



BLOCKCHAIN TECHNOLOGY ADOPTION AND PERFORMANCE OF COMMERCIAL BANKS IN NAIROBI CITY COUNTY, KENYA

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ABSTRACT

Today, banks are affected by economic and digital transformation, financial innovations, and the development of the internet. With the increasing innovation in technology for modernizing our lives, new ways to make day to day life effortless and quicker have been introduced. Blockchain is a disruptive, decentralized, replicable, distributed ledger technology with the potential to change the conventional business landscape in banking. It can transform the banking industry and make processes more democratic, transparent, secure and efficient. Bank transactions are often considered non-transparent, inefficient, and expensive, blockchain is a data structure that ensures that all these issues are taken care of. However, despite the permissionless and self-governing nature of blockchains, the regulation and actual implementation of a decentralized system are problems that remain to be resolved. The fact that no single authority controls blockchain is the heart of its applicability in Kenya. Banks can use digital money to eliminate intermediaries that often constrain the capacity of the individual traders to enter into contracts. Cryptocurrencies operate on a user-to-user basis to enhance flexibility and control by the individual traders. The use of blockchain can help the state to reduce the risk of loss owed to inaccurate authentication and valuation of assets. The main objective of the study is to establish the level of readiness of blockchain adoption in commercial banks and how it can be used to revolutionize the banking industry, the barriers and challenges of blockchain implementation in Kenya and to identify the areas of further strengthening to the effectiveness of blockchain technology in the banking industry. This study used descriptive research design whose main aim was to identify any causal links between the factors or variables that pertain to the research problem. Data collection was done by use of questionnaires. The questionnaire was evaluated for content validity and reliability. Data analysis involved cleaning data and identifying common themes from the respondents' description of their experiences. The data collected was analyzed by use of descriptive and inferential statistics. Multiple regression model was used to show the relationship between the dependent variable and the independent variables. The quantitative data generated was keyed in and analyzed by use of Statistical Package of Social Sciences (SPSS) version 29 to generate information which was presented using tables, charts, frequencies and percentages. The findings from the study revealed that the unclear legal status of cryptocurrencies impacts on banks' willingness to adopt blockchain technology and this could be due to the lack of government regulation on blockchain and cryptocurrencies which indicates a clear need in the regulation of blockchain in Kenya. The study concluded that slow adoption rate of blockchain technology is mostly attributed to lack of understanding and knowledge of the technology. This leads to low uptake of blockchain technology by commercial banks and hence leads to them not realizing the benefits it has to offer. The study recommends that Kenyan banks should analyze the cost-benefit trade-off for implementing blockchain technology which could help them make informed decisions about whether or not to invest in it.

Key Words: Blockchain Technology Adoption, Performance of Commercial Banks, Technological Capability, Regulatory Framework

Background of the Study

Today, banks are continuously exploring new ways to do transactions quicker for enhanced customer services by assuring transparency to customers and regulators while ensuring cost efficiency (Tejal, 2018). Blockchain technology has over the years evolved to become the embodiment of security and transparency. The idea behind the system is to have a digital currency that can be influenced by everyone. It can be created by anyone and is decentralized such that the state or a private body cannot regulate it (Dulea, 2015). Blockchain is a technology that has the ability to revolutionize bank's payment clearing and credit information systems, allowing them to upgrade and transform as they seek new growth opportunities (Guo Y. L., 2016).

Statement of the Problem

Commercial banks are keen on optimizing their utility by saving time and accruing maximum rewards on their investments. The desire to consistently thrive in the industry surpasses all the competing interests. Bank staff, processes and operating systems are required to act as 'gatekeepers' to prevent the misuse of payment systems for financial crime such as money laundering and terrorist financing. Sometimes banks face challenges in conducting customer due diligence to verify the identity of their clients and assess if the transactions with third parties are consistent with the understanding of their clients' businesses. Fighting financial crime, lack of accurate and timely information attached to payment transactions, escalates reconciliation challenges, compounding the problem of opacity in payments. This is evidenced by the number of rejected or repaired payments and delays in payments processing.

According to Gitugu (2012, cited in Muraguri, 2013) despite the fact that internet banking makes the transaction faster and more convenient, several commercial banks in Kenya are yet to fully adopt this new banking product. The banks that have adopted the product have been faced with various obstacles leading to poor application of internet banking services. According to Paul (2009), one of the key challenges that the banking industry in Kenya face is transaction security. According to Brian (2008) insecurity lowers the level of confidence among many. Most customers find banking services to be characterized by high rates of fraud as a result of insider acts, phishing and hacking of various websites that hosts internet banking services. Application of high-quality security systems that leads to confidentiality of online transactions remains a critical problem that has influenced customers to resist the use of internet banking services hence hampering performance in commercial banks in Kenya.

