Int. j. adv. multidisc. res. stud. 2026; 6(3):821-834

Received: 05-04-2026
Accepted: 15-05-2026

International Journal of Advanced Multidisciplinary Research and Studies

ISSN: 2583-049X

Blockchain Adoption and Accounting Transparency in Africa

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Abstract

This study investigates the relationship between blockchain adoption and accounting disclosure quality among listed firms in Africa, with particular emphasis on institutional context and internal governance mechanisms. Motivated by persistent concerns over accounting opacity and weak enforcement in many African capital markets, the study conceptualises blockchain not merely as a technological innovation but as a governance-enhancing infrastructure capable of improving reporting credibility. Drawing on a cross-sectional sample of listed firms across selected African countries over the period 2016–2024, the analysis employs a composite accounting disclosure quality index and firm-level blockchain adoption indicators. To address self-selection bias inherent in voluntary technology adoption, the study applies propensity score matching combined with multivariate regression techniques.

The empirical results provide robust evidence that blockchain adoption is positively associated with higher accounting disclosure quality. Importantly, this relationship remains statistically and economically significant after matching adopters with comparable non-adopters. Further analysis reveals that the transparency-enhancing effect of blockchain adoption is significantly stronger in weaker institutional environments, supporting the view that blockchain functions as a substitute governance mechanism where formal regulatory enforcement is limited. Complementary case study evidence illustrates that these effects operate primarily through improved internal controls, enhanced auditability, and more consistent reporting practices.

The study contributes to the accounting and governance literature by providing the first large-sample firm-level evidence from Africa on blockchain adoption and disclosure quality, advancing methodological rigor through matching-based inference, and offering policy-relevant insights for regulators, firms, and auditors seeking to strengthen financial reporting transparency in emerging markets.

Keywords: Blockchain Adoption, Accounting Transparency, Disclosure Quality, Institutional Quality, Internal Controls, Africa

1. Introduction

1.1 Background and Motivation

The issue of transparency in accounting is still a major challenge in many capital markets in Africa. This is because of poor enforcement systems and institutional structures in many of these countries. Empirical studies conducted in many emerging countries have shown a high correlation between poor disclosure systems and increased earning manipulation activities. This is also true in countries with poor regulatory systems and audit quality (Ahmed *et al*., 2021; Boateng *et al*., 2023) [1, 3]. Despite many improvements in corporate and financial reporting standards in Africa, concerns about transparency and credibility still remain.

Under this context, it may be argued that the emergence of blockchain technology offers an unprecedented opportunity to revolutionize the accounting function. Blockchain offers mechanisms that have the inherent ability to revolutionize the way in which financial information is prepared and disclosed. Accounting and information systems literature has argued that blockchain-based information disclosure systems have the ability to improve internal controls and reduce managerial discretion in disclosed financial information (Dai & Vasarhelyi, 2022 [6]; Schmitz & Leoni, 2019; Yermack, 2020 [21]). These characteristics of blockchain not only position it as an innovation in technology but also in governance.

Despite the increasing trend of blockchain-based application usage by businesses in various economies around the world, research in the field of accounting has been dominated by developed economies as well as some of the prominent economies in

Asia. As far as Africa is concerned, this issue of institutional voids might make the scope of technological benefits in governance more relevant; thus, there is a lack of research in this important area of accounting.

1.2 Problem Statement

Despite the theoretical and normative foundations that argue that the adoption of blockchain technology should result in increased transparency in accounting, there still lacks sufficient empirical validation, especially in Africa. Existing research often employs descriptive approaches to case analysis and surveys that provide little insight into whether improvements in disclosure quality result from the adoption of blockchain technology at the firm level (Fullana & Ruiz-Monterrey, 2023 [9]; Wang *et al*., 2021). Additionally, many quantitative approaches fail to address endogeneity issues arising from self-selection, where firms that adopt blockchain technologies tend to be larger, more governed, and more transparent to begin with.

Such methodological constraints pose important questions regarding the interpretation of causality. In the absence of specific control variables for selection bias, the extent to which the improvement in transparency can be linked to the use of blockchain technology remains questionable, compared to the underlying firm-specific factors that might be present before the study's sample period. In addition, the lack of inclusion of African firms in the study on the relationship between blockchain technology and accounting adds constraints on the global study's applicability to an environment that is characterized by lower levels of enforcement and information risk.

1.3 Research Objectives and Questions

In response to these gaps, the primary objective of this study is to empirically examine whether blockchain adoption enhances accounting transparency among African firms. Specifically, the study seeks to address the following research questions:

1. Does blockchain adoption lead to higher accounting disclosure quality among listed firms in Africa?
2. Are the transparency effects of blockchain adoption stronger in firms operating within weaker institutional and regulatory environments?

By addressing these questions, the study provides a structured empirical assessment of blockchain's governance role in financial reporting within emerging markets.

1.4 Contributions of the Study

The current study also provides several specific contributions to accounting literature. First, this study provides empirical evidence from Africa, which explores the linkages that exist between blockchain adoption and accounting disclosures, thus extending existing literature that has focused predominantly on a specific geographical region. Secondly, this study also provides a methodological contribution through its adoption of a combination of disclosure quality indices and firm-level blockchain adoption measures, as well as a technique that applies PSM in order to address issues of self-selection bias, thus creating a more robust methodological contribution in this specific field of study. Thirdly, this study also provides a contribution in that, through its empirical results, a specific policy contribution is made, which is relevant in a specific geographical region, thus creating a contribution in this regard.

1.5 Structure of the Paper

The remainder of the paper is structured as follows: Section 2 reviews the conceptual and theoretical literature on blockchain technology in relation to accounting transparency; Section 3 develops the theoretical framework; Section 4 outlines the research design, data selection, variable measurement, as well as the research methodology; Section 5 reports on the research findings; Section 6 presents additional case study evidence; Section 7 reflects on the implications of the research findings; Section 8 concludes with policy implications, limitations of the study, as well as avenues for future research.

2. Conceptual and Theoretical Framework

2.1 Conceptual Review

2.1.1 Blockchain Technology in Accounting and Financial Reporting

Blockchain tech, for example, is a type of decentralised distributed ledger tech that enables a series of transactions to be stored in a chronological order. Unlike a conventional centralised system of record-keeping, this type of distributed ledger tech enables financial data to be virtually unalterable once it has been validated or added to a data record. This feature of virtual unalterability has a number of far-reaching effects for financial reporting, particularly with regard to audit trails or data accuracy within financial statements themselves (Dai & Vasarhelyi, 2022 [6]; Liu *et al*., 2021).

From an accounting perspective, blockchain technologies alter the architecture of information production rather than enhancing the outputs of financial reporting. The ability of blockchain technologies to embed transactions within a common ledger that is accessible to authorized stakeholders eliminates the need to rely on reconciliation, verification, and discretionary modifications of the records. Recent research in accounting literature has suggested that blockchain technologies can contribute to the enhancement of the quality of internal controls, minimize asymmetry of information, and limit opportunistic earnings management, especially in environments where enforcement is weak (Demirkan *et al*., 2020; Yermack, 2020) [7, 21]. Therefore, blockchain technologies can be seen as a technological governance approach that can complement, or even replace, traditional forms of formal regulation.

Yet another transformative aspect of accounting systems, which is made possible by the presence of a blockchain, is the incorporation of smart contracts. Smart contracts refer to a set of digital rules, which, when triggered by a set of pre-specified criteria, can lead to their automatic execution. Within the realm of financial reporting, smart contracts can lead to the automatic recognition of revenues, expenses, and compliance, thus eliminating any managerial biases in this regard. As such, smart contracts can challenge the traditional model of periodic reporting, which is currently being followed by most firms in their corporate disclosure practices.

Notably, the applicability of blockchain-based accounting systems assumes greater significance in emerging or developing countries. In the case of African countries, accounting infrastructure gaps, non-enforcement of audit rules, and an overall lack of regulation have made the implementation of blockchain systems an attractive option without the need for an immediate overhaul of the system in

place. While the rationale behind the potential advantages offered by blockchain systems appears sound from a conceptual perspective, there remains a need for an empirical examination in an African context.

