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BLOCKCHAIN TECHNOLOGY AND REVENUE ADMINISTRATION IN NAIROBI CITY COUNTY GOVERNMENT, KENYA

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ABSTRACT

In Kenya, revenue administration faces a myriad of challenges where there are issues of corruption, fraud, evasion, leakage, mismanagement, and inefficiency. These challenges affect the ability of the government to mobilize adequate and equitable revenues. The purpose of the study is to establish the blockchain technology and revenue administration in the Nairobi City County government. The objectives of the study are to determine the effect of Information transparency and data immutability influence revenue administration in Nairobi City County Government, Kenya. The study is anchored on Network Theory and The Theory of Artificial Immutability. The study adopted a descriptive research design because it was based on a review of the relevant literature to find appropriate instruments for data collection. The study unit of analysis was the Nairobi City County Government. The unit of observation was senior and middle-level staff drawn from the ICT and Revenue sections. Then, simple random sampling was used to assign a cluster sample. The researcher used Fisher, Laing, and Stoeckel (1983) formula to arrive at a sample of 384. The study utilized primary data collected using structured Likert scale questionnaires designed as per the study variables. The researcher used the 'drop-and-pick-later' method to administer questionnaires to the respondents. Collected data was analyzed by employing descriptive and inferential statistics as the data analysis techniques. The study also concludes that data immutability has a significant effect on revenue administration in Nairobi City County Government, Kenya. This study highlights the evolving potential of blockchain technology, the significant impact of distributed ledger technology, data redundancy, information transparency, and data immutability across various public sector functions, emphasizing its relevance in revenue administration systems. Further, the study concludes that information transparency has a significant effect on revenue administration in Nairobi City County Government, Kenya. The study also concludes that data immutability has a significant effect on revenue administration in Nairobi City County Government, Kenya. The researcher recommends that the Nairobi City County Government should prioritize the adoption of distributed ledger technology in its revenue administration processes. In addition, Nairobi City County Government should establish a comprehensive data governance framework that defines policies, procedures, and standards for managing data redundancy in revenue administration processes.

Key Words: Blockchain Technology, Revenue Administration, Information Transparency, Data Immutability

Background of the Study

Modern revenue administrations attempt to collect adequate revenue while keeping administration and compliance costs low and treating taxpayers fairly (Betts, 2022). According to Crandall and Kidd (2017) challenges impacting the performance of tax authorities include disparate information sources on taxpayers, an inability to achieve an integrated view of taxpayer liabilities, and difficulty in exchanging data in various formats promptly. Efficiently and effectively collecting revenues and enforcing the revenue laws has been a serious, ongoing problem for revenue authorities worldwide and a topic of discussion by policymakers, scholars, and economists, among others. Despite numerous measures implemented, the revenue gap—the difference between a taxpayer's true revenue liability and the amount of revenue collected—remains a significant concern (Barry, 2017). OECD (2020) argues that the challenges in the existing revenue administration systems hamper revenue authorities' ability to effectively carry out their responsibilities, increase administration and compliance costs, and likely result in a larger revenue gap.

Revenue administration is the execution of the core activities for collecting taxes (IMF, 2018). Revenue administration is closely linked with collecting and managing revenue information. A major goal of revenue administration is to overcome the asymmetry of information between taxpayers and revenue authorities (Orly, 2022). Revenue information originates from various taxpayer activities, but it is not always readily available to the government who must acquire and process the information to enforce the revenue system. Thus, people are required to share revenue information with revenue authorities via various routes (Kosmarski, 2020). This information is sometimes self-reported by taxpayers, such as by filing revenue and information returns, but often the information is reported by third parties including withholding agents or financial institutions, as is the case in the payroll revenue (Crandall & Kidd, 2017). To overcome information asymmetry, the revenue compliance system requires transparency and data immutability.

Blockchain technology is a system of storing and transferring data using distributed ledgers that are secured by cryptography and consensus mechanisms (Kosmarski, 2020). Through the use of a cryptographically encrypted distributed ledger with a consensus process to validate transactions, blockchain technology has the potential to securely record and share information about anything that has value. OECD explains in its report that technology is a solution that can be proposed to anticipate non-compliance that utilizes the advantage of technology (OECD, 2020). Hence, blockchain technology is one of the technologies that can be proposed to anticipate revenue fraud. Blockchain is best suited for an area within the public sector that requires data redundancy, information transparency, data immutability, and a consensus mechanism (Kim, 2021). With these criteria, revenue administration is a strong candidate to incorporate blockchain technology because it requires at least three of the four factors: data redundancy, information transparency, and data immutability.

