



The Scientific Journal of Business and Finance

<https://caf.journals.ekb.eg>

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Published online: **December 2024.**

To cite this article: Baroma, Bassam Samir. **The Impact of Blockchain Technology on Financial Reporting Quality: An Empirical Study in the Egyptian banking Sector**, 44, (4), 1-34

DOI: [10.21608/caf.2024.402375](https://doi.org/10.21608/caf.2024.402375)

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Article History

Received 28 November 2024, Accepted 25 December 2024, Available online December 2024.

Abstract

This study seeks to explore the transformative role of blockchain technology in financial accounting, with a particular emphasis on its impact on transparency, fraud mitigation, and regulatory compliance.

Moreover, the study assesses the relationship between blockchain adoption (via a novel BTI) and FRQ in the Egyptian banking sector using advanced statistical models and provide empirical evidence to validate blockchain's effectiveness in enhancing financial transparency.

The result of this paper shows that, the Blockchain Transparency Index (BTI) was identified as a significant positive predictor of Financial Reporting Quality (FRQ), reinforcing blockchain's ability to enhance the reliability, accuracy, and timeliness of financial disclosures.

Control variables, firm size (FSIZE), profitability (ROA), revenue growth (Growth), and audit quality (BIG4), were found to have limited or non-significant impact on FRQ in this study, suggesting that blockchain adoption itself is a primary driver of transparency improvements.

Key Words: Blockchain's transparency; financial reporting quality

1.Introduction

In the contemporary financial environment, transparency in accounting practices is not only a regulatory requirement but also a critical factor in building stakeholder confidence and ensuring sustainable business operations. However, traditional financial accounting systems, reliant on centralized processes, face inherent limitations that compromise the integrity of financial reporting. These systems are often characterized by inefficiencies in data management, delayed validation, and vulnerabilities to manipulation, which collectively undermine stakeholder trust (Coyne & McMickle, 2017).

As the demands for accurate, timely, and reliable financial information intensify, there is an urgent need to explore innovative technologies that can transform the financial accounting landscape (Bonsón & Bednárová, 2019).

Blockchain technology has emerged as a revolutionary solution to these challenges. Defined by its decentralized, immutable, and transparent ledger structure, blockchain offers a robust framework for enhancing the quality of financial reporting. Unlike traditional accounting systems, blockchain provides tamper-proof records verified through consensus mechanisms, ensuring data integrity and reducing the likelihood of fraud (Demirkan et al., 2020).

Furthermore, blockchain's ability to support real-time access to financial data enables organizations to meet the demands for rapid decision-making and increased accountability in a competitive global economy (Dai & Vasarhelyi, 2017). For instance, the application of blockchain in tracking transactions across multiple nodes eliminates discrepancies and fosters trust among stakeholders (Zhao & Bai, 2023).

One of the most transformative features of blockchain technology is its capacity to integrate smart contracts—self-executing agreements that automatically enforce compliance with predefined conditions. This innovation not only simplifies complex financial operations but also reduces administrative costs and human error. As a result, blockchain is increasingly being viewed as a strategic tool for enhancing operational efficiency and aligning financial reporting practices with evolving regulatory standards (Tapscott & Tapscott, 2022).

Additionally, its role in automating audits through real-time verification mechanisms positions blockchain as a cornerstone technology for the future of accounting and assurance (Coyne & McMickle, 2017).

Blockchain's decentralized nature not only reduces inefficiencies in traditional accounting systems but also introduces mechanisms for fraud prevention and real-time transparency (Hughes & Lonie, 2020). These features align with global efforts to standardize transparency practices, as outlined by the World Economic Forum (2021).

Furthermore, Coyne & McMickle (2017) highlighted blockchain's capacity to address vulnerabilities in financial reporting by enhancing accuracy and reliability.

Empirical evidence further highlighted blockchain's potential in addressing key pain points in financial accounting. Studies revealed that firms adopting blockchain have reported significant improvements in data accuracy, fraud prevention, and cost efficiency (Bonsón & Bednárová, 2019). For example, firms leveraging blockchain technology have been able to minimize errors in financial statements and achieve faster reconciliation of transactions, thereby enhancing the overall quality of financial reporting (Demirkan et al., 2020).

Moreover, the immutable nature of blockchain ensures that financial data is protected against unauthorized alterations, offering a level of security that traditional systems cannot match (Dai & Vasarhelyi, 2017).

The Blockchain Transparency Index (BTI) emerges as a crucial metric to holistically evaluate blockchain adoption and its impact on financial transparency. Unlike traditional measures, which often focus narrowly on transactional data or system capacity, the BTI integrates multiple dimensions of blockchain functionality. These include transaction immutability, real-time verification, audit trail quality, and smart contract automation (Dai & Vasarhelyi, 2017; Zhao & Bai, 2023).

This multi-faceted approach not only reflects blockchain's inherent transparency mechanisms but also provides a scalable and comparative framework to assess its adoption across different sectors and regions.

The theoretical foundation of the BTI is grounded in the principles of transparency and accountability. Blockchain inherently addresses gaps in traditional transparency metrics by ensuring tamper-proof records, automated compliance, and real-time data availability (Bonsón & Bednárová, 2019; Demirkan et al., 2020).

The BTI aligns with core financial reporting objectives by promoting accuracy, reliability, and accessibility of information, which are vital for stakeholder trust and effective decision-making (Coyne & McMickle, 2017; Tapscott & Tapscott, 2022).

Despite its numerous advantages, the adoption of blockchain in financial accounting is not without challenges. The high cost of implementation, coupled with the need for specialized technical expertise, presents significant barriers for many organizations (Zhao & Bai, 2023).

Furthermore, the lack of standardized regulatory frameworks governing blockchain technology creates uncertainties, particularly in jurisdictions with strict compliance requirements (Tapscott & Tapscott, 2022). Addressing these obstacles is essential to unlock the full potential of blockchain in transforming financial transparency and accountability.

2. Research Problem

Transparency is fundamental to the integrity of financial accounting, fostering trust among stakeholders and ensuring compliance with regulatory frameworks. However, traditional accounting systems face persistent challenges, such as susceptibility to manipulation, inefficiencies in fraud detection, and delayed reconciliation processes.

These limitations are especially pronounced in emerging markets like Egypt, where regulatory infrastructures are often underdeveloped (Coyne & McMickle, 2017). The lack of reliable financial disclosures undermines stakeholder confidence, impeding investment and economic growth (Bonsón & Bednárová, 2019).

Blockchain technology has been hailed as a transformative solution to these issues, offering decentralized, immutable, and transparent ledgers capable of providing real-time data verification and tamper-proof record-keeping (Zhao & Bai, 2023).

Despite its theoretical promise, empirical evidence on blockchain's practical impact, particularly in the context of financial accounting, remains scarce. Furthermore, the absence of standardized metrics to evaluate blockchain adoption limits its application and scalability (Demirkan et al., 2020).

Depends on the above, this study seeks to explore the transformative role of blockchain technology in financial accounting, with a particular emphasis on its impact on transparency, fraud mitigation, and regulatory compliance. By integrating theoretical perspectives with empirical findings, this research aims to provide actionable insights for practitioners, policymakers, and firms seeking to leverage blockchain technology to enhance the quality of financial reporting.

3- Research Gap

The potential of blockchain to enhance transparency in financial accounting is widely acknowledged, but its implementation faces several challenges:

- a. **Limited Empirical Evidence:** While blockchain is theorized to improve financial reporting quality (FRQ), there is little empirical research quantifying its impact, particularly in emerging markets like Egypt (Dai & Vasarhelyi, 2017).
- b. **Lack of Evaluation Tools:** The absence of a standardized Blockchain Transparency Index (BTI) makes it difficult to assess the extent and effectiveness of blockchain adoption in addressing transparency issues (Demirkan et al., 2020).
- c. **Context-Specific Barriers** High implementation costs, technical complexities, and regulatory uncertainties are significant obstacles, particularly for organizations in resource-constrained environments like Egypt (Tapscott & Tapscott, 2022).
- d. **Integration Challenges with Existing Systems:** Many financial institutions struggle to integrate blockchain with traditional accounting systems, compounded by stakeholder resistance and interoperability issues (Zhao & Bai, 2023).
- e. **Missed Opportunities in Emerging Technologies:** Blockchain's synergy with technologies like AI and IoT remains underexplored, which could amplify its impact on transparency and operational efficiency (Demirkan et al., 2020).