Cryptocurrencies and blockchain technology have over the years evolved to become the embodiment of security and transparency. The idea behind the system is to have a digital currency that can be influenced by everyone. It can be created by anyone and is decentralized such that the state or a private body cannot regulate it (Dulea, 2015).

According to a survey done by PwC, 63% of financial institutions currently do not offer their clients exposure to crypto assets. One of the greatest barriers to blockchain adoption is regulatory uncertainty since a lot of countries are in the early stages of developing various regulations around blockchain. The survey also indicates that 97% of finance professionals expect the financial industry to be disrupted by crypto assets (PwC, 2022).

The banking sector is faced with serious risks in the age of globalization, including currency, credit, interest rate, and liquidity. Poor practices in the sector have resulted in job losses, corporate bankruptcy, and significant economic losses (World Bank, 2013). To remain relevant and competitive, banks need to keep on innovating in the evolving financial landscape. While blockchain technology holds immense potential to transform the banking sector by offering enhanced security, transparency, and efficiency, its adoption in Kenyan banks remains limited. This limited adoption hinders the potential benefits that blockchain technology can offer to both banks and their customers.

Objectives of the Study

To determine the adoption of blockchain technology and performance of commercial banks in Nairobi County, Kenya.

1. To establish the effect of technological capability on the adoption and performance of commercial banks in Nairobi City County.
2. To analyze how the regulatory framework influences the adoption and performance of commercial banks in Nairobi City County.

LITERATURE REVIEW

Theoretical Framework

Technology Acceptance Model

The Technology Acceptance Model was developed by Davis in 1989 from the Massachusetts Institute of Technology (MIT). The theory gives an emphasis on the reason why users accept or reject information technology and how to improve on the acceptance by offering a way to support and foresee the acceptance more so in the financial markets. The Technology Acceptance Model is based on the two broad foundations of why the users accept technology and the construct of perceived utility and perceived facility (Wright, 2017).

This research study will incorporate Technology Acceptance Model (TAM) to relate on the study's blockchain usefulness and the simplicity pegged on to the two main factors in describing user's acceptance or rejection of blockchain related services. The usage of technology is described as the extent to which an individual think that the adoption of a certain system will boost his/ her individual performances in the financial environment or other business-related services. The TAM model states that the adoption of technology is a decision reached by the user's motivational behavior to utilize and impacted by the attitude of the users when adopted. The attitude of the users is impacted by the opinions about technology, which are made up of the perceived ease of use and the perceived usefulness making it relevance in blockchain technology. The TAM model is grouped in the list of very influential and analyzed theories in stating the behavior of the final users of the technology (Fitriyani & Sfenrianto, 2016). The Technology Acceptance Model (TAM) can be applied in the context of blockchain adoption and the rate of regulation which impacts the level of acceptance by users.

Innovation Diffusion Theory

The Innovation Diffusion of Theory was put forward by Rodgers in 1995. The theory emphasizes the three broad aspects that influence and are main source of influencing the adoption and diffusion of an innovation in the cryptocurrencies market. The main aspects are based on the perception of the innovation characteristics in the market, characteristics of the adopters and contextual factors (Cronnelly, 2016). Commonly, innovation is a theoretical and practical idea that is regarded as original or new on its kind and diffusion is the process through which an innovation is transferred through particular mediums within a specified period of time among a recognized individuals of a system in social context (Rizzo, 2016). The theory of innovation of diffusion expounds on the possible user's choice adoption influence of an innovation founded on social status.

The theory is relevant to the study on the adoption of blockchain technology with a vibrant example of Bitcoin which emerged in 2009 with the aim of creating a currency that is not regulated by any state, financial institutions, or intermediaries. Relatively to the merit of technology diffusion, Bitcoin has exemplified this by offering a more privatized approach compared to the traditional methods of payments. The product also cautions the users against perceived inflation, and it has a steady supply and appreciation in the market. The adoption of blockchain technology is termed to be following the model proposed by Rodgers on the innovation diffusion theory with five categorical points (Ermakova, 2017). This theory can be

applied in the context of technology capability to develop new products, processes, and technological knowledge.

