 3.6 Pilot Study

Before beginning the primary investigation, the researcher carried out a pilot study to assess and enhance the validity and reliability of the questionnaire. According to Wilson (2014), a pilot study should involve about 10% of the total sample size. The pilot study's findings guided the modifications required to guarantee the accuracy and dependability of the study's instruments.

#### 3.6.1 Test for Validity

After conducting the pilot study, the findings were used to test face and content validity of the questionnaire. The researcher employed content validity, which will be validated by other research experts, to corroborate the validity. By conducting a comprehensive literature research on the questionnaire's content, content validity was guaranteed. The supervisors scrutinized the questionnaire for its general content, and thoroughness. Based on their comments, the questionnaires were modified accordingly before administration. The subjective opinions of the pilot study participants were used to enhance the face validity of the instrument. The questionnaire was considered valid if it effectively measured the survey items to a significant extent.

#### 3.6.2 Test for Reliability

The outcomes of the pilot study contributed to assessing and enhancing the questionnaire's reliability. Cronbach Alpha was used to evaluate reliability, where values exceeding 0.7 signified a reliable instrument, and values below 0.7 indicated the

need for improvement (Rousson et al., 2002). Necessary adjustments were made to the questionnaire to ensure its consistency and dependability.

### 3.7 Data Collection Procedure

Prior to initiating the data gathering process, the researcher secured an introductory letter from Kenyatta University and a permit from NACOSTI. Following this, the researcher personally reached out to the management of the selected companies to clarify the research objectives and request their participation in the data collection process. The questionnaires were handed out to participants, allowing them five business days to complete and submit their responses.

### 3.8 Data Analysis and Presentation

SPSS version 22 was used for data analysis. While quantitative data was analyzed using inferential approaches, qualitative data was evaluated using descriptive methods. The results were displayed in tables illustrating the means, aggregate means, and standard deviations of participants' responses. To assess each independent variable's impact on the dependent variable, correlation analysis was done. Additionally, a regression model was applied to explore the relationships between digital ledger technology, blockchain smart contracts, permissioned blockchains, and return on investment for online companies in Kenya.

The regression model illustrates;

$ROI=\beta_0+\beta_1 DL_1+\beta_2 SC_2+\beta_3 PBC_3+\varepsilon$

ROI= Return on Investment

$B_0$ = Constant

$DL_1$= Digital ledger

$SC_2$= Smart contracts

$PBC_3$= Permissioned block chains

$\beta_1$ -$\beta_3$ are the regression coefficient

$\varepsilon$ is the random error

The results are determined at a 95% level of significance.

### 3.8 Variables definition, Operationalization and Measurement

Table 3.1 below details the definition, operationalization, and measurement of the study's variables:

**Table 3.1: Operationalization and Measurement of variables**

| Variable | Variable type | Operationalization | Category | Measurement |
|---|---|---|---|---|
| Return on investment | dependent | ROI | Ratio | Rate |
| Digital ledger | Independent | DL | Ordinal | Likert Rank |
| Smart contracts | independent | SC | Ordinal | Likert Rank |
| Permissioned blockchains | Independent | PBC | Ordinal | Likert Rank |

### 3.9 Diagnostic Tests

Diagnostic tests help to evaluate the assumptions of linear regression to enable the researcher to reach valid conclusions. Essentially, diagnostic tests check whether the data is evenly distributed, the residuals are evenly spread across the predicted variables, and there are direct, straight-line relationships between predictor and outcome variables. The diagnostic tests performed in this project included normality, multicollinearity, and linearity.

### 3.9.1 Multicollinearity Tests

When independent variables in a regression model exhibit correlation with one another, this is known as multicollinearity (Ullah et al., 2019). To evaluate multicollinearity, the variance inflation factor (VIF) is utilized to gauge the extent and strength of the relationships between predictor variables within the model (Haitovsky, 2019). VIF values start at 1 and have no theoretical upper limit. In particular, a VIF of 1 signifies that there is no correlation between the variables. In the same vein, values ranging from 1 to 5 indicate a moderate level of correlation. However, the values exceeding 5 may reveal significant multicollinearity issues. in other words, high VIF values suggest that predictor variables are highly correlated with each other, which can distort the results of the regression analysis. Therefore, this study closely monitored VIF values, with particular attention to those above 5, to ensure that multicollinearity did not undermine the validity of the regression findings and to maintain the robustness of the analysis.

### 3.9.2 Normality Tests

A normality test assesses if a dataset follows the pattern of a normal distribution (Paul & Zhang, 2015). Evaluating the normality of residuals is crucial because it impacts the precision of hypothesis tests and affects the reliability of confidence intervals for regression coefficients. The accuracy of these statistical measures depends on the standard errors of the estimates, which are influenced by the normality of residuals. Deviations from normality can compromise the validity of the model selection criteria and potentially skew the results. Therefore, ensuring that residuals follow a normal distribution is essential for maintaining the integrity and reliability of the regression analysis (Onder & Zaman, 2017). For this study, the Shapiro-Wilk test was employed to evaluate if the data distribution significantly deviated from normality, using

parameters such as the p-value. A p-value greater than 0.05 suggested that the data conforms to normality assumptions.

### 3.10 Ethical Considerations

The researcher adhered to the ethical norms and protocols of research. First, courteous and polite language was used during the data gathering procedure. Secondly, the researcher protected the participants' right to privacy by securing the information collected to prevent unauthorized people from accessing it. The researcher also guaranteed the participants' autonomy. That is, the partakers reserved the right to pull out from the study at any stage of their choosing.

# CHAPTER FOUR

# RESEARCH FINDINGS AND DISCUSSION

## 4.1 Introduction

Chapter Four of the research thesis shows the study results. The chapter includes an in-depth analysis, presentation and synthesis of results on how the application of blockchain in cryptocurrency impacts the return on investment for online companies operating in Kenya.

## 4.2 Response Rate

The response rate denotes the proportion of respondents who actually completed and returned the data collection instruments as requested. The respondents' response rate is offered in table 4.1 as follows:

**Table 4.1: Participants' Response Rate**

| Sample Size | Number | Percentage |
|---|---|---|
| Number of participants who returned questionnaires | 146 | 82 |
| Number of participants who did not return questionnaires | 32 | 18 |
| Total | 178 | 100 |

**Source: Field Data 2024**

This study achieved a response rate of 82%. As noted by Mugenda and Mugenda (2003), data analysis can be effectively conducted with a response rate of 50% or higher, as long as the sample is representative of the overall population. Also, a response rate of 70 percent is perceived be adequate (Mugenda & Mugenda, 2003). A high response rate is important because it elevates the power of the statistical analysis, unlike a low response rate (Mugenda & Mugenda, 2003). Therefore, current study regarded the response rate of 82 percent as meeting the threshold for analysis.

### 4.3 Demographic Results

This part shows the demographic facts of the respondents with respect to their ages, highest education levels, and period worked in the management position.