2.1.2 Accounting Transparency and Disclosure Quality

Transparency in accounting relates to the level to which financial reports reflect relevant, timely, complete, and accurate information to assist stakeholders in making proper decisions. Accounting transparency does not only relate to whether financial reports comply with relevant regulations but also to their clarity, consistency, and verifiability. Therefore, having a high level of accounting transparency can help to overcome agency problems in terms of information asymmetry between managers and external stakeholders, which can contribute to capital market efficiency and corporate accountability (Bushman *et al*., 2021; Leuz & Wysocki, 2016).

In most cases, transparency is used to refer to transparency in a given company, where transparency is normally gauged by a disclosure quality index that systematically evaluates the depth of disclosure in a given company's report. The disclosure quality index is used to capture various dimensions of transparency, including financial completeness, narrative transparency, governance transparency, risk transparency, and, most recently, technology-based assurance attributes, such as those proposed by Hoitash *et al*. (2022) [13] and Hassan & Marston (2020) [12].

In particular, the application of disclosure indices is more appropriate in weak institutional settings, in which the quality of enforcement is not fully effective in governing the quality of reporting. In such an environment, voluntary disclosure patterns and the quality of the governance structure are more important in influencing transparency. Previous studies have found the presence of higher variability in the quality of disclosure in companies operating in an environment with poor regulatory quality. In such an environment, the application of the disclosure index is more appropriate in distinguishing the differences in transparency (Ahmed *et al*., 2021; Boateng *et al*., 2023) [1, 3].

Most importantly, the intersection of blockchain adoption and disclosure quality creates a new dimension for measuring transparency, which centers on the role of blockchain technology in enhancing the verifiability and timeliness attributes of disclosure through the embedding of transaction-level data within an immutable audit trail, which enables real-time access to verified information. Therefore, this study follows the aforementioned argument by employing a disclosure quality index, which is particularly useful for measuring the effects of blockchain adoption on the level of transparency in financial reporting, including the role of this technology in enhancing the level of accounting transparency for firms in Africa.

2.2 Theoretical Framework

The relationship between blockchain adoption and transparency in African firms can be best understood using an integrated theoretical approach that views technology as more than just an operating tool, but also as one that can be leveraged as a tool of firm governance and disclosure. In that respect, in an environment that is marked by weak legal enforcement, high levels of asymmetry, and heterogeneity in firm-level governance, the relationship between blockchain adoption and transparency can best be understood using an integrated approach that combines Agency Theory, Institutional Theory, and Signaling Theory.

From an 'agency theory' perspective, the fundamental drivers of accounting transparency are best described as conflicts of interests between management and outside stakeholders due to differential access to information. Agency problems are likely exacerbated for several African firms due to their highly concentrated ownership structures and low levels of shareholder activism. Audit quality may also vary significantly. Blockchain technology can address this problem by recording every transaction as an immutable 'time stamp' that limits management flexibility regarding recording dates and times. The result is reduced information asymmetry and earnings management opportunities, thus aligning management interests with shareholder interests (Dai & Vasarhelyi, 2022; Rozario & Vasarhelyi, 2021) [6, 17]. In this context, we can see that blockchain acts as an internal control mechanism designed to reduce 'agency costs' by technological means.

Nonetheless, it has to be acknowledged that agency mitigating factors' effectiveness is subject to certain contingencies depending on the general institutional setting within which business transactions take place. The Institutional Theory, in this regard, has offered invaluable insights into factors which could explain why blockchain adoption could prove to be a salient factor in business governance in Africa. As Institutional Theory posits, in business environments characterized by low institutional quality, in terms of regulatory control, efficiency in the application of laws, and accounting control, businesses often seek to compensate by applying other control systems in their quest to achieve credibility in their financial reports. The adoption of technology, in this regard, proves to be a salient factor in business governance, which seeks to compensate for low institutional quality (North, 1990; Boateng *et al*., 2023) [16, 3]. Empirical research findings on previous studies indicate that in business environments characterized by low institutional quality, firm-level innovation in terms of business technologies has a more profound effect on business transparency compared to business environments characterized by high institutional quality (Ahmed *et al*., 2021; Demirkan *et al*., 2020) [1, 7]. Apart from the internal corporate governance and institutional factors, the adoption of blockchain technology also has critical implications for the firm's signaling role in the capital markets. Signaling theories, for example, assert the role of firms' voluntary adoption of costly practices, which are also observable, to transmit private information to external stakeholders, particularly with respect to the firm's quality and credibility. By adopting blockchain technology, firms incur a costly commitment to the development of the technology, processes, and disclosure, which makes the practice a strong credibility-enhancing strategy for firms, particularly because low-quality firms are unlikely to mimic the costly practice of adopting the technology, as argued by Spence (1973) [18] and Yermack (2020) [21]. In the context of the African financial environment, which is characterized by a high level of information risk, the adoption of blockchain technology will likely act as a strong credibility-enhancing strategy for firms, differentiating between firms committed to the disclosure of information through the use of the technology and firms relying on opaque financial reporting practices. Collectively, these theoretical perspectives propose that blockchain adoption has an impact on

accounting transparency through agency, institutional, and signaling effects. While each of these theories adds weight in providing an explanation for this study, Institutional Theory is arguably the most persuasive framework for conducting this research, particularly in light of its recognition of Africa as an operating environment where technological mechanisms often compensate for weak institutions. While recognizing blockchain adoption as an approach aimed at improving reporting mechanisms is important, recognizing it as an approach aimed at providing an alternative mechanism of governance is arguably most pertinent in understanding the context in which blockchain adoption is proposed to have its most significant impact on accounting transparency.

2.3 Empirical Review

Research on the impact of the adoption of blockchain technology on the quality of financial reporting appears to be growing empirically, albeit with mixed findings, depending upon the country/setting and the research methodology adopted for the study. For instance, research conducted in developed countries and large-sized Emerging Market economies appears to suggest that the adoption of blockchain technology may improve the quality of accounting disclosures by facilitating traceability, verification, and the efficacy of controls. For instance, using archival research methodology with firm-level data collected from China, Fang *et al*. (2023) [8] find that the adoption of blockchain technology is associated with an improvement in the quality of accounting disclosures, which in turn is related to lower levels of discretionary accruals by the firm, owing to the higher traceability of transactions facilitated by the adoption of blockchain technology. Similarly, research by Liao (2025) [14] finds that the adoption of blockchain-based invoicing practices by firms results in an improvement in the quality of accounting disclosures to a significant extent, owing to the higher efficiency of accounting practices facilitated by the adoption of blockchain technology.

Additional supporting evidence can be provided by studies of the capital markets, where information asymmetry is addressed in relation to blockchain adoption in firms. Indeed, in their paper "Blockchain Adoption and Financial Disclosure Quality," Wang *et al*. (2025) [19] note that "our results indicate that analyst forecast accuracy is higher after blockchain adoption." Furthermore, in relation to firms in the US, Yen (2021) [20] shows that "Blockchain-related disclosures in annual reports are value-relevant." Such results are in line with accounting theory suggesting that reporting infrastructures can improve the information properties of firms' financial reports.

Nevertheless, the empirical findings are not entirely consistent. For example, nuanced findings by Auté *et al*. (2024) suggest that while the overall transparency for the firm may result from the adoption of blockchains, this may also result in unintentional earnings management for the overall supply-chain system. For example, their study shows that earnings management for suppliers is more likely after their customers have adopted blockchains. This shows that more pressure may result in more opportunistic behaviors.