Conceptual Framework

Conceptual frameworks serve as the blueprint that informs the "why" and "how" of research design, and at the inception of this design lies the researcher's personal interests and goals, which in turn are shaped by the researcher's identity and positionality (Riggan, 2017). The conceptual framework offers many benefits to research. For instance, it assists the researcher in identifying and constructing his/her worldview on the phenomenon to be investigated (Grant, 2014).

This study uses causal relationship where technological capability, and regulatory framework are considered independent variables which influence the performance of commercial banks which is the dependent variable. The relationship between the independent variables and the dependent variable is shown in Figure 2.1.

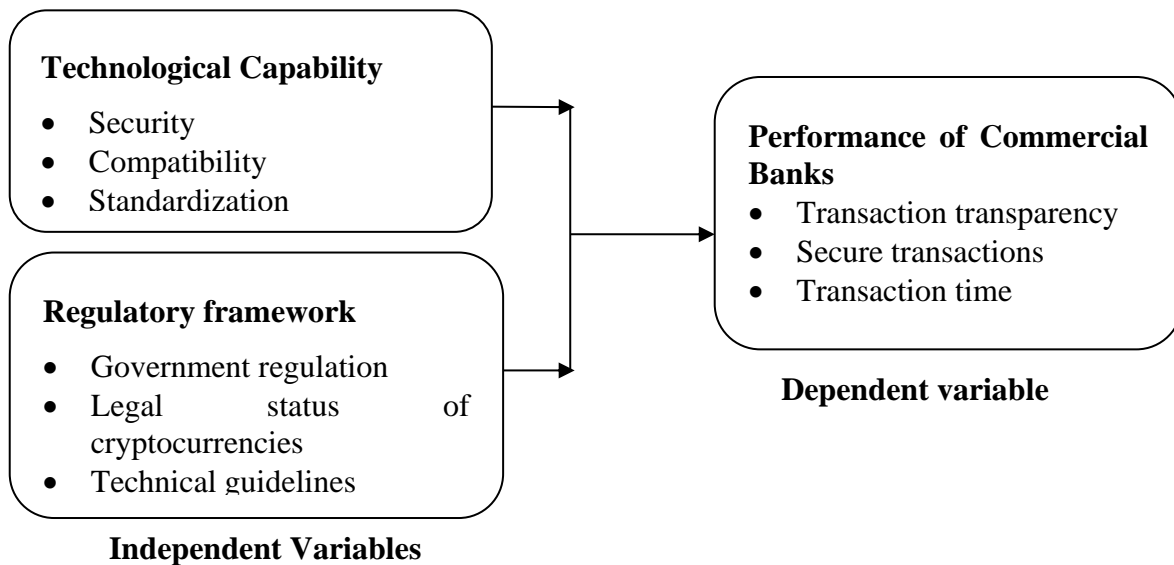


Figure 2.1: Conceptual framework

Technological Capability

Technological capability is the ability of the company to execute any relevant technical function, including the ability to develop new products, processes, and technological knowledge in order to obtain higher levels of organizational efficiency (Tsai, 2018). Through technological capability, the company can gain a competitive edge within the industry, particularly in a high-tech environment (Ortega, 2010). Organizations can leverage blockchain's unique characteristics to achieve specific business objectives.

Security is defined as the circumstances, events and conditions that may cause economic hardship to network resources or data in terms of restrictions, disclosure of data, modification, violation of privacy, abuse, fraud and denial of service (Nadeem, 2021). Blockchain security is essential because blockchain networks are decentralized and distributed, which makes them vulnerable to attacks by malicious actors. By ensuring the security of blockchain networks, users can have confidence in the integrity of transactions and the protection of their digital assets.

Compatibility refers to the degree to which a technology can be integrated into the existing system (Daeheon, 2020). Banks typically have complex and diverse IT landscapes composed of legacy systems, modern applications, and various databases. Integrating blockchain, a new technology with different architectural principles, can be complex and require significant effort (Yiu, 2017). Combining elements of blockchain technology with existing IT infrastructure can

offer a practical approach. Banks can leverage the security and familiarity of existing systems while integrating specific functionalities offered by blockchain (Casino, 2018).

Industry groups and consortia are actively working on establishing standardized protocols for blockchain technology. Efforts by organizations like Hyperledger and the Enterprise Ethereum Alliance aim to create interoperable platforms that can integrate with existing systems (Yiu, 2017). Total standardization in blockchain is yet to be achieved but ongoing efforts are aimed at achieving it.

