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Smart Audits, Smarter Decisions: The AI-Blockchain Duo in Finance



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Abstract

This paper reviews the impact of blockchain on accounting and AI-driven auditing, focusing on how it enhances transparency and decisionmaking. It highlights four key themes: event-based accounting, real-time accounting, triple-entry accounting, and continuous auditing. The study uses agency and stakeholder theories to explore how blockchain mitigates information asymmetry and promotes collaboration. It also mentions the challenges and advises caution in adopting blockchain. Finally, it suggests future research directions: applying the themes and encouraging stakeholder collaboration in designing blockchain ecosystems for accounting and auditing.

Key Words

Smart Audits, AI, Finance, Stakeholder.

Introduction

In recent years, the convergence of two groundbreaking technologies, namely Artificial Intelligence (AI) and blockchain, has pushed the boundaries of the accounting field. It is increasingly clear that these advancements have the capacity to transform the processes of recording, validating, and analyzing financial data. This research paper is

dedicated to thoroughly investigating the incorporation of AI and blockchain in accounting, presenting an indepth analysis of their separate capabilities, their synergistic influence, and the real-world implications for businesses and finance experts. By bridging the gap between traditional accounting and cutting-edge technology, we navigate the landscape where numbers meet algorithms, creating new avenues for transparency, efficiency, and financial security." The transition to digital systems has empowered companies to embrace advanced technological tools, streamlining their operations and catalysing a transformation in their business models (Gomber et al., 2018). This shift has been made possible by the increasing accessibility of powerful computing resources and vast databases (Sousa et al., 2019). Today, the world's most valuable businesses are rooted in the digital realm, driven by the internet and grounded in platform-based models (Iansiti & Lakhani, 2017).

In the realms of academia, social media, various industries, and Government sectors, there is a clear emphasis on digital advancements such as blockchain, artificial intelligence (AI), large-scale data analytics, the Internet of Things (IoT), and cloud computing. These technological breakthroughs hold substantial sway, fundamentally altering the landscape for both institutions and people (Benlian et al., 2018). Among these,

blockchain emerges as a pivotal element in what (Tapscott & Euchner, 2019) describe as an "Internet of value," which has the potential to transform society and redefine the dynamics of business.

Blockchain, often celebrated as a pivotal element of the fifth wave of IT evolution (Thakkar, 2019), is on the verge of assuming the role of the foundational technology in the forthcoming iteration of the Internet (Iansiti et al., 2017; Shermin, 2017).

Literature Review

This review explores the adoption of blockchain as an innovative accounting tool. It highlights its capacity to enable secure, shared, verified, and consensus-driven record-keeping, ultimately enhancing transparency and trust within the accounting realm.

Definition of Blockchain: According to the Institute of Chartered Accountants in England and Wales (ICAEW), Blockchain is not a single technology but functions as a protocol, a specific way of handling transaction records. Unlike the Internet, which primarily facilitates data sharing, blockchain enables the transfer of ownership from one party to another. There are several compelling reasons why blockchain is considered an appealing model. For instance, in a market involving numerous participants, it has the potential to eliminate the need for reconciling different ledgers. Its distributed nature among all users also eliminates downtime and the expenses associated with relying on a central authority to maintain ledger accuracy. Additionally, any participant within the ledger can trace all prior transactions, leading to increased transparency and enabling the blockchain to audit itself.

Emergent Literature on Blockchain: In recent times, research has extensively explored various applications of blockchain technology in diverse domains, including FinTech, supply chains, and corporate governance, as examined by a range of authors (Goldstein Itay et al., 2019; Gomber et al., 2018; Hastig & Sodhi, 2020; Kumar et al., 2020; Lumineau et al., 2021; Yermack, 2017b; Zachariadis et al., 2019; Ziolkowski et al., 2020). Some studies have delved into specific aspects within this realm, such as blockchain, smart contracts, cryptocurrency regulation, and Bitcoin, as explored by others (Biais et al., 2019; L. W. Cong & He, 2019; Holub & Johnson, 2018; Sun Yin et al., 2019).