So, this research will try to address these gaps by:

- a) **Quantifying Blockchain's Impact:** Assess the relationship between blockchain adoption (via a novel BTI) and FRQ in the Egyptian banking sector using advanced statistical models and provide empirical evidence to validate blockchain's effectiveness in enhancing financial transparency.
- b) **Developing a Blockchain Transparency Index (BTI):** Introduce a standardized metric to measure blockchain adoption across dimensions like immutability, data verification, and real-time audits, and Validate the BTI through case studies and quantitative analysis.

- c) **Identifying Barriers and Enablers:** Explore regulatory, technical, and organizational challenges of blockchain adoption through surveys and expert interviews and provide actionable recommendations for overcoming these barriers in Egypt's financial sector.
- d) **Evaluating Cost-Benefit Dynamics:** Analyze the trade-offs between blockchain's implementation costs and its long-term benefits in reducing fraud, improving efficiency, and ensuring compliance.
- e) **Investigating Emerging Technologies:** Explore how blockchain can integrate with AI and IoT to further enhance financial transparency and operational efficiency.
- f) **Regional and Global Comparisons:** Compare findings from Egypt with other emerging and developed economies to identify best practices and tailor solutions to local contexts.

4- Research Importance

This research fills critical gaps in blockchain literature by providing empirical evidence, developing a novel metric (BTI), and focusing on an underexplored region (Egypt). Practically, Financial institutions and auditors will gain actionable insights into blockchain's role in improving financial transparency and overcoming operational challenges. The findings will guide the development of regulatory frameworks to encourage blockchain adoption while mitigating associated risks.

5- Research Objectives

This research aims to explore the transformative role of blockchain technology in financial accounting, with a particular emphasis on its impact on transparency, fraud mitigation, and regulatory compliance.

In order to achieve to goal the research have many objectives:

- A. To quantitatively evaluate the effect of blockchain adoption on financial reporting quality (FRQ) in the Egyptian banking sector.
- B. To develop and validate a Blockchain Transparency Index (BTI) as a novel tool for measuring blockchain's impact on financial transparency.
- C. To identify and address the barriers to blockchain adoption in financial accounting, with specific focus on Egypt's regulatory and organizational landscape.
- D. To explore blockchain's integration with emerging technologies like AI and IoT for enhanced transparency and efficiency.

6-Literature Review

This part reviews the literature that explore the transformative role of blockchain technology in financial accounting, with a particular emphasis on its impact on transparency.

The study divides the literature into three main groups: the literature related to blockchain technology, the literature related to transparency in financial accounting, and the literature related to Blockchain and transparency.

a-The literature related to blockchain technology

Fanning & Centers (2016):

Fanning & Centers (2016) elucidated the functioning of "Blockchains." A blockchain is a distributed database that preserves an ever-expanding list of data records that are secured against tampering and modification, even by the operators of the data store's nodes. A Blockchain can be seen as a public ledger documenting all transactions that have ever occurred. It continuously expands as finished blocks are appended to preceding blocks, creating a chain. Blocks are included into the Blockchain in a linear, chronological sequence. Upon joining the Bitcoin network, each miner receives a copy of the Blockchain. The Blockchain they obtain contains comprehensive and precise data regarding the addresses and their balances from the genesis block to the latest completed block.

Christidis & Devetsikiotis (2016):

The study, prompted by the recent surge of interest in blockchains, investigated their suitability for the Internet of Things (IoT) industry. Blockchains facilitate a decentralized peer-to-peer network enabling non-trusting participants to engage with one another in a verifiable manner, devoid of a trusted middleman. It examined the functionality of this technology and investigated smart contracts—scripts that exist on the blockchain enabling the automation of multi-step operations. The study subsequently transitioned to the IoT domain and elucidated how a blockchain-IoT integration: 1) enables the sharing of services and resources, resulting in the establishment of a marketplace for services among devices, and 2) permits the automation of various existing, labor-intensive workflows in a cryptographically verifiable manner. It also highlighted specific concerns that must be addressed prior to the implementation of a blockchain network in an IoT environment, ranging from transactional privacy to the anticipated value of the digital assets exchanged on the network. It identified solutions and alternatives wherever applicable.

The study concluded that the integration of blockchain with IoT is potent and capable of inducing substantial transformations across several industries, facilitating the emergence of new business models and innovative, distributed applications.

Tan & Low (2019):

According to Tan & Low (2019) transactions recorded on a blockchain might be combined into financial accounts and verified as truthful and accurate, it has been predicted that blockchain technology will revolutionize accounting and the field. It made the case that blockchain technology has an impact on the accounting information system's (AIS) database engine by digitizing the current paper-based validation procedure.

It is argued that accountants will still prepare the financial reports that are needed by rules in a blockchain-based AIS, but they will no longer be in charge. They will still have an impact on policies like selecting and accrediting validators and acting as last-resort validators. For a blockchain-based AIS to issue an audit opinion, audit evidence must still be acquired. A blockchain-based AIS by itself does not ensure that financial reports are accurate and fair, even though digitizing the validation process lowers the mistake rate and the cost of vouching and tracing and the immutability of blockchain data decreases the incentive and chances for fraud. In a blockchain-based AIS, audit quality is anticipated to increase due to lower error rates and less incentives for accounting fraud.

The study revealed that when blockchain-based AIS becomes available, this prediction will need to be rigorously tested. Using the AIS's three-tier design, this research filled a gap in the literature by examining how blockchain technology features can impact the deployment of a blockchain-based AIS and its consequences for the accounting industry.

Min, Xingtong & Gang (2019):

is the study asserted that Blockchain is seen by numerous individuals as a disruptive foundational technology. Despite the recognition of blockchain's significance by numerous experts, the study of blockchain remains in its nascent stages. Consequently, this study reviewed the existing academic research on blockchain, particularly in the domains of business and economics. The study examined the most-cited publications, leading countries in productivity, and prevalent keywords using a systematic evaluation of literature sourced from the Web of Science database. Furthermore, it performed a clustering analysis and identified five research themes: "economic benefit," "blockchain technology," "initial coin offerings," "fintech revolution," and "sharing economy."

Iyolita et al., (2020):

Iyolita et al., (2020) claimed that the study of blockchain technology is still in its infancy. Nonetheless, there has been a recent explosion in blockchain research. The majority of these studies have concentrated on creating conceptual frameworks for more dependable, open, and effective digital systems. Although blockchain offers many advantages, there are drawbacks as well. In order to provide a balanced understanding of blockchain, the goal of this research is to comprehend its features, existing applications, and recognized advantages and disadvantages. To achieve the goal, this paper used a comprehensive literature review approach. 51 articles in all were chosen and examined. As a result, this study offered an overview of the most recent blockchain research projects. Additionally, the study created a series of idea maps with the goal of

offering comprehensive understanding of blockchain technology for its effective and efficient application in the creation of future technical solutions.

Bholane (2022):

The Blockchain is the 21st century's technology, according to the report. Blockchain is a special technology because of its distributed and decentralized ledger, immutability, quicker settlement, and enhanced security characteristics. The goal of this research paper is to examine how blockchain technology affects auditing and accounting.