Regulatory Framework

This refers to the set of laws, regulations, and guidelines established by governments and regulatory bodies to govern the use and operation of blockchain technology and its various applications. The regulatory framework aims to provide clarity, ensure compliance, and protect the interests of participants in blockchain networks, including consumers, businesses, and investors. Indicators in relation to the study include:

Government regulation - the regulatory landscape for blockchain technology is still evolving, with different countries and jurisdictions taking varying approaches to regulating blockchain-based activities. Some countries have embraced blockchain technology and adopted a favorable regulatory framework to encourage its growth and innovation, while others have taken a cautious or even hostile approach, imposing strict regulations and limitations on blockchain-based activities. In January 2024, the Blockchain Association of Kenya published its first draft of the Virtual Assets Service Providers Bill which will regulate crypto assets in the country. The Bill is available for public review and has garnered an overwhelming number of contributions, feedback, and critique from the lobby group's digital asset community.

Legal status of cryptocurrencies - The Central Bank of Kenya (CBK) in December 2015 issued a public warning on the use of crypto-currencies due to their perceived volatility and the lack of specific regulation. The CBK clarified that it does not regulate virtual currencies and offers no comfort to members of the public. Despite the warning by the CBK there is no law prohibiting their use. The CBK is however beginning to embrace the use of blockchain since in February 2022 it released a discussion paper on Central Bank Digital Currency (CBDC), while seeking public comments on the potential benefits and risks, and related policy considerations, of introducing a CBDC in Kenya.

Technical guidelines – there are several industry specific guidelines and best practices that provide recommendations for implementing blockchain technology. These guidelines seek to ensure the effective and secure use of blockchain in various applications. Some of the key standards include interoperability standards which ensure that different blockchain networks can communicate and interact with each other seamlessly such as Hyperledger Fabric and Ethereum ERC-20, security standards e.g., ISO 27001, data protection policies such as the General Data Protection Regulation (GDPR) by the EU and smart contract standards such as Solidity and Chaincode.

Performance of Commercial Banks

Performance essentially measures how well a business translates its plans and strategies into tangible results (Greene, 2021). It reflects the smooth functioning of core business processes. The performance of commercial banks is a critical area of focus, impacting profitability, customer satisfaction, and overall competitiveness.

Performance of service delivery comprises three critical performance factors (quality, dependability, and speed) that are usually present in a service delivery system. Consistent quality, dependability of delivery, and prompt delivery (speed) are critical operations performance factors in service delivery systems (Kumar, 2011) and reflects more directly to the efficiency and effectiveness of the operations within the firm (Gizaw, 2016).

Achieving and sustaining performance is more important than ever in today's challenging economic environment. Cost pressures, changing customer expectations, stronger competitors and other industry and market disruptions are collectively causing a tremendous strain on operational capabilities and performance. Operational performance excellence is no longer a desired end state but a near-term requirement for any successful company. Banks' performance contributes to the operation and growth of an economy through various roles, including that of intermediary and provides of payment settlement facilities. Banks must also execute these roles faultless in order to promote confidence and stability in the system (Johnson, 2012).

Empirical Review

Technological Capability

Using blockchain in conjunction with actual banking systems will augment the power operating between counterparties. We potentially may have a common, ubiquitous blockchain, able to reduce the need for intermediaries to validate financial transactions and the friction created in financial networks due to different intermediaries, which often use different technology infrastructures. In theory, such an interconnected infrastructure has the potential to generate significant efficiency gains, reducing duplicative record keeping, eliminating reconciliation, minimizing error rates and facilitating faster settlements (McLean, 2016).

In addition, such an infrastructure would also be critical to underpinning a future "internet of things". Every device connected to the internet becomes a potential user of banking services, and this infrastructure may enable offering services at much lower cost. Of course, blockchain mining protocols, at least as they look today, are not able to achieve the millisecond response times needed by transactions on the internet of things. A future blockchain with millisecond latency could give devices autonomy, and allow them, for example, to transfer ownership of physical goods without the need to refer to a central management system (Luisanna, 2017).

According to the hash function of the blockchain, the integrity of the data is guaranteed, and the security can be improved through essential control and encryption algorithms to prevent hacker attacks. Each participant needs a public key and a private key to verify their identity and complete the transaction based on their private key. Moreover, when the digital economy is built with the blockchain infrastructure, the identity verification information is encrypted and verified, reducing the risk of personal information disclosure, and ensuring the account's security and uniqueness (Zutshi, 2021).

Regulatory Framework

Adoption of disruptive technology continues to pose a threat to the jurisdiction of many states. On the contrary, some nations have given node on the practice of blockchain technology as a generally acceptable legal tender. Blockchains are observed by all parties involved and thus cannot be adjusted, permitting direct transactions that have no regulator thus decentralized (Harley, 2016).