Other studies focused on auditing create further complexity in the story of transparency. Chen *et al*. (2025) [5] report a finding in which firms adopting or investing in blockchain technologies experience an increase in their audit costs. They argue this is an indication of an increase in audit efforts due to the nature of the transition period. Contrary to the initial argument of a reduction in complexity, adopting a blockchain-based technology may first increase the complexity of reports, which in turn forces auditors to create new methods of verifications. Additional empirical support is provided by a study conducted by Ma *et al*. (2024) [15], which reports a finding indicating an increase in internal control weaknesses and restatements, especially in cases where there is poor integration of a blockchain-based infrastructure.

In addition, there exists a scarcity of methodologically sound studies in emerging and developing economies. Survey studies and mixed-methods analyses commonly find positive correlations with blockchain adoption and accounting transparency, audit efficiency, or information quality (Demirkan *et al*., 2020; Fullana & Ruiz-Monterrey, 2023) [7, 9]. However, these studies often fail to establish cause-effect relations or quantify actual improvements in disclosure quality due to their reliance on self-reported or perceived measures and often conflate blockchain awareness or experimentation with actual adoption, obscuring the distinction between symbolic and actual implementation. In both developed market and emerging market research, some common methodological limitations can still be observed. For one, endogeneity remains a widespread issue as most blockchain users are found to be larger, more innovative, and better governed firms even before they started to use blockchain (Dai & Vasarhelyi, 2022) [6]. Secondly, most reporting quality measurements are still indirect measurements using proxies such as analyst forecasts or audit fees. Lastly, most of these existing literature on transparency effects of blockchain adoption are concentrated only in specific countries such as China and the US. For African countries, for instance, transparency effects may likely be different because of poor enforcement of governance practices and higher information risk (Ahmed *et al*., 2021; Boateng *et al*., 2023) [1, 3]. Collectively, existing research findings indicate that, while blockchain adoption has the potential to positively contribute to some aspects of reporting quality and corporate information, it does so neither universally nor automatically. The inconsistencies in research findings, methodological limitations, and absence of firm-level studies in Africa provide further justification to conduct research studies that overcome issues related to selection bias, employ accounting-focused measures of disclosure quality, and investigate in less developed institutional contexts. The present study fills a number of these research gaps by providing African research findings on blockchain adoption, which utilize disclosure indices and propensity score matching to more credibly investigate its relationship with accounting transparency.

2.4 Research Gap and Conceptual Framework

Yet, as significant as the growth rate of scholarly inquiry into blockchains and their applications for accounting and financial reporting has been, the extant body of knowledge shows a significant gap between known and yet-to-be explored. Indeed, as blockchains and their applications have grown more prominent, so has their presence been limited with reference to the broader context of Africa. The body of knowledge with reference to blockchains and their applications for accounting and financial reporting shows that this emerging technology has the capacity for

improving some aspects of the information environment. However, several key issues still remain to be addressed. For instance, the empirical evidence with regard to the impact of the adoption of blockchain technology by firms on the quality of accounting disclosures, beyond an indirect audit or market effect, is still limited. A second key area of concern relates to the fact that a large portion of the empirical research did not adequately control for issues of endogeneity and self-selection, which may imply that the benefits to transparency may be related to pre-existing characteristics of the adopting firms, rather than the adoption of blockchain itself. A third area of interest relates to the fact that African countries were largely absent in the earlier large-sample research, yet the countries experience an environment in which the role of governance by technology would be most salient to the broader governance challenges faced by the region. For instance, would blockchain merely be an efficiency-enhancing innovation, or would it be an alternative form of governance that would help to mitigate the problems associated with weak law enforcement? This study aims to fill the existing research void by shifting the focus away from downstream market perceptions towards the fundamental accounting process that underlies transparency creation. Thus, instead of blockchain technology's direct influence on disclosure quality, the study introduces a concept of internal control quality as a transmission channel that links blockchain technology's influence to disclosure quality, given that blockchain technology's adoption is expected to positively influence internal controls, thereby enhancing the completeness, accuracy, and verifiability of disclosed accounting information. The proposed transmission channel is consistent with agency theory, especially in weak institutional environments where reliance on formal enforcement is deemed inadequate to ensure reporting quality. To aggregate the above relationships, a conceptual framework is proposed where blockchain technology's influence on disclosure quality is mediated by its influence on internal controls.

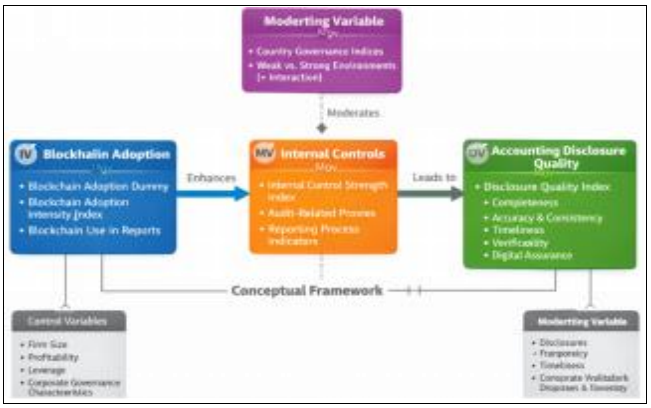

Fig 1: Conceptual Framework Linking Blockchain Adoption to Accounting Disclosure Quality in African Firms

This figure illustrates the proposed framework of analysis of the study, with the following description: how the adoption of blockchain technology, as captured by the adoption indicators and intensity measures at the firm level, contributes to the quality of internal control through the improvement in the audit trails, the degree of automation, and the real-time verification aspects, thereby boosting the quality of accounting disclosure. The framework also points to the moderating impact of the quality of the institutional environment.

The theory posits that firms adopting blockchain technology in their accounting/reporting systems observe an enhancement in the effectiveness of their internal control systems, as indicated by an immutable audit trail, validation, and reduction in discretion, thereby enhancing their overall disclosure quality. By specifically modeling this process, the theory extends the prior literature beyond simplistic adoption-outcome associations.

In this respect, this study makes an important contribution by providing an analytical perspective which is contextual in nature, helping to elucidate the circumstances under which the adoption of blockchain technology can lead to an increase in accounting transparency in Africa.

2.5 Hypotheses Development

Following the establishment of a conceptual framework and a set of integrated theoretical approaches as discussed within the sections above, this research develops a set of hypotheses that will specifically formalize the nature of causality between blockchain technology adoption and accounting transparency within African contexts. The basis of this hypothesis will be premised on the view that blockchain technology represents not merely a technology upgrade, but also a governance-improvement mechanism.

Further, the adoption of blockchain is expected to be related to accounting disclosure quality in a direct and positive manner. This is owing to the fact that the application of blockchain technology increases the quality of accounting disclosures by facilitating the recording of transactions in an unalterable record, which restricts the discretion of the company to change the record of transactions. Additionally, the application of smart contracts eliminates the role of humans in the reporting process, which increases the quality of accounting disclosures by promoting the completeness, precision, and verification of the disclosed accounting information. This assertion is consistent with the agency theory, which proposes that the application of blockchain increases the quality of accounting disclosures by eliminating the asymmetry of information between the company's managers and the company's shareholders. Therefore, it is anticipated that the application of blockchain accounting would be related to higher accounting disclosure quality for adopting firms in comparison to non-adopting firms.

H1: There is a positive relationship between the adoption of blockchains and accounting disclosure quality

Second, it is hypothesized that the transparency-enhancing effect of adopting blockchain would be contingent upon the institutional environment within which a particular firm operates. According to institutional theory, in a setting where formal institutional enforcement is limited, investor protection is limited, and oversight is inconsistent, a key feature of a particular setting would be that governance at a particular firm would play a disproportionately critical role in influencing reporting outcomes. Therefore, it is hypothesized that a setting where institutional enforcement is limited would be one where a new mechanism of governance, i.e., a mechanism that involves a direct integration of monitoring within accounting systems, would be more likely to be used.