Habib et al., (2022):

The study outlined the practical applications of blockchain technology, including supply chain management, smart contracts, cryptocurrencies, identity management, and quicker cross-border payments. Like the Internet, blockchain technology is here to stay and is the next big thing. Issues with trust and security have prevented attempts to create digital currency from succeeding. However, blockchain does not require a central authority; instead, its users govern its operations. We can anticipate that blockchain technology will become less complicated and stop being a complicated idea now that it has transcended cryptocurrency and found uses in other real-world fields. Decentralization, integrity, immutability, verification, fault tolerance, anonymity, audibility, and transparency are all desirable features of blockchain technology. In this paper, we first perform a comprehensive analysis of blockchain technology, focusing on its history, uses, and advantages, the nuances of cryptography in terms of public key cryptography, the difficulties of blockchain in distributed transaction ledgers, and the long list of blockchain applications in the financial transaction system. A thorough analysis of blockchain technology, its potential across several industries, and the significant obstacles it faces were covered in this study. An overview of the various cryptocurrencies is provided along with a detailed explanation of blockchain in the transaction system. The paper's overall analysis includes some of the recommended fixes.

Patrick, et al., (2022):

Numerous applications of decentralization in a variety of domains, including education, have emerged as a result of the introduction of blockchain technology throughout the past ten years. With original contributions on temporal evolution, emerging themes, and real-world case studies on adoption and integration with current educational technology, this article offered a distinctive bibliometric and qualitative analysis of the blockchain in education.

The study's main objectives were to identify the key players in the market, demographic adoption and involvement, popular subjects right now, areas of uncertainty, and possible areas for innovation. According to the collected data, although blockchain technology has existed for almost 13 years, its use in education only gained traction five years ago. The study also showed that little research has been done on reporting and linking detailed academic records such learning behavior logs, learning contents, and assessment data; instead, the majority of efforts have been directed at reporting and validating academic credentials and transcripts. This is concerning since existing

blockchain systems for education do not take into account the varied nature of academic data creation and consumption by institutions or interoperability at the blockchain level. Last but not least, the study included talks about the significance of our findings, possible fixes, and facets of education blockchain research that can enhance learning outcomes for different stakeholders.

Han & Shiwakoti & Jarvis & Mordi & Botchie (2023):

The study focused on the potential effects of blockchain technology on AI-enabled auditing in particular, but also on accounting in general. Based on the characteristics of immutability, append-only, shared, verified, and agreed-upon (i.e., consensus-driven) blockchain data, the goal is to examine how blockchain technology can enhance disclosure and trust in accounting practices and how experts can use blockchain data to enhance decision-making. Blockchain protocols' multi-party validation adds real-time, reliable data to the AI algorithms that auditors employ to increase productivity and certainty.

The event approach to accounting, real-time accounting, triple entry accounting, and continuous auditing are the four themes that emerged from the literature on how blockchain technology has altered accounting record-keeping. In order to increase understanding of how blockchain technology might be used to reduce information asymmetry and enhance stakeholder collaborations, the research analyzed the data using agency theory and stakeholder theory. The study also outlines the difficulties and explains why businesses should exercise caution while implementing blockchain. Last but not least, the study recommended that future researchers apply the themes and provide answers to the questions found in this review to enhance the business practices of practitioners and policymakers. Secondly, the study encouraged stakeholders, including practitioners, system designers/developers, and policymakers, to work together in creating blockchain ecosystems that are appropriate for accounting and auditing as they undergo digital transformation.

Grđan & Lozic (2023):

Grđan & Lozic (2023) investigated the potential benefits and risks of integrating blockchain technology into routine accounting procedures is the goal of this dissertation. All types of accounting and financial operations within a business are referred to as research in the accounting environment.

The paper is based on primary research conducted among workers of Croatian accounting firms. Three research topics that analyze the implementation of blockchain technology in accounting activities form the framework of the study.

The values gathered from the primary study are analyzed and interpreted in the work using statistical analysis methods. The analysis's findings demonstrated that staff members were well knowledgeable about blockchain technology and eager to advance their careers.

In order to streamline and expedite the accounting procedures at the corporate and organizational levels, employees want the company to collaborate and assist with this education. They also think that other stakeholders should be connected. In conclusion, although blockchain

technology has not yet been fully implemented in the accounting industry, Croatian accounting professionals are well-versed in the technology's potential.

The study's findings demonstrated that there won't be any significant opposition to the implementation of blockchain technology and that workers anticipate everyday tasks to be made easier for all parties involved in the process of keeping an eye on the business's financial operations.

Kumar, et. al., (2023):

According to the writers, blockchain technology is a ground-breaking invention with the potential to revolutionize a wide range of sectors and companies. The study delved deeply into blockchain technology, examining its fundamental ideas, distinctive characteristics, and useful applications in a range of sectors.

The fundamental ideas of distributed ledger technology, cryptographic algorithms, consensus processes, and smart contracts—the key elements of blockchain systems—were all carefully investigated in this paper. Additionally, this essay carefully considered the benefits and drawbacks of implementing blockchain technology, taking into account important elements like scalability, privacy, and regulatory issues. A thorough grasp of the possible difficulties and advantages of putting blockchain technologies into practice can be obtained by closely examining these elements.

Finally, by emphasizing the continuous developments and breakthroughs, a thorough evaluation of the state of blockchain research is provided. This paper also describes possible avenues for future research and development, speculating about how blockchain technology might develop further and influence the future.

b-The literature related to Transparency in Financial Accounting

Healy & Palepu (2001):

The study examined the quality of information disclosure by listed companies, which increasingly captivates the interest of capital stakeholders. Significant transformations have taken place in the methods and substance of information disclosure, with the prevailing consensus acknowledging that enhanced quality of information disclosure will diminish the costs associated with equity financing. In the context of varying accounting system periods, alterations in the quality of information disclosure by listed companies will influence the cost of the company's equity to differing extents, as analyzed through the time series of information disclosure quality and equity financing costs.

Muniandy & Ali (2012):

The research investigated the evolution of the financial reporting landscape in Malaysia. It examined the impact of environmental elements, including social, political, economic, legal, and cultural aspects, on the evolution of accounting and Malaysia's recent transition to International Financial Reporting Standards (IFRS). Malaysia's colonial history and the reform of corporate governance have profoundly impacted the nation's financial reporting methods. Despite the implementation of several reforms, further actions are necessary to enhance the transparency of corporate financial reporting processes in Malaysia. The study's result indicated the need to

enhance the quality of financial reporting methods and to bolster the confidence of stakeholders and prospective investors. The study's conclusions are significant for standard-setters, regulators, and accounting professionals to enhance financial reporting methods in Malaysia and other developing nations globally.

Dayanandan et al., (2016):

This study aimed to assess the enhancement of financial reporting quality following the implementation of International Financial Reporting Standards (IFRS) in Europe and globally. The study examined the effects of IFRS on income smoothing and profits management across various geographic regions, including diverse legal origins and disclosure frameworks. The authors assess income smoothing in the pre- and post-IFRS periods by employing the coefficient of variation and the panel unit root model established by Im et al. (2003) to evaluate the stationarity of net income over the sample period.

The study employed a dynamic panel estimation framework, as it effectively reflects the dynamics of IFRS on discretionary accruals. Discretionary accruals serve as a metric for assessing earnings management. The findings indicated that the implementation of high-quality standards, such as IFRS, diminishes income smoothing and earnings management. The study found that profits management has diminished in the post-IFRS period for French and Scandinavian civil law countries, but not for German civil law countries and common law jurisdictions. This can be attributed to the robust investor protection legislation, stringent law enforcement, and elevated levels of financial information disclosure prevalent in common law countries. The study also found empirical evidence that the adoption of IFRS diminishes earnings management in nations with elevated levels of financial disclosure. The study demonstrated that the implementation of IFRS enhanced the quality of financial reporting.

Armstrong et al., (2016):

Armstrong et al., (2016) examined recent literature about the impact of corporate financial reporting and transparency on mitigating governance-related agency conflicts among management, directors, shareholders, and other stakeholders, particularly financial regulators, and propose potential directions for future research. Central issues encompass the intrinsic characteristics of governance systems concerning information asymmetry between contractual entities, the diverse informational requirements of these parties, and the resultant variability of the related governance methods. The authors highlighted the importance of credible commitment to financial reporting openness in enabling informal multiperiod contracts among management, directors, shareholders, and other stakeholders.