The R3 blockchain consortium is also exploring the formulation of industry standards for interbank applications. In China, the blockchain technology research group of the Interbank Market Technology Standards Workgroup was established in August 2016. This workgroup is to conduct prospective research on interbank market blockchain technology, regulations, and legal framework (Guo Y. L., 2016).

It is worth noting that the problems of regulation, efficiency, and security have always sparked extensive debate in the process of each new financial innovation. However, history is not stopped by current obstacles, as the technical, regulatory, and other problems of blockchain technology will ultimately be resolved. Hence, the prospect of integrating blockchain technology into the banking industry will most likely occur in the near future (Guo Y. L., 2016).

International payments in banking will also benefit from regulatory friendly and compliant infrastructure. Countries such as Sweden with the e-Krona, South Korea and Japan are in late stages of implementing central bank based digital currencies (Fan, 2018).

In the context of the application of blockchain, the Kenyan regulation is yet to regard its use in the industry in relation to other global markets like Japan. Central Bank of Kenya for instance has embarked trying to puzzle the issues of blockchain technology and various taskforce have been formed to look into the matter and not to lag behind (Giancarlo, 2016).

RESEARCH METHODOLOGY

This study used descriptive research design whose main aim was to identify any causal links between the factors or variables that pertain to the research problem. The unit of analysis of the study was the 44 licensed commercial banks that are operating in Nairobi City County, Kenya. The unit of observation of the study consisted of ICT officers, cyber security experts, risk officers and finance officers selected from each of the 44 licensed commercial banks that are operating in Nairobi City County. The recommended number of individuals for a descriptive study is less than 100 (Leavy, 2022). Using a formula by Yamane (1967). The desired sample size of 132 respondents was derived from the target population where $N=200$. The study used a stratified random sampling technique. Kenya has many banks (ITA, 2024). This study focused on tier 1 and tier 2 commercial banks. The research used questionnaires with open-ended and close-ended questions. Regression analysis is a statistical method that is used to analyze the relationship between a dependent variable and one or more independent variables. The dependent variable is the variable that is being predicted, and the independent variables are the variables that are used to predict the dependent variable. Regression analysis can be used to identify the factors that are most important in predicting the dependent variable, and to estimate the strength of the relationship between the dependent variable and the independent variables (Field, 2017). All the data gathered from questionnaires were encoded and entered into SPSS software version 29 for data analysis. Findings will be tabulated and presented using charts, graphs and tables.

RESEARCH FINDINGS AND DISCUSSIONS

The study surveyed 132 respondents from five tier one banks in Kenya using a structured questionnaire. A total of 120 questionnaires were filled and returned for analysis. This implied that a response rate of 92% was obtained. According to (Theuri, 2015), a response rate of 50% is adequate, 60% good while 70% response rate is very good. This implies that the 92% response rate obtained in this study is adequate for analysis and making conclusions and recommendations of the study.

Descriptive Analysis of the Study Variables

Technological Capability

The first objective of the study was to assess the role of technological capability as a determinant of blockchain technology adoption and performance of commercial banks in Nairobi County, Kenya. The study sought to establish the ability of technological capability to steer organizational performance through blockchain adoption. The respondents were asked to respond to specific statements formulated based on the sub-constructs of the variable which were; security, compatibility and standardization. A five-point Likert's scale was used as the measure where 1 was strongly disagree, 2 disagree, 3 uncertain, 4 agree and 5 strongly agree.

The study sought to establish the respondents' level of agreement or disagreement with specific statements regarding security as an aspect of blockchain technology adoption and its influence on firm performance. The findings, as indicated in Table 1 revealed that majority of the respondents agreed with the statement that the use of blockchain will ensure more secure transactions by a mean of 3.93 and a standard deviation of 1.20. On the second statement, majority of the respondents agreed with the statement that the use of blockchain-based banking services or applications will reduce cyber-attacks by a mean of 3.57 and a standard deviation

of 0.65. The findings imply that the use of blockchain technology will improve the security of transactions and reduce cyber-attacks in banks.

Table 1: Security

Statement	Mean	Std. Dev.
The use of blockchain will ensure more secure transactions	3.93	1.20
The use of blockchain-based banking services or applications will reduce cyber attacks	3.57	0.65

The study sought to establish the respondents' level of agreement or disagreement with specific statements regarding compatibility as an aspect of blockchain technology adoption and its influence on firm performance. The findings, as indicated in Table 2 revealed that majority of the respondents agreed with the statement that the use of blockchain technology will be compatible with our current ICT systems with a mean of 3.5 and standard deviation of 0.94. On the second statement, majority of the respondents agreed with the statement that existing ICT infrastructure will be adequate to support blockchain technology by a mean of 3.36 and a standard deviation of 1.00. The findings imply that the existing ICT infrastructure in commercial banks is compatible with blockchain technology-based services and applications.

