

The Impact of Blockchain Technology and Artificial Intelligence on Accounting and Auditing: Challenges and Opportunities

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Abstract

In recent decades, emerging technologies—especially blockchain and artificial intelligence (AI)—have brought extensive changes to the traditional structures of financial industries, including accounting and auditing. Blockchain, with features such as transparency, immutability, and decentralization, enables the recording and storage of financial data in a secure, tamper-proof manner. Meanwhile, artificial intelligence, relying on machine learning algorithms, natural language processing, and predictive analytics, automates many complex and time-consuming processes in accounting and auditing while significantly increasing the accuracy of data analysis. The study comprehensively examines the effects of these transformative technologies on accounting and auditing by first explaining key concepts and related theoretical frameworks, then analyzing their practical applications, benefits, challenges, and implementation limitations in financial environments. The findings show that combining blockchain and AI can enhance transparency, reduce fraud, improve audit quality, and strengthen financial decision-making. However, challenges such as weak technology infrastructure, a lack of skilled labor, legal complexities, and security concerns persist; if ignored, they can hinder the full potential of these technologies. The article concludes that successful adoption and implementation in the accounting and auditing professions require a strategic approach, upgrades to the technical knowledge of accountants and auditors, and revisions to existing financial and auditing regulations. Future research should focus on developing local frameworks and international standards for integrating AI and blockchain into financial systems.

Keywords: Blockchain, Artificial Intelligence, Accounting, Auditing, Financial Transparency, Financial Automation

INTRODUCTION

In the era of digital transformation, new technologies such as blockchain and artificial intelligence are redefining traditional methods of conducting financial, accounting, and auditing operations. These technologies do not only play the role of auxiliary tools but are also recognized as fundamental infrastructures in the path of transformation of the financial industry (Dai and Vassarelli, 2017: 54). Currently, many leading companies in the global arena and even some audit organizations in Iran are seeking to integrate these technologies into their operational processes (Ahmadi et al., 2024; Azizi et al., 2024; Hoshdar et al., 2017; Masoumi Bilondi et al., 2025).

As a distributed and decentralized ledger, blockchain provides the ability to record transactions in an immutable and transparent manner and minimizes the risk of data distortion and fraud by eliminating intermediaries (Tapscott and Tapscott, 2016: 137). This capability has wide-

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ranging applications, especially in accounting processes, such as financial document recording, financial statement preparation, and regulatory compliance (Collier, 2015; Dako et al., 2020; Saleh et al., 2023; Zhao & Wang, 2024). In the auditing field, blockchain can also be the basis for simultaneous and continuous auditing, which is a long-standing goal of the profession (Dyball & Seethamraju, 2022; Noori Doabi et al., 2025; Wang et al., 2025).

On the other hand, artificial intelligence, using machine learning algorithms, big data analysis, and natural language processing, has become a powerful tool for rapid and accurate analysis and interpretation of financial data. AI-based systems are able to discover hidden patterns in data and provide timely warnings about potential risks (Brynjolfsson and McAfee, 2017: 71). In auditing, this technology allows auditors to bypass traditional sampling methods and analyze the entire dataset with high accuracy (Celestin & Vanitha, 2019; Elumilade et al., 2024; Eulerich et al., 2023; Gepp et al., 2018).

In Iran, the process of digitalization of accounting and auditing has also accelerated; however, there are still obstacles such as weak technological infrastructure, lack of local standards for blockchain data, and lack of expertise in using AI systems (Darandashi et al., 2025; Hemati et al., 2025). This is while in developed countries, large audit firms such as Deloitte, EY, and PwC have made huge investments in developing AI- and blockchain-based infrastructures and have published reports on cost reduction, increased transparency, and improved service quality (FT, 2025; FRC, 2024). Therefore, the present study aims to closely examine the opportunities and challenges of applying blockchain and AI technologies in the field of accounting and auditing. The research approach is descriptive-analytical, and an attempt has been made to present a comprehensive look at the technical, legal, human, and strategic dimensions of these technologies, based on reputable domestic and foreign research (Al Shamsi, 2024; Eulerich et al., 2023; Golmohammadi & Kazerooni, 2021; Viswanath et al., 2025). The main question of the article is: How can blockchain and artificial intelligence be used to improve the performance of the accounting and auditing profession without the challenges associated with them becoming structural obstacles?