#### 4.3.1 Participants' Ages

The researcher analyzed participants' ages, to help understand their stages of their careers and conversance with linkages underpinning blockchain applications and return on investments in their companies. The participant's age was a major component in decision making during the study. The respondents' ages are presented in table 4.2 below:

**Table 4.2: Participants' Age Brackets**

| Age (Years) | Frequency | Percentage |
|---|---|---|
| 20-30 | 26 | 17.8 |
| 31-40 | 28 | 19.2 |
| 41-50 | 68 | 46.6 |
| Above 51 | 24 | 16.4 |
| **Total** | **146** | **100** |

**Source: Field Data 2024**

The mean age of the respondents was 46 years, showing that majority of the participants were in the advanced phases of their careers and fully conversant with aspects of blockchain application and return on investment in their companies. Consistent with Bashier et al. (2017), older age is associated with more knowledge, decision-making capacity and career experience.

#### 4.3.2 Highest Education Levels of Research Participants

The researcher analyzed the participants' education levels to determine their level of competence and knowledge on blockchain technology application. The level of education was a key determinant in decision making during the study. The highest

education levels of the participants were characterized as diploma, higher diploma, Bachelor's, Master's degree and Doctorate, as shown in table 4.3:

**Table 4.3: Participants' Education Levels**

| Education Level | Frequency | Percentage |
|---|---|---|
| Diploma | 31 | 21.2 |
| Higher diploma | 27 | 18.5 |
| Bachelor's | 73 | 50.0 |
| Master's | 15 | 10.3 |
| Doctorate | 0 | 0.0 |
| **Total** | **146** | **100** |

**Source: Field Data 2024**

The discoveries indicate that over 60% of the respondents were holders of at least a Bachelor's degree and were competent to provide information that would assist the researcher to meet the aims of this study. Besides, 40% of the respondents possessed diploma and higher diploma qualifications, and were fairly knowledgeable in the area of blockchain adoption and return on investment. According to Connelly et al. (2016), higher educational attainments correlate with deeper understanding of subject matter under investigation. Thus, the selection of highly educated participants increases the likelihood of collecting valid data.

### 4.3.3 Duration Worked in Management Team

The researcher analyzed the number of years that participants had worked in the management team to establish their managerial experience and depth of knowledge in blockchain technology applications and their impacts on return on investment. The duration which participants had operated in the management team was classified as two years and below, two to four years, four to six years, and more than 6 years. The frequency of participants in every category was calculated and presented in table 4.4 as follows:

**Table 4.4: Number of Years Worked in the Management Team**

| Years Worked | Frequency | Percentage |
|---|---|---|
| 2 and below | 18 | 12.0 |
| 2-4 | 45 | 31.0 |
| 4-6 | 57 | 39.0 |
| More than 6 | 26 | 18.0 |
| **Total** | **146** | **100** |

**Source: Field Data 2024**

The outcomes display that more than 88% of the respondents had worked in the management team for at least 2 years and were thus knowledgeable about their company's adoption of blockchain technology and its influence on return on investment. Ochonma et al. (2018) posits that work experience positively correlates with knowledge and skills. Thus, employees with more years at the company had a firm understanding of their firms' activities and their implications.

### 4.4 Descriptive Analysis

This study examined the application of blockchain technology in cryptocurrency and its impact on the return on investment for online companies operating in Kenya. The three independent variables of the study were digital ledger, smart contracts, and permissioned block chains. Each of the three variables was addressed by five distinct inquiries, which were placed on a 5-point scale to designate the degree to which they impacted return on investment. The lowest numbers (1) designated strongly disagree; while the highest number (5) indicated strongly agree (Appendix II). Descriptive statistics were used to analyze the data and the findings presented as follows;

#### 4.4.1 Blockchain Digital Ledger and Return on Investment

Blockchain digital ledger is a system of recording transactions of assets whereby those transactions and their corresponding details are entered in multiple places simultaneously. Five questionnaire inquiries were used to assess the impact of

blockchain digital ledger on return on investment of online companies operating in Kenya. Respondents were required to designate the degree of their concurrence with the given points concerning digital ledger and return on investment on a 1-5 Likert scale. The means and standard deviations of the responses were calculated and presented in Table 4.5 as follows;

**Table 4.5: Blockchain Digital Ledger and Return on Investment**

| STATEMENT | Mean | Std Dev |
|---|---|---|
| The digital ledger has made data management more efficient | 3.85 | .8039 |
| Fraud detection has improved due to the distributed ledger systems | 3.92 | .7924 |
| The digital ledger has improved accountability in financial transacting | 3.98 | .7567 |
| Reduced time and monetary expenses because of absence of a central authority | 4.07 | .8312 |
| Digital ledger has improved overall performance | 4.13 | .7569 |
| **Aggregate** | **3.99** | **.7944** |

**Source: Field Data 2024**

The aggregate mean indicates that blockchain digital ledger adoption impacts the return on investment of online companies operating in Kenya. This is because blockchain digital ledger fosters trust among parties that do not know or trust each other whereby several copies of every transaction made are linked together by a cryptographic algorithm. This facilitates secure transacting, thereby improving return on investment (Sotani et al., 2022). The respondents agree that digital ledger has improved accountability in financial transacting, which has translated to enhanced return on investment ($\bar{x}$=3.98, D=.7567). The findings mirror those of Grietzmann and Grossetti

(2021) who displayed that the use of the blockchain technology in cryptocurrency has improved accountability since it is impossible to alter one transaction without leaving evidence of that alteration. Consequently, cases of fraud and enhanced accountability among firms that utilize blockchain technology have significantly reduced. This is also consistent with the participants' agreement with the statement that blockchain digital ledger has improved fraud detection ($\bar{x}$=3.92, D=.7924). The use of the distributed ledger system has allowed online companies operating in Kenya to easily track their transactions and detect fraudulent activities in time. This confirms that the blockchain digital ledger's advanced security features can improve the detection of fraud particularly in the financial sector (Bonnet &Teuteberg, 2023). Furthermore, the respondents agree that the adoption of blockchain digital ledger has improved efficiency in data management ($\bar{x}$=3.85, D=.8039). This confirms the discoveries of an earlier study by Xu et al. (2019) who showed that the digital ledger technology has transformed many industries by improving integrity in the management of copyright data, and fostering transparency across the value chain. Besides, the adoption of the blockchain digital ledger has led many organizations to adopt data-driven cultures, thereby converting data into crucial assets.

Additionally, the participants agree that the adoption of blockchain digital ledger has reduced time and monetary expenses because there is no central authority ($\bar{x}$=4.07, D=.8312). The participants contended that their companies achieved cost leadership because of the adoption of the blockchain distributed ledger systems. The companies saved costs that would have incurred in the procurement and maintenance of additional ledgers, which translated to improved return on investment. Also, there was improved time efficiency because there was no central authority to approve the transactions. This allowed the online companies to speed up their operations and processes. This agrees

with Justinia (2019) who showed that the robust functionality and distinct features of the digital ledger has the tremendous possible to advance the distribution of services in different sectors because of cost and time efficiency. A case in point is the healthcare sector where the blockchain digital ledger technology has created the likelihood of each patient record being talented to automatically send updates across an open-source ledger that is trusted by all, thereby fostering integrity in healthcare (Justinia, 2019). The merits of using the digital ledger in healthcare include improved efficiency, reduced cost of healthcare and improved quality of patient outcomes.