Table 2 Compatibility

Statement	Mean	Std. Dev.
The use of blockchain technology will be compatible with our current ICT systems	3.5	0.94
Existing ICT infrastructures will be adequate to support blockchain technology	3.36	1.00

The study sought to establish the respondents' level of agreement or disagreement with specific statements regarding standardization as an aspect of blockchain technology adoption and its influence on firm performance. The findings, as indicated in Table 3 revealed that majority of the respondents agreed with the statement that the existing banking standards accommodate the adoption of blockchain technology by a mean of 3.79 and standard deviation of 1.05. On the second statement, majority of the respondents agreed with the statement that standardization innovations on interoperability will improve blockchain adoption in banking by a mean of 3.29 and a standard deviation of 1.32. The findings imply that existing banking standards and ongoing innovations to improve them are adequate to support blockchain technology adoption in the banking sector.

Table 3: Standardization

Statement	Mean	Std. Dev.
The existing banking standards accommodate the adoption of blockchain technology	3.79	1.05
Standardization innovations on interoperability will improve blockchain adoption in banking	3.29	1.32

Regulatory Framework

The second objective of the study was to assess the role of regulatory framework as a determinant of blockchain technology adoption and performance of commercial banks in Nairobi County, Kenya. The study sought to establish the ability of technological capability to steer organizational performance through blockchain adoption. The respondents were asked to respond to specific statements formulated based on the sub-constructs of the variable which were; security, compatibility and standardization. A five-point Likert's scale was used as the measure where 1 was strongly disagree, 2 disagree, 3 uncertain, 4 agree and 5 strongly agree.

The study sought to establish the respondents' level of agreement or disagreement with specific statements regarding government regulation as an aspect of blockchain technology adoption and its influence on firm performance. The findings, as indicated in Table 4.9 revealed that

majority of the respondents disagreed with the first statement that there is adequate government regulation on blockchain technology by a mean of 2.71 and a standard deviation of 1.27. The respondents also disagreed on the second statement that the current regulatory framework in Kenya is adequate for blockchain implementation by a mean of 2.36 and a standard deviation of 1.08. This indicates that there isn't sufficient government regulation of blockchain technology, and this is because various regulations such as the Virtual Assets Service Providers Bill (2024) are still in the early stages of development.

Table 4: Government Regulation

Statement	Mean	Std. Dev.
There is adequate government regulation on blockchain technology	2.71	1.27
The current regulatory framework in Kenya is adequate for blockchain implementation	2.36	1.08

The study sought to establish the respondents' level of agreement or disagreement with specific statements regarding the legal status of cryptocurrencies as an aspect of blockchain technology adoption and its influence on firm performance. The findings, as indicated in Table 4.10 revealed that majority of the respondents agreed with the first statement that the unclear legal status of cryptocurrencies impacts on banks' willingness to adopt blockchain technology by a mean of 3.93 and a standard deviation of 1.33. On the second statement, the respondents agreed with the statement that lack of clear regulations regarding cryptocurrencies hinder the development of innovative blockchain-based solutions for banking by a mean of 3.36 and a standard deviation of 1.15.

The findings compare with those by (International Monetary Fund, 2019) who found that the uncertainty of regulation on cryptocurrencies has impacted financial institution's willingness to adopt blockchain technology and highlights on the importance of clear regulation to encourage innovation and mitigate risks.

Table 5: Legal Status of Cryptocurrencies

Statement	Mean	Std. Dev.
The unclear legal status of cryptocurrencies impacts on banks' willingness to adopt blockchain technology	3.93	1.33
Lack of clear regulations regarding cryptocurrencies hinder the development of innovative blockchain-based solutions for banking	3.36	1.15

The study sought to establish the respondents' level of agreement or disagreement with specific statements regarding technical guidelines as an aspect of blockchain technology adoption and its influence on firm performance. The findings, as indicated in Table 4.11 revealed that majority of the respondents agreed with the first statement that there are developed standards and best practices for creating blockchain based applications by a mean of 3.21 and standard deviation of 1.05. Majority of the respondents disagreed with the second statement that the institution has got a policy, and regulations related to blockchain technology by a mean of 2.57 and standard deviation of 1.02. The findings imply that there are available standards for blockchain technology e.g. on Ethereum and Hyperledger platforms. While this has been made available, most banks are yet to adopt such technical guidelines for blockchain applications.