H2: The positive effect of blockchain adoption on accounting disclosure quality is more pronounced in firms operating in poor institutional environments

In addition to direct effects and conditional effects, another effect posited by this study is an indirect effect whereby disclosure quality improves as a result of blockchain adoption. The indirect effect arises from the fact that blockchain will minimize discretionary reporting behavior. The auditability of reports will improve as well as internal controls. The cost of opportunistic reporting will therefore decrease. The agency theory will therefore support this effect as will the institutional theory. The direct effect may not be observable directly on disclosure quality scores; however, it is likely to manifest at the level of internal control quality.

H3: Adoption of blockchains decreases discretionary reporting due to enhanced auditability and internal control

Together, these hypotheses provide a consistent empirical basis to examine the direct, moderating, and mechanism-influenced effects of blockchain adoption on accounting transparency, which facilitates a rigorous investigation of whether and how blockchain contributes to better disclosure quality among African firms.

3. Methodology

3.1 Research Design

The present study utilizes a quantitative cross-sectional approach in exploring the relationship between blockchain adoption and accounting disclosure quality of firms in Africa that have gone public with their stocks. This approach is particularly pertinent since decisions around blockchain adoption, control systems, and disclosure practices are primarily firm-specific rather than industry or country-specific in nature. Moreover, focusing on firms is particularly important since it allows heterogeneity between blockchain adopters and non-adopters, thereby helping us isolate transparency effects of blockchain technology in particular.

African capital markets constitute a rich environment for this research design. The heterogeneous enforcement of capital regulations and varying institutional and governance conditions are common issues for capital markets. Under conditions of heterogeneous capital regulation and governance, firm-level governance and technological innovations are likely to have a significant influence. The cross-sectional research design, with the incorporation of propensity score matching, allows for the exploitation of cross-firm variation while controlling for endogeneity problems.

3.2 Sample Selection and Data Sources

The study population consists of listed non-financial firms from various African stock exchanges, covering countries known to have relatively active capital markets and corporate disclosure practices. The study focuses on listed firms to ensure a degree of similarity concerning reporting requirements and disclosure obligations.

The empirical analysis will cover a period ranging from 2016 to 2024, a period that covers the inception and spread of blockchain technology-related applications across various systems of corporate transactions and reports within the African market, as well as a period where there is a focus on regulatory oversight of digital reports and governance systems on the continent.

Companies are excluded from the sample if they fall under one of the following conditions: firms that fall within the financial industry due to different reporting requirements, firms that lack sufficient annual, sustainability, or integrated report data to derive the disclosure quality index, or firms that lack sufficient data related to certain variables used in the study, such as independent variables and control variables.Data related to blockchain usage is collected manually from annual reports, sustainability reports, integrated reports, and company-level technology disclosures, whereas data related to financial variables and governance is collected manually from audited financial statements and other financial databases.

3.3 Measurement of Variables

3.3.1 Blockchain Adoption Indicators

The adoption of blockchain technology, being the primary independent variable, is measured with firm-level indicators of substantive adoption of blockchain-based systems. Two measures of adoption are used in tandem with each other.

First, a binary measure of blockchain adoption is created by taking a value of one if a firm makes an explicit disclosure about its use of blockchain technology in its accounting, reporting, auditing, invoicing, supply chain tracking, and transaction validation activities, and zero if not. Next, to account for differences in the degree of blockchain technology adoption, a blockchain adoption intensity index is created by using disclosure information on distributed ledger technology use, smart contracts, automatic reconciliation, real-time verification, and blockchain assurance by a third party. The use of two approaches reduces the risk of a binary adoption dummy capturing symbolic rather than actual adoption behavior by firms.

3.3.2 Accounting Disclosure Quality Index

Accounting transparency can be measured using a composite measure, called Accounting Disclosure Quality Index or ADQI, constructed using firm-level disclosure data. The ADQI measures various dimensions of transparency that are relevant to blockchain reporting technologies, as per theoretical and empirical considerations.

ADQI consists of four main dimensions: completeness, referring to financial or governance-related disclosures; timeliness, referring to the speed at which financial reports are generated or updated; verifiability, referring to audit paths or statements; and digital assurances, referring to disclosures regarding financial or non-financial technologies. Each dimension is scored based on a set of criteria, after which a single index is obtained. The scoring mechanism is similar for all criteria to ensure consistency. Additionally, it is validated through internal consistency tests.

3.3.3 Control Variables

In order to filter out the effects of the adoption of blockchain technology on disclosure quality, this study also employs a range of control variables, which are usually used in existing studies of corporate finance, accounting, and corporate governance. Size is measured as the natural logarithm of assets, financial leverage is measured as debt to assets, and profitability is measured as return on assets. In addition, the quality of the auditor is also measured as a proxy for a Big-4 auditor, and corporate governance is controlled for through

the independence of the board and the level of ownership concentration, where feasible.

In order to control for institutional effects, country-level institutional quality indicators are used, which encompass the strength of the regulatory environment and the corporate governance environment.

Table 1: Variable Measurement and Operational Definitions

Variable Category	Variable Name	Conceptual Definition	Measurement / Proxy	Data Source	Expected Sign
Dependent Variable	Accounting Disclosure Quality (DQI)	The extent to which a firm's financial disclosures are complete, timely, reliable, and verifiable	Composite Disclosure Quality Index constructed from annual, integrated, and sustainability reports, capturing completeness, timeliness, verifiability, and digital assurance	Annual reports; sustainability/integrated reports	—
Independent Variable	Blockchain Adoption	The extent to which a firm integrates blockchain technology into accounting, reporting, or transaction systems	(i) Binary indicator = 1 if firm discloses substantive blockchain use; 0 otherwise; (ii) Adoption intensity index based on disclosed blockchain applications	Annual reports; technology disclosures	+
Mediating Variable	Internal Control Quality	Effectiveness of internal mechanisms ensuring accurate and reliable financial reporting	Index capturing disclosures on automated controls, digital audit trails, continuous monitoring, and IT control integration; supplemented by audit-related proxies	Annual reports; audit disclosures	+
Moderating Variable	Institutional Weakness	Degree of weakness in a country's regulatory and governance environment	Composite institutional weakness index (inverse of regulatory quality, rule of law, and control of corruption)	Country-level governance indicators	±
Interaction Term	Blockchain × Institutional Weakness	Conditional effect of blockchain adoption under weak institutions	Product of blockchain adoption indicator and institutional weakness index	Author computation	+
Control Variable	Firm Size	Scale of firm operations	Natural logarithm of total assets	Financial statements	+
	Profitability	Firm financial performance	Return on Assets (ROA)	Financial statements	+
Control Variable	Leverage	Financial risk exposure	Total debt divided by total assets	Financial statements	±
Control Variable	Auditor Quality	External audit strength	Big-4 auditor dummy (1 = Big-4; 0 = otherwise)	Audit reports	+
Control Variable	Corporate Governance	Strength of internal governance structures	Board independence ratio / ownership concentration (where available)	Annual reports	+
Control Variable	Industry Effects	Sector-specific reporting norms	Industry fixed effects	Stock exchange classification	Controlled
Control Variable	Country Effects	National institutional heterogeneity	Country fixed effects	—	

The following table shows the definitions of operation, measurement approach, and data source for each of the variables used in empirical testing. Disclosure Quality Index is constructed with structured content analysis in order to account for multidimensional characteristics of accounting transparency. Blockchain adoption is measured with firm-level disclosures in order to distinguish between implementation and symbolic adoption of blockchain technology. Institutional weaknesses are defined in such a manner that they increase with weaker governance environments, facilitating an understanding of interactions in line with institutional substitution theory.

3.4 Propensity Score Matching (PSM)

In light of the voluntary nature of blockchain adoption, self-selection bias poses a significant threat to causal inference in the study's results. One way to reduce the risk of self-selection bias in the study's design is by employing PSM in matching a group of non-adopting firms with similar observable attributes with those firms that adopted blockchain technology. The propensity score is calculated using a logistic regression equation with various independent variables including size, profitability, leverage ratio, type of auditor, corporate governance attributes, industry type, and institutional quality at the country level. The study employs nearest neighbor matching with replacement in matching the non-adopters with adopters while employing kernel matching as a robustness test for PSM in assessing the study's results.