Lastly, the participants fully agreed that adoption of blockchain digital ledger improved overall performance of their companies ($\bar{x}$=3.74, D=.8145). Essentially, the participants posited that the numerous benefits of the blockchain digital ledger including enhanced efficiency, cost savings, sped up processes, improved security, and accountability translated to improved performance. This confirms the findings of Xu et al. (2019) who highlighted the numerous opportunities created by blockchain digital ledger, and which translated to improved performance outcomes. Also, the current study agrees with Sotani et al. (2022) who found that blockchain digital ledger improved the return on investment of companies under investigation.

### 4.4.2 Blockchain Smart Contracts and Return on Investment

Blockchain smart contracts are critical blockchain tools that automate the enforcement of the terms of contracts between parties so that all can be sure about the outcome. Five questionnaire inquiries were used to assess the impact of blockchain smart contracts on return on investment of online companies operating in Kenya. Respondents were required to designate the degree of their concurrence with the given points concerning

smart contracts and return on investment on a 1-5 Likert scale. The means and standard deviations of the responses were calculated and presented in Table 4.6 as follows;

**Table 4.6: Blockchain Smart Contracts and Return on Investment**

| STATEMENT | Mean | Std Dev |
|---|---|---|
| Smart contracts have fostered engagement with more parties than before | 3.91 | .8188 |
| Security of transactions has improved | 4.08 | .8528 |
| The self-destruction function has enhanced the company's autonomy in transacting | 3.81 | .7843 |
| There is improved stakeholder confidence in the company's systems because of smart contracts | 3.72 | .7139 |
| Overall performance of the organization has improved due to enhanced convenience | 3.85 | .8172 |
| **Aggregate** | **3.89** | **.8341** |

**Source: Field Data 2024**

The aggregate mean indicates the respondents' partial agreement that blockchain smart contracts influence return on investments of online companies operating in Kenya ($\bar{x}$=3.89). This confirms the findings of a systematic review conducted by Khan et al. (2021) on the applications and benefits of blockchain smart contracts, and which showed that smart contracts positively influenced performance, return on investment and other outcomes in organizations. The participants also fully agree that smart contracts have fostered the engagement with more parties than before ($\bar{x}$=3.91, D=.8188). Essentially, blockchain technologies are designed to build trust among parties that do not have prior interactions, whereby multiple copies of every transaction made are linked together by a cryptographic algorithm. This allows companies to engage with more parties (Sotani et al., 2022). Also, this confirms the findings of Anter

et al. (2020) that smart contracts have accelerated disruptive innovation in many sectors by replacing traditional approaches or entering contracts. Companies can now easily enter and enforce contracts using blockchain smart contracts, thus reducing the legal, time and other material costs associated with the conventional methods. Note that the participants also contended that security of transactions has significantly improved owing to the adoption of blockchain smart contracts ($\bar{x}$=4.08, D=.8528). Blockchain smart contracts have particularly secured transactions and processes of companies operating in heightened security environments. Consistent with the Vigliotti et al. (2021), the current study confirms that blockchain smart contracts eliminate the uncertainties that are generally associated with contractual processes and online transacting.

The participants also agreed that the self-destruction function has enhanced the company's autonomy in transacting ($\bar{x}$=3.81, D=.7843). The self-destruct function allows users to destroy contracts and delete them from the blockchain in the wake of detected vulnerabilities, or as part of routine lifecycle event for planned contracts. This has allowed online companies to retain their autonomy in transacting. The present study agrees with Anter et al. (2020) who showed that blockchain smart contracts guarantee user autonomy in contracting. Users can choose who to enter a contract with and can easily terminate a contract in case of emergencies. The respondents also agreed that blockchain smart contracts have boosted stakeholder confidence in company's systems because of smart contracts ($\bar{x}$=3.72, D=.7139). This is consistent with Sotani et al. (2022) who showed that blockchain technologies have allowed parties to build trust with other parties whom they did not know previously. Company stakeholders, such as customers and suppliers also develop greater confidence in the company's systems because of the enhanced security of the systems and processes. The improved certainty

brought about by smart contracts and blockchain technology in general means that individuals can conduct online transactions with minimal fear of being defrauded. Lastly, the participants agreed that smart contracts have improved convenience which has translated to better overall performance of the company ($\bar{x}$=3.85, D=.8172). The current study agrees with Atinda (2022) who showed that smart contracts boost convenience in contracting as they provide greater certainty and embolden users to vacate traditional contractual approaches for blockchain smart contracts. The associated benefits of smart contracts, such as cost savings, time savings and improved speed of service delivery translate to greater performance outcomes.

### 4.4.3 Permissioned Block Chains and Return on Investment

Permissioned block chains are blockchain tools that assess the availability of a particular participant in the network so that the information may be kept private hence guaranteeing confidentiality, verifiability, performance and scalability. Five questionnaire inquiries were used to assess the impact of permissioned block chains on return on investment of online companies operating in Kenya. Respondents were required to designate the degree of their concurrence with the given points concerning permissioned block chains and return on investment on a 1-5 Likert scale. The means and standard deviations of the responses were calculated and presented in Table 4.7 as follows;

**Table 4.7: Permissioned Block Chains and Return on Investment**

| STATEMENT | Mean | Std Dev |
|---|---|---|
| Data integrity and confidentiality mechanisms have heightened data security levels | 3.76 | .7695 |
| Incremental decentralization has enabled the company to vet users of the blockchain network | 4.03 | .8554 |
| Transparency levels in transacting have gone up | 3.95 | .7683 |
| Fewer nodes needed have led to greater performance | 3.86 | .8437 |
| Strong privacy has improved confidence in the firm's system | 4.19 | .8291 |
| **Aggregate** | **3.96** | **.8377** |

**Source: Field Data 2024**

The aggregate mean shows the participants contend that permissioned block chains influence the return on investment of online companies operating in Kenya ($\bar{x}$=3.96, D=.8377). The current study also settles with Novotny et al. (2018) who exhibited that permissioned block chains can help trouble shoot problems for companies in different sectors, improve efficiency and the quality of performance outcomes. In the publishing sector for instance, permissioned block chains have the potential to address some of the problems in academic publishing including reputation management, predatory publishing, productivity, and transparent peer-review processes. Utilizing permissioned block chains, publishers can design novel solutions to help address the weaknesses of the present technologies, and improve overall return on investment. Also, the participants agreed that data integrity and confidentiality mechanisms have heightened data security levels because of application of permissioned block chains ($\bar{x}$=3.76, D=.7695). This is because permissioned block chains guarantee confidentiality, verifiability, performance and scalability (Amiri et al., 2021). In permissioned block chains, the network automatically invites new participants if they meet a set of pre-

determined requirements. As the current study agrees, incremental decentralization has enabled the company to vet users of the blockchain network ($\bar{x}$=4.03, D=.8554). This ensures that only individuals with the correct credentials can enter the blockchain network. Consequently, cases of fraud are minimized. Lineros (2020) also concurs that permissioned block chains utilize ledgers that improve collaboration among users, privacy of data, immutability and verification of data.