In the US, the IRS estimated that the annual amount of noncompliance with revenue laws is approximately $381 billion after IRS enforcement efforts are taken into account. This number represents the average net revenue gap, or the difference between what taxpayers are obligated to pay (taxpayers' true revenue liability) and the amount of revenue taxpayers pay (Orly, 2022). As a result, 14.2% of all individual and corporate income taxes, employment taxes, estate and gift taxes, and excise taxes owed go unpaid.

In Africa, ATAF (2017) argues the average cost of revenue administration is considerably higher in Africa compared to OECD economies. On average in 2016 revenue administrations in Africa

spent 1.6 per cent of the revenue collected on operational costs, a marginal increase over the average between 2011 and 2016. In Rwanda, revenue was boosted by 6 per cent through digitization. In South Africa, e-taxation lowered the time (by 21.8 per cent) and cost (by 22 per cent) of complying with the value-added tax (VAT) (Yayman, 2021). In Kenya, digitization of VAT operations helped identify data inconsistencies and raised VAT collections by more than $1 billion between 2016 and 2017 (PwC, 2018). However, despite digitization efforts by the governments, revenue gap has been widening in these developing economies.

Statement of the Problem

The Nairobi City County government has faced persistent challenges in its revenue collection and administration, leading to significant losses and inefficiencies. These issues have been worsened by various factors, including outdated revenue systems, lack of transparency, fraud, data redundancy, and corruption. The existing revenue collection and administration processes are often plagued by manual errors, data inconsistencies, and a lack of real-time monitoring, which hinder the county's ability to optimize revenue generation and effectively allocate resources. Blockchain technology, with its inherent characteristics of transparency, immutability, and decentralization, has the potential to address many of the challenges faced by Nairobi City County in its revenue administration. By leveraging blockchain's secure and tamper-resistant distributed ledger, the county can enhance the integrity of revenue data, reduce the risk of fraud and theft, and improve overall efficiency in revenue collection and management.

Mik and Noked (2021) argue that blockchain could substantially improve revenue administration. Orly (2022) posits that the use of blockchain technology can have an impact on the transparency and effectiveness of taxation (Mangoting, Setiawan & Nuralim, 2023). Contextually, in the Nairobi City County Government, the current revenue system is flawed because the compliance burden on revenue payers is high due to the multiple reporting requirements, and because different county offices collect duplicable data and perform overlapping audits (Mik & Noked, 2021). Consequently, the current revenue administration system suffers from a large revenue gap, high compliance and administrative costs, a lack of transparency, and myriad inefficiencies. The county government suffers major revenue leakages as dishonest revenue officials allow unjustified revenue breaks to obliging revenue evaders. This study seeks to demonstrate why blockchain technology’s core features can provide valuable benefits to revenue administration.

Despite the expansive literature on blockchain technology and the growing necessity to modernize the revenue administration system, the question of how to apply blockchain technology to the revenue administration in devolved government units remains significantly underexplored (Kim, 2021). For instance, the limited scholarship discussing blockchain technology’s potential effect in the revenue administration space generally considers the use of blockchain-based applications to improve particular revenue systems rather than how to adopt blockchain technology to improve the revenue administration space more broadly (Ainsworth, Alwohaibi, & Cheetham, 2019). A study by Mangoting, Setiawan and Nuralim, (2023) focused on bliss effect of taxpayers in adopting blockchain technology. However the study present conceptual gap as it failed to focus on blockchain technology features and their influence on revenue administration. This study sought to fill the gap in the literature by analyzing the blockchain technology influence on revenue administration in county governments in Kenya with special focus on Nairobi City County Government.

General Objective

The general objective of the study is to determine the influence of blockchain technology on revenue administration in Nairobi City County Government, Kenya

Specific Objectives

i. To explore the effect of information transparency on revenue administration in Nairobi City County Government, Kenya.
ii. To find out the effect of data immutability on revenue administration in Nairobi City County Government, Kenya.

Theoretical Review

Network Theory

Understanding and explaining the form and dynamics of a business's external networks—which entail relationships with a variety of parties, including suppliers, rivals, consumers, and other entities with whom the firm is connected—is the primary focus of network theory (Gulati et al., 2000). According to Borgatti and Halgin (2011), network theory has grown in importance as a diagnostic tool for network connections in management consulting. It also explains why businesses should develop high-quality, trust-based relationships with their network partners in order to collaborate with them successfully (Afuah, 2013). Businesses must have a solid cooperative connection in order to acquire outside resources, strengthening the network between businesses (Treiblmaier, 2018).