3.5 Econometric Model Specification (Revised and Explicit)

To formally test the study's hypotheses, the empirical analysis employs cross-sectional regression models estimated using both the full sample and the propensity score–matched sample. The dependent variable in all specifications is the Accounting Disclosure Quality Index (DQI). Robust standard errors are used throughout, and country and industry fixed effects are included to control for unobserved heterogeneity across institutional and sectoral contexts.

Baseline Model (H1: Direct Effect)

The baseline regression examines the association between blockchain adoption and accounting disclosure quality:

$$\mathbf{DQI_{i,c}=\alpha_0+\alpha_1 Blockchain_{i,c}+\sum \alpha_k Controls_{i,c}+\delta_c+\gamma_j+\varepsilon_{i,c}}$$

Where:

$DQI_{i,c}$ is the disclosure quality index for firm *i* in country *c*;

$Blockchain_{i,c}$ is a firm-level indicator of blockchain adoption;

$Controls_{i,c}$ include firm size, profitability, leverage, auditor quality, and governance variables;

δ_c and γ_j represent country and industry fixed effects, respectively;

$E_{i,c}$ is the error term.

A positive and statistically significant coefficient on $\alpha_1$provides support for **H1**, indicating that blockchain adoption is associated with higher disclosure quality.

Moderation Model (H2: Institutional Environment Effect)

To examine whether the transparency effect of blockchain adoption varies with institutional conditions, the following interaction model is estimated:

$$DQI_{i,c}=\beta_0+\beta_1 Blockchain_{i,c}+\beta_2 InstitutionalWeakness_c+\beta_3(Blockchain_{i,c}\times InstitutionalWeakness_c)+\sum\beta_k Controls_{i,c}+\delta_c+\gamma_j+\varepsilon_{i,c}$$

Where:
$InstitutionalWeakness_c$ captures country-level regulatory and governance weakness (higher values indicate weaker institutions);
β_3 captures the conditional effect of blockchain adoption in weak institutional environments.
A positive and significant β_3 coefficient supports **H2**, consistent with the institutional substitution argument that blockchain's governance role is stronger where formal enforcement is weak.

Mediation-Oriented Specification (H3: Mechanism via Internal Controls)
To examine whether blockchain adoption improves disclosure quality through enhanced internal controls, the following mediation-oriented models are estimated:
First-stage (Blockchain → Internal Controls):

$$InternalControls_{i,c}=\theta_0+\theta_1 Blockchain_{i,c}+\sum\theta_k Controls_{i,c}+\delta_c+\gamma_j+\nu_{i,c}$$

Second-stage (Blockchain + Internal Controls → Disclosure Quality):

$$DQI_{i,c}=\phi_0+\phi_1 Blockchain_{i,c}+\phi_2 InternalControls_{i,c}+\sum\phi_k Controls_{i,c}+\delta_c+\gamma_j+\xi_{i,c}$$

Evidence of mediation is inferred if: (i) blockchain adoption significantly predicts internal control quality ($\theta_1>0$), and (ii) internal controls are positively associated with disclosure quality while attenuating the blockchain coefficient in the second-stage regression.

Matched-Sample Estimation
All models are re-estimated on the **propensity score–matched sample** to mitigate observable self-selection bias. Consistency of coefficient signs and significance between full-sample and matched-sample regressions strengthens causal interpretation.

3.6 Robustness and Sensitivity Tests
A series of robustness tests is conducted in order to check the stability of the results. These tests include re-running the analysis with different weight schemes in the disclosure quality index, different matching methods, and sub-sample analysis by institutional strength and industry classification. Sensitivity tests include filtering out firms with symbolic blockchain adoption in order to check if the results are driven by adoption.
Thus, in conclusion, it can be stated that the methodological framework combines scientific measurement of variables, reduction of selection bias, and robust econometric analysis in order to produce reliable results with regard to the relationship between blockchain adoption and accounting transparency in Africa.

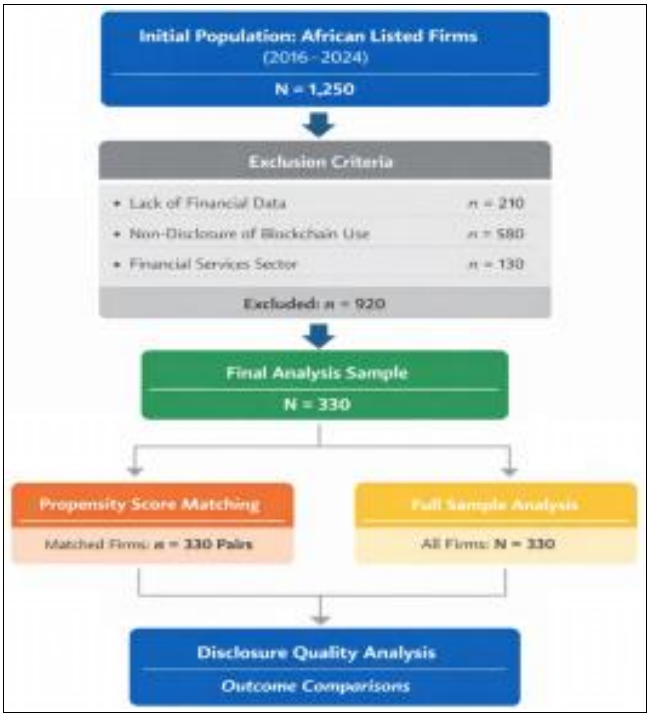

Fig 2: Sample Selection and Research Design Flow Diagram

This figure illustrates the step-wise procedure for the construction of the samples, as well as the empirical design used in the study. Starting with the initial population of the African listed firms, the figure illustrates the application of the selection criteria, the determination of the final analysis sample, and the parallel estimation procedures using the entire sample, as well as the PS-matched samples, to examine the impact of the adoption of blockchain technology on the quality of the disclosure in the financial reports.

4. Empirical Results
4.1 Descriptive Statistics
Descriptive statistics on the total sample of African firms that are included in the analysis are presented in Table 4.1. From these summary statistics, it can be observed that there are significant differences in terms of blockchain adoption as well as disclosure quality, thereby supporting the choice of conducting an empirical analysis at the firm level. A small but significant fraction of firms have adopted blockchain, consistent with its developing role in African firm-level accounting and reporting systems.
The mean disclosure quality index points towards a moderate transparency profile, reflecting a significant dispersion across firms, which is consistent with heterogeneous governance practices and institutional environments. Firms that adopt blockchain technology report, on average, higher disclosure quality scores and stronger internal control proxies than non-blockchain firms, highlighting the need to control for firm characteristics, including potential self-selection biases related to adopting blockchain technology. The country-level institutional variables highlight significant dispersion across the sample, emphasizing the role of institutional environments in determining reporting outcomes.

Table 4.1: Descriptive Statistics of Key Variables

Variable	Mean	Std. Dev.	Min	Max
Disclosure Quality Index (DQI)	0.62	0.15	0.25	0.92
Blockchain Adoption (Dummy)	0.28	0.45	0	1
Internal Control Quality	0.67	0.14	0.3	0.95
Firm Size (log of total assets)	14.85	1.32	11.2	18.4
Profitability (ROA)	0.071	0.06	−0.080	0.28
Leverage	0.46	0.21	0.1	0.88
Big-4 Auditor	0.41	0.49	0	1
Institutional Weakness Index	0.54	0.18	0.15	0.88

Notes:
This table includes descriptive statistics for the full sample of listed African firms for the years 2016-2024. The Disclosure Quality Index is a composite measure of financial reporting's completeness, timeliness, verifiability, and electronic assurance. Blockchain Adoption is a binary variable representing whether a firm reports the adoption of blockchain in its accounting, reporting, or transactional systems. Institutional Weakness is measured in a way such that higher values represent weaker institutions.