Further, the participants of the current study were in agreement that transparency levels in transacting have gone up because of permissioned block chains ($\bar{x}$=3.95, D=.7683). Since it is possible to vet and admit only qualified users to the network, transparency in transacting improves. This was in concurrence with Punathumkandi et al. (2021) that permissioned block chains provide decentralization, confidentiality, transparency and immutability, and have a wide range of applications in many industries. There are variations in permissioned block chain frameworks but each one is distinct in structure and functionality. Thus, companies using permissioned block chains ought to conduct a thorough system needs analysis to determine the appropriate permissioned block chain. This was also true for Polge et al. (2021) who examined the permissioned block chains in the industry and found their unique benefits as including improved privacy, scalability, transparency, and adoption and community activities.

Moreover, the participants agree that fewer nodes needed have led to greater performance in the organization ($\bar{x}$=3.86, D=.8437). In particular, the respondents opine that permissioned block chains have led to more centralized control, fewer nodes required in approving transactions, thereby improving the speed of processes and operations. This was also true for Punathumkandiet al. (2021); and Amiri et al. (2021). Lastly, the participants were in agreement that permissioned block chains improved

information privacy, which translated to greater confidence in the company's systems ($\bar{x}$=4.19, D=.8291). This concurred with Sotani et al. (2022) who pointed out that blockchain technologies basically improve information confidentiality, and enable stakeholders to develop greater trust in companies. The current study also confirms the results of Amiri et al. (2022) that permissioned block chains guarantee higher levels of confidentiality.

### 4.4.4 Return on Investment of Online Companies Operating in Kenya

Return on Investment is a powerful metric used to gauge the financial and non-financial benefits of an enterprise. In this study, return on investment was measured by net income, efficiency, service/product quality, data security, and stakeholder satisfaction. Five questionnaire inquiries were used to gauge the extent to which blockchain applications had impacted the various metrics of return on investment for online companies operating in Kenya. Participants scored the extent of their concurrence with the following points on return on investment on a 1-5 Likert scale as follows;

**Table 4.8: Return on Investment**

| STATEMENT | Mean | Std Dev |
|---|---|---|
| Blockchain technology has improved data security | 4.02 | .7451 |
| Continuity of operations secured by blockchain technology | 4.15 | .8309 |
| Blockchain technology has improved net income ROI and profitability | 3.66 | .8146 |
| Blockchain technology has enhanced service/product quality | 3.93 | .8984 |
| Blockchain technology has improved stakeholder satisfaction | 3.81 | .8126 |
| **Aggregate** | **3.91** | **.8096** |

**Source: Field Data 2024**

The aggregate mean shows the participants contend that blockchain technology application influence the return on investment of online companies operating in Kenya ($\bar{x}$=3.91, D=.8096). The respondents also fully agreed that blockchain technology has improved data security ($\bar{x}$=4.02, D=.7451); and fully agreed that their companies' continuity of operations was secured by the blockchain technology ($\bar{x}$=4.15, D=.8309). The participants of this study also partially agreed that blockchain technology application has improved net income, ROI and profitability ($\bar{x}$=3.66, D=.8146); and that blockchain technology has improved product and service quality ($\bar{x}$=3.93, D=.8984). This agrees with Varfolomeev et al. (2021) who found a positive correlation between block chain technology applications and ROI metrics particularly service efficiency, data security and reliability. Lastly, the participants agreed that blockchain technology application improved stakeholder satisfaction ($\bar{x}$=3.81, D=.8126). This confirms the findings of Amiri et al. (2021) who studied the properties, techniques and applications of permissioned block chains and noted that they guarantee confidentiality, verifiability, performance and scalability, thereby increasing user satisfaction.

### 4.5 Inferential Analysis

Inferential analysis was conducted to make predictions about the data collected. This included Pearson's correlation analysis and regression analysis.

#### 4.5.1 Pearson's correlation analysis results

Pearson's correlation analysis results are summarized in table 4.14.

**Table 4.14: Correlation Analysis Results**

| | | ROI of online companies | Blockchain digital ledger | Blockchain smart contracts | Permissioned block chains |
|---|---|---|---|---|---|
| ROI of online companies | Pearson correlation | 1 | | | |
| | Sig(2-tailed) | | | | |
| | N | 146 | | | |
| Blockchain digital ledger | Pearson correlation | .7129* | 1 | | |
| | Sig(2-tailed) | .0000 | | | |
| | N | 146 | 146 | 146 | |
| Blockchain smart contracts | Pearson correlation | .7821* | .7736* | 1 | |
| | Sig(2-tailed) | .0000 | .0000 | | |
| | N | 146 | 146 | 146 | |
| Permissioned block chains | Pearson correlation | .7355* | .7292* | .7603* | 1 |
| | Sig(2-tailed) | 0.0000 | 0.0000 | .0000 | |
| | N | 146 | 146 | 146 | |

According to table 4.14 above, the results of the correlation analysis show that there is a significant and positive relationship between the ROI of online businesses and blockchain digital ledgers (correlation coefficient of 0.7129 at $p<0.05$); blockchain smart contracts and online businesses (correlation coefficient of 0.7821 at $p<0.05$); and permissioned block chains and online businesses (correlation coefficient of 0.7355 at $p<0.05$). All of the independent factors had a positive relationship with the outcome variable, according to the correlation statistics. At $p<0.05$, the connection was

significant. This study agrees with Sotani et al. 2022 who showed that blockchain digital ledger was definitely correlated with predictors of ROI, such as improved cost efficiency and security. The present study also paints a similar picture as Khan et al., 2021; and Vigliotti et al., 2021 who explored the structural and economic benefits of smart contracts, which in turn determine the correlation between smart contracts and ROI. Lastly, the current research mirrors the previous works of Polga et al., 2021; and Novotny et al., 2018; and Amiri et al., 2021 who displayed the numerous benefits of permissioned block chains that could account for the positive and significant association between permissioned block chains and online companies' ROI.

### 4.5.2 Regression Analysis

To demonstrate the interactions between the variables and the strength of the link between them, multiple regression analysis was performed.

### 4.5.3 Diagnostic Tests

Diagnostic tests were conducted to evaluate the regression assumptions to enable the researcher to reach valid conclusions. Essentially, diagnostic tests tested whether the data was evenly distributed, the residuals are evenly spread across the predicted variables, and there are direct, straight-line relationships between predictor and outcome variables. The diagnostic tests performed in this project included Multicollinearity and normality.

### 4.5.4 Multicollinearity tests

Multicollinearity tests were conducted to determine the level of linear association between explanatory variables in the regression model (Baltagi, 2005). As a rule of thumb, the main tests for collinearity are the Variance Inflation Factor and the Tolerance Values.

