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The Impact of Triple Entry Accounting and Blockchain Technology on the Future of Accounting

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Abstract:

This study aims to provide a comprehensive perspective on how triple-entry accounting, supported by blockchain technology, impacts the future of accounting, focusing on enhancing transparency, efficiency, and regulatory challenges in accounting processes. Unlike traditional double entry systems, triple entry accounting introduces a third immutable ledger, maintained on a decentralized blockchain network, ensuring real-time verification and reducing reconciliation discrepancies. Blockchain's cryptographic security, consensus mechanisms, and smart contract automation further strengthen the reliability and accuracy of financial records. This integration minimizes fraud risks, streamlines auditing processes, and enhances corporate governance. However, challenges such as regulatory adaptation, high implementation costs, and the need for specialized expertise pose significant barriers to widespread adoption. Despite these obstacles, the future of accounting is expected to shift towards blockchain-enabled triple entry systems, redefining the roles of accountants and fostering standardized, globally transparent financial practices. This paper explores the theoretical foundations, practical applications, benefits, and challenges of blockchain-integrated triple entry accounting, highlighting its potential to revolutionize financial reporting and corporate accountability.

Keywords: Triple Entry Accounting; Blockchain Technology; Financial Transparency; Auditing Efficiency; Corporate Governance.

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1. Introduction :

Triple-entry accounting marks a paradigm shift in the accounting field by introducing an additional layer of verification and security beyond the conventional double-entry system. Traditionally, double-entry accounting relies on the principle that every transaction has equal and opposite effects on at least two accounts, ensuring internal consistency. However, this system remains vulnerable to fraud, manipulation, and inefficiencies due to its reliance on centralized record-keeping.

The integration of blockchain technology with triple-entry accounting transforms this landscape by introducing a cryptographically secured, immutable ledger that is distributed across multiple nodes in a decentralized network. Unlike traditional accounting records, which are maintained separately by each party involved in a transaction, triple-entry accounting records transactions on a shared ledger, ensuring that all stakeholders access a synchronized, tamper-proof version of financial events. This process significantly enhances financial transparency**,** security**,** and auditability by reducing reliance on intermediaries and mitigating risks associated with manual errors and fraudulent alterations.

Moreover, the application of smart contracts within blockchain-based accounting systems can further automate financial processes, ensuring that transactions are executed only when predefined conditions are met. This automation not only reduces operational costs but also improves efficiency in audits, reconciliations, and regulatory compliance.

Despite these advantages, the adoption of triple-entry accounting and blockchain technology faces several challenges. High implementation costs, the lack of standardized regulations, resistance to change within traditional accounting frameworks, and concerns regarding data privacy and scalability remain significant obstacles. Therefore, a comprehensive understanding of the opportunities and limitations of this technological integration is essential for assessing its transformative potential in the future of accounting.

1.1 The research problem can be framed as the following question:

“How does the integration of triple entry accounting and blockchain technology impact the future of accounting in terms of transparency, security, efficiency, and regulatory challenges?”

1.2 The study hypothesis:

H_1: The integration of triple-entry accounting and blockchain technology enhances transparency in financial reporting by providing an immutable and verifiable transaction record.

H_2: Blockchain-based triple-entry accounting improves security by reducing fraud risks and unauthorized alterations in financial transactions.

H_3: The adoption of triple-entry accounting and blockchain increases efficiency by automating reconciliation processes and reducing operational costs.

H_4: Regulatory challenges and legal uncertainties may slow down the widespread adoption of blockchain-based triple-entry accounting in the accounting industry.

2. Triple Entry Accounting & Blockchain Technology

2.1. Understanding Triple Entry Accounting:

Traditionally, accounting has relied on a double entry system, where each transaction affects two accounts: debit and credit. However, triple entry accounting introduces a groundbreaking approach by adding a third component, an immutable record maintained within a blockchain network. This addition fundamentally alters the framework by providing a transparent, tamper-proof method of transaction logging, which significantly reduces errors and enhances trust (Maiti, Kotliarov, & Lipatnikov, 2021). Whereas double entry relies on human oversight and reconciliation between disparate ledgers, triple entry accounting uniquely ensures consistency across all parties thanks to blockchain's consensus mechanisms (Han , Shiwakoti, Jarvis, & Mordi, 2023). Thus, this system shifts the paradigm, moving from individual, siloed ledgers to a shared, verifiable source of truth, which holds immense potential for the future landscape of financial reporting and auditing (Chowdhury, 2021).