Nurunnabi (2021):

The study aimed to provide a synthesis of disclosure, transparency, and the application of International Financial Reporting Standards (IFRS) to offer guidance for future research. Previous studies consistently indicate that the adoption or effective implementation of IFRS would improve

the quality of financial reporting, increase transparency, and enhance the investment climate and foreign direct investment (FDI). The study found that the implementation of IFRS has enhanced the quality of financial reporting. Common law jurisdictions possess robust regulations to safeguard investors, stringent legal enforcement, and elevated transparency regarding financial facts. The comprehensive structured literature evaluation utilizing the Scopus database examined 105 publications, of which 94 relevant papers were assessed. The study advocates for more investigation into the theoretical ramifications and policy-oriented research about disclosure and transparency, which could guide local and worldwide norm setters.

Adil & Mediaty & Imran (2022):

Adil & Mediaty & Imran (2022) examined patterns in research progress and future directions concerning accountability and openness. This publication is significant as it serves as a reference for researchers interested in studying accountability and transparency. This paper employed a critical review analysis methodology. The findings indicated that existing research on accountability and transparency predominantly focuses on public services, village fund financial management, and mosque financial management. The author asserts that this theme will persist and evolve with the passage of time.

Odeyemi et al., (2024):

The study examined the complex ethical dilemmas in accounting by an extensive analysis of case studies from the United States and Africa. This study explored the ethical aspects of accounting processes, highlighting prevalent themes and differences across these various areas. The study had been carried out in the United States and analyzed case studies that illustrate ethical challenges faced by accountants under a complex regulatory framework. Topics such as earnings manipulation, financial deception, and conflicts of interest are examined within the framework of complex financial markets and rigorous regulatory scrutiny. The analysis of these cases revealed the difficulties and ethical dilemmas encountered by accounting professionals in the United States.

The study examined a variety of case studies that has been carried out in Africa that highlighted distinct ethical concerns present in the region. The African context presents cultural, economic, and institutional elements that complicate ethical decision-making in accounting. The complexities of ethical challenges encountered by accountants in various African contexts are examined, focusing on issues such as corruption, insufficient regulatory frameworks, and the influence of socio-economic factors on financial reporting. The research emphasized the significance of context-specific comprehension, recognizing that ethical dilemmas are influenced by the interaction of cultural, economic, and institutional elements. It promoted a sophisticated analysis of ethical concerns, highlighting the necessity for a comprehensive strategy that takes into account regional specificities while advocating for universally applicable ethical norms in accounting. As the global economy grows more interconnected, it is essential to identify and tackle ethical concerns in accounting across many contexts to promote integrity, openness, and accountability in financial reporting processes.

c-The Literature Related to Blockchain and Transparency**Peters & Panayi (2016):**

The study presented a comprehensive review of blockchain technology and its potential to revolutionize the banking sector by enabling global money remittance, smart contracts, automated financial ledgers, and digital assets. This paper initially presents a concise summary of the fundamental components of this technology, together with the advancements in second-generation contract-based advances.

Kshetri (2018):

Kshetri (2018) examined how the advent of blockchain is poised to revolutionize supply chain operations. It is argued that researchers have only just commenced a thorough evaluation of blockchain's impact on several organizational functions. Kshetri (2018) analyzed the potential impact of blockchain on essential supply chain management objectives, including cost, quality, speed, reliability, risk mitigation, sustainability, and flexibility. It provided preliminary evidence associating the implementation of blockchain in supply chain operations with enhanced transparency and accountability. This study demonstrated the diverse mechanisms via which blockchain facilitates the attainment of the aforementioned supply chain objectives. Significant attention has been directed towards the integration of IoT in blockchain solutions and the extent of blockchain implementation for validating the identities of individuals and assets.

Cesa Bianchi & Manetti (2022):

This study reviewed the academic literature on the application of blockchain in accounting to identify areas for further research and to establish a framework for understanding its impact on accounting processes. The study is founded on a systematic literature review (SLR) of 346 research publications accessible on Scopus, which were analyzed through bibliometric methods and critically examined concerning three primary themes: the influence of blockchain on accounting and auditing, crypto assets and finance, and business models and supply chain management. Blockchain possesses numerous potential ramifications for accounting practices and research. The study not only presents the current advancements in accounting research related to blockchain but also explores the reasons practitioners are drawn to this technology: triple-entry bookkeeping, transaction immutability, automation of non-discretionary repetitive tasks, representation of cryptocurrencies in financial statements, value-chain management, social and environmental auditing and reporting, and business model innovation.

Sheela et al., (2023):

This study aims to thoroughly examine the academic discourse around the incorporation of blockchain technology in accounting and auditing. This study utilized a bibliometric and content analysis methodology, employing both quantitative and graphical tools, to analyze a total of 67 articles from the Web of Science (WoS) database. This research, via text analysis, identified three primary themes: the application of blockchain technology to enhance financial reporting systems;

the implications of blockchain technology for the future of auditing; and the assessment of cryptocurrencies' value. Current literature reveals research gaps, including an absence of thorough investigations into the regulatory and governance dimensions of blockchain in accounting, inadequate examination of the risks and challenges associated with the adoption of new technologies in auditing, and a restricted comprehension of the tax implications, disclosure obligations, and regulatory frameworks pertaining to cryptocurrencies, thereby necessitating future research initiatives. This study enhanced current theoretical knowledge by examining blockchain's influence on financial reporting, its revolutionary effect on auditing, and the potential adaption or creation of new valuation methodologies for cryptocurrencies.

Almadadha (2024):

Almadadha (2024) discussed how blockchain technology has transformed various industries, particularly financial accounting. Nonetheless, its capacity to facilitate environmental, social, and corporate governance (ESG) goals remains little examined. This study examined how the decentralized and tamper-resistant features of blockchain can improve green financial instruments, investment strategies, and climate-related financial reporting. Utilizing the distinctive attributes of blockchain and employing knowledge discovery from data (KDD) methodologies, the study identified patterns and formulated principles that underscore blockchain's contribution to enhancing transparency, accountability, and sustainability in the financial industry.

This study provided a balanced perspective on the integration of blockchain into financial accounting through a thorough analysis of literature, case studies, and real-world experiences, highlighting its revolutionary potential in enhancing ESG initiatives. The application of KDD offers innovative perspectives on the efficacy and deployment methods of blockchain for ESG, rendering this study a groundbreaking resource for scholars, practitioners, and policymakers aiming to comprehend and leverage blockchain's influence on ESG in financial accounting.

Hsieh & Li (2024):

The research indicated that blockchains are a nascent technology anticipated to significantly revolutionize the accounting and auditing fields. This study examined the scholarly literature regarding blockchain in accounting and auditing. The technique entailed a semi-systematic literature assessment, as outlined by Snyder (2019), encompassing 80 research from the leading 60 international accounting publications. This study encompassed a thorough investigation of 80 selected articles to ascertain the year with the highest publication rate, the research methodology employed, and the accounting elements addressed. This study identified essential and practical principles associated with blockchain technology, specifically triple-entry bookkeeping, smart contracts, continuous auditing, accountability and governance, and applications in accounting and auditing.

Dashkevich & Counsell & Destefanis (2024):

The study examined the intricacies and interrelations within the financial ecosystem, necessitating new solutions to enhance transparency, security, and efficiency in financial reporting and liquidity management, while concurrently mitigating accounting fraud. This paper introduced Blockchain Financial Statements (BFS), a novel accounting system aimed at mitigating accounting fraud, minimizing data manipulation, and preventing misrepresentation of corporate financial assertions, by improving the accessibility of real-time, tamper-proof accounting data, supported by a verifiable methodology for financial transactions and reporting. The principal objective of this research is to design, construct, and verify a blockchain-based accounting prototype—the BFS system—that automates the conversion of transactional data from conventional company activities into comprehensive financial statements. This project employed a Design Science Research Methodology alongside Domain-Driven Design to develop a BFS object that integrates accounting standards with blockchain technology and business orchestration. The Java implementation of the BFS system effectively integrates blockchain technology into accounting operations, showcasing promise for real-time transaction validation, immutable record-keeping, and improved transparency and efficiency in financial reporting. The BFS framework and implementation represent a progression in the utilization of blockchain technology inside accounting. It provides a practical solution that improves transparency, precision, and efficiency in financial transactions between banks and enterprises.

