Research Article

Blockchain and Big Data Integration in Financial Transparency: Explore How Combining Blockchain with Big Data Improves Transparency in Financial Reporting and Fraud Detection

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About Article

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ABSTRACT

Financial transparency, accountability, fraud detection and accuracy of reporting are changing their meanings in the context of blockchain and big data. Big data is able to perform intensive analysis of regular large and complex financial data in real-time, whereas blockchain allows maintaining an immutable registry of financial transactions, which guarantees protection and traceability. Collectively, these technologies promote a higher level of trust, improve the reporting frameworks, and reinforce regulation. Their synergy could help financial institutions to detect abnormalities, reduce fraud, and enhance the quality of decisions. In addition, the combination provides better answers to international auditing standards, investor confidence issues, and conventional audit models constraints. The paper is a review and synthesis of the literature on the intersection of blockchain and big data, and how their combination can help the financial sector to become more transparent and accountable. Using 50 sources of secondary data, the review identifies the possible advantages and issues with these technologies in transforming the financial auditing and regulation, which ultimately leads to the creation of a safer, healthier, and more responsible financial system.

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1. INTRODUCTION

The international markets are highly dependent on transparency and where investors have more confidence and accountability in the financial markets; this is what is termed as sustainable financial markets. On the other hand, traditional financial reporting systems are in most cases said to be inefficient, information asymmetry, and prone to manipulation or fraud. Such deficiencies have brought the clamor of the more technologically advanced solutions that would guarantee the integrity of data and foster real-time accountability (Saleh *et al.*, 2023; Prokopenko *et al.*, 2024). In this environment, blockchain-big data integration has become a possible paradigm of restructuring the transparency and improving the resilience of the financial systems.

Blockchain technology offers an immutable and decentralized account of the financial transactions, which is secure and accurate. It is a competitive feature because it minimizes the risks of error or manipulation since this functionality allows checking the records in real-time, which reduces the need to rely on the standard audit processes (Dashkevich *et al.*, 2024). To complement this, big data analytics can allow organizations to process and analyze massive amounts of structured and unstructured data and uncover hidden patterns, manage risks better, and detect fraud (Zhou *et al.*, 2020; Udeh *et al.*, 2024). The way these technologies are combined makes them a strong platform that enhances accountability and enables effective reporting and critical weaknesses inherent in traditional financial systems to be addressed.

Furthermore, institutional responses of transparency and fraud detection are changing with the integration of blockchain and sophisticated data analytics systems including machine learning and artificial intelligence. Such integrations to power predictive models can detect an anomaly before it grows into a significant financial threat, thus making the process proactive in preventing fraud (Bello *et al.*, 2024; Jubiter, 2025). Moreover, financial reporting of financial institutions is improving compliance with international standards, making the investors more trustful, and making the regulation more effective due to fintech-driven financial reporting that is supported by big data (Martinez *et al.*, 2024; Almadadha, 2024).

With the increasing complexity of financial ecosystems through globalization, online transactions, and growing regulatory pressures, blockchain and big data integration stops being merely an innovation and is taking the nature of a necessity. Its forecasting and open nature makes it a foundation of building a financial system capable of surviving the present and operating in the future, which is lean, safe, and responsible (Rane *et al.*, 2023; Alzoubi, 2024).

1.1. Objective of the review

In this paper, I will review the current literature on the issue of integrating blockchain and big data in financial systems and synthesize the information. In particular, it looks at the ways these technologies work together to improve transparency, accountability, and fraud detection along with the compliance, as well as what challenges and opportunities come with them.

2. LITERATURE REVIEW

The concerted effort of blockchain and big data is progressively being poised as revolution in financial analysis, especially in enhancing transparency, accountability and detecting fraud. Information asymmetry, fraud, and ineffective audit are common attributes to traditional financial systems, which compromise integrity of reporting. According to the scholars, the decentralized and immutable structure of blockchain is a direct solution to these issues as it makes sure that financial records cannot be modified (Prokopenko *et al.*, 2024; Rijanto, 2024). Simultaneously, big data analytics can enable companies to process huge amounts of structured and unstructured financial data, identify anomalies, and enable more informed decisions, therefore, promoting responsibility and minimizing the risk of fraud (Zhou *et al.*, 2020; Udeh *et al.*, 2024).

A number of researches highlight the revolutionary nature of blockchain in financial reporting. Dashkevich *et al.* (2024) also note its ability to automate liquidity control and replace manual audit with transparent and real-time reporting. In a comparable manner, Almadadha (2024) highlights the fact that blockchain aligns with the concept of environmental, social, and governance (ESG) principles, establishing it as a trust-building tool that has gone beyond the scope of security to a wider concept of corporate responsibility.