Network connections could help blockchain firms quickly expand internationally (Zalan, 2018). Establishing trusting relationships with partners can yield significant benefits for firms. Specifically, these relationships can provide an avenue for accessing strategic assets, including knowledge, information, and other crucial resources, as noted by Davis et al. (2000) and Hitt et al. (2001). In the evolving process of corporate partnerships, blockchain technology may assist companies and their partners in establishing trustworthy relationships, hence fostering reciprocal trust (Tian, 2016). The primary goal of blockchain technology is to build trust between businesses via interactive procedures and cooperative relationships. Network theory may be used to examine how business networks interact from a blockchain viewpoint. Managers can learn whether personal relationships can be replaced by the information exchange provided by blockchain technology by forming partnerships and promoting information transparency between businesses (Kummer et al., 2020).

The Theory of Artificial Immutability

Sandra Wachter (1956) developed the Theory of Artificial Immutability. The theory proposes that in digital systems, particularly in the context of distributed ledgers and blockchain technology, the intentional design and implementation of immutability mechanisms are crucial for ensuring the integrity, transparency, and trustworthiness of data. Artificial immutability relies on decentralized architectures where data is distributed across multiple nodes or participants in a network. Each node maintains a copy of the data and participates in the consensus process to validate and append new transactions or blocks to the ledger. Decentralization ensures that no single entity can unilaterally modify or manipulate the data, thus enhancing its immutability.

Cryptographic hashing functions play a fundamental role in achieving artificial immutability. Each block of data is cryptographically hashed, creating a unique digital fingerprint or "hash"

that serves as a tamper-evident seal. Any attempt to alter the data within a block would result in a change to its hash value, immediately alerting network participants to the unauthorized modification. Artificial immutability relies on consensus mechanisms to ensure agreement among network participants on the validity and ordering of transactions. By reaching consensus through protocols such as Proof of Work (PoW), Proof of Stake (PoS), or Practical Byzantine Fault Tolerance (PBFT), the network establishes a single, immutable history of transactions that cannot be altered without the collusion of a majority of participants.

Blockchain data structures, such as Merkle trees or Directed Acyclic Graphs (DAGs), contribute to artificial immutability by organizing data in a manner that facilitates efficient verification and validation. These structures enable rapid traversal and verification of data integrity, even in large-scale distributed systems, enhancing the immutability of the overall ledger. Artificial immutability involves designing systems with built-in mechanisms for detecting and resisting tampering attempts. This includes cryptographic signatures, digital timestamps, and immutable audit trails that provide robust protection against unauthorized modifications or deletions. This study used The Theory of Artificial Immutability to assess the effect of data immutability on revenue administration in Nairobi City County Government, Kenya.

Conceptual Framework

A conceptual framework serves as the theoretical foundation for a research study, providing a structure to guide the investigation and analysis of the research problem. The conceptual framework helps researchers organize their thoughts, identify key variables, and understand the relationships between these variables.

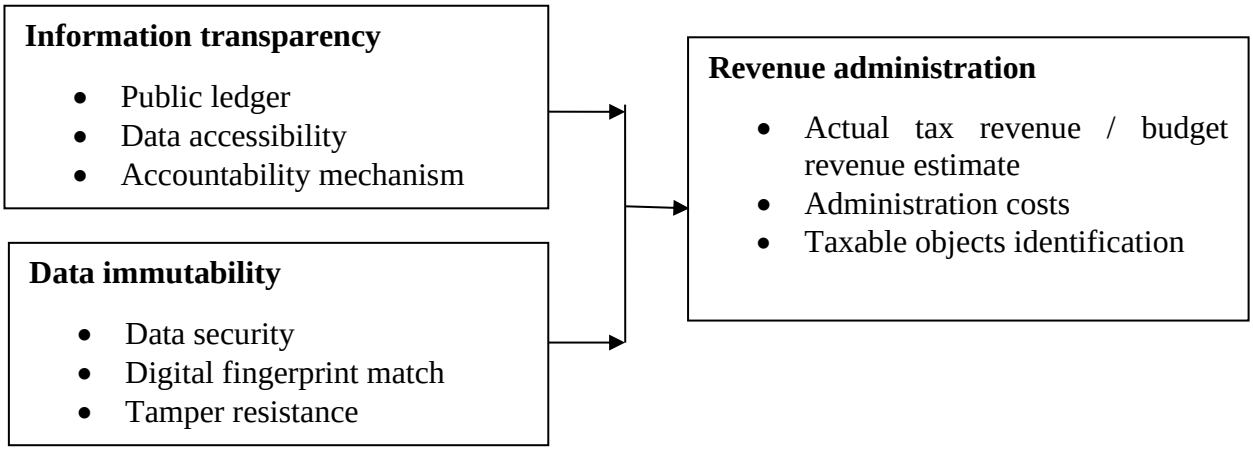

Figure 2. 1: Conceptual Framework

Information Transparency

The visibility and accessibility of data contained in a block on the network are referred to as data transparency in the context of blockchain technology. Because blockchain technology increases transaction transparency, it can have a major positive impact on tax administration. It does this by producing a transparent audit trail of all transactions made on the blockchain, which enhances data accessibility across many counterparties, allows a wider range of transactions and business processes to be traced, and facilitates the potential for real-time reporting. By making it simpler to communicate and share data with other government agencies, tax authorities, and third-party reporters, this openness enhances the visibility of many transactions and can assist tax authorities in overcoming some of the information restrictions they now confront.