Table 6: Technical Guidelines

Statement	Mean	Std. Dev.
There are developed standards and best practices for creating blockchain based applications	3.21	1.05
The institution has got a policy, and regulations related to blockchain technology	2.57	1.02

Performance of Commercial Banks in Nairobi County, Kenya

The main aim of the study was to assess the influence of determinants of blockchain adoption on the performance of commercial banks in Nairobi County, Kenya. The dependent objective of the study was therefore the performance of commercial banks in Nairobi County, Kenya. The variable was measured by transaction transparency, secure transactions and secure transactions. Specific statements were used whereby the respondents were asked to rate them based on the Likert's scale. The responses are as herein presented.

The respondents' level of agreement on the statement regarding the transaction transparency was sought. The findings as shown in Table 7 revealed that majority of the respondents agreed with the first statement that the use of blockchain technology will create a more auditable trail for financial transactions, improving accountability within banks by a mean of 3.64 and a standard deviation of 1.08. On the second statement, the respondents agreed that blockchain-based solutions empower customers to have greater visibility and control over their financial transactions by a mean of 3.14 and a standard deviation of 1.03.

The findings compare with those by (Technologies, 2021) who found out that blockchain improves transparency in banking due to how traditional banking systems can lack transparency due to centralized control and limited visibility for customers. Blockchain, with its distributed ledger and immutability, creates a more open and auditable record of transactions, fostering trust and accountability.

Table 7: Transaction Transparency

Statement	Mean	Std. Dev.
The use of blockchain technology will create a more auditable trail for financial transactions, improving accountability within banks	3.64	1.08
Blockchain-based solutions empower customers to have greater visibility and control over their financial transactions	3.14	1.03

The respondents' level of agreement on the statement regarding secure transactions was sought. The findings as shown in Table 8 revealed that majority of the respondents agreed with the first statement that blockchain technology has potential to streamline internal processes in banks while maintaining high levels of security by a mean of 4.14 and a standard deviation of 0.95. On the second statement, the respondents agreed that blockchain technology can help mitigate the risks of cyberattacks and fraudulent activities in financial transactions by a mean of 3.86 and a standard deviation of 1.10.

The findings compare with those by (PWC, The Impact of Blockchain on the Banking Sector in Kenya, 2019) who found out that blockchain's security features like cryptography and distributed ledger technology can significantly improve transaction security in banking by making them more tamper-proof and auditable.

Table 8: Secure Transactions

Statement	Mean	Std. Dev.
Blockchain technology has potential to streamline internal processes in banks while maintaining high levels of security	4.14	0.95
Blockchain technology can help mitigate the risks of cyberattacks and fraudulent activities in financial transactions	3.86	1.10

The respondents' level of agreement on the statement regarding transaction time was sought. The findings as shown in Table 9 revealed that majority of the respondents agreed with the first statement that blockchain transactions are processed much faster than traditional banking transactions, which can save banks and customers time and money by a mean of 4.00 and standard deviation of 0.96. On the second statement, majority of the respondents agreed with

the statement that blockchain technology can potentially streamline cross-border payments, eliminating delays associated with intermediaries by a mean of 3.36 and standard deviation of 1.39.

The findings compare with those by (Garg, 2018) who established that the elimination of intermediaries and the use of peer-to-peer networks in blockchain can significantly reduce processing delays compared to traditional systems with multiple handoffs and clearinghouses. This will automate tasks, eliminate paperwork, and streamline communication between parties, leading to faster trade finance transactions (Accenture, 2016).

Table 9: Transaction Time

Statement	Mean	Std. Dev.
Blockchain transactions are processed much faster than traditional banking transactions, which can save banks and customers time and money	4.00	0.96
Blockchain technology can potentially streamline cross-border payments, eliminating delays associated with intermediaries	3.36	1.39

Correlation Analysis

Correlation analysis was conducted to determine the strength, direction, and presence, of a linear relationship between relational blockchain technology and performance of commercial banks. The correlation coefficient (r) values range from -1, indicating a perfectly linear negative correlation (independent variables are positively and negatively related to the dependent variable) to +1, showing a perfectly linear positive correlation (predictor variables are perfectly and positively correlated with predicted variables). Nevertheless, a correlation coefficient close to (0) indicates little correlation (the independent variables cannot describe the variation in the dependent variable) (Kothari, 2014). The study conducted correlation analysis using the Pearson correlation coefficient technique. Table 10 provides the results and an explanation for every specific objective.