This study distinguishes itself through several novel contributions, including a comprehensive comparative analysis of both blockchain and AI technologies and their synergistic potential in accounting and auditing systems. It uniquely addresses the implementation challenges specific to developing countries and employs a multidimensional analytical framework that encompasses technical, legal, organizational, and strategic perspectives, moving beyond narrow technical analyses to provide a more holistic understanding.

The research aims to closely examine the opportunities and challenges of applying these technologies through a descriptive-analytical approach, focusing on multiple dimensions. Its specific objectives are to analyze the transformative technical characteristics of blockchain and AI, evaluate their benefits like enhanced transparency and efficiency, identify implementation barriers such as regulatory complexities and skill gaps, compare their impacts in different accounting functions, and propose strategic adoption recommendations tailored for developing contexts. This investigation is guided by a central research question on how to utilize these

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technologies to improve professional performance while ensuring the associated challenges do not become structural obstacles to effective implementation.

By addressing these objectives, the research contributes significantly to both academic discourse and practical application. Theoretically, it advances the understanding of technology-driven transformation in professional services within complex institutional settings. Practically, it aims to deliver actionable insights for professionals, organizational leaders, regulators, and policymakers to inform strategic technology investments, curriculum development, and necessary adaptations to regulatory frameworks for successful digital integration.

RESEARCH METHOD

This study used a qualitative approach with a descriptive-analytical method to examine the impact of blockchain technology and artificial intelligence (AI) on accounting and auditing practices. This method was chosen because the research aimed to comprehensively describe the technological phenomenon and analyze its implications for the accounting and auditing profession in depth.

The data used in this study were secondary data obtained from various sources, including:

1. International and national scientific journal articles published in indexed and reputable journals, specifically those that discussed the application of blockchain and AI in the field of accounting and auditing.
2. Technical reports and publications from international professional organizations such as IFAC (International Federation of Accountants), FRC (Financial Reporting Council), and global audit firms such as PwC, Deloitte, EY, and KPMG.
3. Reference books and monographs that discussed blockchain technology, artificial intelligence, and their applications in financial and accounting systems.
4. Regulatory and policy documents related to the digitization of accounting and auditing, both from international and domestic sources (Indonesia/Iran).

Data collection was carried out through library research by conducting a systematic literature search. The data collection process included:

1. Identifying sources of literature through academic databases such as Google Scholar, IEEE Xplore, ScienceDirect, Emerald, and JSTOR using keywords: "blockchain", "artificial intelligence", "accounting", "auditing", "financial technology", "fintech", and combinations thereof.
2. Selecting literature based on criteria of topic relevance, source credibility, and publication novelty (priority given to the last 5 years, while still considering fundamental classical literature).
3. Documenting and categorizing the literature based on main themes: basic concepts of technology, practical applications, benefits, implementation challenges, and implications for the accounting and auditing professions.

Data analysis was carried out through a content analysis approach with the following stages:

1. Data reduction: identifying and extracting relevant information from each literature source, focusing on the characteristics of blockchain and AI technologies, working mechanisms, applications in accounting and auditing, and their impact on professional practice.

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2. Categorization and classification: classifying findings from the literature into thematic categories, such as: (a) technical aspects of technology, (b) benefits and opportunities, (c) challenges and barriers, (d) strategic implications for the profession.
3. Comparative analysis: comparing findings from various sources to identify patterns, consensus, and differing views regarding the impact of blockchain and AI on accounting and auditing.
4. Synthesis and interpretation: integrating findings from various sources to generate a comprehensive understanding of the role of blockchain technology and AI in transforming accounting and auditing practices, as well as formulating strategic recommendations for their implementation.
5. Triangulation of sources: validating findings by comparing information from different types of sources (academic journals, industry reports, professional organization publications) to improve the credibility and validity of the analysis.

This research used the Technology Acceptance Model (TAM) framework and Diffusion of Innovation Theory as a theoretical foundation to understand the adoption of blockchain technology and AI in the context of accounting and auditing. These two theories helped analyze the factors that influenced technology acceptance, including perceptions of benefits, ease of use, and implementation obstacles.

This research had several limitations, including:

1. Reliance solely on secondary data, which did not capture the direct practical experiences of accounting and auditing practitioners.
2. The rapid development of blockchain technology and AI, which made some research findings potentially obsolete in a short time.
3. A primary focus on the international context with limited case studies from the local context, requiring careful generalization of findings to specific developing-country settings.