It is crucial to remember that this technology will not be able to address every informational limitation now faced by the IRS, including those pertaining to cash transactions and revenue from self-employment. However, because blockchain technology makes it easier for tax authorities to participate in a wider range of automated information sharing regimes, it may enhance the visibility of cross-border transactions. Different proprietary systems are commonly used by organizations, which makes it challenging to exchange pertinent information with parties outside of the business. By enabling authorized users to directly access the same copy of the shared database within and between companies, blockchain technology solves these problems.

Furthermore, blockchain technology may promote transparency since it makes it simpler for users to identify the information's original source than it would be with other technologies. This is due to the fact that entries are signed with "a unique cryptographic signature that proves the right participant has added the right record according to the right rules" before being added to the blockchain. This aspect of the blockchain framework gives all authorized parties access to verifiable records and further strengthens the system's credibility.

Blockchain technology is designed to facilitate peer-to-peer transactions between parties that lack complete trust in one another or in a central authority to verify transactions or resolve conflicts. The parties may rely on technology to capture the information in a tamper-proof manner even if they have little faith in one another. As a result, trust is built and the system becomes visible. To create this kind of confidence, blockchain uses a consensus method. Consensus techniques guarantee that every node spread out over the network adds the same new block by formulating a set of rules that all nodes have agreed to abide by. All users in the system are guaranteed confidence since these protocols are implemented by code and are easily testable by comparing the output of each node to that of every other node in the system.

Data Immutability

One of the main features of blockchain technology is data immutability. on a blockchain, data immutability describes how difficult it will be to change or modify the data that already exists on the blockchain. It implies that once data is saved on a network, it cannot be modified and will always be available. The nature of the blockchain network is linear. This indicates that it can only function in a single way, i.e., every single block of data is connected to every other block, making it impossible for anybody to alter. If someone does this, the network as a whole is interrupted, which compromises data privacy.

Cryptographic methods that offer a mathematical guarantee that the data cannot be compromised safeguard data secured by blockchain. Blockchain prevents tampering by accounting for all data access. Organizations utilize several measures such as firewalls, audit trails, multiple approvers, access restrictions, and reconciliation to guarantee data immutability in databases. Even with these methods in place, the data kept in the database is subject to change. It indicates that after gaining access to the data, those with sufficient authorization and access privileges can change it. This is where blockchain technology's immutability shines.

Every effort to alter data would be visible as the new digital fingerprint would not match the old one since data is registered in the blockchain using a digital fingerprint that contains a date and time stamp. Since information stored in blockchains is immutable and, in principle, eternal, they are frequently viewed as trustworthy record-keeping technologies. "Immutability" is the term used to describe this quality. We have to distinguish between three scenarios to make sense of the alleged significance of immutability for tax administration. It is possible to associate

immutability with blockchain code, off-chain event data, and cryptocurrency and token transactions.

In the first scenario, a transaction cannot be undone or altered after it has been approved for inclusion in a block and added to the blockchain. That being said, this capability is not very important for systems that are utilized for tax administration. Tax administration typically deals with data that is off chain, or existing in the real world.

An authorized user can often see, edit, and even permanently remove data stored in a database in a conventional database system. However, information stored on a blockchain is unchangeable. It is very difficult to go back and change the contents of the block once the data has been added and published onto the blockchain. A hashing algorithm is used by blockchain systems to link each block in a sequence that cannot be broken without breaking the rest of the chain.

Empirical Review

Information Transparency and Revenue Administration

In 2020, Setyowati, Utami, Saragih, and Hendrawan conducted research on the use of blockchain technology in value-added tax systems. This study aims to examine the potential applications of blockchain technology models in the VAT system, namely in the e-Invoice system. This study examined blockchain technology models that may be implemented in a VAT system using a qualitative methodology. Two methods of gathering data were literature studies, which involved reading literary works that were relevant to the research issues, and field studies, which involved interviewing well-known speakers in-depth. The main data gathering was place between August and December 2019 for around five months. A qualitative data analysis approach was employed for the data analysis. The study's findings suggest that blockchain technology is only suitable for taxpayer data that does not need to be private because of its inherent properties.

