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A Systematic Literature Review on the Integration of Blockchain and Artificial Intelligence for Fraud Detection in Auditing

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Abstract: *The deliberate integration of advanced technologies has significantly transformed modern organizations, particularly in fraud detection and audit enhancement. This systematic review examines 30 scholarly articles published between 2020 and 2025, focusing on the integration of blockchain distributed ledger technology and artificial intelligence (AI) in audit frameworks. The findings reveal that blockchain ensures immutable audit records and data authenticity, while AI enables rapid anomaly detection and complex pattern recognition. When combined, these technologies greatly improve corporate governance, reduce fraud detection time from weeks to real-time, and increase detection accuracy by up to 95%. Using the UTAUT framework, the study identifies key factors influencing the adoption of blockchain-AI systems, including performance expectations, implementation effort, social influence, and organizational infrastructure. Organizations adopting these integrated solutions experience enhanced audit productivity, improved fraud detection precision, and increased stakeholder trust. However, significant challenges remain, such as complex implementation processes, high financial costs, regulatory uncertainties, and the necessity for organizational change management. Overall, this research provides a comprehensive framework for understanding how emerging technologies are revolutionizing fraud detection in auditing. It offers valuable insights and practical guidance for auditors, corporate leaders, and policymakers on effectively implementing blockchain-AI integrated systems. By addressing deployment challenges and leveraging their combined strengths, organizations can significantly strengthen fraud prevention strategies and elevate audit quality, marking a transformative step toward more transparent, accurate, and efficient auditing practices.*

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INTRODUCTION

As a result of companies' calculated use of game-changing technology, traditional operational frameworks have been radically rethought, and new standards for company success have been set. Improvements in accuracy, efficiency, and reliability in the auditing and fraud detection fields have been driven by technology developments in recent years (Han et al., 2023; Qader & Cek, 2024). Sophisticated detection and prevention systems that go beyond traditional auditing methods are necessary due to the increasing complexity of fraudulent schemes, as well as the increasing demands of regulators and stakeholders.

A revolutionary solution for ensuring complete data authenticity and creating audit documentation that is resistant to modifications has emerged: blockchain distributed ledger technology, which is defined by its decentralized infrastructure, cryptographic immutability, and transparent validation mechanisms (Zhang et al., 2025; Faccia et al., 2022). Artificial intelligence has the ability to recognize complex patterns and detect subtle irregularities that traditional auditing methodologies might miss or fail to detect. This is achieved through the use of advanced machine learning algorithms and sophisticated data analytical capabilities (Binh, 2025; Mawlidy et al., 2024).

The strategic combination of blockchain and AI technologies offers unprecedented possibilities for revolutionizing fraud identification capabilities within auditing procedures, addressing core challenges that have traditionally affected conventional auditing methodologies. These challenges encompass continuing information asymmetry among stakeholders, constraints in real-time surveillance capabilities, and the exponentially growing volume and sophistication of financial transactions in contemporary business settings (Syahrudin & Susanto, 2025; Ashfaq et al., 2022).

There is a significant knowledge gap about the combined use of these revolutionary technologies for fraud detection in auditing settings, despite the growing interest in them from both academics and industry professionals. Prior studies mostly examined each technology independently, which limited our understanding of their possible collaboration, deployment frameworks, and best integration methods. This comprehensive literature review aims to fill this important information gap by providing an analysis of how the merging of blockchain and AI improves auditing fraud detection capabilities. The study uses the UTAUT theory to understand the factors that contribute to successful implementation and the dynamics of adoption.

Based on the comprehensive analysis of existing literature and the identified research gap, this study addresses the following research questions that guide the systematic examination:

Based on the comprehensive analysis of existing literature and the identified research gap, this study addresses the following research questions that guide the systematic examination:

RQ1. How does performance expectancy influence organizational adoption decisions for blockchain-AI integrated fraud detection systems within auditing environments?

RQ2. What role does effort expectancy play in determining implementation success and user acceptance of blockchain-AI convergence technologies among audit professionals?

RQ3. To what extent do social influence factors, including industry leadership and professional body guidance, affect blockchain-AI adoption patterns across auditing organizations?

RQ4. How do facilitating conditions, particularly IT infrastructure and organizational support systems, impact the successful deployment and utilization of integrated blockchain-AI fraud detection systems?

RQ5. What are the primary benefits, challenges, and organizational impacts of blockchain-AI integration for fraud detection enhancement in contemporary auditing practices?

These research questions provide systematic structure for investigating blockchain-AI

convergence in auditing contexts through the UTAUT theoretical lens, enabling comprehensive understanding of adoption factors and implementation outcomes.