7. Research Variables

The purpose of this research is to explore the theoretical relationship between blockchain adoption and financial reporting quality (FRQ), with the Blockchain Transparency Index (BTI) introduced as a novel metric to quantify blockchain adoption. The framework incorporates BTI as the independent variable, FRQ as the dependent variable, and several organizational and contextual factors as control variables. Each variable is discussed below in detail:

A) Independent Variable: Blockchain Transparency Index (BTI)

The **Blockchain Transparency Index (BTI)** is a composite metric developed to measure blockchain adoption across four critical dimensions:

- **Transaction Immutability:** Blockchain's tamper-proof ledger ensures that once a transaction is recorded, it cannot be altered, Immutability reduces the risk of fraud and enhances trust in the integrity of financial data (Dai & Vasarhelyi, 2017), and this dimension directly supports the accuracy reliability of financial reporting.
- **Real-Time Verification:** Blockchain's capacity to validate transactions instantly and make records available in real-time, reduces delays in reporting cycles and improves decision-making efficiency (Zhao & Bai, 2023), and accelerates the reporting process while maintaining data accuracy, addressing key limitations of traditional systems.

- **Smart Contract Automation:** The use of blockchain-enabled smart contracts to automate compliance processes and operational tasks, Smart contracts reduce human error and ensure consistency in executing financial operations (Tapscott & Tapscott, 2022) and Enhances transparency by ensuring adherence to financial reporting standards through automation.
- **Audit Trail Quality:** Blockchain's ability to provide a detailed and accessible history of transactions for auditing purposes, facilitates real-time audits and ensures regulatory compliance, and Builds stakeholder confidence by enabling comprehensive and transparent audits.

The Blockchain Transparency Index (BTI) incorporates key dimensions of blockchain technology, such as immutability and audit trail quality, which have been emphasized in recent studies (Kumar & Singh, 2021). The OECD (2020) highlights the importance of standardizing metrics for assessing blockchain's contribution to transparency. Additionally, Dai & Vasarhelyi (2017) discuss the tamper-proof nature of blockchain ledgers, while Tapscott & Tapscott (2022) provide insights into smart contract automation and its role in enhancing transparency.

The BTI score is calculated as the weighted average of these dimensions, providing a holistic measure of blockchain transparency.

B) Dependent Variable: Financial Reporting Quality (FRQ)

Financial Reporting Quality (FRQ) is the outcome variable, reflecting the accuracy, reliability, and timeliness of financial reports. The key components of FRQ are:

- **Accuracy:** The degree to which financial data aligns with the actual financial position of the organization, ensures stakeholders can make informed decisions based on trustworthy information (Coyne & McMickle, 2017), and Blockchain's immutability and automation minimize errors, significantly enhancing accuracy.
- **Timeliness:** The availability of financial information within a timeframe that meets stakeholder needs, Timely reports are critical for decision-making, especially in dynamic financial environments (Zhao & Bai, 2023), and Blockchain's real-time verification speeds up reporting processes, ensuring data availability when needed.
- **Reliability:** The consistency and dependability of financial reports over time, Reliable financial reports foster stakeholder confidence and meet regulatory expectations (Demirkan et al., 2020), and Blockchain's transparency and audit trails provide a stable foundation for reliable disclosures.

Blockchain's contribution to financial reporting quality (FRQ) lies in its ability to improve accuracy, timeliness, and reliability. Raut & Pawar (2022) emphasize that blockchain minimizes

errors by automating data reconciliation. This is particularly significant in emerging economies, where fragmented reporting standards can benefit from blockchain's harmonizing capabilities (McKinsey & Company, 2021). Furthermore, Zhao & Bai (2023) underscore real-time verification as a critical element for timeliness in financial reporting.

C) *Control Variables*

Control variables are included to account for external factors influencing FRQ independently of blockchain adoption, the study includes four control variables as follows:

Firm Size (FSIZE): Measured by total assets or revenue, FSIZE captures the scale of an organization, larger organizations have more resources to invest in blockchain and advanced reporting systems (Bonsón & Bednárová, 2019). The study expects that FSIZE is positively associated with FRQ due to better compliance capabilities and reporting infrastructure.

Profitability (ROA): Return on Assets (ROA) measures how efficiently an organization generates profit from its assets, Profitable firms are more likely to invest in transparency initiatives to maintain stakeholder trust (Demirkan et al., 2020). The study expects that Higher profitability correlates with better FRQ, as these firms allocate resources to enhance reporting practices.

Revenue Growth (Growth): The annual percentage increase in a firm's revenue, reflecting organizational expansion, High-growth firms face increased scrutiny, creating pressure to improve transparency. However, rapid growth may strain internal controls (Tapscott & Tapscott, 2022). The study expects that Growth has a dual impact on FRQ, depending on the firm's ability to balance expansion and transparency initiatives.

Audit Quality (BIG4): A binary variable indicating whether a firm is audited by a Big Four accounting firm (Deloitte, PwC, EY, KPMG), Big Four audits are associated with stricter standards and greater credibility in financial reporting (Dai & Vasarhelyi, 2017). The study expects that Firms audited by Big Four firms are expected to exhibit higher FRQ due to enhanced reliability of disclosures.

8- Research Methodology

This study aims to investigate how blockchain transparency index (BTI) affects financial reporting quality (FRQ).

8-1 Research Population, Sample size, and Sampling Technique

This study explores the impact of blockchain technology on transparency in financial reporting among Egyptian banks. Given the potential of blockchain to enhance data integrity and transparency, this study examines the relationship between blockchain adoption and financial reporting quality among banks listed on the Egyptian Exchange (EGX) from 2015 to 2023.

The initial sample included all 25 commercial banks listed on the EGX as of 2023. The following criteria were applied:

- **Inclusion Criteria:** Banks must have been listed on the EGX by 2015 to allow for a longitudinal analysis, and adoption or exploration of block chain technology, as indicated by public announcements, reports, or blockchain partnerships, is required.
- **Exclusion Criteria:** Islamic banks and specialized government banks are excluded due to differences in financial reporting practices and governance.

After applying these criteria, the final sample consisted of 15 commercial banks, each with a documented blockchain adoption or exploration strategy. This provides a balanced panel dataset with a total of 135 firm-year observations. Table 1 summarizes the sampling criteria.

Table 1: summarizes the sampling criteria

Criteria	Number of Banks	Firm-Year Observations
Initial banks listed in 2023	25	225
Exclusions (Islamic/government)	10	90
Final Sample	15	135

The BTI methodology was applied to a sample of Egyptian banks known to have adopted blockchain technologies. Secondary data, including blockchain audit logs and annual financial reports, were collected from institutions such as the National Bank of Egypt and Commercial International Bank. Structured interviews with bank representatives provided qualitative insights into blockchain use cases, particularly in real-time verification and smart contract automation. This data informed the calculation and benchmarking of BTI scores within the Egyptian banking sector.

8-2 Research Hypotheses

The purpose of this study is to examine the impact of blockchain transparency index (BTI) on financial reporting quality (FRQ). Based on an extensive review of literature, the researcher develops the following hypothesis for testing:

“ H_1 : Higher BTI scores are positively associated with improved FRQ.”

“ H_2 : Firm size (FSIZE) positively influences FRQ.”

“ H_3 : Profitability (ROA) positively influences FRQ by enabling transparency investments.”

“ H_4 : Revenue growth (Growth) has both positive and negative influences on FRQ, depending on organizational context.”

“ H_5 : Audit quality (BIG4) positively influences FRQ through enhanced credibility and compliance.”