Gitaru (2019) researched on the Impact of system automation on revenue Collection in Kenya Revenue Authority. The results established that the revenue collected was directly proportional to the exchange rates due to the positive sign in the coefficient. The number of transactions, as predicted by the econometric model, has positive relationship with revenue collection process. In conducting analysis of variance in the Gretl software, the probability value of p-value 2.6e-013 was obtained showing that the regression model was significant in predicting the relationship all the coefficients and revenue collected at 95% level of significance. The study findings established that there was a significant increase in the revenue collected after the automation to the simba system. In view of number of transactions completed, the numbers of transactions were more in the period after the automation to Simba system as shown in the figure above.

Data Immutability and Revenue Administration

Olonde (2020) conducted a study on the effect of information technology on tax compliance by Kenya Revenue Authority in Nairobi, Kenya. . The target population was all the I.T staff at the Kenya Revenue Authority who are based at The Times Towers who were 65 in number. Purposive sampling technique was used to identify respondents and they were 46 so as to be adequately representative. A questionnaire was the tool for data collection and was sent to the respondents through email. The data was thereafter analyzed using descriptive statistics which include means and standard deviation, and inferential statistics which was regression analysis. The study findings indicated that in general, information technology has an effect on tax compliance i.e. taxpayers' registration, filing of returns, and income declaration. The study also

found that iTax system has an effect on tax compliance to a very great extent and also well accepted by users, while data analytics and blockchain technology have an effect on tax compliance to a great extent and also the acceptance of the technologies are well accepted

Malonza (2016) also conducted a study analyzing the effect of iTax use on corporation tax compliance by medium corporate taxpayers in Kenya. The compliance was measured in terms of filing, reporting, and payment. The study was done through a descriptive research design where data was collected using a questionnaire that was sent to the taxpayers. The study had a population of 1,500 where 75 taxpayers were selected for the data collection. The study findings indicated that the use of iTax led to enhanced compliance by medium taxpayers in Kenya.

RESEARCH METHODOLOGY

Research Design

The purpose of this study is to ascertain how revenue administration and blockchain technology are related; it does not provide long-term trends. For the purpose of evaluating the connection, one round of data collection is sufficient. As a result, this study uses a cross-sectional time range that would be both economical and somewhat accurate. Given the short amount of time allotted to conduct this research, a cross-sectional design is acceptable (Creswell, 2015). Additionally, the design enabled the researcher to examine variations among groups and gather data from a sizable subject pool.

Target Population

A population is an entire group of individuals, events or objects having common characteristics that conform to a given specification (Cooper & Schindler, 2016). The study unit of analysis was ICT and Revenue sections in Nairobi City County Government. The unit of observation was senior and middle level staff drawn from ICT and Revenue sections.

Table 3. 1: Population Size

Strata	Target Population	Percentage
Revenue Section	451	83.5
ICT Section	89	16.5
Total	**540**	**100%**

Source; NCG HR (2023)

Sample Size and Sampling Technique

The study employed multistage sampling techniques involving purposive sampling and simple random sampling techniques. Purposive sampling was utilized to select those units which directly or indirectly deal with revenue administration. Then, simple random sampling was used to assign a cluster sample. Simple random sampling helped minimize bias and increase the generalizability of the results.

To calculate the sample size needed for a given population with a 95% confidence level and a margin of error of 0.05, the researcher used Fisher, Laing and Stoeckel (1983) formula.

$n = [Z^2.p\ (1-p)/E^2]$

Where:

n= required sample size

Z = Z-score corresponding to the desired confidence level (for a 95% confidence level, the Z-score is approximately 1.96)

p = estimated proportion of the population (0.5) to give the maximum sample size required

E= margin of error

$n = [1.96^2 . 0.5(1-0.5)/0.05^2]$

n = 384.16

Table 3. 2: Sample Proportion

Strata	Target Population	Sample Proportion
Revenue Officers	451	321
ICT Officers	89	63
Total	**540**	**384**

Data Collection Instruments

Research instruments are measurement tools that are designed to obtain data on the research topic (Creswell, 2015). This study used both primary data and secondary data. Primary data was collected by use of semi-structured questionnaires which were developed based on the research objectives.

Data Collection Procedures

The data collection procedures involved getting the authority letter from Jomo Kenyatta University of Agriculture and Technology and Nairobi City County government. Prior to data collection, the respondents were briefed concerning the purpose of the study. The structured questionnaires were administered through 'drop and pick later' method. This gave respondents ample time to fill the questionnaires. The filled questionnaires were collected within two weeks and any follow ups were done through calls where necessary.