There has also been the study of big data concerning financial transparency. Big data will improve reporting accuracy by identifying the latent patterns and reducing the reporting error. Muheidat *et al.* (2022) is also potential in the predictive fraud detection, whereas Ahmed (2025) and Alzoubi (2024) indicate that the combination of big data and blockchain guarantees both information integrity and immediate detection of the fraud.

The other emergent line of research is that of blockchain intersecting with artificial intelligence (AI) and machine learning (ML). Rane *et al.* (2023) state that blockchain-AI can enhance predictive analytics and financial safety, whereas Martinez *et al.* (2024) also observe efficiency improvement in all financial systems in the world. The sources of Bello *et al.* (2024) and Jubiter (2025) develop this piece of work by providing conceptual models of blockchain-ML-enabled real-time fraud detection, demonstrating how they can be scaled throughout the fintech ecosystem.

Blockchain has been identified as a way to improve accountability in the field of corporate governance. It is emphasized by Achebe *et al.* (2024) as being auditably and legally enforceable to manage fraud risk whereas Hossain (2023) and Nofel *et al.* (2024) discuss its use in forensic accounting and automated reporting respectively. According to these studies, blockchain can be used to minimize malpractice by integrating transparency into organizational operations.

Other than reporting, there is an increasing relationship between blockchain and big data integration and other wider financial ecosystems. The articles by Guo *et al.* (2022) and Rahman *et al.* (2025) show that big data solutions facilitated by blockchains enhance supply chain finance transparency and traceability, supporting the international implications of digital reporting.

Combined, the literature comes to the point of permanence and trust ensured by blockchain and interpretability and predictive power guaranteed by big data. Their combination, especially together with AI and ML, creates a strong beginning in the fight against fraudulent activities, transparency, and accountability that have had a long history (Kumbhar *et al.*, 2025; Alzoubi, 2024).

Table 1. Expanded summary of key literature on blockchain and big data in financial transparency

Author(s) & Year	Focus of Study	Key Contribution
Prokopenko *et al.* (2024)	Blockchain in accounting	Immutable records enhance transparency
Dashkevich *et al.* (2024)	Blockchain in reporting	Automated, transparent financial statements
Almadadha (2024)	Blockchain for ESG reporting	Enhances corporate responsibility and investor trust
Saleh *et al.* (2023)	Big data in reporting	Improves quality and accuracy of reports
Muheidat *et al.* (2022)	Blockchain + big data	Supports predictive fraud detection
Rane *et al.* (2023)	Blockchain & AI integration	Improves security and predictive analytics
Martinez *et al.* (2024)	AI + blockchain in finance	Enhances efficiency and global security
Bello *et al.* (2024)	ML + blockchain	Real-time fraud detection frameworks
Jubiter (2025)	Fintech fraud prevention	AI-driven blockchain fraud detection
Achebe *et al.* (2024)	Corporate fraud management	Ensures auditability and legal accountability
Hossain (2023)	Forensic accounting	Blockchain for fraud investigation
Nofel *et al.* (2024)	IoT + Blockchain in reporting	Automates accounting with integrated systems
Guo *et al.* (2022)	Blockchain + IoT in finance	Improves supply chain financial transparency
Rahman *et al.* (2025)	Supply chain blockchain	Strengthens transparency in distributed ledgers
Kumbhar *et al.* (2025)	Blockchain + big data synergy	Provides secure analytics solutions

3. METHODOLOGY

This research paper will assume a systematic literature review design to integrate past academic research on the incorporation of blockchain and big data into the financial systems. The methodology is based on the standard practices of conducting systematic reviews in management and information systems research, which gives rigor, transparency, and replicability.

3.1. Sources of Data and Search Strategy

Peer-reviewed journal articles, conference proceedings, and credible institutional reports pertinent to the past 2020-2025 were found to be a source of secondary data. The major databases that were used were Scopus, Web of Science, IEEE Xplore, ScienceDirect and Google Scholar. The keywords that were used in search were blockchain, big data, financial reporting, fraud detection, financial transparency, accountability, and compliance. The search was broadened or narrowed by using the operators of Boolean (AND/OR).

3.2. Inclusion and Exclusion Criteria

Only the studies written in English, published not earlier than 2020 and directly investigating the intersection between blockchain and big data in the financial sector were included to guarantee quality and relevance. Those articles that only incorporated blockchain or big data, but did not reference financial applications were eliminated, and non-academic sources (news articles and marketing resources) were also excluded.

3.3. Selection Process

The first search provided 142 articles. The 89 articles were retained after the elimination of duplicates and filtering of titles and abstracts. Another full-text screening according to the inclusion /exclusion criteria decreased it to 50 high-quality sources that made up the basis of the review.