The following cases serve as examples illustrating the diverse and wide-ranging technological applications of blockchain, showcasing how it can:

- a) Catalyse advancements in AI, as explored by (Salah et al., 2019).
- b) Contribute to the technological development of digital currencies, ensure privacy, enhance cybersecurity, and bolster the security of smart contracts.
- c) Address the challenges of scalability in data management and consensus protocols.
- d) Foster interoperability in terms of incentives, governance, and ethical considerations within ecosystems, as discussed by (Jie et al., 2020).
- e) Provide cost-effective solutions for businesses, as demonstrated by (Xu et al., 2019).
- f) Create value across various FinTech innovations, including those related to AI, as noted by (Hua et al., 2019).
- g) Improve data management by making it auditable and verifiable, simplifying the secure handling of trusted information.
- h) Enhance operations in business, healthcare, IoT, privacy, and data management within the complex domains of supply chains, as examined by (Casino et al., 2019).

These instances underscore the adaptability and promise of blockchain technology in promoting innovation and tackling complex challenges across various industries and sectors.

Blockchain in Accounting: Prominent accountancy organizations, including ICAEW, ACCA, CIMA, CIPFA, and IFAC, regularly publish reports on their websites related to blockchain technology. These organizations recognize the significance of blockchain in the accounting field. Notably, major firms like Deloitte, EY, KPMG, and PwC have taken proactive steps to integrate blockchain into their operations, responding to evolving customer demands for blockchain-based transactions, as highlighted by (O'Neal, 2019). For instance, Deloitte established its Rubix division and introduced a user-friendly blockchain product (Leung Angus, 2016; Palmer Daniel, 2019).

It has the potential to enhance the efficiency of transaction accounting, aligning with the findings of (ICAEW, 2018). (Deloitte, 2017) and (McWaters et al., 2016) identify several ways in which blockchain technology effectively addresses current accounting challenges. It simplifies operations, reduces transaction-settlement times and the associated counterpart risk, mitigates fraud, and contributes to improved regulatory compliance and capital liquidity. These advantages underscore the transformative role of blockchain in the accounting domain.

Blockchain adds trust for AI-enabled Auditing: The primary objective of utilizing blockchain technology in accounting record-keeping is to establish trust, as emphasized by (P. Smith, 2019), by creating a trust network that may or may not involve a trusted third party, as noted by (FRC, 2018). In this process, blockchain collects verified information about transaction amounts, payees, and payers, subsequently hashing and adding this data to the existing chain, as described by (Fanning & Centers, 2016).

The distinctive characteristics of blockchain hashes provide a source of trust, contributing to its resilience, as observed by (Deloitte, 2016). Moreover, discussions by (Ølnes et al., 2017) have pointed out that blockchain technology holds the promise of improving the auditability and transparency of information. In summary, blockchain's ability to foster trust, data integrity, and security is grounded in its innovative features, making it a valuable tool in modern accounting practices.

Theoretical Perspectives of the study: This review delves into the influence of blockchain-powered accounting in a broad sense and AI-fuelled auditing, focusing on the perspectives of both agency and stakeholder theories. The study is based on two essential conditions: the integrity of network participants and the incorporation of raw data from public or private blockchain networks. It seeks to investigate the integration of blockchain and AI tools into the realms of accounting and auditing with the primary goal of fostering trust in financial data. This integration aims to reduce information asymmetry and enable the creation of value for a diverse range of stakeholders, including CEOs, managers, shareholders, accountants, auditors, investors, policymakers, and others. Ultimately, it facilitates collaborative decision-making and commitment among these stakeholders.

Agency Theory Perspective: Since the work of (Jensen & Meckling, 1976), which built upon (Berle & Means, 1932) research and introduced the concept of principal-agent relationships, scholars in the field of corporate governance have explored various mechanisms for monitoring and controlling these relationships. Internal governance mechanisms primarily revolve around aspects such as boards of directors, their composition, size, independence, ownership structures, and incentive systems for managers. External governance mechanisms, on the other hand, deal with factors related to the external market, as well as legal and regulatory frameworks.

In the context of accounting research, agency theory has become the prevailing approach. It underscores the importance of addressing "uncertain conditions that give rise to potential information disparities between company executives and external investors," as articulated by (Walker, 2013). Information asymmetry, a key concept in agency theory, arises when information is not equally available to all parties and may be selectively disclosed or manipulated by managers to influence decisions or transactions, as described by (Williamson, 1979).