Pilot Study

Pilot study is a small scale study aimed at checking the data collection toll internal consistency and validity prior to actual data collection (Kothari, 2014). A pilot study was conducted on 39 respondents drawn from Finance department in Kiambu County government to test the readiness of the research instruments. The pilot study is supported by Riel (2016) who recommends that a minimum pilot test of 10% of the target population can be used for pilot testing.

Data Analysis and Presentation

The study utilized Statistical Package for Social Sciences (SPSS version 29) as a data analysis tool. For data analysis techniques, the study used both descriptive and inferential analyses. Descriptive statistics were used as a measure of central tendencies and measures of dispersion (mean and standard deviation). Multiple regression analysis was conducted to test whether the strength of the relationship between the independent variables and the dependent variable are statistically significant.

DATA ANALYSIS AND PRESENTATIONS

Descriptive Statistics

Information Transparency and Revenue Administration

The first specific objective of the study was to explore the effect of information transparency on revenue administration in Nairobi City County Government, Kenya. The respondents were requested to indicate their level of agreement on various statements relating to information transparency and revenue administration in Nairobi City County Government, Kenya. A 5-point Likert scale was used where 1 symbolized strongly disagree, 2 symbolized disagree, 3 symbolized neutral, 4 symbolized agree and 5 symbolized strongly agree. The results were as presented in Table 4.1.

From the results, the respondents agreed that the transaction data is made visible to all parties concerned. This is supported by a mean of 3.943 (std. dv = 0.986). In addition, as shown by a mean of 3.926 (std. dv = 0.840), the respondents agreed that the transaction data is accessible to all network members. Further, the respondents agreed that the technology provides for accountability mechanisms. This is shown by a mean of 3.846 (std. dv = 0.879). The respondents also agreed that the tax payer is able to know tax payable due. This is shown by a mean of 3.831 (std. dv = 0.904).

Table 4. 1: Information Transparency and Revenue Administration

	Mean	Std. Deviation
The transaction data is made visible to all parties concerned	3.943	0.986
The transaction data is accessible to all network members	3.926	0.840
The technology provides for accountability mechanisms	3.846	0.879
The tax payer is able to know tax payable due	3.831	0.904
Aggregate	**3.788**	**0.897**

Data Immutability and Revenue Administration

The second specific objective of the study was to find out the effect of data immutability on revenue administration in Nairobi City County Government, Kenya. The respondents were requested to indicate their level of agreement on various statements relating to data immutability and revenue administration in Nairobi City County Government, Kenya. A 5-point Likert scale was used where 1 symbolized strongly disagree, 2 symbolized disagree, 3 symbolized neutral, 4 symbolized agree and 5 symbolized strongly agree. The results were as presented in Table 4.2.

From the results, the respondents agreed that the blockchain technology guarantees data security. This is supported by a mean of 3.891 (std. dv = 0.865). In addition, as shown by a mean of 3.818 (std. dv = 0.945), the respondents agreed that there is digital fingerprint match in the revenue administration system. Further, the respondents agreed that the transactions are secures stored for future reference. This is shown by a mean of 3.808 (std. dv = 0.611). The respondents also agreed that the transactions are tamper resistance. This is shown by a mean of 3.721 (std. dv = 0.908).

Table 4. 2: Data Immutability and Revenue Administration

	Mean	Std. Deviation
The blockchain technology guarantees data security	3.891	0.865
There is digital fingerprint match in the revenue administration system	3.818	0.945
The transactions are secures stored for future reference	3.808	0.611

The transactions are tamper resistance	3.721	0.908
Aggregate	**3.825**	**0.758**

Correlation Analysis

The present study used Pearson correlation analysis to determine the strength of association between independent variables (information transparency and data immutability) and the dependent variable (revenue administration in Nairobi City County Government, Kenya). Pearson correlation coefficient range between zero and one, where by the strength of association increase with increase in the value of the correlation coefficients.

Table 4. 3: Correlation Coefficients

		Revenue Administration	Information Transparency	Data Immutability
Revenue Administration	Pearson Correlation	1		
	Sig. (2-tailed)			
	N	369		
Information Transparency	Pearson Correlation	.821**	1	
	Sig. (2-tailed)	.002		
	N	369	369	
Data Immutability	Pearson Correlation	.867**	.278	1
	Sig. (2-tailed)	.000	.076	
	N	369	369	369

The results revealed that there is a very strong relationship between information transparency and revenue administration in Nairobi City County Government, Kenya (r = 0.821, p value =0.002). The relationship was significant since the p value 0.002 was less than 0.05 (significant level). The findings are in line with the findings of Wenbo and Qin (2020) that there is a very strong relationship between information transparency and revenue administration.