3.4. Data Analysis and Extraction

All of the chosen articles were coded in terms of (1) thematic focus (e.g. financial reporting, fraud detection, governance, compliance, supply chain finance), (2) key contributions, and (3) methodological orientation (conceptual, empirical, case-studies, and model development). Findings were organized into major domains with the help of a thematic synthesis approach and included financial reporting integrity, fraud prevention, investor trust, governance, and regulatory implications.

3.5. Validity and Reliability

In order to improve the reliability, explicit criteria were used to select the relevant literature and cross-checking was also made to eliminate the chances of missing the relevant literature. The use of various databases also reduced publication bias.

4. RESULTS AND DISCUSSION

The thematic analysis of 50 academic articles demonstrated four overarching thematic findings on the topic of implementing blockchain and big data into financial systems, specifically increased transparency, better fraud detection,

greater compliance and accountability, and efficiency in operation. These results are indicators of general agreement in the literature, but issues and shortcomings were identified as well.

4.1. Increased financial transparency
In various studies, blockchain was repeatedly mentioned as one of the tools of guaranteeing decentralized, immutable, and verifiable records. It will mitigate the risk of financial reporting manipulation and allow regulators and investors to receive credible information in real time (Prokopenko *et al.*, 2024; Dashkevich *et al.*, 2024). It has also been mentioned in the literature that the inconsistency and reliability of audit results can be enhanced through blockchain-based reporting systems (Martinez *et al.*, 2024).

4.2. Improved fraud detection
There is no clear consensus among the reviewed studies that big data analytics can be stronger fraud detectors when used together with blockchain because it allows arranging anomalies and predictive modeling. The conventional audit solutions were referred to as reactive, and blockchain-big data provide fraud prevention proactively, but some research revealed that the fraud detection rate is increased by up to 40 percent (Zhou *et al.*, 2020; Bello *et al.*, 2024; Jubiter, 2025).

4.3. Non-conformance and responsibility
The other theme that was evident was enhanced adherence to international reporting standards and regulations. The immutability of blockchain guarantees that financial reports are not altered once recorded, and big data analytics is used to show organizations their compliance with international regulatory and ESG standards. All these technologies combined create more investor trust as they instill accountability in reporting (Almadadha, 2024; Rane *et al.*, 2023).

4.4. Operational efficiency
It was also in studies on efficiency gains. Blockchain-big data integration was demonstrated to reduce the cost of auditing and the time used in auditing, decrease the number of errors in reporting and enhance the accuracy of reporting. This develops costs savings and enhances stakeholder relationships as competitive advantages to organizations (Achebe *et al.*, 2024; Guo *et al.*, 2022).

Table 2. Contrasts traditional financial systems with blockchain–big data–integrated systems, reflecting the thematic findings from the literature.

Dimension	Traditional Financial Systems	Blockchain–Big Data Integrated Systems
Financial Transparency	Centralized, prone to manipulation	Decentralized, immutable, verifiable in real time
Fraud Detection	Reactive, post-event auditing	Proactive, anomaly detection and predictive modeling
Regulatory Compliance	Manual, error-prone, and costly	Automated, verifiable, aligned with global standards
Audit Efficiency	Time-intensive, resource-heavy	Reduced audit time and costs, real-time insights
Investor Confidence	Weakens after scandals, reliant on external audits	Strengthened by tamper-proof reporting

4.5. Interpretation
The literature review indicates that blockchain and big data are complementary in each other in filling the gaps in the conventional financial reporting systems. Blockchain offers security/transparency and big data gives it predictive analytics and monitoring anomalies. It is perceived that their integration is a paradigm shift between a reactive and proactive form of governance that provides organizations with enhanced financial accountability and competitive edge. Simultaneously, it was also mentioned in studies that there are challenges related to scalability, interoperability, privacy, and regulatory adaptation, which are also a focus of future research (Alzoubi, 2024; Nofel *et al.*, 2024).

4.6. Discussion
As the results of this paper have shown, the opportunities of introducing blockchain and big data technologies into the transformation of the financial systems are enormous. As it has already been said, a strong background in the form of the guarantee of accuracy and transparency of financial reporting is provided with the help of the unavoidable registry of blockchain and its decentralization opportunities (Prokopenko *et al.*, 2024;

Dashkevich *et al.*, 2024). Meanwhile, fraud detection and risk management also belong to the scope of big data analytics usage, given that data processing and pattern recognition among volumes of financial data can be performed in real-time (Zhou *et al.*, 2020; Udeh *et al.*, 2024).

Together, the technologies develop synergistic solutions to all long-standing problems that were faced in the area of financial governance, in particular, the problem of fraud, inefficiency in reporting and poor compliance framework.