Stakeholder Theory Perspective: The stakeholder theory recognizes that organizations are fundamental elements within a broader social ecosystem, and thus, their choices must not be taken in isolation. This theory promotes the cultivation of an open and inclusive connection with all stakeholders, encompassing not just managers, directors, and investors but also employees, other businesses, service providers, Government bodies, and society at large, as articulated by (Freeman, 2010).

In the present context of accounting practices, external users of financial information frequently face challenges in gaining insight into a company's actual transactions and accounting methods, as emphasized by (Yu et al., 2018). (Vasarhelyi, 2012)

(Dai & Vasarhelyi, 2017) proposed a blockchain-driven accounting ecosystem, enabling active collaboration among managers, accountants, business partners, and investors to authenticate transactions. This approach would empower organizations to address a wider spectrum of interests.

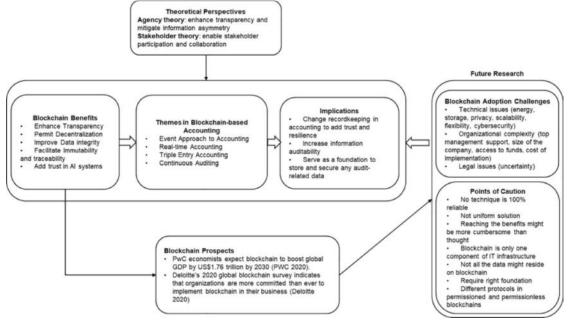
Methodology

This study adopted a review methodology similar to that employed by (de Bakker et al., 2019). The process began with a manual examination of a carefully curated list of relevant articles sourced from reputable academic journals. Subsequently, a systematic search of pertinent literature was conducted, incorporating keywords relevant to the study. Furthermore, given the emerging nature of blockchain technology, this study expanded its search to encompass industry literature, including reports, blogs, and news articles related to blockchain technology. This comprehensive approach aimed to provide a thorough overview of the blockchain literature, with a specific focus on its potential applications in revolutionizing record-keeping within accounting and its auditing aspects.

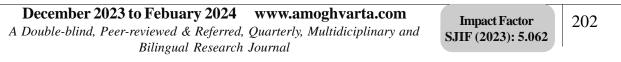
Results

The studies within our dataset compiled in literature review is largely conceptual in nature, which is not surprising given that research on blockchain technology is still in its nascent stages. This aligns with the trends observed in other fields such as business, energy, and industrial strategy literature, as evidenced by works like (BEIS, 2020; Toufaily et al., 2021).

Furthermore, the figure below provides a summary of the four primary themes identified in the literature related to blockchain-enabled accounting, along with key considerations to be mindful of when implementing this technology.



(Figure: Summarized topics covered in this review)



These four emerging themes in blockchain-enabled accounting are closely linked to the impact of blockchain on accounting and auditing processes utilizing AI tools. They encompass the event-driven accounting approach, real-time accounting updates, the introduction of triple-entry accounting, and the adoption of continuous auditing. With blockchain, financial transactions are recorded in real-time, improving accuracy and timeliness.

Event Approach to Accounting

Blockchain technology presents valuable research opportunities for advancing the event-driven approach to accounting, offering improved access to real-time accounting data (Wu et al., 2019). By utilizing blockchain for accounting records, data becomes more traceable and visible, enabling interested parties to access less aggregated transaction information in real-time, tailored to their specific decision-making needs (Moll & Yigitbasioglu, 2019; Yermack, 2017a).

(Sorter, 1969) introduces the concept of the event-based accounting approach and compares it to the value-based approach. The author provides an illustrative example of an investor making projections regarding a company's worth using these approaches.

The emergence of blockchain-based technologies has shed light on the need for financial standards, particularly regarding emerging FinTech products like crypto-assets (Singh, 2020). Nevertheless, it's important to recognize that any form of aggregation inherently involves a loss of information, a notion emphasized by (Ijiri, 1967).