RESULTS AND DISCUSSION

Overview of Technologies: Blockchain in Accounting and Auditing

Definition and Characteristics of Blockchain Technology

Blockchain is a distributed, decentralized ledger technology that enables the recording and storage of data in a chained, permanent, immutable, and transparent manner (Nakamoto, 2008). Data recorded on the blockchain is stored in blocks that are linked together using cryptographic algorithms. This feature ensures that no one can change or delete the data except by consensus of the network, which is especially important for trust-based industries such as accounting and auditing (Topscott and Topscott, 2016: 145).

Key features of blockchain technology include:

1. Information transparency: all network users are able to view transactions.
2. Immutability: data cannot be edited once recorded.
3. Decentralization: no single authority has control over all the data.
4. High security: using cryptography and consensus mechanisms such as PoW or PoS (Narayanan et al., 2016: 44-42).

Blockchain applications in accounting

Blockchain technology can revolutionize accounting processes by automating the recording of transactions, reducing the need for bookkeeping, and increasing the traceability of transactions (Peters and Panayi, 2016). Traditional accounting is based on double-entry bookkeeping, while blockchain enables the creation of a “triple-entry bookkeeping.” In this method, transactions are not only recorded in the books of the parties, but an encrypted copy of them is stored on the blockchain, which acts as a trusted intermediary (Lejiri, 1989; Dai and Vasarelia, 2017). According to a report by Rutgers University, the use of blockchain in accounting leads to increased data accuracy, reduced processing time, and the elimination of discrepancies in financial reporting (Hahn et al., 2023). In addition, companies such as IBM and SAP have developed blockchain-based accounting solutions that can record companies’ financial transactions in real time and without errors (PwC, 2020).

In Iran, a review of an article by Ghasemniai Galeshklami and Farahani (1402: 7–9) shows that the use of blockchain in government financial systems can reduce administrative corruption, increase transparency in resource allocation, and promote public trust.

Application of Blockchain in Auditing

In the field of auditing, blockchain has the potential to fundamentally change the processes of evidence collection, internal control analysis, and data validation. With auditors’ direct access to the public ledger, the need for traditional confirmations or client submissions is reduced, and the audit process is carried out in a synchronous and continuous manner (Konica et al., 2017; Appel-Boam et al., 2021).

Research by Zhang et al. (2025: 87) suggests that blockchain can play a key role in detecting complex financial frauds, as it enables complete traceability of transactions from source to destination. However, challenges such as legal interpretation of encrypted information, lack of standard audit frameworks for blockchain-based audits, and the need for auditor retraining also arise (FRC, 2024).

Blockchain Implementation Limitations and Challenges in Iranian Accounting

Despite the high potential of this technology, in Iran, obstacles such as the lack of an appropriate legal infrastructure, ambiguity in the legal acceptance of digital data as an official document, and the lack of sufficient skills among accountants and auditors have prevented the widespread implementation of blockchain (Taghizadeh, 1403: 6). A survey conducted by Azizi and Teymouri (1401) shows that only 18% of financial organizations in Iran have even a basic familiarity with the concept of blockchain, which indicates the need for extensive training and the development of precise policies.

Applications of Artificial Intelligence in Accounting and Auditing

Definition and Dimensions of Artificial Intelligence

Artificial intelligence refers to a branch of computer science that aims to develop systems that have the ability to learn, reason, perceive, and make decisions similar to humans (Russell and Norvig, 2021: 25). Artificial intelligence includes subfields such as machine learning, natural language processing, machine vision, and expert systems, each of which has specific applications in financial environments (Jordan and Michel, 2015).

In recent years, the use of artificial intelligence in the financial industry has increased significantly, and companies such as KPMG, Deloitte, and EY are integrating this technology into their auditing and accounting systems (PwC, 2023). This transformation is due to the ability of AI to rapidly process large volumes of structured and unstructured data, identify hidden patterns, and provide predictive analytics and risk-based alerts (Brian-Jolfson and McAfee, 2017: 62).

Application of AI in Accounting

In the field of accounting, AI has been able to automate some repetitive, time-consuming, and error-prone activities such as data entry, invoice reconciliation, expense classification, and financial reporting (Rishins et al., 2017). The use of machine learning algorithms in advanced accounting software such as Xero, QuickBooks, and SAP has increased the accuracy of reports and reduced operational costs (Zhou et al., 2020).