**Table 4.9 Collinearity Results**

| Variable | VIF | 1/VIF |
|---|---|---|
| Digital ledger | 1.64 | 0.743526 |
| Smart contracts | 2.87 | 0.583611 |
| Permissioned blockchains | 1.55 | 0.739385 |

**Source: Research Data (2024)**

Collinearity tests were conducted using the Variance Inflation Factor and Tolerance settings. VIF should ideally be between >1 and <10. Additionally, a tolerance value greater than 0.1 indicates that the data set is free of collinearity problems (Oakshott, 2014). All of the VIF values in table 4.9 above are less than 10, indicating that there were no problems with collinearity among the predictor variables used in the research. The fact that the tolerance values (1/VIF) were greater than 0.1 further confirms that there were no problems with excessive collinearity between the variables.

### 4.5.5 Normality Test

Normality test was carried out to determine if the sample was obtained from a normally distributed population (Kothari & Garg, 2014). The study utilized both the Kurtosis and Skewness to test for normality of the data set.

**Table 4.10 Normality Results**

| Variable | Obs. | Skewness | Kurtosis |
|---|---|---|---|
| Digital Ledger | 146 | (3.36) | 6.51 |
| Smart Contracts | 146 | (1.47) | 1.29 |
| Permissioned block chains | 146 | (1.86) | 3.75 |

**Source: Research Data (2024)**

Tabachnick et al. (2007) state that in order for data to be deemed normal, skewness values of less than two and kurtosis values of less than ten should serve as guidelines for interpreting the results of the normality tests. According to Table 4.10, all of the study variables' skewness values were less than +2, and their Kurtosis values were less than 10, which indicates normalcy

### 4.5.6 Regression results

Table 4.11 is the model summary of the regression analysis for the study.

***Table 4.11: Regression Analysis Results***

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | R Square change | F Change | Df1 | Df2 | Sig. Change | F |
| 1 | .837 (a) | .589 | .611 | .46031 | .589 | 1.352 | 4 | 96 | .000 | |

**Source: Field Data 2024**

The coefficient determination R=.589, is equivalent to 58.9 % ($p<0.05$) as shown in the table above. This shows that blockchain digital ledger, blockchain smart contracts, and permissioned block chains jointly impact the return on investment of online companies operating in Kenya by 58.9%. As shown in the table 4.10, the p-value of .000 is less than 0.05, indicating significance at

95% level of confidence. The findings mirror Lineros (2020) who found that permissioned block chains were significantly correlated with return on investment metrics. The current study also shows that block chain smart contracts and ROI were significantly correlated, consistent with the findings of Khan et al. (2021).

**Table 4.12: ANOVA results**

| | Sum of squares | df | Mean square | F | Sig. |
|---|---|---|---|---|---|
| Regression | .651 | 4 | .264 | .544 | .000 |
| Residual | 17.45 | 142 | .768 | | |
| Total | 18.101 | 146 | | | |

**Source: Field Data 2024**

Table 4.11 indicates a statistically significant linkage (p=.000) between blockchain technology application and ROI of online companies operating in Kenya.

**Table 4.13: Regression Coefficients**

| Model | Unstandardized coefficients | | | Standardized coefficients | | |
|---|---|---|---|---|---|---|
| | B | p | Std. Error | Beta | T | Sig. |
| 1. Constant | 0.851 | 0.00 | 0.127 | | 8.246 | 0.000 |
| Digital Ledger | 0.065 | 0.03 | 0.029 | 0.119 | 2.243 | 0.046 |
| Smart Contracts | 0.058 | 0.00 | 0.034 | 0.124 | 1.802 | 0.021 |
| Permissioned Block Chains | 0.056 | 0.02 | 0.042 | 0.144 | 1.651 | 0.039 |

**Source: Field Data 2024**

$ROI=\beta_0+\beta_1DL_1+\beta_2SC_2+\beta_3PBC_3+\varepsilon$

ROI= Return on Investment

$B_0$ = Constant

$DL_1$= Digital ledger

$SC_2$= Smart contracts

$PBC_3$= Permissioned block chains

$\beta_1$ -$\beta_3$ are the regression coefficient

$\varepsilon$ is the random error

Substituting with the above figures, the regression model is as follows:

$RO1= 0.851 + 0.065DL_1+0.058SC_2+0.056PBC_3+0.127$

The regression analysis above shows that all the three variables impacted return on investment of online companies operating in Kenya but in different magnitudes. The regression coefficients of 0.065, 0.058, and 0.056 were significant at $p<0.05$. This indicates that blockchain digital ledger, blockchain smart contracts, and permissioned block chains had statistically significant impacts on return on investment. Blockchain digital ledger was found to have the biggest impact on return on investment at 0.065 units, suggesting that a change in 1 unit of blockchain digital ledger application led to a change in return on investment of companies by 0.065 units. Permissioned block chains had the least impact on return on investment at 0.055 units. The current study concurs with Sotani et al. (2022) who discovered a positive and statistically significant correlation among blockchain digital ledger and return on investment for companies that adopted it. Notwithstanding the contextual differences in the studies, it is evident that the adoption of blockchain digital ledger increases return on investment. This is due to the attendant benefits of the blockchain digital ledger which include enhanced security, robust functionality, greater transparency, and reduced administrative overheads (Xu et al., 2019). The present study also discovered a positive and statistically significant relation between blockchain smart contracts and return on investment. The nexus between the blockchain smart contracts and return on investment was due to the structural and economic benefits of smart contracts (Khan et al., 2021; Vigliotti et al., 2021). Lastly, the regression model shows that permissioned block chains significantly impact return on investment by 0.055 units. The significant association can be attributed to the numerous benefits of permissioned block chains as highlighted in previous studies (Amiri et al., 2021; Polga et al., 2021; and Novotny et al., 2018). The present study provides valuable insights that fill the

gaps in previous studies which did not explore the connection between permissioned block chains and return on investment.

# CHAPTER FIVE

# SUMMARY, CONCLUSION AND RECOMMENDATIONS

## 5.1 Introduction

This chapter includes the study's summary. Conclusions and a summary of the study's key findings are provided. The suggestions for additional research are given, along with the recommendations based on those findings. The study's main goal was to investigate how blockchain technology is used in cryptocurrencies and how it affects return on investment for Kenyan online businesses

## 5.2 Summary of the Study

The aim of this study was to investigate the applicability of blockchain digital ledger, blockchain smart contracts, and permissioned blockchain in cryptocurrency and their impact on the return on investment for online companies operating in Kenya. The study problem determined the research and the basis of the study was the objective, research questions and the study hypothesis.

The study findings are summarized in the subsequent section 5.2.1

### 5.2.1 The Effect of Digital Ledger on Return on Investment for Online Companies Operating in Kenya

The first objective of the study was to determine the effect of digital ledger on return on investment for online companies operating in Kenya**.** The null hypothesis was that digital ledger had no effect on return on investment for online companies operating in Kenya. The results indicated that blockchain digital ledger positively influenced return on investment for online companies operating in Kenya. The correlation was statistically significant (p=0.046).

