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Blockchain and the future of accounting: A critical examination of promise versus practice

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Abstract---Blockchain has been widely promoted as a transformative technology capable of redefining financial reporting, auditing, assurance, and real-time accounting workflows. Its core attributes immutability, decentralised consensus, cryptographic verification, and distributed ledgers are frequently associated with enhanced transparency, reduced fraud, automated compliance, and audit efficiency. Yet despite strong theoretical potential, practical adoption across the accounting profession has been slow, uneven, and surrounded by technical, regulatory, organisational, and ethical barriers. This paper critically examines the gap between blockchain's promises and its real-world implementation in accounting contexts. Drawing on emerging empirical studies, industrial applications, and regulatory insights, the paper evaluates how blockchain affects transaction recording, audit trails, asset tokenisation, smart contracts, and financial statement integrity. The findings show that while blockchain demonstrably improves traceability and internal control reliability, challenges related to scalability, interoperability, governance, data privacy, and organisational readiness significantly limit mainstream adoption. The study argues that expectations regarding blockchain's ability to replace accountants or fully automate auditing are overstated. Instead, blockchain

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supports a shift toward hybrid human-AI-blockchain systems, reshaping rather than eliminating the accountant's role. The paper concludes that blockchain's future in accounting depends not only on technical innovation but also on regulatory clarity, ethical frameworks, and institutional adaptation.

Keywords---Blockchain, accounting technology, distributed ledger, smart contracts, audit automation, transparency, financial reporting, tokenization, assurance systems.

I. INTRODUCTION

Blockchain has emerged as one of the most discussed technological innovations in the accounting and financial sectors, often positioned as a disruptive force capable of reshaping the core foundations of bookkeeping, auditing, compliance, and financial reporting. Its decentralised ledger architecture eliminates the need for a central authority to validate transactions, theoretically reducing fraud, enhancing transparency, and ensuring tamper-proof audit trails. In accounting discourse, blockchain is frequently associated with the potential for real-time financial information, automated internal controls, and reduced reconciliation workloads. Professional bodies such as the AICPA, ICAEW, and IFAC have highlighted blockchain as a key component of the future digital accountant, prompting educational institutions and firms to explore its implications for skills, standards, and governance.

However, the narrative surrounding blockchain's transformative promise often overlooks the significant challenges that have prevented large-scale adoption. While pilot projects in auditing, supply-chain reporting, and asset tokenisation have shown technical viability, real-world accounting environments face complex regulatory constraints, data privacy requirements, interoperability issues, and substantial implementation costs. Further, blockchain's immutable nature raises concerns about the handling of erroneous entries, compliance with standards such as GDPR, and the reconciliation of blockchain records with legacy accounting systems. Despite the rhetoric of "disintermediation," accountants continue to play essential roles in judgment, interpretation, assurance, and governance areas where blockchain provides support but cannot replace professional reasoning.

This paper critically evaluates both the promise and the practice of blockchain within accounting. It examines how blockchain impacts transaction recording, auditability, control systems, financial statement reliability, and the broader institutional environment. By contrasting theoretical potential with actual industry adoption patterns, the paper provides a balanced assessment of blockchain's realistic trajectory in the accounting profession.

II. LITERATURE REVIEW

Early academic literature centred on blockchain's core technical features immutability, decentralised validation, and cryptographic integrity and extrapolated potential benefits for accounting systems. Researchers argued that fraud reduction, automated verification, and permanent audit trails could substantially enhance trust and efficiency in financial reporting [1], [2]. Several studies emphasised blockchain's ability to create a shared, real-time ledger between organisations, eliminating reconciliation and enabling continuous auditing [3]. Others highlighted smart contracts as mechanisms for embedding compliance, internal controls, or revenue-recognition rules directly into the ledger [4].

However, contemporary empirical studies challenge the assumption that blockchain can seamlessly replace established accounting systems. Large firms report difficulties in integrating blockchain with ERP systems, maintaining data privacy, managing off-chain data, and dealing with the rigidity of immutable records [5]. Regulatory literature stresses the absence of global standards and the risk of conflicting interpretations when blockchain records interact with IFRS, GAAP, or tax law requirements

[6], [7]. Audit research notes that while blockchain improves the reliability of transaction evidence, it does not ensure the accuracy of underlying economic events, meaning professional scepticism remains essential [8].

The literature also documents inconsistencies in blockchain's performance across use cases. High-volume environments face scalability constraints, and different blockchain architectures (public, private, permissioned, consortium models) exhibit varying degrees of trust, speed, cost, and auditability [9], [10]. Studies further reveal that many organisations overestimate blockchain's benefits without adequately considering implementation complexity, interoperability with legacy systems, and cybersecurity risks [11], [12]. Overall, current literature suggests that blockchain holds substantial potential for accounting innovation, but its practical adoption is shaped by socio-technical, institutional, and regulatory factors.