4.2 Correlation Analysis

Table 4.2 reports the Pearson correlation matrix for main variables. The adoption of Blockchain exhibits a positive and statistically significant relationship with both accounting disclosure quality and internal controls measures, offering preliminary support for hypothesis H1. Disclosure quality is found to correlate positively with firm size, profitability, auditor quality, and institutional quality, consistent with prior accounting literature.

It is noteworthy that the correlations did not indicate severe problems of multicollinearity among the regressors, since the variance inflation factors, which are not presented, remain well below the threshold that would indicate a problem of regression estimate bias due to such a phenomenon. Although the correlations presented above provide some first insights, they did not account for any potential confounders, which is why it is important to use multivariate analysis techniques, including matching procedures.

Table 4.2: Pearson Correlation Matrix

Variable	DQI	Blockchain	Internal Controls	Firm Size	Institutional Weakness
DQI	1				
Blockchain Adoption	0.34	1			
Internal Controls	0.42	0.31	1		
Firm Size	0.38	0.27	0.33	1	
Institutional Weakness	−0.290	−0.180	−0.220	−0.250	1

Variance inflation factors (VIFs), not tabulated, are below conventional thresholds in all regression specifications.
Notes:
The table provides Pearson correlation coefficients for the key variables. The disclosure quality has positive correlations with blockchain adoption and internal control quality; it has a negative correlation with institutional weakness. The correlation coefficients are moderate in size but do not suggest serious multicollinearity problems.

4.3 Propensity Score Matching Diagnostics

As can be seen from Table 4.3, the diagnostics for the propensity score matching are as follows. Statistically significant differences are observed between the groups of firms that have adopted and have not adopted blockchain technology, as measured by important firm-level covariates, before matching. However, after matching, the differences are considerably reduced and are statistically insignificant for all the matching variables. The standardized mean differences are well below the threshold values. Furthermore, the visual assessment of the propensity score support also shows appropriate common support between the groups. All this shows that the matching has been effective and that the matching provides an appropriate control group for estimating the treatment effect. The matching provides a more appropriate framework for testing the effect of transparency.

Table 4.3: Covariate Balance Before and After Propensity Score Matching

Covariate	Std. Bias Before Matching (%)	Std. Bias After Matching (%)
Firm Size	21.4	3.2
Profitability	18.7	2.8
Leverage	15.3	3.5
Big-4 Auditor	24.9	4.1
Board Independence	19.1	3

All post-matching standardized biases fall below 5%, indicating successful covariate balance and adequate common support.
Notes:
This table reports the differences in standardized means for blockchain-adopting and non-adopting firms before and after propensity score matching. These propensity scores are calculated as firm size, profitability, leverage, type of auditor, governance variables, industry type, and country-level quality.

4.4 Main Regression Results

The main regression results of Table 4.4 show a positive and significant relationship between blockchain adoption and accounting disclosure quality, holding constant various control variables, including firm characteristics, corporate governance, and country and industry fixed effects. This lends initial support to Hypothesis 1.

However, the magnitude and statistical significance of the blockchain coefficient are robust in the matched sample specifications. This suggests that the positive relationship is not solely the result of observable differences between adopters and non-adopters. Overall, the findings here provide evidence suggesting the relationship between the adoption of blockchains and the quality of disclosure is associated with real differences in quality.

In keeping with Hypothesis 2, the interaction term involving blockchain adoption and institutional weakness is positive and statistically significant, which suggests that the transparency-enhancing effects of blockchain adoption increase in environments where institutional weakness is pronounced, consistent with our argument about the

substitute governance function of blockchain adoption. The control variables largely behave as anticipated, as size, profitability, and auditor quality positively relate to disclosure quality.

Table 4.4: Blockchain Adoption and Accounting Disclosure Quality

Variable	Baseline Coefficient	t-Statistic	Matched Sample Coefficient	t-Statistic
Blockchain Adoption	0.084	3.21***	0.079	2.98***
Institutional Weakness	−0.062	−2.44**	−0.058	−2.21**
Blockchain × Institutional Weakness	0.091	2.89***	0.095	3.01***
Firm Size	0.047	4.76***	0.043	4.11***
Profitability	0.129	3.98***	0.121	3.62***
Big-4 Auditor	0.058	2.67**	0.054	2.41**

Robust standard errors are used.
*** p < 0.01, ** p < 0.05, * p < 0.10.

Notes:
This table reports regression results examining the association between blockchain adoption and accounting disclosure quality. The baseline model uses the full sample, while the matched model is estimated on the propensity-score-matched sample. All models include industry and country fixed effects.

4.5 Robustness Results

Table 4.5 outlines a series of robustness and sensitivity tests. Firstly, re-estimation of the models with alternative weighting procedures for the disclosure quality index produces similar results, thus implying that the results are insensitive to alternative index constructions. Secondly, alternative matching procedures, including kernel matching, are implemented and confirm consistent coefficient values for blockchain adoption. Thirdly, sub-sample regression models based on institutional quality confirm that the positive influence of blockchain adoption on disclosure quality is restricted to weaker institutional environments. Additional sensitivity testing, excluding small-disclosing firms with minimal or rhetorical uses of blockchains, confirms that the initial results are largely unaffected by disclosure rhetoric. The series of robustness testing provides strong support for the overall robustness and dependability of the results, thus offering strong support for the overall hypotheses proposed by this study.

Table 4.5: Robustness and Sensitivity Analyses

Robustness Test	Blockchain Coefficient	Significance
Alternative DQI weighting	0.081	***
Kernel matching	0.077	***
Excluding symbolic adopters	0.074	**
Weak institutional sub-sample	0.102	***
Strong institutional sub-sample	0.031	n.s.

The blockchain effect is economically and statistically stronger in weak institutional environments, while it becomes insignificant in strong institutional settings, consistent with the institutional substitution argument.

Notes:
This table summarises robustness checks assessing the stability of the blockchain adoption effect on disclosure quality. Alternative disclosure index weightings, matching algorithms, and sub-sample analyses are employed.

Fig 3: Propensity Score Matching (PSM) Diagnostics Visualization

This figure presents a graphical view of the distribution of the propensity scores of firms adopting blockchain technology compared with firms that do not. From the figure, it is clear that there is a low degree of balance in the data before matching, as shown in the left panel, but a substantial degree of balance in the data is observed in the right panel, which presents the data after performing a propensity score matching, thus increasing the credibility of the inference concerning the effect of adopting blockchain technology.

It is evident that empirical studies have always supported that blockchain adoption is positively associated with accounting disclosure quality in Africa, particularly in environments with weaker institutions, without any effects of selection or measurement issues.

5. Case Study Evidence

In order to complement the large sample-based inferential analysis, and further shed light on the mechanisms that underlie blockchain adoption's impact on organizational transparency, this research incorporates case-based evidence from selected African listed organizations. The rationale for using case-based evidence is not intended to replace inferential analysis but, rather, to further enrich understanding on the mechanisms that underlie blockchain adoption, using best practices for mixed-method research approaches, especially for accounting research, as propounded by Gendron (2022) [10].

The case firms were selected by means of purposive sampling according to three criteria. Firstly, the case firms had disclosed significant blockchain usage for accounting-relevant activities, including transaction recording, invoicing, traceability for supply-chain management and cost accounting, or audit trail management. Symbolic or exploratory references were excluded. Secondly, the case firms are embedded in institutional environments with low levels of regulatory enforcement. This criterion matches with the institutional theory orientation of this study. Thirdly, the case firms were selected across different sectors. This criterion aims at reducing sectoral bias and increasing the analytical generality of this study. The method for case selection is comparable with several studies focusing on governance and reporting innovations by means of theoretically informed case selection for emerging markets (Busco *et al*., 2020; Giovannoni *et al*., 2023) [4, 11].