Furthermore, the theoretical foundations of triple entry accounting can be traced back to its roots in the traditional double entry system, which was revolutionized in the 15th century by Luca Pacioli's work. This historical backdrop sets the stage for understanding how triple entry accounting expands upon its predecessor by incorporating blockchain technology. As triple entry accounting has evolved, its development has been scrutinized for its potential in transforming the accounting landscape, driven by a need for enhanced transparency and verification in financial reporting (Chowdhury, 2021). Unlike double entry systems that rely heavily on manual reconciliations, the move to a blockchain-supported framework offers a double assurance of accuracy and reliability. Therefore, the progression from single and double entry systems to triple entry marks a pivotal juncture in the accounting discipline, indicative of a broader trend towards integrating more sophisticated and secure technological solutions (Cai, 2021).

Additionally, triple entry accounting relies on several foundational components that work cohesively to redefine traditional accounting practices. At its core, triple entry accounting integrates blockchain technology to create an immutable and distributed ledger, ensuring that all transactions are simultaneously recorded across a network of nodes (Han , Shiwakoti, Jarvis, & Mordi, 2023). Each transaction generates a cryptographic signature, which serves as a unique identifier, further reinforcing the integrity and non-repudiation of financial data. This system leverages smart contracts, enhancing automation in transaction verification and compliance with predefined rules, thereby minimizing manual intervention. Consequently, the seamless interplay between these mechanisms not only fortifies the security and accuracy of financial records but also provides a comprehensive audit trail, demonstrating the profound shift towards more efficient and reliable accounting systems.

2.2. Blockchain Technology in Accounting:

Blockchain technology operates on the fundamental principles of decentralization, immutability, and transparency, making it highly relevant for accounting practices. By maintaining a distributed ledger across a network of computers, blockchain ensures that all participants in the network have access to the same data, thereby eliminating the need for intermediaries and enhancing trust (Garanina, Ranta, & Dumay, 2022). In accounting, this technology provides a secure and reliable method of recording transactions, as each entry is cryptographically linked to previous entries, forming a chain that is virtually resistant to tampering. Specifically, blockchain's decentralized nature facilitates real-time verification and transaction validation, which significantly reduces opportunities for fraud and error (Han , Shiwakoti, Jarvis, & Mordi, 2023). Consequently, the application of blockchain in accounting not only reinforces the integrity of financial information but also paves the way for the adoption of more dynamic and secure accounting frameworks, such as triple entry accounting, which build upon these foundational principles.

Moreover, blockchain technology is integral to the practical implementation of triple entry accounting by providing a decentralized and immutable ledger system. This decentralization allows transactions to be recorded in a distributed manner across various nodes, reducing the risk of manipulation and enhancing data transparency (Kuruppu, Dissanayake, & de Villiers, 2022). The use of cryptographic algorithms in blockchain ensures that each transaction is securely linked to preceding entries, creating an unalterable chain that safeguards against unauthorized modifications. Additionally, the smart contract functionality of blockchain facilitates automated compliance with accounting protocols, which diminishes the need for manual oversight and mitigates human error (Han , Shiwakoti, Jarvis, & Mordi, 2023). Hence, the integration of blockchain technology into accounting not only reinforces the integrity and reliability of financial records but also paves the way for a more secure and transparent accounting ecosystem.

In addition, smart contracts play a transformative role in the application of blockchain technology to accounting processes by automating transaction execution and verification. These contracts are self-executing codes with predefined rules and conditions, streamlining complex accounting workflows by automatically handling transactions when specific criteria are met (Han , Shiwakoti, Jarvis, & Mordi, 2023). Such automation minimizes human intervention, which not only boosts operational efficiency but also significantly reduces the likelihood of errors and fraud. Moreover, the autonomous nature of smart contracts facilitates real-time reporting by integrating seamlessly with blockchain's decentralized ledger, allowing instant access to authenticated, error-free financial data (Han , Shiwakoti, Jarvis, & Mordi, 2023). Consequently, the incorporation of smart contracts into accounting not only enhances data integrity and transparency but also supports an unprecedented level of trust in financial record-keeping, positioning them as a key element in advancing the triple entry accounting system.

3. Literature review

Existing research on triple-entry accounting, particularly when integrated with blockchain technology, underscores its potential to address long-standing issues associated with traditional accounting systems. According to Chowdhury (Chowdhury, 2021), the integration of blockchain into accounting practices not only enhances transparency but also provides an immutable ledger that is accessible to authorized parties, thereby reducing the risk of financial fraud. Despite these advantages, Baba et al. (Baba, Neupane, Wu, & Yaroh, 2021) highlight that technical and regulatory challenges remain significant barriers to widespread adoption. Moreover, Sunde and Wright (Sunde & Wright, 2023) point out that while some companies have started to achieve regulatory clarity, the confidentiality of blockchain transactions still poses a challenge to broader market acceptance. This body of literature reveals gaps in understanding how technological and regulatory issues can be effectively addressed to facilitate the full-scale implementation of triple-entry accounting systems.