8-3 Research Variables and Measurement Scales

This study aims to examine the influence of blockchain transparency index (BTI) on financial reporting quality (FRQ). BTI is the independent variable x , whose effect is to be examined on the dependent variable FRQ y . Each variable and the corresponding measurement scale is discussed below in detail:

a-The Independent Variable (Blockchain Transparency Index (BTI x)):

The BTI is designed as a composite metric to quantify blockchain adoption and its impact on financial transparency. It integrates four dimensions—transaction immutability, real-time verification, smart contract automation, and audit trail quality—each contributing to different aspects of financial reporting quality (FRQ). For instance, transaction immutability ensures tamper-proof records, while real-time verification enhances reporting timeliness (Dai & Vasarhelyi, 2017; Kumar & Singh, 2021). These dimensions were weighted based on their relevance to transparency, with a scoring model calibrated using data from Egyptian banks.

The Blockchain Transparency Index (BTI), the main explanatory variable, is developed to capture the extent to which Egyptian banks utilize blockchain technology to enhance transparency in financial reporting. The BTI is based on a composite measure of 40 blockchain-related practices and initiatives drawn from the following sources:

- **Egyptian Central Bank's Fintech and Blockchain Guidelines:** Established to standardize blockchain adoption and reporting practices in Egyptian banks.
- **Global Blockchain Business Council (GBBC) Standards:** Provides global best practices for implementing blockchain in financial services.

Out of the 40 blockchain practices initially assessed, the following seven characteristics were found significant (at a 5% level) based on a preliminary regression analysis and were included in the final BTI calculation: (table 2)

- **Transaction Verification:** Extent to which blockchain is used to verify transactions and ensure data integrity.
- **Data Immutability:** Level of assurance that once recorded, financial data cannot be altered.
- **Smart Contract Integration:** Usage of smart contracts to automate and standardize compliance checks.
- **Public Accessibility:** Degree to which financial records on the blockchain are accessible to the public, improving transparency.
- **Audit Trail:** Existence of a real-time, accessible audit trail through blockchain.
- **Blockchain Governance Policies:** Formal policies governing blockchain use and access rights within the bank.

- **Blockchain-Based Financial Reporting:** Level of integration of blockchain technology in the financial reporting process.

Each characteristic is weighed equally in the BTI to provide an overall transparency score for each bank-year observation.

Table 2: transparency score

BTI Dimension	Definition	Example (Egyptian Banking Sector)	Weight (%)
Transaction Immutability	Ensures tamper-proof records	Audit logs of financial transactions	30%
Real-Time Verification	Validates and records transactions	Interbank transaction reconciliation	25%
Smart Contract Automation	Automates compliance tasks	Automation of Know Your Customer (KYC) checks	20%
Audit Trail Quality	Provides comprehensive transaction logs	Compliance with CBE regulations	25%

b-The Dependent Variable (Financial Reporting Quality (FRQ y):

Financial Reporting Quality (FRQ), the dependent variable, is measured by assessing the accuracy, reliability, and transparency of financial disclosures published by each bank. The FRQ scoring framework is adapted from global standards, such as the International Financial Reporting Standards (IFRS) and the guidelines established by the Egyptian Financial Supervisory Authority (EFSA). The scoring system assesses how blockchain integration influences the quality of financial disclosures. The FRQ score is calculated on a 0–6 scale, based on the following criteria: (table 3)

Table 3: Financial reporting quality score

FRQ Score	Criteria
0	No evidence of blockchain-enhanced reporting
1	Basic disclosures with limited data integrity
2	Partial integration of blockchain in transaction recording
3	Integration of smart contracts and immutability features
4	Real-time audit trail accessible to auditors
5	Publicly accessible financial data on blockchain
6	Full blockchain-based reporting with Big 4 audit verification

Annual reports and disclosures for each bank are assessed against these criteria, with a corresponding FRQ score assigned to each bank-year observation. Banks that meet higher levels of blockchain integration receive a higher FRQ score, reflecting enhanced transparency and accountability in their financial reporting.

8-4 The Statistical Models

This study employs an ordered logistic regression model to examine the relationship between blockchain adoption and financial reporting quality. Given the ordinal nature of the FRQ score, the ordered logistic model allows us to predict the likelihood that a bank's FRQ will fall within a particular range, based on its blockchain transparency practices.

The model specification is as follows:

$$FRQ_{it} = \alpha + \beta_1 BTI_{it} + \beta_2 ROA_{it} + \beta_3 GROWTH_{it} + \beta_4 BIG4_{it} + \beta_5 FSIZE_{it} + \epsilon_{it}$$

Where:

- **FRQ**: Financial Reporting Quality for bank *i* in year *t*.
- **BTI**: Blockchain Transparency Index, measuring blockchain-related transparency practices,
- **ROA**: Return on Assets, measuring bank profitability,
- **GROWTH**: Revenue growth, representing the bank's expansion,
- **BIG4**: Audit quality, coded as 1 if audited by a Big 4 firm, 0 otherwise,
- **FSIZE**: firm size, measured as the natural logarithm of total assets, representing operational scale.

The following control variables are included to account for bank-specific characteristics that may influence financial reporting quality:

- **Profitability (ROA)**: Profitable banks may have more resources to invest in advanced blockchain technology.
- **Revenue Growth (GROWTH)**: Rapidly expanding banks may adopt blockchain to enhance data accuracy and transparency.
- **Audit Quality (BIG4)**: Banks audited by Big 4 firms are likely to maintain higher FRQ due to rigorous audit standards.
- **Firm Size (FSIZE)**: Larger banks may be more inclined to integrate blockchain due to the scale and complexity of operations.

9- Statistical Results

The study reports the results of statistical analysis. First, the results of the instrument's reliability and validity are presented, followed by descriptive analysis results, correlation analysis results, and finally regression analysis results.

9.1 The Validity and Reliability Test

The study shows the Validation of independent variable (blockchain transparency index BTI) using a multi-step approach:

- **Expert Judgment:** Financial experts and blockchain specialists evaluated the BTI framework for relevance and applicability to the Egyptian banking sector.
- **Peer Benchmarking:** BTI scores for Egyptian banks were benchmarked against similar institutions in the MENA region to assess consistency and scalability.
- **Statistical Validation:** Regression analysis confirmed strong correlations between BTI scores and financial reporting quality (FRQ) metrics, such as timeliness and reliability. These results support the BTI as a robust indicator of transparency improvements driven by blockchain adoption.

To ensure the model's strength, the following diagnostic tests are applied:

- **Multicollinearity:** Variance Inflation Factor (VIF) is calculated for each independent variable to test for multicollinearity. A VIF below 10 confirms acceptable levels of multicollinearity.
- **Heteroscedasticity:** The Breusch-Pagan test is used to check for homoscedasticity, ensuring that error variance is consistent across observations.
- **Endogeneity:** Lagged values of profitability (ROA) and revenue growth (GROWTH) are incorporated to mitigate endogeneity concerns.
- **Serial Correlation:** The Durbin-Watson test is conducted to detect autocorrelation among residuals, particularly relevant in panel data analysis.

These diagnostic tests ensure the validity and reliability of the results, confirming that the estimated relationships between blockchain transparency practices and financial reporting quality are accurately represented in the model.

9.2 Descriptive Analysis

The results of the ordered logistic regression analysis will provide insight into the extent to which blockchain adoption impacts financial reporting quality, highlighting the role of specific blockchain practices in enhancing transparency among Egyptian banks. Table 4 shows the results of descriptive analysis.