III. METHODOLOGY

This study adopts a **conceptual–analytical research design**, relying exclusively on secondary data to examine the gap between the theoretical promises of blockchain and its practical adoption in accounting. Instead of conducting empirical testing or primary data collection, the methodology synthesises insights from peer-reviewed literature, professional accounting standards, regulatory documents, industry analyses, and real-world blockchain pilot projects. This approach enables a critical evaluation of blockchain's applicability within diverse accounting functions, including financial reporting, auditing, internal controls, and assurance services.

The analysis draws upon four primary categories of secondary sources: academic research in accounting and information systems, industry publications from the Big Four and global consulting firms, regulatory and standards-based documents from bodies such as IFAC and IASB, and technical documentation related to blockchain platforms. These sources collectively inform a multidimensional assessment of blockchain's strengths, limitations, and practical constraints.

Table 1. Data Sources for the Analytical Framework

Data Category	Sources Used	Purpose
Academic Research	Journals in accounting, IS, and auditing	Understand theoretical and conceptual claims
Industry Reports	Big Four, Gartner, Deloitte, PwC	Assess real-world adoption and market trends
Standards/Regulations	IFAC, IASB, PCAOB, SEC	Identify compliance, assurance, and legal challenges
Technical Documentation	Blockchain white papers & developer docs	Analyse architectural suitability and limitations

Analytical Framework

To systematically examine blockchain's role in accounting, the study follows a structured five-step analytical framework:

1. **Identify and categorise the promises** attributed to blockchain in accounting theory and professional discourse.
2. **Evaluate technical, regulatory, and organisational barriers** that affect blockchain implementation.
3. **Compare adoption levels across sectors**, including financial services, supply-chain accounting, and auditing.
4. **Assess blockchain's impact on accounting processes**, such as financial reporting, internal controls, and assurance procedures.

5. **Determine realistic future developments** and the probable trajectory of blockchain within the accounting profession.

Table 2. Evaluation Dimensions

Dimension	Key Factors Examined
Technological	Scalability, interoperability, cybersecurity, privacy
Organisational	Implementation costs, skill requirements, system readiness
Regulatory	IFRS/GAAP alignment, data protection laws, audit standards
Professional	Auditor judgement, ethics, evolving roles, assurance needs

Through this structured methodology, the study provides a comprehensive and balanced evaluation of blockchain's theoretical potential versus its practical adoption in accounting environments. It ensures that the analysis captures both technological capabilities and real-world institutional constraints, offering a realistic understanding of blockchain's future role in the profession.

IV. ANALYSIS AND DISCUSSION

Blockchain has generated substantial enthusiasm within the accounting community because of its promise to deliver transparent, tamper-resistant, and real-time financial information. The conceptual literature frequently positions blockchain as a transformative technology capable of eliminating reconciliation, enhancing audit trail integrity, and supporting continuous auditing. However, when these theoretical claims are compared with evidence from industry implementations and pilot studies, a significant disparity becomes evident between what blockchain *promises* and what it *practically delivers* in accounting settings. Real-world adoption remains modest due to technological, organisational, and regulatory constraints that fundamentally shape how blockchain operates within complex accounting ecosystems.

A central insight emerging from the analysis is that blockchain performs well in controlled, permissioned environments where transaction volumes are manageable, data formats are standardised, and multiple parties collaborate under uniform governance. In such settings, blockchain reliably enhances traceability, ensures non-repudiation, and strengthens internal control environments. Yet when applied to large, heterogeneous accounting systems particularly those requiring flexibility, error correction, and interoperability the technology encounters limitations. These limitations are not merely technical but structural, reflecting the complexity of accounting as a socio-technical practice where legal compliance, professional judgement, and organisational processes remain central. The contrast between blockchain's theoretical capabilities and practical outcomes is summarised in the following table.

Table 3. Blockchain's Theoretical Benefits Versus Practical Realities in Accounting

Theoretical Promise	Practical Reality Observed
Immutability ensures error-free, tamper-resistant records	Immutability complicates correction of mistakes; reversal entries often required
Real-time reporting and continuous auditing	Integration with ERP systems delays real-time synchronisation
Elimination of reconciliation across entities	Limited adoption among value-chain partners reduces effectiveness
Smart contracts automate compliance rules	Smart-contract logic requires expert auditing and is prone to coding errors
Transparent shared ledger improves audit evidence	Blockchain shows transaction *existence*, not *economic substance*
Fraud reduction due to cryptographic verification	Fraud still occurs at data-entry points and off-chain processes

While blockchain enhances certain dimensions of accounting, such as auditability and traceability, its operational limitations challenge assumptions about its transformative potential. Scalability concerns reduce feasibility in high-volume transaction systems typical of banks, insurance companies, and multinational corporations. Similarly, the need to comply with data protection laws such as GDPR introduces contradictions between blockchain's immutability and legal requirements for data alteration or deletion. These issues highlight that blockchain cannot simply replace existing accounting infrastructure but must be integrated through hybrid architectures combining on-chain and off-chain data components.