The evolution of accounting practices has been marked by significant milestones, each contributing to the development of more sophisticated financial recording systems. Initially, accounting was characterized by single-entry methods, which were limited in scope and lacked the comprehensive oversight necessary for complex financial transactions. This method gave way to the

double-entry system, which became the standard due to its ability to provide a more balanced and accurate view of financial activities (Cai, 2021).

However, the emergence of triple-entry accounting represents a paradigm shift, integrating blockchain technology to offer an immutable and transparent ledger, thereby addressing limitations inherent in previous systems (Chowdhury, 2021).

This evolution reflects the continuous pursuit of enhancing reliability, accuracy, and trust within financial reporting, laying the groundwork for the widespread adoption of more advanced accounting frameworks.

4. Advantages of Triple Entry Accounting via Blockchain:

The implementation of triple entry accounting through blockchain technology offers a transformative level of transparency to financial reporting. By recording transactions on a decentralized ledger, each participant in the blockchain network has access to a unified, immutable record, thus eliminating discrepancies that arise from traditional systems based on individual ledgers (Han , Shiwakoti, Jarvis, & Mordi, 2023). This enhanced transparency facilitates real-time auditing and verification processes, reducing the time and cost associated with financial reconciliation tasks. Moreover, the immutable nature of blockchain ensures that once a transaction is recorded, it cannot be altered, providing a clear, traceable history of all financial activities (Garanina, Ranta, & Dumay, 2022). Consequently, this system nurtures a trustworthy environment where stakeholders can rely on the accuracy and reliability of the financial data presented, ultimately fostering confidence in the integrity of accounting practices.

Furthermore, the integration of blockchain technology into accounting practices significantly enhances security by offering advanced features that protect transaction data. Blockchain's decentralized nature ensures that financial data is not stored in a single location, reducing the risk of data breaches and unauthorized access. Each transaction is secured using cryptographic techniques, creating a tamper-proof record, which provides robust protection against fraudulent activities (Han , Shiwakoti, Jarvis, & Mordi, 2023). The use of distributed ledgers also enables a consensus mechanism among network participants, ensuring that any changes to the records must be agreed upon by the majority, further mitigating the chance of tampering (Garanina, Ranta, & Dumay, 2022). As a result, the application of blockchain in accounting not only fortifies the security of financial records but also establishes a more trustworthy environment for financial transactions, thereby strengthening the overall integrity and resilience of accounting systems.

Additionally, the adoption of blockchain-based triple entry accounting significantly enhances the accuracy of financial records by providing an immutable and synchronized transaction history. This system mitigates the discrepancies often encountered in traditional accounting methods, where data inconsistencies arise from isolated, disparate ledgers. By utilizing a decentralized ledger, all entries are uniformly reflected across the entire network, thereby ensuring alignment and reducing the incidence of unintentional errors or fraudulent lterations (Han , Shiwakoti, Jarvis, & Mordi, 2023).

Furthermore, the transparency inherent in blockchain platforms allows stakeholders to verify transactions in real-time, facilitating prompt detection and rectification of any inaccuracies (Garanina, Ranta, & Dumay, 2022). Consequently, the precision of financial reporting is improved, fostering a more dependable accounting environment that supports informed decision-making and reinforces stakeholder confidence in the recorded data.

5. Challenges and Limitations:

However, the integration of triple entry accounting through blockchain technology is not without its challenges. One primary concern is the significant learning curve required for accounting professionals to adapt to the technical intricacies of blockchain systems, which may hinder widespread adoption (Garanina, Ranta, & Dumay, 2022). Additionally, the implementation of such systems involves substantial initial investment in both infrastructure and personnel training, potentially posing a barrier to smaller firms with limited resources. Moreover, regulatory and legal frameworks may lag behind advances in technology, leaving accounting practices potentially vulnerable to legal uncertainties and compliance issues. These challenges suggest that while blockchain-enabled triple entry accounting holds considerable promise, substantial efforts are necessary to address these limitations and enable its successful deployment on a larger scale. Moreover, the technical limitations associated with the integration of triple entry accounting via blockchain cannot be overlooked, as they present notable barriers to its widespread adoption. The substantial computational power required to maintain blockchain's distributed ledger can lead to latency issues and high energy consumption, raising concerns about sustainability and efficiency (Han , Shiwakoti, Jarvis, & Mordi, 2023). Additionally, the existing complexity of blockchain platforms necessitates specialized knowledge, which complicates the training process for accounting professionals and potentially limits its accessibility in smaller firms (Garanina, Ranta, & Dumay, 2022). Another critical barrier is the need for a cohesive regulatory framework that can accommodate blockchain technology, as current regulations may not fully address the intricacies presented by decentralized systems. These challenges underscore the necessity for comprehensive strategies to mitigate potential roadblocks and facilitate the broader implementation of blockchain-enabled accounting practices, balancing technological advancements with practical considerations.