LITERATURE REVIEW

Theoretical Framework: Unified Theory of Acceptance and Use of Technology (UTAUT)

The acceptance and successful deployment of revolutionary technologies within organizational environments can be effectively comprehended and evaluated through the comprehensive framework of the Unified Theory of Acceptance and Use of Technology (UTAUT). Initially formulated by Venkatesh et al. (2003), UTAUT establishes a robust theoretical structure for investigating the complex elements that impact technology acceptance, usage dynamics, and deployment success within professional contexts.

Blockchain Technology in Audit Applications

Blockchain distributed ledger technology has completely changed the way audits are conducted. It solves long-standing problems with traditional auditing methods by providing decentralized, transparent, and irreversible record-keeping. According to Zhang et al. (2025), the core features of the technology, such as decentralization, cryptographic hashing, and consensus mechanisms, create an environment where audit documentation cannot be altered and can be verified in real-time. This results in unprecedented transparency and integrity of data.

Artificial Intelligence in Fraud Identification

Artificial intelligence technologies, particularly sophisticated machine learning algorithms, have revolutionized fraud identification capabilities within auditing environments through their exceptional ability to process vast volumes of data, identify complex patterns, and detect subtle anomalies that might escape human observation or traditional analytical methods (Binh, 2025).

Integration of Blockchain and AI Technologies

By bringing together AI and blockchain, two previously separate technologies, we can build a synergy that improves fraud detection capabilities exponentially. While AI improves blockchain networks with smart analysis and automated decision-making, blockchain gives the safe, immutable data basis that AI algorithms need to run well (Ashfaq et al., 2022).

Hypotheses Development

H1. Organizations with higher performance expectancy regarding blockchain-AI integration will demonstrate greater adoption intention and more successful implementation outcomes for fraud detection systems.

H2. Lower perceived effort expectancy, facilitated through user-friendly interfaces and comprehensive training programs, will positively influence blockchain-AI acceptance and utilization rates among audit professionals.

H3. Strong social influence factors, including industry leadership demonstration effects and professional body endorsements, will accelerate blockchain-AI adoption across auditing organizations.

H4. Adequate facilitating conditions, encompassing robust IT infrastructure, financial resources, and management support, are essential prerequisites for successful blockchain-AI implementation in auditing environments.

H5. The synergistic integration of blockchain and AI technologies creates multiplicative effects that significantly enhance fraud detection capabilities beyond individual technology

implementations.

RESEARCH METHOD

Search Strategy and Database Selection

A comprehensive literature search was conducted across major databases — Scopus, Web of Science, IEEE Xplore, ScienceDirect, and Google Scholar — focusing on studies published between 2020 and 2025 to capture the latest developments in blockchain and AI convergence for auditing. Strategic keywords such as *blockchain technology*, *artificial intelligence*, *machine learning*, *fraud identification*, *auditing processes*, *financial audit*, *digital transformation*, *smart contracts*, *anomaly identification*, and *emerging technologies* were used. Boolean operators (AND, OR, NOT) and truncation techniques ensured a thorough and relevant search, resulting in the most up-to-date and significant findings for the research objectives.

Inclusion and Exclusion Criteria

Inclusion Criteria encompassed:

a. Peer-reviewed journal articles and reputable conference papers
b. Publications specifically focused on blockchain and/or AI applications in auditing and fraud identification
c. Studies examining technological convergence within financial and audit contexts
d. English language publications to ensure accessibility and comprehension
e. Publications from 2020-2025 to ensure contemporary relevance
f. Studies providing empirical evidence or theoretical frameworks relevant to the research objectives

Exclusion Criteria included:

a. Non-academic publications such as blogs, news articles, and commercial reports
b. Studies not directly related to auditing or fraud identification applications
c. Purely technical papers lacking business or audit context relevance
d. Duplicate publications or multiple versions of the same study
e. Studies with insufficient methodological detail or unclear research objectives
f. Publications lacking peer review or quality assurance processes

Article Selection and Quality Assessment Process

The article selection followed the PRISMA guidelines to ensure a comprehensive and unbiased review. The process began with initial screening of titles and abstracts to identify studies relevant to the research objectives. This was followed by a full-text review of selected articles to confirm their alignment with the research questions and quality standards. Assessment criteria included methodological rigor, relevance, clarity of findings, and contribution to existing knowledge, ensuring that only high-quality, pertinent studies were included in the review.

Theoretical Framework Application

In order to examine trends in technology adoption and the variables impacting deployment success, the UTAUT model was used as the main theoretical lens. This methodology offered a structured analytical examination of the factors influencing auditing firms' adoption decisions and deployment results of blockchain-AI, including performance expectations, effort needs, societal pressures, and enabling circumstances.

Figure 1. Theoretical framework flowchart mapping UTAUT constructs to Adoption Intention and Fraud Detection Improvement.