According to Taghizadeh's research (1403: 8), the deployment of artificial intelligence systems in the financial units of large Iranian companies such as Mobarakeh Steel and Bank Melli has led to an average reduction of 22% in recording errors in accounting books. Also, these systems have the ability to identify unusual transactions and alert financial managers in real time.

Application of artificial intelligence in auditing

In auditing, artificial intelligence is a powerful tool for analyzing aggregate data. Unlike the traditional sampling method, artificial intelligence is able to examine all transactions and discover statistical deviations or hidden risks (Zhang et al., 2022: 90). This leads to a reduction in the probability of audit errors and an increase in the efficiency of fraud detection (Kokina and Davenport, 2017).

For example, deep learning systems in internal auditing can identify patterns that are inconsistent with organizational policies by analyzing transaction sequences and alert the auditor to suspicious activity (Appel-Boam et al., 2021). This technology even plays a role in predicting the risk of financial collapse for companies (Gap et al., 2018). The FRC (2024) report shows that in world-class audit firms, the use of artificial intelligence in analyzing banking data, tax files, and related transactions has increased the accuracy of detecting financial irregularities by up to 38%.

Challenges of Implementing Artificial Intelligence in Iranian Accounting

Despite the high potential of artificial intelligence, the implementation of this technology in Iran faces serious obstacles, including:

1. Lack of appropriate hardware and software infrastructure;

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2. Lack of trained human resources in combining financial knowledge and technology;
3. Concerns about systemic errors and public trust in AI outputs;
4. Legal gaps in accepting machine-processed data as audit documents.

According to a study by Hosseinnejad and Qanavati (2012: 9–11), only 27% of Iranian companies are relatively prepared to use intelligent systems in their financial units, and the majority resist due to lack of familiarity with the benefits or fear of change.

Comparative Comparison of the Impact of Blockchain and Artificial Intelligence on Accounting and Auditing

Blockchain and AI technologies both play an important role in the structural transformation of financial processes, but there are fundamental differences in their approach, performance, and level of intervention in accounting and auditing. Comparing these two technologies not only helps to better understand their opportunities and challenges, but also provides a basis for designing hybrid and integrated models in the future.

In Accounting

From an application perspective, blockchain acts more as a secure data infrastructure for recording and maintaining financial records, while AI is more effective in data analysis and interpretation and decision-making (Rishins and Deegan, 2017; Dai and Vassaroli, 2017: 60).

Blockchain Features AI Main Role Secure recording, protection and data transfer, data analysis, prediction and classification Application in triple-entry bookkeeping, prevention of distortions and discrepancies Automation of document registration, error detection, cost analysis Key advantage Transparency and reliability Speed, accuracy and predictability Main limitation Low scalability, maintenance cost Dependence on accurate data and system training.

As the PwC report (2023) emphasizes, the combination of these two technologies in new generation accounting software has increased the reliability and accuracy of financial reports and accelerated managers' decision-making.

In Auditing

In auditing, blockchain plays an effective role in increasing transparency and traceability of transactions; while artificial intelligence excels in data analysis and anomaly detection (Appel-Boam et al., 2021; Zhang et al., 2022). According to research by Cocina and Davenport (2017), intelligent audit systems can accurately identify suspicious activities among millions of transactions with more than 90%.

On the other hand, blockchain allows auditors to access companies' financial documents in a decentralized and reliable platform, without worrying about fraud or data deletion (Han et al., 2023). When combined, these two technologies can provide the foundation for continuous, automated, and human-error-free auditing.

Professional User Perspectives in Iran

In a field study conducted by Ghasemniai Galeshklami and Farahani (1402), out of 47 Iranian senior accountants and auditors, 83% rated AI as more effective than blockchain in increasing their professional efficiency, while 65% believed that blockchain plays a more important role in making

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financial information more transparent. These results indicate that the two technologies are complementary in practice, not substitutes.

Synergy and the Fusion Model

The combination of AI and blockchain can lead to the development of fourth-generation financial systems in which Blockchain is responsible for the immutable recording of data, and AI examines the recorded data to detect fraud, analyze financial performance, and predict risk. The conceptual models presented in Zhang et al.'s (2025: 91) study suggest that in the near future, accountants and auditors should be able to work simultaneously with both technologies, and interdisciplinary (finance-technology) training will replace traditional training approaches.