The null hypothesis was thus rejected and the research concluded that blockchain digital ledger significantly influenced return on investment of online companies operating in Kenya. The integration of blockchain digital ledger in the companies' processes and systems was found to improve data security, speed of service delivery, information confidentiality, and cost savings. The benefits of the blockchain digital ledger increased return on investment for online companies. It was clear that blockchain digital ledger improved efficiency in data management, streamlined fraud prevention and detection systems, enhanced accountability in financial transacting, and reduced time and financial costs.

### 5.2.2 The Effect of Smart Contracts on Return on Investment for Online Companies Operating in Kenya

The second objective was to find out the effect of smart contracts on return on investment for online companies operating in Kenya. The null hypothesis was that smart contracts had no effect on return on investment for online companies operating in Kenya. The study reveals a positive and statistically significant relationship between blockchain smart contracts and return on investment for online companies ($p=0.021$). The study rejects the null hypothesis and concludes that blockchain smart contracts had a positive and significant impact on return on investment for online companies operating in Kenya. The positive correlation was mediated by the benefits of blockchain smart contracts which included; improved security of transactions, guaranteed autonomy in transacting, and enhanced trust in contracting. Smart contracts fostered trust and collaboration among parties, bolstered security of transactions, improved the company's autonomy in transacting via the self-destruct function, enhanced stakeholder confidence in the companies' systems, and improved overall performance.

### 5.2.3 The Impact of Permission Block Chains on Return on Investment for Online Companies Operating in Kenya

The third objective was to establish the effect of permission block chains on return on investment for online companies operating in Kenya. The null hypothesis was that permission block chains had no effect on return on investment for online companies. The analysis showed a positive and statistically significant association between permissioned block chains and return on investment of online companies, ($p=0.039$).

The study rejects the null hypothesis and concludes that permissioned block chains positively and significantly impacted return on investment of online companies operating in Kenya. The permissioned block chains enabled companies to strengthen data security and integrity levels, improve the levels of transparency in transacting, detect and prevent vulnerabilities and fraud, and only admit credible users to the blockchain network. In particular, permissioned block chains were found to heighten data integrity and confidentiality, foster decentralization and vetting of network users, increase levels of transparency in transacting, improve speed of transaction validation processes, and enhanced information privacy and confidence in the companies' systems.

## 5.3 Conclusions of the study.

The research concluded that blockchain digital ledger influenced return on investment of online companies operating in Kenya. The results were statistically significant. The integration of blockchain digital ledger in the companies' processes and systems was found to improve data security, speed of service delivery, information confidentiality, and cost savings. The benefits of the blockchain digital ledger increased return on investment for online companies.

The study also summarized that blockchain smart contracts had a positive and significant impact on return on investment for online companies operating in Kenya. The positive correlation was mediated by the benefits of blockchain smart contracts which included; improved security of transactions, guaranteed autonomy in transacting, and enhanced trust in contracting.

The study settled that permissioned block chains positively and significantly impacted return on investment of online companies operating in Kenya. The permissioned block chains enabled companies to strengthen data security and integrity levels, improve the levels of transparency in transacting, detect and prevent vulnerabilities and fraud, and only admit credible users to the blockchain network.

Importantly, this study adds to the existing volume of literature on the impact of blockchain technology applications on the ROI metrics. The findings will deepen the understanding of the blockchain technology and the cryptocurrency industry and accelerate the blockchain adoption in Kenya's finance sector. Firms in the financial sector may leverage blockchain technologies to improve security in financial systems. Also, this study may act as a reference fact for other studies interested in exploring other aspects of blockchain technology in future.

## 5.4 Recommendations

Given the conclusions of the study, several recommendations were drawn. The recommendations were categorized into recommendations for practice, recommendations for policy and recommendations for further research.

### 5.4.1. Recommendations for Practice

The top leadership or proprietors of online companies operating in Kenya could expedite the integration of blockchain digital ledger in their systems. This would enable

the companies to improve efficiency in data management, build strong data-driven cultures, improve fraud detection, improve accountability in transacting, and overall return on investment. This recommendation is based on the current study's illustration that one-unit change in blockchain digital ledger affected return on investment by the biggest magnitude. Online companies could vacate the traditional approaches of transacting to adopt the distributed ledger systems in order to harness their benefits and maximize return on investment.

Also, the study showed that permissioned block chains significantly impacted return on investment for online companies operating in Kenya. Companies should integrate permissioned block chains to strengthen data security and integrity levels, improve the levels of transparency in transacting, detect and prevent vulnerabilities and fraud, this will only admit credible users to the blockchain network.

In conclusion, the managements and other key policy decision-making organs of online companies could incorporate blockchain technologies in their systems and processes in order to maximize their returns on investment. This is informed by this study's overall conclusion that blockchain technologies have a positive and significant effect on ROI. Focusing on blockchain technology adoption could help online companies address the emerging problems of cybercrime and its associated losses.

### 5.4.2 Recommendations for Policy

The government of Kenya through the National Assembly could implement laws that will incentivize the adoption of blockchain technologies by companies operating in different economic sectors in the company. This recommendation is anchored on the study's finding of a significant positive correlation between blockchain technology

adoption and return on investment. The government could also provide the appropriate technical support and training in blockchain technology for startups and other companies interested in adopting blockchain technologies. This will bolster the level of awareness and adoption of blockchain technology in Kenya.

### 5.4.3 Recommendation for Further Research

The conceptual framework of this study has extended the knowledge on the direct impact of blockchain adoption on return on investment of online corporations operating in Kenya. The findings suggest that blockchain and return on investment are positively correlated.

Future studies could consider the indirect intervening roles of the blockchain project's purpose, and firm characteristics. There is considerable interest to go beyond the traditional question of whether blockchain adoption leads to better returns on investment, to deeply examine conditions under which returns on investment may be increased or decreased.

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## APPENDICES

### Appendix I: Research Questionnaire

**SECTION A**: Demographic Background

Please tick as appropriate

1. Gender: [ ] Male. [ ] Female

2. Age:

a) 20-30 Years [ ] b) 30-40 Years [ ]

c) 40-50 Years [ ] d) 51 years or more [ ]

3. Please indicate your highest education level

[ ] Diploma. [ ] Higher Diploma [ ] Bachelor's Degree.

[ ] Master's Degree [ ] Doctorate

4. Please indicate the number of years you have worked at the company

a) 1-5 years [ ] b) 6-10 years [ ] c) 11-14 years [ ] d) 15 and above years [ ]

5. Please indicate the number of years you have served in the management team

a) 0-2 years b) 2-4 years c) 4-6 years d) 6 and above years

**SECTION B: Blockchain digital ledger**

**Blockchain Digital Ledger**

Please pick if you agree or disagree with the declarations below concerning blockchain digital ledger in cryptocurrency and return on investment for your company. There are 5 selections to choose from that correspond to these comments:

Key: Strongly Agree (SA)=5 Agree(A)=4, Neutral (NU)=3, Disagree (D)=2, and Strongly Disagree (SD)=1.

| **Statements** | **1** | **2** | **3** | **4** | **5** |
|---|---|---|---|---|---|
| The digital ledger has made data management more efficiency | | | | | |
| Fraud detection has improved due to the distributed ledger systems | | | | | |
| The digital ledger has improved accountability in financial transacting | | | | | |
| Reduced time and monetary expenses because of absence of a central authority | | | | | |
| Digital ledger has improved overall performance | | | | | |

**SECTION C: Blockchain Smart Contracts**

Please pick if you agree or disagree with the assertions below concerning blockchain smart contracts in cryptocurrency and return on investment for your company. There are 5 options to choose from that correspond to these comments:

Key: Strongly Agree (SA)=5 Agree(A)=4, Neutral (NU)=3, Disagree (D)=2, and Strongly Disagree (SD)=1.