A complementary relationship between blockchain and big data is one of the largest themes that the analysis has revealed. Blockchain, despite its distributed and tamper-proof design and resulting trust and verifiability, lacks an advanced analytical capability in itself. On the other hand, the big data does not only provide more advanced predictive data but it also depends on the quality of the data which it is working with (Almadadha, 2024). The combination of the two is a guarantee of the reliability of the information, as well as its actionability in real-time. This addresses one of the most endemic issues of financial systems the failure to distinguish between fraudulent activity and legitimate but unusual behavior (Achebe *et al.*, 2024).

The discussion also indicates that the systemic implications of this integration. Corporations and other financial institutions are now more than ever, pressurized to comply with the global requirements of reporting, more particularly the requirements that come with the environmental, social and governance (ESG) requirements. The data about the ESG-related areas cannot be separated and changed by blockchain but can be monitored and evaluated properly by the organizations with the help of big data (Martinez *et al.*, 2024). Not only is this type of fit rendering the corporate responsible but it is also rendering the investor more confident and this is an essential element in bringing sanity to the market. Since financial scandals will have the effect of reducing the degree of trust among the population, a complex of technologies that will improve not only transparency but also predictive control will reorganize relations between investors and the specifics of the global market (Bello *et al.*, 2024).

However, the path towards the integration of these technologies is not a smooth sailing one. A proof-of-work network is both slow and energy-intensive, restricting the transaction to its application in a blockchain network (Alzoubi, 2024). Speaking of which, big data requires a lot of infrastructure and investment, which is a challenge to smaller organisations or organisations within the developing economy (Guo *et al.*, 2022). The ethical aspect also comes up specifically in the data privacy realm. Blockchain might not conform to the privacy regulations as some data on transactions are shown too much, even though they are accessible. Similarly, the other potential issue that big data analytics can provoke is the permission and abuse of personal financial data (Nofel *et al.*, 2024). When we are dealing with these issues, we have to invent ways of dealing with technologies but also we are important to offer good policy frameworks to balance between innovation and control.

In reality, blockchain and big data integration cannot identify and report fraud. One way they can completely transform a whole financial ecosystem is through their application to supply chain finance, decentralized finance (DeFi) and real-time auditing (Rahman *et al.*, 2025). In this respect, with big data insights, blockchain-based supply chains can deliver traceable and verifiable origins of transactions to enhance accountability in the global trade networks. To that end, blockchain-based automated auditing systems decrease human auditor turnover, automate compliance, and cut costs (Nofel *et al.*, 2024). All these new applications are futuristic because blockchain and massive amounts of data will not only support the finances of corporations but also the cross-border trade, taxation and even the state government.

Overall, the discussion shows that blockchain and the big data not only execute the function of introducing certain minor alterations to the financial systems, but also, the revolution, which can potentially re-discover the principles of transparency, accountability, and trust. Their general advantages, especially in fraud detection, reporting etc, cannot be underestimated, albeit scalability is still a challenge, coupled with interoperability and privacy issues, in the build of safe, effective and globally competitive financial ecosystems. The effects are regulatory, institutional and technological in nature, i.e. those stakeholders that embrace the systems early will end up gaining colossal strategic benefits in the digital economy.

5. CONCLUSION

This review has already shown that blockchain and big data paradigm shift in accountancy and fraud prevention that can be used to complement each other to improve financial transparency, better fraud detection, enhanced compliance and investor confidence. Blockchain ensures immutability and decentralized assurance, and big data is associated with predictive analytics that can be used to handle fraud and manage risks proactively. Those technologies, combined, could potentially make financial reporting more transparent, efficient and sustainable and the one that regulator, corporations, and even investors can trust.

Nonetheless, there are a number of limitations that should be admitted. To begin with, the research is limited to secondary sources of literature, and therefore, it fails to present new empirical findings. The inferences will depend on the extent, quality and the possible bias of the studies reviewed. Second, even though the literature is quite unambiguous in terms of benefits, the practical issues of large-scale implementation have less empirical support. Some of the concerns like the high cost of adoption, the risk of data privacy, interoperability limitations, and lack of organizational change are not well addressed. These loopholes point to the fact that technological, organizational, and regulatory contexts should be cautiously considered prior to thorough adoption.

Multiple avenues are recommended to be used in future studies. The theoretical benefits discovered in the literature are to be validated by the empirical research, and this is to be done with the help of the industry-specific case study and longitudinal research. The comparative study of various financial sectors and international jurisdictions would also give a better insight into barriers to adoption and success factors. Additionally, the discussion of the topics of combining blockchain and big data with artificial intelligence and machine learning may provide some insights into the future fraud prevention systems. Lastly, the work in the future must evaluate the cost benefit effects and look at the changing role of regulatory frameworks in supporting or limiting these innovations.

To sum it up, blockchain and big data are not flawless, but their combination can be a significant way to create more transparent, responsible, and resilient financial ecosystems. Further empirical investigation and joint regulatory methods will play an important role in achieving this potential.

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