The results also revealed that there was a very strong relationship between data immutability and revenue administration in Nairobi City County Government, Kenya (r = 0.867, p value =0.000). The relationship was significant since the p value 0.000 was less than 0.05 (significant level). The findings are in line with the results of Otim (2017) who revealed that there is a very strong relationship between data immutability and revenue administration.

Regression Analysis

Multivariate regression analysis was used to assess the relationship between independent variables (information transparency and data immutability) and the dependent variable (revenue administration in Nairobi City County Government, Kenya)

Table 4. 4: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.931	.857	.858	.10428

a. Predictors: (Constant), information transparency and data immutability

The model summary was used to explain the variation in the dependent variable that could be explained by the independent variables. The r-squared for the relationship between the independent variables and the dependent variable was 0.857. This implied that 85.7% of the variation in the dependent variable (revenue administration in Nairobi City County Government,

Kenya) could be explained by independent variables (information transparency and data immutability).

Table 4. 5: Analysis of Variance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	141.081	2	70.54	3562.63	.000[b]
	Residual	7.254	366	.0198		
	Total	148.335	368			

a. Dependent Variable: Revenue Administration

b. Predictors: (Constant), information transparency and data immutability

The ANOVA was used to determine whether the model was a good fit for the data. F calculated was 3562.63 while the F critical was 2.396. The p value was 0.000. Since the F-calculated was greater than the F-critical and the p value 0.000 was less than 0.05, the model was considered as a good fit for the data. Therefore, the model can be used to predict the influence of information transparency and data immutability on revenue administration in Nairobi City County Government, Kenya.

Table 4. 6: Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.245	0.065		3.769	0.000
	Information transparency	0.357	0.098	0.356	3.643	0.002
	Data immutability	0.375	0.099	0.376	3.788	0.001

a Dependent Variable: revenue administration

The regression model was as follows:

$$\mathbf{Y = 0.245 + 0.357X_1 + 0.375X_2}$$

The results revealed that information transparency has significant effect on the revenue administration in Nairobi City County Government, Kenya, $\beta 1=0.357$, p value= 0.002). The relationship was considered significant since the p value 0.002 was less than the significant level of 0.05. The findings are in line with the findings of Wenbo and Qin (2020) that there is a very strong relationship between information transparency and revenue administration.

In addition, the results revealed that data immutability has significant effect on the revenue administration in Nairobi City County Government, Kenya, $\beta_1=0.375$, p value= 0.001). The relationship was considered significant since the p value 0.001 was less than the significant level of 0.05. The findings are in line with the results of Otim (2017) who revealed that there is a very strong relationship between data immutability and revenue administration.

Conclusions

The study concludes that information transparency has a significant effect on revenue administration in Nairobi City County Government, Kenya. The study findings revealed that public ledger, data accessibility and accountability mechanism influence revenue administration in Nairobi City County Government, Kenya.

The study also concludes that data immutability has a significant effect on revenue administration in Nairobi City County Government, Kenya. The study findings revealed that data

security, digital fingerprint match and tamper resistance influence revenue administration in Nairobi City County Government, Kenya.

Recommendations

This study recommends that Nairobi City County Government should consider implementing public ledger systems to enhance information transparency in revenue administration processes. Public ledgers provide a tamper-proof and transparent record of transactions, promoting accountability and trust among stakeholders.

Nairobi City County Government should prioritize the enhancement of data security measures to protect revenue administration data from unauthorized access, manipulation, or theft. This includes implementing encryption, access controls, firewalls, and intrusion detection systems to safeguard sensitive information.

REFERENCES

Afuah, A. (2013). Are network effects really all about size? The role of structure and conduct. *Strategic Management Journal, 34*, 257–273. doi: 10.1002/smj.2013.

Ainsworth, R. T., Alwohaibi, M. & Cheetham, M. (2019), A High-Tech Proposal for the U.K. and Saudi-VATs: Fighting Fraud with MiniBlockchains and VATCoins, *Tax Notes International, 511*, 526–539.

Alharthi, S., Cerotti, P.R. & Far, S.M., (2020), An exploration of the role of blockchain in the sustainability and effectiveness of the pharmaceutical supply chain, *Journal of Supply Chain and Customer Relationship Management 2020,* 562376. https://doi. org/10.5171/2020.562376

Aketch, S. ., Mwambia, F. ., & Baimwera, B. . (2021). Effects of blockchain technology on the performance of financial markets in Kenya. International Journal of Finance and Accounting, 6(1), 1 – 15. https://doi.org/10.47604/ijfa.1237

Barry, W. J. (2017), Federal tax compliance research: Revenue gap estimates for tax years 2011–2013, 2019 4–5 https://bit.ly/3aN6iSg; James Alm & Jay A. Soled, W(h)ither the Tax Gap?, *Washington Law Review, 521*, 527–28. 3. S

Betts, S. (2022), Revenue administration compliance risk management framework to drive revenue performance. *IMF Technical Notes and Manuals 2022/005*, Fiscal Affairs Department, IMF

Crandall, W. & Kidd, M. (2017). Revenue administration: A toolkit for implementing a revenue authority. *IMF Technical Notes and Manuals.* Washington, DC: IMF.