For all cases considered, a similar process for implementing blockchain can be identified, starting with a gradual integration of distributed ledger systems into particular transactional cycles, rather than a replacement of traditional accounting systems. Most organizations used a series of blockchain modules to facilitate particular transaction types that are considered to be of a high volume or a high-risk profile, thus providing a mechanism for time-stamping irreversible transactional data. Additionally, some cases identified a series of smart contracts used to facilitate a more streamlined validation of particular transactions based on predefined accounting procedures. This type of implementation is consistent with a gradual or modular approach to adopting a new system for accounting based on cost considerations or learning limitations.

Significantly, in conjunction with the adoption of blockchain technology, there have also been observable changes in reporting practices, as indicated in our sample companies, whereby there have been enhanced consistencies in reporting, largely as a result of more robust audit trails and real-time validation of transactions. Managers and audit teams have also indicated that there have been observable benefits in terms of reduced reconciliation time and adjustments in reports after period closure, as well as more emphasis on real-time monitoring as part of internal audit functions. These have resulted in more detailed reporting in annual reports, as well as sustainability reports, particularly in areas such as revenue, inventory, and supply chain attribution. These are consistent with previous studies that have indicated that blockchain technology can positively impact reporting, particularly in terms of more robust internal control and less opportunistic reporting, as it embeds governance into technology infrastructure, as indicated in previous studies by Demirkan *et al*. (2020) [7] and Fullana & Ruiz-Monterrey (2023) [9].

The case evidence also points to the auditability channel presented in the conceptual framework of the study. Firms' external auditors reported increased reliance on the generated audit trails and validation logs, despite the initial increase in audit efforts for the firms to adapt to the new technology. Ultimately, the external auditors expressed increased confidence in the data, which points to the argument presented in the study, suggesting an increase in the credibility of the financial reports through the implementation of blockchain technology, given the quality of internal controls. This argument is consistent with recent audit-related literature, which points to the increased complexity for firms to adapt to the new technology, despite the increased transparency offered by the implementation of blockchain technology (Chen *et al*., 2025; Ma *et al*., 2024) [5, 15]. More importantly, however, these qualitative results strongly triangulate with those obtained quantitatively earlier. The positive changes observed with auditability, internal controls, and reporting consistency at the firm level are highly consistent with those obtained between blockchain adoption and disclosure quality statistically at the aggregate level earlier. In addition, the fact that these effects are observed more strongly for firms operating within lower institutional environments supports the main argument developed here. That is, by incorporating greater verification and transparency directly within accounting practices via blockchain adoption, firms circumvent external regulatory capabilities altogether, as theoretically implied by both Ahmed *et al*. (2021) [1] and Boateng *et al*. (2023) [3].

The combined case study evidence offers rich process validation for the empirical findings, which enhances the study's inference by showing the ways in which blockchain adoption enhances accounting transparency, rather than merely whether it does so.

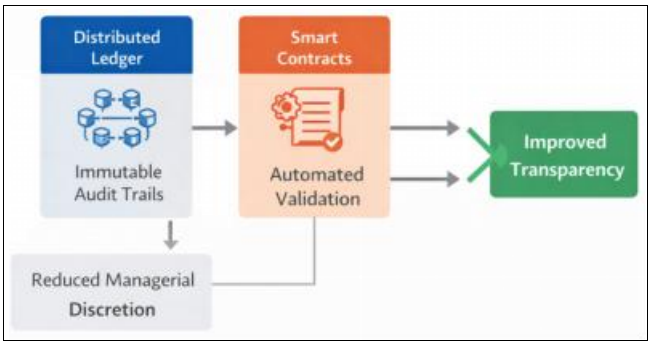

Fig 4: Blockchain Governance Mechanism and Reporting Transparency Pathway

The above figure highlights the mechanism of governance through which accounting transparency is enhanced with the adoption of blockchain technology. As can be seen, distributed ledger technology results in an immutable audit trail, while smart contracts enable automatic verification of any given transaction, thereby limiting management's discretion in reporting accounting information.

6. Discussion of Findings

The findings of this study provide coherent and theoretically informed support to the notion that blockchain adoption is related to positive changes in the quality of accounting disclosures made by African-listed firms, especially in poor institutional contexts. The findings not only support the notion of a technology effect but also provide insights into blockchain's role in corporate governance, which is relevant in contexts with poor institutional support. The findings, interpreted in light of the integrated theoretical framework, indicate that blockchain adoption has agency-cost-reducing, institutional substitute, and credibility-signaling effects, with the institutional effect being most pronounced in the African context.

According to agency theory, the positive relationship found in the study between blockchain adoption and disclosure quality may be explained by the reduction in information asymmetry between managers and external parties. The increased audibility and recordability in blockchain systems restrict managers' freedom in decision-making regarding disclosure policies and timing. The relative importance of the internal-control-mediated route supports the notion that blockchain impacts disclosure by changing the process of financial information development instead of its output. Such an understanding resonates with recent accounting literature that emphasizes the potential value of digital infrastructures in bolstering internal controls and reporting discipline (Dai & Vasarhelyi, 2022; Rozario & Vasarhelyi, 2021) [6, 17].

Moreover, the moderation effects also support the importance of the institutional theory in explaining the findings. The stronger effect of blockchain adoption in less robust institutions implies that blockchain adoption acts as a substitute governance mechanism in situations in which formal oversight and monitoring are not as effective. This is in line with previous research in EMs, in which firm-level

governance innovations were found to have more influence on reporting quality in situations in which institutions were less effective (Ahmed *et al*., 2021; Boateng *et al*., 2023) [1, 3]. Moreover, the moderating effect of stronger institutions reducing the effect of blockchain adoption implies that blockchain's contribution to governance is less important in situations in which formal monitoring is more effective.

When compared with past studies, the results confirm and extend the existing body of knowledge. Consistent with China and developed markets studies, the results support the notion that the adoption of blockchain technology enhances some dimensions of the firm information environment and reporting quality (Fang *et al*., 2023; Liao, 2025; Wang *et al*., 2025) [8, 14, 19]. However, by utilizing disclosure quality indices and controlling for self-selection bias with propensity score matching, this study extends the past research by moving past indirect measures of disclosure quality, including analyst forecast-based or audit fee-based measures. Furthermore, the setting provides insights into some unique contextual factors that were largely absent in past studies due to their concentration in data-rich environments with strong institutional settings.

The findings also contribute to reconciling mixed evidence in the literature. Prior research that identified complexity, higher audit fees, or disclosure problems following blockchain adoption typically concluded that such findings negate the transparency benefits of blockchain adoption, such as in Autore *et al*. (2024) [2], Chen *et al*. (2025) [5], among others. The present study's findings, however, propose a different interpretation: blockchain adoption increases complexity initially, but its governance effects, especially over a longer horizon, result from enhanced internal controls and disclosure, especially where institutional constraints are binding. This interpretation brings together contradictory evidence by highlighting the contingency of blockchain's effects, including its timing. However, critically, the study also reveals why the technology is more important in Africa than in many advanced markets. In fact, the study reveals why the technology is more important in Africa than in many advanced markets. In essence, the The discussion thus underscores that adoption of blockchain is, in essence, an issue of governance whose transparent impact is contingent upon context. With this study showing that blockchain reporting benefits are most significant in contexts where they are most needed, it is evident that it is contributing an important contextual understanding of digital governance in accounting, along with the need for alignment between technological innovation and context.

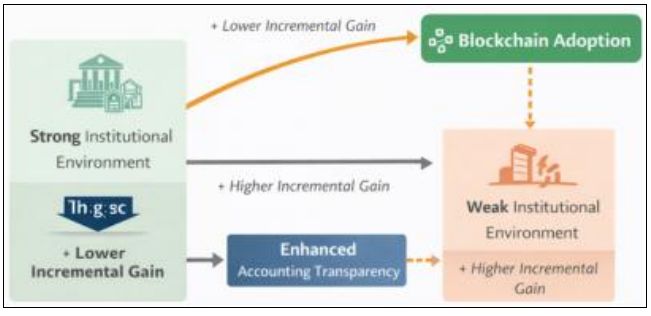

Fig 5: Institutional Moderation Framework for Blockchain and Accounting Transparency in Africa

This graph illustrates the way the institutional environment acts as a moderator between the relationship between blockchain technology and accounting transparency. In environments with strong institutions, the additional value of added transparency due to blockchain technology is lower due to the presence of effective institutional enforcement. However, for environments with weaker institutional environments, as seen in most of Africa, blockchain technology acts as a substitute form of governance and provides higher levels of added value for accounting transparency.