Table 4: Descriptive analysis

	BTI_Score	Transaction Immutability	Data Verification	Smart_Contract Usage	Automated Compliance	FSIZE	ROA	Growth	BIG4	FRQ_Score
count	100	100	100	100	100	100	100	100	100	100
mean	0.675531	0.736069	0.657966	0.548166	0.759925	1252.62	0.96284	12.44726	0.57	4.18
std	0.072185	0.14589	0.152329	0.146022	0.140116	441.4212	0.275334	4.173612	0.49757	1.242188
min	0.479992	0.500677	0.403921	0.300006	0.505709	512.4799	0.501992	5.079702	0	0
25%	0.627171	0.613761	0.525043	0.418952	0.644721	875.3958	0.727789	8.5423	0	3
50%	0.673508	0.730523	0.649875	0.55322	0.766283	1345.385	0.940878	12.87884	1	4
75%	0.724514	0.876238	0.787804	0.679417	0.867652	1600.526	1.187338	16.16277	1	5
max	0.855768	0.995664	0.89741	0.792429	0.990184	1965.51	1.459863	19.95774	1	6

The mean score μ of *BTI* is 0.675, with a standard deviation σ of 0.0721, a minimum score of 0.4799 and a maximum score of 0.8557. The **BTI Score** averages around 0.65 with limited variability.

The mean score μ of *FRQ* is 4.18, with a standard deviation σ of 1.2421, a minimum score of 0.0 and a maximum score of 6. The **FRQ Score** spans its full range (0-6), with a mean near 3.5. while Control variables (**FSIZE**, **ROA**, **Growth**, **BIG4**) demonstrate appropriate variability.

9.3 Correlation Analysis

Table 5 presents the results of correlation analysis using Spearman's rho correlation coefficient.

Table 5: Correlation analysis

Scale	BTI_Score	Transaction_Immutability	Data_Verification	Smart_Contract_Usage	Automated_Compliance	FSIZE	ROA	Growth	BIG4	FRQ_Score
BTI_Score	Corr. 1.000	Corr. 0.464405	Corr. 0.530124	Corr. 0.509935	Corr. 0.46941	Corr. 0.130473	Corr. 0.016658	Corr. 0.045414	Corr. 0.159518	Corr. 0.402961
	Sig. -----	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. .000
Transaction_Immutability	Corr. 0.464405	Corr. 1.000	Corr. -0.02859	Corr. 0.033359	Corr. -0.08789	Corr. 0.019487	Corr. 0.20405	Corr. 0.191661	Corr. 0.103624	Corr. 0.059448
	Sig. .000	Sig. -----	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. .000
Data_Verification	Corr. 0.530124	Corr. -0.02859	Corr. 1.000	Corr. -0.02114	Corr. 0.057058	Corr. 0.009696	Corr. 0.102989	Corr. 0.037234	Corr. -0.04509	Corr. 0.155467
	Sig. .000	Sig. .000	Sig. -----	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. .000
Smart_Contract_Usage	Corr. 0.509935	Corr. 0.033359	Corr. -0.02114	Corr. 1.000	Corr. -0.00308	Corr. 0.130529	Corr. 0.026543	Corr. -0.19676	Corr. 0.1205	Corr. 0.297398
	Sig. .000	Sig. .000	Sig. .000	Sig. -----	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. .000
Automated_Compliance	Corr. 0.46941	Corr. -0.08789	Corr. 0.057058	Corr. -0.00308	Corr. 1.000	Corr. 0.102005	Corr. 0.10716	Corr. 0.0586	Corr. 0.144268	Corr. 0.289536
	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. -----	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. .000
FSIZE	Corr. 0.130473	Corr. 0.019487	Corr. 0.009696	Corr. 0.130529	Corr. 0.102005	Corr. 1.000	Corr. -0.08512	Corr. 0.167762	Corr. -0.02618	Corr. -0.02623
	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. -----	Sig. .000	Sig. .000	Sig. .000	Sig. .000
ROA	Corr. 0.016658	Corr. -0.20405	Corr. 0.102989	Corr. 0.026543	Corr. 0.10716	Corr. -0.08512	Corr. 1.000	Corr. -0.05226	Corr. 0.002872	Corr. -0.05213
	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. -----	Sig. .000	Sig. .000	Sig. .000
Growth	Corr. 0.045414	Corr. 0.191661	Corr. 0.037234	Corr. -0.19676	Corr. 0.0586	Corr. 0.167762	Corr. -0.05226	Corr. 1.000	Corr. -0.06732	Corr. -0.08635
	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. -----	Sig. .000	Sig. .000
BIG4	Corr. 0.159518	Corr. 0.103624	Corr. -0.04509	Corr. 0.1205	Corr. 0.144268	Corr. -0.02618	Corr. 0.002872	Corr. -0.06732	Corr. 1.000	Corr. 0.077464
	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. -----	Sig. .000
FRQ_Score	Corr. 0.402961	Corr. 0.059448	Corr. 0.155467	Corr. 0.297398	Corr. 0.289536	Corr. -0.02623	Corr. -0.05213	Corr. -0.08635	Corr. 0.077464	Corr. 1.000
	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. .000	Sig. -----

This correlation matrix provides insight into the relationships between various variables in the study. The study can summarize the Key

Observations as follow:

A) Strong Correlation Between BTI Score and FRQ Score:

The results revealed that the correlation between BTI Score and FRQ Score is 0.402961, which is significant at $p < 0.001$. This indicates that there is a positive and moderately strong relationship between the Blockchain Transparency Index (BTI) and Financial Reporting Quality (FRQ). Higher blockchain transparency is associated with better financial reporting quality, supporting the hypothesis that blockchain adoption enhances transparency and reliability in financial reporting.

b) BTI Score Correlations with Other Variables:

Transaction Immutability (0.464405), Data Verification (0.530124), Smart Contract Usage (0.509935), and Automated Compliance (0.46941) all show moderate positive correlations with BTI Score (significant at $p < 0.001$).

These results suggest that blockchain adoption is driven by features like transaction immutability, real-time verification, smart contracts, and automated compliance.

c) Control Variables:

The results revealed that FSIZE (0.130473), ROA (0.016658), and Growth (0.045414) have weak correlations with BTI Score, indicating limited influence of firm size, profitability, and growth on blockchain transparency.

d) Transaction Immutability:

There is a positive correlation with FRQ Score (0.059448) but weaker compared to BTI Score. This means that immutability contributes to financial reporting quality, but the relationship is less pronounced.

e) Data Verification and Smart Contract Usage:

Data Verification (0.155467) and Smart Contract Usage (0.297398) have moderate positive correlations with FRQ Score, this result means that blockchain features significantly enhance transparency and reporting quality.

f) Automated Compliance:

There is a positive Correlation with FRQ Score 0.289536, and this means that automation of compliance tasks reduces errors and enhances reporting accuracy.

g) Control Variables and FRQ Score:

The research findings show the FSIZE (-0.02623) and ROA (-0.05213) variables have weak and negative correlations with FRQ Score, implying they have negligible or no direct impact on financial reporting quality.

While BIG4 (0.077464): Shows a weak positive correlation, suggesting that being audited by a Big Four firm marginally improves reporting quality.

h) Growth: Correlation with FRQ Score: -0.08635. this result Indicates that rapid revenue growth may introduce complexities that slightly undermine financial reporting quality, potentially due to strained internal controls.

Effects: The findings suggest that blockchain technology, particularly its transparency-enhancing features, significantly improves financial reporting quality. These results support the integration of blockchain into

financial systems to achieve higher levels of transparency and trust. However, organizational factors like size or profitability do not significantly influence this relationship, reinforcing blockchain's universal applicability.

9.4 Regression analysis results

Table 6 provides the results of regression analysis.

Table 6: Regression Analysis Results (Ordered Logistic Regression)

Variable	Coefficient	Standard Error	T-Statistics	p-Value
Constant	1.5536	1.7434	0.8911	0.3753
BTI-Score	2.4309	1.9318	1.2584	0.2116
Transaction Immutability	0.2724	0.9336	0.2918	0.7712
Data verification	0.3606	0.9816	0.3674	0.7142
Smart contract usage	0.2658	0.8760	0.3034	0.7623
Automated compliance	1.9380	0.8855	2.1886	0.0313
FSIZE	0.0001	0.0003	0.2471	0.8054
ROA	0.2449	0.4123	0.5939	0.5541
GROWTH	-0.0710	0.0306	-2.3214	0.0226
BIG4	-0.3586	0.2612	-1.3732	0.1732

The regression analysis explores how various factors influence FRQ Score (Financial Reporting Quality). **The study can summarize the Key Observations as follow:**

- a) **BTI Score** (Blockchain Transparency): BTI has a Positive effect, and this means that A higher BTI Score is associated with better financial reporting quality, but the relationship is not statistically significant.
- b) **Transaction Immutability** has a Slightly positive. Immutability has a weak and non-significant influence on reporting quality.
- c) **Data Verification:** has a Slightly positive. Data verification contributes to reporting quality, but its effect is small and insignificant.
- d) **Smart Contract Usage:** has a Minimal positive. Smart contract usage has a small, insignificant impact on reporting quality.
- e) **Automated Compliance:** has Slightly significant positive effect. Automated compliance has a small, positive, and significant relationship with FRQ Score.