Creswell, (2015), *Research design: Qualitative, quantitative, and mixed methods approaches,* Los angeles Univ. Nebraska–Lincoln.

Dai, X. (2021), *Research on the scalable storage mechanism for blockchain systems.* Ph.D. Thesis, Huazhong University of Science and Technology, Wuhan, China, 2021.

Dai, J. & Vasarhelyi, M.A. (2017), Toward Blockchain-Based Accounting and Assurance, *Journal of Information Systems, 31*(3), pp. 5–21.

Fatz, F., Hake, P., & Fettke, P. (2020), Confidentiality-preserving Validation of Tax Documents on the Blockchain. In: Proc. 15. *Internationale Tagung Wirtschaftsinformatik* (WI 2020). 2020.

IMF (2018), *Revenue Administration Diagnostic Assessment Tool (TADAT) Program Document*. The International Monetary Fund, Washington.

Kamau, G., Boore, C., Maina, E., & Njenga, S. (2018, May). Blockchain Technology: Is this the Solution to EMR Interoperability and Security Issues in Developing Countries? In 2018 IST-Africa Week Conference (IST-Africa) (pp. Page-1). IEEE.

Kibet, A., Thiga, M. M., Karume, S. M., & Nakuru, K. (2019). Towards A Blockchain-Based Smart Contracts Model Design For Housing Market Applications. *International Journal of Advanced Research in Computer Engineering & Technology (IJARCET), 8(8).*

Kim, Y. R. (2021), *Blockchain initiatives for Revenue administration.* 69 UCLA Law Review 240 (2022), University of Utah College of Law Research Paper No. 427.

Kosmarski, A. (2020), Blockchain adoption in academia: Promises and challenges. *Journal of Open Innovation: Technology. Market and Complexity, 6,* 117; doi:10.3390/joitmc6040117

Mangoting, Y., Setiawan, P. A., & Nuralim, E. (2023). Bliss effect of taxpayers in adopting blockchain technology. *Journal of Accounting and Investment, 24*(2), 408-426.

Richard, T. A., Musaad, A., & Mike, C. (2019), A High-Tech Proposal for the U.K. and Saudi-VATs: Fighting Fraud with MiniBlockchains and VATCoins, *Tax Notes International, 511*, pp. 526–39.

Saragih, S. M. F. & Setyowati, M. S. (2019), *E-Readiness of Blockchain Technology in Modernization of Tax Administration in Indonesia.* Unpublished Thesis, University of Indonesia, Indonesia.

Setyowati, M. S., Utami, N. D., Saragih, A. H. & Hendrawan, A. (2020), Blockchain Technology Application for Value-Added Tax Systems. *Journal of Open Innovation: Technology, Market and Complexity, 6,* 156; doi:10.3390/joitmc604015

Tian, Z. (2018), *Research on Distributed File Placement Algorithm without Depending on Popularity Information.* Master's Thesis, Xi'an University of Science and Technology, Xi'an, China, 2018.

Tornatzky, L. G., & Fleischer, M. (1990), *The Process of Technological Innovation,* Lexington, MA: Lexington Books.

Treiblmaier, H. (2018). The impact of the blockchain on the supply chain: A theory-based research framework and a call for action. *Supply Chain Manag. 23*, Pp. 545–559. doi: 10.1108/SCM-01-2018-0029

Troncia, M., Galici, M., Mureddu, M., Ghiani, E., & Pilo, F. (2019), Distributed Ledger Technologies for Peer-to-Peer Local Markets in Distribution Networks. *Energies, 12*, Pp. 3249. https://doi.org/10.3390/en12173249

Yayman, D. (2021). Blockchain in Revenue Administration. *Journal of Accounting and Finance, 21*(4), 140-155. https://doi.org/10.33423/jaf.v21i4.4530

Wang, M. & Yang, Y. (2022), An empirical analysis of supply chain flexibility using blockchain technology. *Frontiers in Psychology, 13,* 1004007.

World Bank (2023), *Blockchain & Distributed ledger technology*. Retrieved from https://www.worldbank.org/en/topic/financialsector/brief/blockchain-dlt