Opportunities and challenges of implementing blockchain and AI technologies in accounting and auditing

Technological developments, especially in the field of blockchain and AI, have created unique opportunities to improve the efficiency, transparency, and accuracy of accounting and auditing processes. However, these developments are also accompanied by technical, legal, organizational and cultural challenges that affect the success of their implementation in different countries.

Global opportunities

A. Increased transparency and public trust:

Blockchain technology, through the immutable recording of transactions, provides full transparency in the financial books of companies, which can play an important role in gaining investor confidence, reducing the risk of asymmetric information and preventing financial manipulation (Topscott and Topscott, 2016: 153).

B. Increased productivity and reduced costs:

By automating repetitive tasks such as recording, classification and reporting, artificial intelligence significantly increases the productivity of financial units and leads to savings in personnel and time costs (Zhou et al., 2020).

C. Continuous and real-time auditing:

The integration of AI and blockchain enables real-time auditing, where auditors continuously and uninterruptedly monitor transactions and identify anomalies in real time (Appel-Boam et al., 2021). This new model will revolutionize internal control processes and increase stakeholder trust.

D. Facilitating regulatory compliance:

In many countries, smart technologies have become an effective tool for financial compliance with standards and laws (e.g. IFRS, SOX, AML). RegTech, especially in financial institutions, uses AI for risk analysis and blockchain for legal document storage (Arner et al., 2017).

Global challenges

A. Lack of professional standards and frameworks

One of the main challenges is the lack of specific international standards for the use of blockchain and AI in accounting and auditing. Many professional bodies such as IFAC and IAASB are still developing detailed guidelines for the use of these technologies (IFAC, 2024).

B. Cybersecurity and privacy

New technologies, while offering benefits, also have security risks. Sensitive data leaks, cyberattacks on private blockchain networks, and algorithmic decision-making errors are among the risks that require comprehensive security policies (Narayanan et al., 2016).

C. Organizational and cultural resistance

In many organizations, changing traditional cultures and resistance to new technologies are serious obstacles to implementing AI and blockchain. The lack of proper training of human resources also contributes to this issue (Brian-Jolfson and McAfee, 2017: 89).

Realizable opportunities and benefits in Iran

A. Reducing corruption and improving financial transparency

Given the structural financial problems in many government and quasi-government institutions in Iran, the use of blockchain can be a platform for eliminating intermediaries, transparently recording budget allocations, and preventing financial violations (Qasemnia and Farahani, 2014, p. 9).

B. Digital leap in government accounting systems

Creating artificial intelligence-based systems in the General Treasury, the Tax Affairs Organization, and the Court of Accounts can lead to a serious transformation in financial supervision, real-time monitoring of income and expenditure flows, and improving financial health (Taghizadeh, 2014: p. 12).

C. Educated Human Resources in the Field of Technology

The presence of human resources specialized in the fields of information technology, financial engineering, and data science in the country is considered an important potential for the indigenous development of smart and blockchain systems.

Implementation Challenges in Iran

A. Lack of Legal and Regulatory Infrastructure

Currently, blockchain and its data are not recognized in most Iranian accounting and financial regulations. Also, professional auditing regulations regarding the validity of information generated by AI are not yet clear (Azizi and Teymouri, 2014, p. 8).

B. Weak technical and internet infrastructure

Blockchain networks and machine learning systems require stable internet infrastructure, cloud space, strong data centers, and advanced processors, which are either absent or outdated in many Iranian government institutions.

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C. Technological knowledge gap in the accounting community

According to the Audit Organization report (2014), more than 70% of the country's certified accountants are not familiar with the concepts of blockchain and AI, which indicates an urgent need for professional retraining.

CONCLUSION

Technological advancements over the last two decades, particularly blockchain and artificial intelligence (AI), have revolutionized accounting and auditing by introducing immutable, transparent transaction recording via blockchain's "triple ledger" and enhancing productivity through AI's automation, big data processing, and predictive analytics. These technologies complement each other—blockchain excels in data recording and verification, while AI focuses on interpretation and utilization—potentially forming fourth-generation financial systems that enable digital, continuous, error-free, real-time auditing. However, challenges like absent professional standards, security risks, inadequate infrastructure, and interdisciplinary knowledge gaps have hindered adoption in developing countries such as Iran, despite favorable factors including skilled human resources, regulatory shifts toward digital transformation, and demands for financial transparency. Future research could conduct empirical case studies in Iran to evaluate the practical integration of blockchain and AI in local firms, measuring tangible outcomes like cost savings and audit efficiency to guide policy and training initiatives.

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