Another key finding concerns the organisational readiness required for blockchain adoption. Many firms lack the technological expertise and financial capacity to implement blockchain solutions at scale. Training employees, redesigning internal processes, integrating new systems with legacy ERP platforms, and establishing governance frameworks all involve substantial investment. For SMEs in particular, blockchain offers limited immediate value and considerable transition costs, resulting in low adoption rates despite strong theoretical appeal. This organisational gap further widens the difference between blockchain's potential and its actual usage in practice.

The analysis also shows that regulatory uncertainty plays a decisive role in shaping adoption. Standards-setters have not yet provided comprehensive guidance on blockchain-based accounting treatments or audit assurance procedures. As a result, firms remain cautious, preferring traditional systems that fully comply with IFRS, GAAP, PCAOB and tax regulations. This cautious approach constrains innovation and reinforces the dominance of established accounting technologies. To illustrate how these issues cluster across different dimensions, the following table integrates the analytical dimensions derived from the methodology.

Table 4. Cross-Dimensional Assessment of Blockchain's Practical Impact on Accounting

Dimension	Strengths Identified	Limitations Identified
Technological	Strong security; reliable audit trails; decentralised verification	Poor scalability; limited interoperability; immutability challenges
Organisational	Enhanced internal controls; reduced reconciliation workload	High cost; skill shortages; low network adoption
Regulatory	Transparent records support compliance reviews	Limited standards; conflicts with data-protection laws
Professional	Supports continuous auditing and analytic roles	Cannot replace judgement; requires new competencies

Overall, the analysis indicates that blockchain's most meaningful contributions lie in strengthening auditability, securing transactional records, and improving inter-organisational transparency. However, the widespread belief that blockchain will radically transform or fully automate accounting practices is overstated. Instead, blockchain is emerging as one component within a broader digital accounting ecosystem complementing but not replacing existing technologies, professional judgement, or regulatory frameworks. Its long-term impact depends less on technical capabilities and more on institutional adaptation, regulatory support, and the development of accounting professionals who can interpret, govern, and assure blockchain-based systems.

V. CONCLUSION

This study critically examined the relationship between blockchain's theoretical promise and its practical implementation within accounting systems. Although blockchain is frequently portrayed as a transformative technology capable of delivering unprecedented transparency, audit reliability, and real-time financial reporting, the analysis demonstrates that these expectations often exceed what is currently

achievable in real organisational environments. Blockchain undeniably contributes meaningful advantages: it strengthens audit trails, reduces opportunities for tampering, and provides a decentralised validation mechanism that enhances trust within multi-party transactions. However, these benefits operate effectively only under controlled conditions where technological standards are aligned, stakeholder participation is high, and governance structures are clearly defined.

In practice, accounting environments reveal significant barriers that restrict blockchain's broader adoption. Technical limitations, such as scalability constraints, immutability challenges, and lack of interoperability, reduce the feasibility of integrating blockchain into complex financial systems. Organisational factors—including high implementation costs, insufficient technical competencies, and the absence of clear return on investment—further discourage adoption, particularly among small and medium-sized enterprises. Regulatory uncertainties, especially in relation to data protection, audit evidence requirements, and accounting standard alignment, create additional hesitation. Moreover, the profession's reliance on judgment, interpretation, and assurance means that blockchain cannot replace accountants but instead reconfigures their roles toward digital governance, smart-contract assurance, and data-validation activities.

VI. FUTURE WORK

Future research should focus on developing integrated frameworks that enable blockchain to function more seamlessly within existing accounting infrastructures. A critical area of exploration involves designing interoperable architectures capable of linking blockchain platforms with mainstream ERP systems and financial databases, reducing the fragmentation that currently limits real-time reporting and continuous auditing. Additionally, further studies should investigate hybrid models that combine blockchain with AI, digital identity systems, and advanced analytics to support more robust fraud detection, automated compliance, and predictive financial insights. These hybrid approaches may offer more practical value than blockchain operating in isolation.

Another important direction for future work involves the regulatory environment. Standards-setting bodies such as IASB, PCAOB, and IFAC must develop authoritative guidelines for blockchain-based financial records, smart-contract auditing, and the recognition or measurement implications of tokenised assets. Without clear frameworks, organisations will remain hesitant to integrate blockchain into financial reporting processes. Research must also address ethical and data-governance challenges, particularly those related to privacy, data correction rights, and the durability of immutable records under evolving regulatory contexts.

Finally, future studies should examine the evolving skill requirements for accountants working in blockchain-enabled environments. As the profession transitions toward more technology-mediated responsibilities, accounting education and professional development programs must incorporate competencies in blockchain architecture, smart-contract evaluation, and distributed system assurance. By expanding the profession's technological literacy and aligning institutional structures with emerging digital practices, the accounting field can better realise blockchain's long-term potential. In this way, future research will play a pivotal role in bridging the gap between conceptual promise and practical implementation.

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