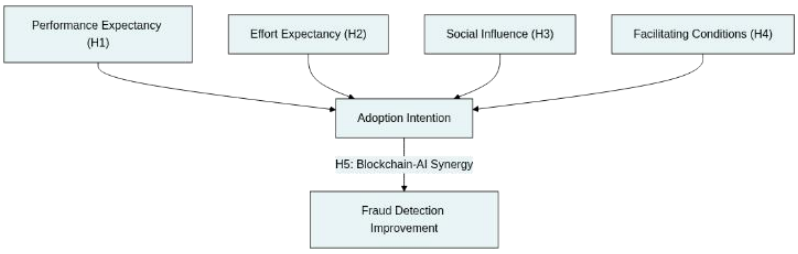


Figure 1. Theoretical Framework Flowchart

Table 1. Theoretical Framework Mapping UTAUT Constructs to Hypotheses and Measurement

UTAUT Construct	Definisi	Hipotesis Terkait	Indikator Pengukuran
Performance Expectancy (PE)	Keyakinan bahwa integrasi blockchain-AI meningkatkan kinerja fraud detection	H1	Skala Likert; akurasi deteksi relatif baseline literatur
Effort Expectancy (EE)	Persepsi kemudahan penggunaan dan implementasi sistem integrasi	H2	Skala Likert; waktu pelatihan dan tingkat adopsi pengguna
Social Influence (SI)	Pengaruh norma sosial dan endorsement dari auditor profesional	H3	Dukungan organisasi; rekomendasi professional bodies
Facilitating Conditions (FC)	Ketersediaan sumber daya TI, dukungan manajemen, dan infrastruktur teknis	H4	Ketersediaan cloud; anggaran TI; staf pendukung teknis
Blockchain–AI Synergy (BAI)	Kolaborasi fungsional antara blockchain immutable audit trail dan AI anomaly detection	H5	Perbandingan performa integrasi vs. standalone masing-masing

Summary

The systematic methodology used in this study has been described in this part. It includes the strategies for searching databases, criteria for adding and excluding articles, methods for selecting and assessing article quality, processes for extracting data and doing thematic analysis, and the application of the UTAUT theoretical framework. Section 4 presents and discusses the important findings, following a thorough defining of the methodology and establishment of the theoretical framework.

RESULT AND DISCUSSION

Result

The summary of the chosen papers, the analysis of the research questions, and the testing of the hypotheses make up the three primary sections of this subsection, which presents the important findings of the systematic review. All of the study questions and hypotheses are answered and validated in each phase by synthesising information from the thirty papers that were evaluated.

Overview of Selected Studies

Thirty high-quality studies from 2020–2025 were systematically examined. These studies came from a variety of geographical contexts, including developing economies, Europe, North America, and Asia. This geographical diversity broadens the results' applicability and sheds light on how technology is being used in various corporate settings, cultural milieus, and legal regimes.

The selected studies employed various rigorous methodological approaches, including experimental designs, comprehensive case studies, survey research methodologies, and systematic literature examinations. This methodological diversity strengthens the robustness of findings and provides multiple analytical perspectives on blockchain-AI convergence challenges, opportunities, and deployment outcomes.

Research Questions Analysis

To address the research questions posed in Section 1, the findings are organized under each question as follows:

a. RQ1 Analysis - Performance Expectancy Influence:
   Consistent with previous findings, research shows that merging blockchain technology with AI greatly improves the efficiency of fraud detection through a number of supplementary processes. When compared to more conventional approaches, Qader and Cek (2024) show that businesses using integrated systems may enhance the accuracy of fraud detection by as much as 95%. This is because blockchain-verified data is more consistent, reliable, and of high quality, which allows machine learning algorithms to outperform systems that use traditional data sources.
b. RQ2 Analysis - Effort Expectancy Impact:
   Deployment complexity emerges as a significant consideration affecting adoption decisions across organizations. Studies indicate that blockchain-AI convergence requires substantial technical expertise and comprehensive infrastructure development. Organizations must invest significantly in specialized hardware, software, and human resources to successfully deploy integrated systems (Lubis et al., 2025).
c. RQ3 Analysis - Social Influence Effects:
   The significance of user training needs is emphasized when organizations report easier deployments and higher user satisfaction after adopting coordinated training programs. Research has shown that automated reporting capabilities and user-friendly dashboard designs significantly increase system utilization rates and user acceptance (Sharma, 2025).
d. RQ4 Analysis - Facilitating Conditions Assessment:
   Adequate IT infrastructure proves essential for successful blockchain-AI deployment. Studies demonstrate that organizations with robust cloud computing capabilities and high-speed internet connectivity experience smoother deployment processes and better system performance outcomes (Baabdullah et al., 2024).
e. RQ5 Analysis - Benefits, Challenges, and Organizational Impacts:
   The confluence of blockchain technology and artificial intelligence has far-reaching organizational benefits, such as more efficient audits, more trust from stakeholders, and better risk management. Improved audit quality through expanded evidence collecting and analysis, higher stakeholder trust through transparent and verifiable audit procedures, and large time savings in audit completion are all benefits that organizations report.