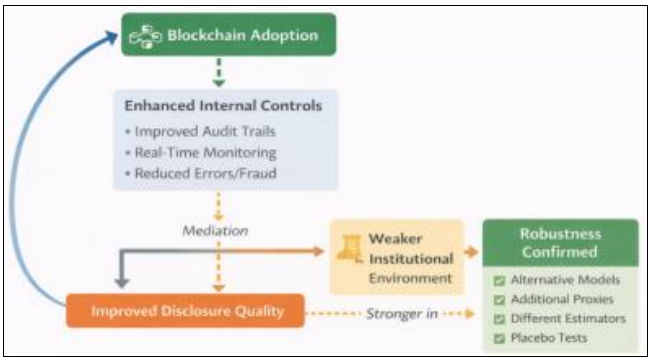

Fig 6: Empirical Results Synthesis Diagram

The following diagram attempts to synthesize the main empirical results obtained from this study by showing how: (1) Blockchain adoption is positively related to accounting disclosure quality; (2) The relationship between Blockchain adoption and accounting disclosure quality is mediated by better internal controls; (3) The transparency effect is heightened when environmental institutional quality is lower. Moreover, this diagram highlights the robustness of these results when different model specifications are used to test for sensitivity.

7. Policy and Managerial Implications

Significance of the study's results: The results of the present study hold important implications for regulators, standard setters, firms, and auditors that aim to boost transparency in accounting within African economies. The demonstration of blockchain's ability to boost disclosure quality, even in weak institutional environments, highlights the role of digital infrastructure alongside traditional regulatory and governance tools.

From a policy perspective, the study results reveal to regulators and standard setters the need to look beyond a technology-neutral approach and to seriously begin contemplating digital reporting standards and how they might incorporate blockchain-enabled accounting systems. Indeed, existing global and national reporting frameworks and standards have largely been built on a foundation of periodic and ex post reporting approaches, which differ from those facilitated through a blockchain environment where continuous verification, immutable audit trails, and real-time data integrity can occur. The integration of reporting on blockchain-based record-keeping, digital audit trails, and validation approaches would certainly promote transparency without unduly burdening reporting organizations, which is consistent with a new and evolving academic literature on standard setting and its need to adapt to new technologies to

ensure reporting quality and interfirm comparability (Dai & Vasarhelyi, 2022; Fullana & Ruiz-Monterrey, 2023) [6, 9].

The results will equally support the development of Blockchain-enabled Assurance Frameworks. The audit regulators will use the verification capabilities of Blockchain to design audit models around continuous auditing rather than just reliance on sampling methods. The audit costs may initially rise during the transition period, but long-term benefits will include reliable data sets and reduced information risk. The prior literature on audit effectiveness reveals that audit credibility can improve when audit models are supported by information technologies, especially when enforcement capabilities are limited (Rozario & Vasarhelyi, 2021; Chen *et al*., 2025) [17, 5]. For African audit regulators with limited capacities, Blockchain-enabled audit models provide a solution for improving audit oversight without expanding audit infrastructure.

With respect to organizations, the findings highlight the significance of strategic rather than symbolic blockchain adoption by organizations. In this context, organizations that use blockchain technology strategically by incorporating it into accounting and disclosure practices are likely to benefit from transparency and governance outcomes rather than organizations that use blockchain technology superficially as a peripheral aspect of governance disclosure policies. The position taken by this study is also informed by empirical evidence suggesting that the governance advantages of blockchain technology are contingent on its strategic rather than disclosure of adoption intentions (Fang *et al*., 2023; Liao, 2025) [8, 14].

Moreover, the study also points out the significance of transparency as a form of capital market signaling. In environments with high information asymmetry and investor skepticism, as is common in Africa, the ability for companies to commit themselves towards more transparent disclosure by embracing blockchain technology can act as a way for companies to stand out and possibly access capital more easily. The signaling theory also points out that this can have significant value for companies, as this form of signaling is more likely when it is more difficult for their rivals to mimic this kind of action, as is the case with the implementation of blockchain technology for accounting purposes (Yermack, 2020) [21].

The implications for auditors are that they need to be adapting their assurance approaches and developing their competence in blockchain-enabled systems. Auditors have a crucial role in helping translate the technology's transparency into an external reporting environment, particularly in transition phases when reporting may be more complex. Auditors' ability in interpreting blockchain-generated information will be crucial in realizing its potential in providing greater transparency in reporting, as suggested by earlier studies (e.g., Ma *et al*., 2024; Rozario & Vasarhelyi, 2021) [15, 17]. Overall, these policy and managerial implications support the argument that the adoption of blockchain technology is a decision involving strategic-level implications for corporate strategy, rather than a straightforward decision involving a new technology for financial reporting, which carries important implications for the quality of financial reports and the level of trust in the marketplace, particularly in the context of the continent of Africa.

8. Conclusion

This study aims to examine the linkages between the adoption of blockchain technology and accounting disclosure quality in African-listed firms, with specific reference made to institutional effects and internal corporate control systems. Using a dataset of firms and disclosure quality indices, together with a matching technique, the empirical results suggest a positive link between the adoption of blockchain technology and accounting disclosure quality. More notably, this link is found to exist despite the presence of observable self-selection effects, with a much more substantial link observed in weaker institutional settings. Using a set of cases, this study further provides empirical support showing that these improvements in disclosure quality occur due to improvements in internal controls, auditability, and consistency. Overall, this set of empirical results provides a strong indication of a substantive link between the adoption of blockchain technology and the process of accounting disclosure, rather than merely a link at the disclosure outcome level.

The study makes several contributions to the literature. Firstly, the study expands the research on the intersection of blockchain and accounting to the African region, which is largely unexplored despite the region's well-known constraints to governance and reporting practices. Secondly, the study makes a methodological contribution by combining structured disclosure quality indices with firm-level adoption measures using the PSM method, which enhances the study's ability to establish causality in an otherwise non-expperimental research design. Thirdly, the study makes a theoretical contribution by explicitly incorporating the role of internal controls as a transmission effect and the role of institutional quality as a moderator to the study of digital technologies as substitutes for governance in emerging markets.

Despite these contributions, the study recognizes certain limitations that need cautious interpretation. The nature of the study design restricts its ability to draw strong causal inferences regarding dynamic effects over time, particularly in light of the potential for gradual changes in blockchain adoption and reporting practices. The study's ability to measure blockchain adoption relies on disclosed information, which may not capture non-disclosed information or variations in the depth of adoption. Second, while the disclosure quality index is constructed with care, by its nature as an index-based measure, there may be subjective weighting and scoring effects that have an impact despite the checks in place for robustness.

These findings indicate several avenues of potential future research. For instance, studies could employ a longitudinal research design to investigate whether the effects of blockchain adoption on organizational transparency vary over time, while transitional costs convert to stronger governance effects in the long term. Future research could also investigate other potential mechanisms, such as interactions between blockchain adoption and external audit quality, regulatory reform, or capital market development effects. Comparative studies, especially across regions or between public and private organizations, can further contribute to research on institutional contingencies. Moreover, with further advancements in blockchain-enabled

reporting technologies, future research can investigate whether new technologies, such as continuous auditing or real-time regulatory reporting, can transform the boundaries of accounting transparency in developing economies. Thus, the study concludes that the adoption of blockchains in capital markets in Africa is not merely an innovation in technology; it is an innovation in governance with important implications for accounting transparency. In highlighting the transparency effects of blockchains in capital markets in Africa as being more pronounced in the presence of more glaring institutional weaknesses, the study underlines the need to align digital innovation with the reality of the institutional context.

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