Table 10: Correlation Matrix

Variable	1	2
Technological Capability	1	
Regulatory Framework	.695**	1
Performance	.680**	.770**
	.000	.000

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

There was a positive moderate significant relationship between technological capability and performance of commercial banks ($r=0.680^{**}$, $p<0.01$). Thus, the results suggested that an increase in technological capability will automatically increase the performance of commercial banks in Kenya. These findings were supported by (Vik, 2020) who advocated that strengthening the technology function and bringing more technology capabilities closer to the business's strategy and operations has boosted the financial performance of firms. Strong performance on core IT tasks enables faster progress against a company's digital goals and doing so presents opportunities to increase productivity and the pace at which digital products and services are brought to market.

There was a positive strong significant relationship between regulatory framework and performance of commercial banks ($r=0.770^{**}$, $p<0.01$). Thus, the results suggested that an increase in regulatory framework will automatically increase the performance of commercial banks in Kenya. The findings were supported by (Guo, 2016) who advocated that the problems of regulation, efficiency, and security have always sparked extensive debate in the process of each new financial innovation. However, history is not stopped by current obstacles,

as the technical, regulatory, and other problems of blockchain technology will ultimately be resolved. Hence, the prospect of integrating blockchain technology into the banking industry will most likely occur in the near future.

Regression Analysis

This was conducted to understand how a change in the independent variable may cause a change in the dependent variable. To determine the specific nature of the influence, technological capability, and regulatory framework were jointly regressed as predictor variables with the composite index of performance of commercial banks as the predicted variable. The raw regression equation model given was:

Table 12: Multiple Regression Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients Beta	t	Sig
	B	Std. Error			
1 (Constant)	3.571	0.202		17.678	0.469
Technological Capability	0.185	0.270	0.206	0.686	0.510
Regulatory Framework	0.433	0.348	0.418	1.242	0.245

Technological capability had a regression coefficient of $\beta=0.206$, $p=0.510$, hence not a significant predictor. Regulatory framework had a regression coefficient of $\beta=-0.418$, $p=0.245$, hence a significant predictor. The results revealed that technological capability regulatory framework had a significant and positive influence on the performance of commercial banks in Kenya. The model now becomes:

$$Y = 3.571 + 0.185X_1 + 0.433X_2$$

The model output reveals that a unit change in technological capability would lead to 18.5% increase in the performance of commercial banks in Kenya. A unit change in regulatory framework would lead to 43.3% increase in the performance of commercial banks in Kenya while significantly influenced the performance of commercial banks in Nairobi City County, Kenya.

Conclusions of the Study

The study concluded that technological capability was a critical driver to the performance of commercial banks in Nairobi City County, Kenya. The findings outlined the prospects of technological capability such as security and compatibility as the main determinants of technological as the main determinants of technological prosperity as far as enhancing performance of commercial banks is concerned. The study concluded that commercial banks have the technological capability to implement blockchain initiatives, but this has not yet been implemented and hence impacting their performance.

The study concluded that the regulatory framework has a critical role in determining commercial banks performance. The lack of government regulation on blockchain technology poses a lot of uncertainty which makes commercial banks hesitant to implement it. This is because it could expose the banks to potential risks and even losses if there are no policies and regulations to safeguard them. Implementation of such regulations would give commercial banks some level of confidence to innovate and explore the use of blockchain technology.

Recommendations of the Study

Top management support on blockchain technology will help commercial banks improve their adoption rate. Leaders need to engage on how to incorporate blockchain into their institutions. This can be done through providing training for staff on blockchain, allocation of funds for blockchain initiatives and inclusion of blockchain in strategic plans.

The government and other regulatory bodies such as CBK (Central Bank of Kenya) need to come up with policies and regulations on blockchain technology since most banks are hesitant to explore the use of blockchain due to lack of regulation.

Recommendations for Further Studies

Blockchain technology has a wide range of potential applications in the banking sector. A deeper dive into specific use cases, such as trade finance, cross-border payments, or identity management, could provide valuable insights into the impact of blockchain on specific performance metrics.

While blockchain offers many potential benefits, there are also costs associated with its implementation. A study that analyzes the cost-benefit trade-off for Kenyan banks could help them make informed decisions about whether or not to invest in blockchain technology. This study focused on the use of blockchain technology in the banking sector. A similar study could thus be conducted for institutions in other sectors for comparison purposes.

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