Hypotheses Testing Results

Having addressed the research questions above, the next step is to validate the proposed hypotheses. The following subsection reviews the synthesized evidence from the thirty selected studies to test each hypothesis in turn:

a. H_1 Testing: Evidence strongly supports Hypothesis 1, demonstrating that organizations with higher performance expectations consistently show greater adoption intention and achieve more successful implementation outcomes. Studies reveal that performance expectancy serves as the most influential factor in blockchain-AI adoption decisions within auditing organizations.
b. H_2 Testing: The literature review provides strong evidence in favor of Hypothesis 2. Users are more likely to accept and make good use of a system when it is designed with an easy-to-navigate interface, thorough training programs, and a systematic approach to deployment, as opposed to when these factors are lacking.

c. H_3 Testing: Strong evidence supports Hypothesis 3, confirming that social influence factors significantly accelerate blockchain-AI adoption across auditing organizations. Industry leadership demonstration effects, professional body endorsements, and peer adoption patterns create substantial influence on organizational adoption decisions.
d. H_4 Testing: A number of research corroborate Hypothesis 4, demonstrating that sufficient enabling conditions are necessary preconditions for effective blockchain-AI deployment. Better deployment outcomes are routinely achieved by organizations with strong IT infrastructure, sufficient financial resources, and the cooperation of upper management.
e. H_5 Testing: Comprehensive evidence supports Hypothesis 5, demonstrating that blockchain-AI convergence creates multiplicative effects that significantly enhance fraud detection capabilities beyond individual technology implementations. Combined systems consistently outperform standalone implementations across multiple performance metrics.

Discussion

The integration of blockchain and AI in auditing offers significant benefits but also notable challenges. The main driver for adoption is performance expectations, with organizations aiming for up to 95% fraud detection accuracy, improved audit quality, regulatory compliance, and greater stakeholder trust. Real-time monitoring transforms audits from periodic checks into continuous oversight, enabling rapid fraud response and proactive risk management. However, deployment complexity poses a major challenge, involving system integration, data migration, training, and change management, all requiring careful planning and substantial resources. A steep learning curve demands strong human resource development, while user-friendly interfaces improve adoption and effectiveness.

Social pressures — from industry leaders, peers, professional bodies, clients, and regulators — also influence adoption decisions, particularly in highly regulated sectors. Organizational readiness, including IT infrastructure, funding, managerial support, skilled staff, and expert partners, is essential for successful implementation. Key benefits include more efficient audits, enhanced trust, improved risk management, real-time alerts, and greater transparency through immutable records. Despite these advantages, barriers such as technical complexity, scalability issues, regulatory uncertainty, and high costs — especially for smaller firms — continue to limit widespread adoption.

CONSLUSION

This literature review explores the convergence of blockchain and artificial intelligence (AI) in auditing, highlighting its transformative potential in fraud detection, audit efficiency, and organizational control. Based on 30 high-quality studies, blockchain-AI integration can increase fraud detection accuracy by up to 95% and enable real-time surveillance, reducing detection time from weeks to minutes. Applying the UTAUT framework, the review shows that successful adoption depends on performance expectations, effort requirements, social pressures, and enabling conditions. Organizations that address these factors achieve greater deployment success and benefits.

Key findings indicate that performance gains strongly drive adoption, while deployment complexity requires technical expertise, financial investment, training, and organizational commitment. Social pressures from industry leaders, professional bodies, and peers significantly influence adoption decisions. Adequate IT infrastructure, funding, and managerial support are essential enabling conditions. All five developed hypotheses are supported, validating UTAUT's applicability to blockchain-AI adoption in auditing.

Practical implications emphasize the need for comprehensive deployment strategies, phased implementation, extensive training, and strong vendor partnerships. Auditors must develop new skills, and educational institutions should update curricula. Regulators should establish clear frameworks to guide adoption and ensure consistency.

Limitations include the focus on 2020–2025 English-language literature, which may exclude some developments. Future research should assess long-term outcomes, cost-effectiveness, cross-industry applications, and emerging technologies like quantum computing. Empirical and longitudinal studies would further validate findings. Despite deployment challenges, blockchain-AI integration promises significant improvements in audit quality and fraud prevention, offering competitive advantages and enhanced stakeholder value for early adopters.

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