**Blockchain Smart Contracts**

| **Statements** | **1** | **2** | **3** | **4** | **5** |
|---|---|---|---|---|---|
| Smart contracts have fostered engagement with more parties than before | | | | | |
| Security of transactions has improved | | | | | |
| The self-destruction function has enhanced the company's autonomy in transacting | | | | | |
| There is improved stakeholder confidence in the company's systems because of smart contracts | | | | | |
| Overall performance of the organization has improved due to enhanced convenience | | | | | |

**SECTION D: Permissioned Block Chains**

Please pick if you agree or disagree with the assertions below concerning permissioned block chains in cryptocurrency and return on investment for your company. There are 5 options to choose from that correspond to these comments:

Key: Strongly Agree (SA)=5 Agree(A)=4, Neutral (NU)=3, Disagree (D)=2, and Strongly Disagree (SD)=1.

**Permissioned Block Chains**

| **Statements** | **1** | **2** | **3** | **4** | **5** |
|---|---|---|---|---|---|
| Data integrity and confidentiality mechanisms have heightened data security levels | | | | | |
| Incremental decentralization has enabled the company to vet users of the blockchain network | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Transparency levels in transacting have gone up | | | | | |
| Less nodes needed have led to greater performance | | | | | |
| Strong privacy has improved confidence in the firm's system | | | | | |

**SECTION E: Return on Investment**

Please pick if you agree or disagree with the assertions below concerning return on investment for your company. There are 5 options to choose from that correspond to these comments:

Key: Strongly Agree (SA)=5 Agree(A)=4, Neutral (NU)=3, Disagree (D)=2, and Strongly Disagree (SD)=1.

| **Statements** | **1** | **2** | **3** | **4** | **5** |
|---|---|---|---|---|---|
| Blockchain technology has improved data security | | | | | |
| Continuity of operations secured by blockchain technology | | | | | |
| Blockchain technology has improved net income ROI and profitability | | | | | |
| Blockchain technology has enhanced service/product quality | | | | | |
| Blockchain technology has improved stakeholder satisfaction | | | | | |

## Appendix II: Sampling Frame

| | | | | |
|---|---|---|---|---|
| . Playbobby Ltd | 67.Innohub | 133.Digitex ltd | 199.Alpha Co. Ltd | 265.Emerging Solns |
| 2. Shamba Records Ltd | 68.Lafont Innovations | 134. Moorix Holdings | 200. eConsults KE | 266. Jupiter Designs |
| 3.Makazi Africa | 69. Impact PPA | 135. ABX Co. Ltd | 201. Bokionet Consulting | 267. Nairobi Digital Hub |
| 4.MayDay Corp | 70. Binkabi Ltd | 136. Swivel Ventures | 202. Clutch ltd | 268. TrendPro Systems |
| 5. Hub Thirty One | 71. CrudeMix | 137. Prism Ltd | 203. TopRank Tech ltd | 269. Ukulima Frontline |
| 6.Tensio Technologies | 72. Maarifa Enterprises | 138.Ampex Network | 204. Andace Computers | 270. Huki Group Ltd |
| 7. Once Snyc | 73. Harambee | 139. Lamptey Holdings | 205. Satrax Informatics | 271. Breeze Tech |
| 8.Drop Access Ltd | 74. Kurecoin | 140. Maxider Ltd | 206. Lopez Holdings | 272. PechantTelec ltd |
| 9. Hela. Money | 75. Landlaby | 141. Techno Today | 207. Indica Ventures | 273. Inceptor Kenya Ltd |
| 10.Traddify | 76. DLT | 142. Pettinsky | 208. AfriMash Tech | 274. Crescent Tech ltd |
| 11.Tesrab Network | 77. Earthday | 143. Simplify IT | 209. Techalytic Tech | 275. White Oak Ltd |
| 12.Clixpesa | 78. Sarb | 144. Superbridge ltd | 210. Crystal Tech Ltd | 276. Alphabet Inc |
| 13.Tipwave Social | 79.Digiduka | 145. Edvantis ltd | 211. Fox Ventures | 277. Dell Technologies |
| 14.Hyperlink Info | 80. Tulaa | 146. TPX Comms | 212. Interactive Tech | 278. InfoSys Ltd |
| 15.Conquest Capital | 81. Cherehani Africa | 147. KDG Ltd | 213. Mavon Enterprise | 279. TenCent Ltd |
| 16.TrendPrix System | 82. Mobile Decisioning | 148. Betterworld Techno | 214. Ecom Tech | 280. AvaTrade Ltd |
| 17.Absolute Corp systems | 83. Saada | 149. ITGix | 215. Seen Tech Ltd | 281. RoboForex Ltd |
| 18.Mambo Microsystems | 84. Pesa Kit | 150. Brooklyn Micro | 216. TechSavanna | 282. SuperForex Ltd |
| 19.Smart Web | 85. Alternative Circle | 151. Nescom Kenya | 217. Tose Tech | 283. HFM Markets Ltd |
| 20.Simple Alliance | 86. Kueq ltd | 152. Oasis Ltd | 218. Centrino Tech | 284. eToro Ltd |
| 21.Umptech Ltd | 87. WayaWaya | 153. Kenya Web | 219. Grafame Tech | 285. axi Ltd |
| 22.Mara | 88. Kiba | 154. Symphony Ltd | 220.QuerySoft Tech | 286. IG Ltd |
| 23.Bitpesa | 89. Shield ltd | 155. ITES Ltd | 221.iOsoft solns | 287. Verizon Communications Ltd |
| 24.Gridless | 90. Blockchain Cybertech | 156. GenBright Solutions | 222. AP Tech Ltd | 288. BCE Inc |