While blockchain operates as a distributed ledger system, XBRL serves as a data standard. Since blockchain depends on data standards for its effective functioning, it is imperative for system designers, accounting professionals, and policymakers to collaborate and ascertain whether existing standards like XBRL can be adapted, or if the development of new standards is necessary, as emphasized by (Singh, 2020).

Real Time Accounting

Blockchain technology constitutes a groundbreaking innovation with the capacity to transform numerous facets of financial processes, including invoicing, payment processing, contracts, and documentation. (Kokina & Davenport, 2017).

Enterprise resource planning systems (ERPs) currently maintain real-time data on various aspects such as cash, receivables, payables, and manufacturing inventories. However, the data within ERPs is centralized and does not involve validation from multiple parties. In contrast, blockchain permits the public display of encrypted transactions and leverages multi-party validation.

Crucially, blockchain is not meant to supplant the XBRL standard; rather, it can augment efficiency when XBRL provides high-quality structured data. The integration of XBRL and blockchain holds the potential to enable real-time reporting and accounting. (XBRL, 2020).

Triple Entry Accounting

Triple entry accounting, when implemented through blockchain technology, establishes a shared ledger accessible within business networks. This utilization of blockchain's shared ledger has the potential to bring about significant enhancements in transparency and trust, thanks to multi-party validated records. This concept has been acknowledged and discussed in various studies (Cai, 2021; Carlin, 2019; Dai & Vasarhelyi, 2017; Faccia Alessio & Mosteanu Narcisa Roxana, 2019; Karajovic et al., 2019; Schmitz & Leoni, 2019; Simoyama et al., 2017; Tapscott & Euchner, 2019).

In addition to the concept of triple entry accounting, there exists a framework known as "trebit," which introduces a third layer of entries to complement the conventional debit and credit entries (Ijiri, 1967). Unlike traditional triple entry accounting, trebit incorporates digitally signed receipts shared by each participant, adding a powerful layer of evidence through record sharing (Grigg, 2005). In this context, a digitally signed

receipt serves as the third transaction, ensuring trust and transparency in accounting records (Cai, 2021). The adoption of triple-entry accounting, especially in blockchain networks, follows an independent and secure pattern, enhancing the reliability of financial statements and fostering increased confidence in sharing financial information with network participants (Dai & Vasarhelyi, 2017; Simoyama et al., 2017).

Continuous Auditing

Conventional auditing methods are no longer sufficient to meet the demands of the modern digital economy and its evolving business needs (Chiu et al., 2018).

Continuous auditing entails the utilization of advanced technology to automate audit procedures on an ongoing basis, encompassing activities such as control testing, risk analysis, exception identification, anomaly detection, pattern analysis, and trend review. This approach is expected to further progress by integrating artificial intelligence and blockchain into a cohesive ecosystem, enhancing the assurance process (Cong et al., 2018).

There are several cautionary considerations for organizations contemplating the adoption of blockchain technology. It's important to recognize that blockchains do not offer universal solutions; their applicability varies depending on the context, and they may not always represent the optimal choice. However, blockchain holds the potential to address contemporary accounting challenges by introducing multi-party validation of transactions, fostering trust, and supporting digital corporate reporting.

Furthermore, it is unrealistic to expect organizations to entirely replace their existing IT infrastructures with blockchain. Companies will gradually implement blockchain in specific areas of their operations while retaining their existing infrastructure, as not all data may be suited for storage on blockchain platforms.

Discussion

The four themes discussed above illustrate the potential transformation of accounting and auditing through the integration of blockchain and AI technologies. These advancements have the capacity to enhance transparency and trust within the field of accounting. Accounting professionals can leverage blockchain's attributes, such as immutable, append-only, shared, verified, and consensus-driven data, in conjunction with AI's data-driven learning capabilities to make more informed and effective decisions.

Blockchain-enabled real-time accounting offers several advantages, including increased efficiency, reduced settlement times for payments, and a decreased risk of earnings manipulation. Triple entry accounting can lower the costs associated with ledger maintenance and reconciliation.

In the following section, we delve into the theoretical and practical implications of the transformative influence of blockchain and AI technologies on the fields of accounting and auditing.