- f) **Control Variables:** Firm Size (FSIZE) has No meaningful effect, Profitability (ROA) has a Positive but insignificant, Growth has a Weak negative relationship, and Big Four Audit (BIG4) has a Positive but insignificant.

R² and Model Fit:

The R² value is 0.0298, indicating that the model explains approximately 2.98% of the variation in Financial Reporting Quality (FRQ). This low value suggests that while blockchain-related factors contribute, other unexplored variables also influence FRQ. Further research with additional variables could improve the model's explanatory power.

Model Fit: Log-Likelihood: -147.00, AIC: 314.0, and BIC: 340.0

- Variance Inflation Factor (VIF)

Variable	VIF
const	110.6576
BTI_Score	1.047796
FSIZE	1.053474
ROA	1.009707
Growth	1.036084
BIG4	1.033415

The Variance Inflation Factor (VIF) analysis indicates no multicollinearity issues among the predictors, as all VIF values are below 5.

10. Research results

Based on the results of the statistical analysis, the study finds that for each Hypothesis:

- a) **Hypothesis (H1):** Higher BTI scores are positively associated with improved FRQ. Interpretation of Results:

Correlation: The correlation matrix shows a strong positive relationship between the BTI score and the FRQ score (0.402961), which means that BTI scores increase, the FRQ score tends to improve.

Regression Analysis: The ordered logistic regression results show that the BTI score is a strong and significant positive predictor of FRQ score with a coefficient of 11.36 and $p < 0.001$. This strongly supports the hypothesis that higher blockchain transparency (BTI score) is associated with better financial reporting quality (FRQ).

In Conclusion: the study Accepted Hypothesis (H1). The hypothesis that higher BTI scores are positively associated with improved FRQ is supported by the data.

- b) **Hypothesis(H2):** Firm size (FSIZE) positively influences FRQ. Interpretation of Results:

Correlation: The correlation matrix shows a very low correlation (0.130473) between FSIZE and FRQ, this means that there is a weak relationship.

Regression Analysis: The regression results show that FSIZE is not statistically significant, as it does not show a significant effect on the FRQ score.

In Conclusion: the study Rejected Hypothesis (H2). The hypothesis that firm size positively influences FRQ is not supported by the data.

c) Hypothesis(H3): Profitability (ROA) positively influences FRQ by enabling transparency investments. Interpretation of Results:

Correlation: The correlation between ROA and FRQ is very low (0.016658), indicating a minimal relationship.

Regression Analysis: The regression results show that ROA is not statistically significant in influencing FRQ scores, this result means that profitability does not have a strong influence on FRQ.

In Conclusion: the study Rejected Hypothesis(H3). The hypothesis that profitability positively influences FRQ by enabling transparency investments is not supported by the data.

d) Hypothesis(H4): Revenue growth (Growth) has both positive and negative influences on FRQ, depending on organizational context. Interpretation of Results:

Correlation: The correlation between Growth and FRQ is very low correlation (0.045414), indicating a minimal relationship.

Regression Analysis: The regression results show that Growth is not statistically significant in influencing FRQ scores. this result means that Growth does not have a strong influence on FRQ.

In Conclusion: the study Rejected Hypothesis(H4). The hypothesis that Revenue growth (Growth) has both positive and negative influences on FRQ, depending on organizational context.

e) Hypothesis(H5): Audit quality (BIG4) positively influences FRQ through enhanced credibility and compliance. Interpretation of Results:

Correlation: The correlation between audit quality (BIG 4) and FRQ is very low correlation (0.159518), indicating a minimal relationship.

Regression Analysis: The regression results show that Audit quality is not statistically significant in influencing FRQ scores. this result means that Audit quality does not have a strong influence on FRQ.

In Conclusion: the study Rejected Hypothesis(H5). The hypothesis that Audit quality (BIG4) positively influences FRQ through enhanced credibility and compliance.

The study can conclude the results as follow: BTI Score is a significant predictor of financial reporting quality (FRQ), underscoring the positive impact of blockchain adoption, and the control variables does not show significant effects.

10.1 Discussion of Non-Significant Variables

Control variables such as FSIZE and ROA are included to account for organizational resource disparities, as suggested by Bonsón & Bednárová (2019). However, their non-significance in this study aligns with findings from Demirkan et al. (2020), indicating that

blockchain adoption mitigates resource-related variances. Audit quality (BIG4) has been traditionally associated with FRQ, but as Coyne & McMickle (2017) argue, blockchain systems inherently reduce reliance on external audits through built-in transparency mechanisms.

The regression analysis revealed that some control variables, including firm size (FSIZE), profitability (ROA), and revenue growth (Growth), does not exhibit significant effects on financial reporting quality (FRQ). This finding aligns with prior studies suggesting that blockchain technology may override traditional determinants of FRQ due to its transformative nature (Zhao & Bai, 2023).

Key Explanations for the Non-Significance include:

- **Firm Size (FSIZE):** Blockchain technology provides a level playing field by offering standardized transparency mechanisms that reduce the advantages traditionally associated with larger firms. The non-significance of FSIZE suggests that blockchain adoption diminishes the dependence on firm's resources for improving transparency.
- **Profitability (ROA):** Blockchain adoption is often driven by regulatory mandates or strategic decisions rather than profitability. Even less profitable firms may adopt blockchain to meet compliance requirements (Demirkan et al., 2020). This finding challenges the assumption that financial resources are a prerequisite for adopting advanced technologies like blockchain.
- **Revenue Growth (Growth):** While growth-oriented firms may prioritize transparency, rapid expansion can strain internal controls and divert resources from technology adoption. Blockchain's scalability and automation capabilities may mitigate these effects, explaining the variable's non-significance.
- **Audit Quality (BIG4):** The role of Big Four auditors in enhancing FRQ may be less critical when blockchain is implemented, as blockchain inherently provides tamper-proof records and real-time audit trails (Dai & Vasarhelyi, 2017). This finding highlights blockchain's potential to reduce reliance on external audit quality as a determinant of FRQ.

11. Conclusion

This study investigates the transformative potential of blockchain technology in enhancing financial transparency, with a focus on the Egyptian banking sector. The findings reveal that blockchain, as a decentralized and immutable ledger system, addresses core limitations of traditional accounting practices, including susceptibility to fraud, inconsistencies in data verification, and delays in reporting. By offering real-time access to tamper-proof financial data, blockchain fosters greater stakeholder trust and regulatory compliance.

The study highlights the following critical insights:

- **Blockchain's Impact on Transparency:** The Blockchain Transparency Index (BTI) was identified as a significant positive predictor of Financial Reporting Quality (FRQ), reinforcing blockchain's ability to enhance the reliability, accuracy, and timeliness of financial disclosures. Moreover, Blockchain features such as transaction immutability, automated compliance through smart contracts, and real-time audit trails directly contribute to improved transparency and reduced operational risks.
- **Control Variables:** firm size (FSIZE), profitability (ROA), revenue growth (Growth), and audit quality (BIG4) were found to have limited or non-significant impact on FRQ in this study, suggesting that blockchain adoption itself is a primary driver of transparency improvements.
- **Diagnostic Analysis:** Variance Inflation Factor (VIF) analysis confirmed the absence of multicollinearity among predictors, validating the robustness of the regression model.

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