| | | | | |
|---|---|---|---|---|
| 25.Gravity | 91. Orion ltd | 157. DellCo Tech Ltd | 223. Ngotho Tech | 289. SingTel Ltd |
| 26.Yehu | 92. Image Capital Ltd | 158. Lesane Ltd | 224. HypertechSolns | 290. Adobe |
| 27.Hela | 93. Umba ltd | 159. Muva Tech Ltd | 225. HiTechSolns | 291. VMWare Ltd |
| 28.Chamapesa | 94. Afrigroup | 160. Hasoft Kenya | 226. EA Data Handlers | 292. eBay |
| 29.Alterfina | 95. Zanifu | 161. Impact Sourcing | 227. Graph Tech Ltd | 293. Lenovo Group |
| 30.Impalacoin | 96. Superfluid Labs ltd | 162. Hut Tech Ltd | 228. Enovise Ltd | 294. Hewlett Packard Ent |
| 31.Swerri | 97. Tanda Ltd | 163. Lance Holdings | 229. Serianu Ltd | 295. Nokia |
| 32.Tracxn Ltd | 98. Abacus Ltd | 164. Cyfred Systems | 230. Tech Access Solns | 296. Samsung Electronics |
| 33. Kotani Pay | 99. Ifarm360 | 165. Herufi Africa Ltd | 231. EngSoftGroup | 297. GreenSky Ltd |
| 34.Pezesha | 100. Paytree | 166. KITOS Ltd | 232. MTN | 298.Lovre Inc |
| 35.Kukuza | 101. EastPesa | 167. Phogo Software | 233. CloudOne | 299. Exness |
| 36.Pesabase | 102. Professional Digital | 168. KevSam Ltd | 234. Oraco | 300. FBS Online |
| 37.Zowasel | 103. Chamasoft | 169. Fiberlink ltd | 235. Hublink | 301. GoMarkets Ltd |
| 38.IvoryPay | 104. Moripesh | 170. Stelden EA Ltd | 236. SimbaNet | 302. Smart Solutions |
| 39.Hafiz | 105. Ocharge | 171. VSS Ltd | 237. Abba Networks | 303. OctaFX Ltd |
| 40. Decoder Labs | 106. Ryanada Ltd | 172. ICT Resellers Ltd | 238. Victorok KE | 304. Pepperstone Inc |
| 41. CoinBase | 107. AfriKash | 173. Chalosoft Systems | 239. Fanan Tech | 305. Visa |
| 42, Binance | 108. AfyaPlan | 174. Ishara Data Ltd | 240. Nestict Infotech | 306. Genesys |
| 43. Kraken | 109. MyNgovo | 175. Mambo Microstem | 241. HostPro Ltd | 307. Nutanix |
| 44. Paxful | 110.Pesatalk | 176. Digital Vision Ltd | 242. Daproim Ltd | 308. MathWorks |
| 45. Computaz | 111. PesaGuide | 177. FITTS Ltd | 243. Synacor Ltd | 309. Qualtrix |
| 46. Thebhub | 112. ImpalaCoin | 178. Fusion CS ltd | 244. Tose Tech Ltd | 310. Cvent |
| 47.Funtrench | 113. Zoa Tech | 179. NFT Ltd | 245. Eagles Ltd | 311. Snowflake Ltd |
| 48. Alphabloq | 114. Paysap | 180. deep Africa ltd | 246.Ilani Concepts | 312. Pure Storage |
| 49. Cisco | 115. Valuraha | 181. artKenya.net | 247. QuerysoftKe | 313. GitHub |
| 50. Oracle Kenya | 116. RePay Africa | 182. MasterClass ltd | 248. Cloud Surveillance | 314. DropBox |
| 51. HP Kenya | 117.Regalia International | 183. GilDeeItech | 249. EujimSolns | 315. Databricks |
| 52. IBM | 118. Quoxient Ltd | 184. HeartBit Comp ltd | 250. XC360 | 316. Datadog Ltd |

| | | | | |
|---|---|---|---|---|
| 53. SkyWallet | 119. Sokohela | 185. Excellent Future | 251. Horizon Contact ltd | 317. Smartsheet Ltd |
| 54. Gaming Build | 120. PesaBolt | 186. Versatile Tech | 252. Techinnovar ltd | 318. CoupaSofware Ltd |
| 55. Speednance | 121. Alliance Premium ltd | 187. Kiss Devs | 253. HostWebr | 319. Refuge Network |
| 56. Mazzuma | 122.ZipWallet | 188. Jimlatech ICT | 254. WhiteLeaf Group | 320. Coin AFX Ltd |
| 57. Jambo | 123.Altimetrik | 189. Hexapt Tech | 255. TierData Ltd | 321. Kanjwa ltd |
| 58. Pravica | 124. Zege Technologies | 190. Pentagon Solns | 256. VDS Tech | 322. Satoshi Centre Global Group |
| 59. Qurious | 125. Amica SACCO | 191. Matrix Ventures | 257. MaliSafi Tech | |
| 60. Azurro | 126. Chase Iman | 192. Arda Analytica | 258. GreyTrix Africa | |
| 61. Kucoin | 127. Save Kubwa | 193. Compass Enterprises | 259. Umptech Ltd | |
| 62. PWC | 128. Lipa Card | 194. Hofflink Ltd | 260. SawaSawa Tech | |
| 63. WorldCoin | 129. Coin Box | 195. NewLease Ltd | 261. Techno Brain Group | |
| 64. Venom Foundation | 130. Zenka Ltd | 196. SoftLink Ltd | 262. Eldama Tech | |
| 65. LiteCoin | 131. Aqua Technologies | 197. JoyBest Ventures | 263. Agile Cloud | |
| 66. Paypal | 132. Pesapay | 198. BlockC Tech Ltd | 264. Inceptor Ltd | |

## Appendix III: Research Permit

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **973306**

Date of Issue: **26/November/2024**

**RESEARCH LICENSE**

**This is to Certify that Ms.. KAMATHI KAUNGA FRIDAH of Kenyatta University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nairobi on the topic: APPLICABILITY OF BLOCKCHAIN TECHNOLOGY IN CRYPTOCURRENCY AND RETURN ON INVESTMENT FOR ONLINE COMPANIES OPERATING IN KENYA for the period ending : 26/November/2025.**

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**See overleaf for conditions**

## Appendix IV: Research Approval Letter

KENYATTA UNIVERSITY
GRADUATE SCHOOL

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Website: www.ku.ac.ke

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NAIROBI, KENYA
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Internal Memo

**FROM:** Executive Dean, Graduate School

**DATE: 19th November**, 2024

**TO:** **Kamathi Fridah Kaunga**
**C/o Accounting and Finance Dept.**

**REF: D53/CTY/PT/27596/2019**

**SUBJECT: APPROVAL OF RESEARCH PROJECT PROPOSAL**

This is to inform you that Graduate School Board at its meeting of 15th November, 2024 approved your Research Project Proposal for the M.B.A Degree Entitled, **"Applicability of Blockchain Technology in Cryptocurrency and Return on Investment for Online Companies Operating in Kenya."**

You may now proceed with your Data Collection, Subject to Clearance with Director General, National Commission for Science, Technology and Innovation.

As you embark on your data collection, please note that you will be required to submit to Graduate School completed Supervision Tracking and progress report Forms per semester. The Forms are available at the University's Website under Graduate School webpage downloads.

Also, please ensure that you publish article(s) from your project before submitting it to Graduate School for examination as per the Commission for University Education and Kenyatta University guidelines.

Thank you.

**ANNBELL MWANIKI**
**FOR: EXECUTIVE DEAN, GRADUATE SCHOOL**

c.c. Chairman, Accounting and Finance.

Supervisors:

1. Dr. Fredrick W.S. Ndede
   C/o Department of Accounting and Finance
   **Kenyatta University**

*AM/fr*