Theoretical Implications

In theory, the distinctive features of blockchain, such as transparency, precise distribution, immutability, and the logic of computer technology, have the potential to tackle information asymmetry and reduce ethical risks through the utilization of smart contracts and automation. Furthermore, this technology can stimulate creative financial collaboration among managers, accountants, business partners, investors, and auditors, promoting cooperation and coordination within blockchain networks and ecosystems.

From a stakeholder theory perspective, blockchain technology can serve as an effective tool for fostering an open and inclusive environment. Various stakeholders, such as accountants, business partners, and investors, can participate and collaborate within blockchain ecosystems, where they can access, update, or verify transactions based on their granted permissions. This enables organizations to enhance stakeholder inclusion and explore new business opportunities within blockchain networks. The event-based accounting approach, combined with real-time blockchain data, can cater to the unique needs and objectives of diverse accounting

information users. However, it's crucial to manage conflicts of interest among stakeholders, and companies must carefully design their blockchain ecosystems to optimize collaboration capabilities.

Practical Implications

This section delves into the real-world implications of incorporating blockchain into accounting, with a specific focus on four key aspects: the changing roles of accountants and auditors, potential challenges that may emerge, important considerations and cautions for those adopting blockchain, the choice between different types of blockchain, and the potential influence on small and medium-sized accounting practices (SMPs).

Choices Between Different Types of Blockchains

When organizations are choosing blockchain applications, it is crucial to ensure that these systems are suitably designed and configured to harmonize with their internal controls, as underscored by the (FRC, 2018).

The decision between implementing a permissionless or permissioned blockchain has a significant impact on the system's security and throughput. At present, private, permissioned, or consortium blockchains are more likely to find initial adoption in mainstream business environments for several reasons:

- a) **Security:** They provide a secure environment for safeguarding sensitive company information.
- b) Access Control: These blockchains allow for the differentiation of access among stakeholders based on their particular requirements for accounting information, thereby improving control over who can access and modify the ledger.
- c) **Cost Efficiency:** The consensus mechanisms in permissioned blockchains are less expensive because the identities of participants are known, requiring fewer nodes to achieve consensus.
- d) **Sharing:** These blockchains make it possible to share specific accounting records with internal departments and external entities such as suppliers, customers, investors, regulators, and auditors.
- e) Transaction Speed: Greater control over participants allows for faster transaction verification.
- f) **Transaction Flexibility:** They offer more flexibility in fixing or reversing transactions when necessary (Coyne & McMickle, 2017; Sheldon, 2019; Yermack, 2017b).

Implications for Small and Medium Practices (SMPs)

The Big 4 accounting firms are at the forefront of adopting blockchain and AI applications in their operations. This presents a concern for Small and Medium-sized Practices (SMPs) that may lack the financial resources and expertise required to implement blockchain-related services.

To address these challenges, Professional Accountancy Organizations (PAOs) can play a crucial role in supporting SMPs. They can organize forums and provide resources to keep practitioners updated on the latest developments in blockchain applications for accounting and auditing.

Furthermore, collaboration among companies, accountants, auditors, system developers, and regulators is essential. By pooling their knowledge and skills, they can design and implement blockchain solutions in financial record-keeping and leverage AI to enhance business operations and resilience. This collaborative effort is vital to meet the demands of the digital economy and ensure that all segments of the accounting profession can benefit from technological advancements.

Conclusion and Future Research

This study provides a comprehensive overview of the evolving landscape of recordkeeping in accounting with the integration of blockchain technology, highlighting four key themes. It underscores the potential of blockchain to offer shared, verified, and consensus-driven auditable data, which can significantly enhance the effectiveness of auditing when coupled with AI tools.

These questions encompass topics such as the types of accounting transactions suitable for blockchain recording and their associated costs, the synchronization of blockchain data in AI-driven auditing, the establishment of data standards for blockchain and AI integration, governance mechanisms for blockchainbased accounting information systems, regulatory adaptations to support innovation in this domain, and the varying responses and challenges faced by large accounting firms and Small and Medium-sized Practices (SMPs) when adopting blockchain technology.

In conclusion, blockchain's full integration into the financial system requires ongoing development, standardization, and refinement to overcome the technical, organizational, and regulatory hurdles. Empirical research and continued exploration of these questions will be essential in shaping the future of blockchain-enabled accounting and auditing practices.

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207