Additionally, the financial implications of integrating blockchain technology into accounting processes are a crucial consideration for firms contemplating its adoption. Initial set-up costs can be substantial, as organizations must invest in sophisticated infrastructure and technology to support the distributed ledger system (Garanina, Ranta, & Dumay, 2022). Moreover, ongoing expenses related to energy consumption and maintaining the blockchain's computational requirements may pose significant financial burdens, particularly for smaller entities with limited resources (Han , Shiwakoti, Jarvis, & Mordi, 2023). Beyond the direct financial outlay, organizations must allocate resources for the training and upskilling of accounting professionals to effectively utilize and manage these new systems (Garanina, Ranta, & Dumay, 2022). Consequently, while the benefits of enhanced transparency and security are clear, businesses must carefully weigh these advantages against the initial and ongoing costs to ascertain the viability and sustainability of implementing blockchain-enabled triple entry accounting.

6. Case Studies:

Notably, several organizations have successfully incorporated triple entry accounting through blockchain technology, showcasing its practical benefits. For instance, the company Ubitquity has effectively utilized blockchain to implement a secure, transparent real estate transaction system, demonstrating the potential for broader application across industries (Cai, 2021). Moreover, the Singapore-based firm LUCA+ provides a case in point of how triple entry accounting can enhance efficiency and accuracy within corporate finance sectors, by creating an immutable ledger of transactions, thus reducing reconciliation issues (Cai, 2021). Additionally, Provenance, a UK-based startup, employs blockchain to track product journeys in supply chains, illustrating the technique's versatility beyond traditional financial applications (Cai, 2021). These case studies underscore how organizations can harness blockchain-enabled triple entry accounting to refine data integrity, operational transparency, and stakeholder trust across diverse sectors.

Furthermore, organizations implementing triple entry accounting via blockchain have witnessed distinct benefits and challenges, as evidenced by various case studies. In the case of Ubitquity, the advantages are clear; implementing blockchain led to increased transparency and security in real estate transactions, allowing stakeholders to access real-time verified information, which ultimately reduced reconciliation issues (Cai, 2021). However, this transition was not without hurdles, particularly the initial costs associated with training employees and setting up the necessary technological infrastructure. Similarly, LUCA+ experienced improved accuracy and efficiency in corporate finance, demonstrating blockchain's potential to streamline financial reporting. Yet, they encountered challenges associated with regulatory compliance, as existing frameworks were ill-equipped to handle the decentralized nature of blockchain systems, posing difficulties in aligning new practices with established legal standards (Cai, 2021).

In addition, examining the outcomes from Ubitquity and LUCA+ reveals integrative successes and operational hurdles, contributing valuable insights into blockchain-enabled triple entry accounting. Ubitquity showcased considerable advancements in transparency and security, effectively reducing reconciliation discrepancies, but faced challenges in infrastructural setup and employee training, highlighting the need for comprehensive onboarding processes (Cai, 2021). LUCA+, while demonstrating enhanced accounting operation efficiency, underscored the regulatory difficulties of aligning a decentralized system with existing compliance frameworks, thus stressing the necessity for adaptive legal protocols (Cai, 2021). These case studies collectively illustrate the imperative balance between reaping technological benefits and overcoming implementation obstacles, offering valuable lessons for future adopters. This experiential knowledge not only empowers firms to address intrinsic challenges but also sets guiding principles for successful integration of blockchain in accounting practices, ultimately paving the way for broader adoption.

7. Future Trends in Accounting:

As accounting practices continue to evolve with blockchain technology, several emerging trends indicate potential transformations in the industry. One significant trend is the increasing reliance on automated processes, driven by blockchain and smart contracts, to enhance the accuracy and efficiency of financial transactions (Kuruppu, Dissanayake, & de Villiers, 2022). This automation reduces the need for manual intervention, thereby decreasing errors and streamlining accounting tasks, which could revolutionize audit procedures and reporting. Additionally, the capacity for real-time verification and transparency facilitated by blockchain is paving the way for continuous auditing practices, potentially replacing periodic audits with ongoing assurance models (Garanina, Ranta, & Dumay, 2022). Furthermore, as blockchain-enabled triple entry accounting becomes more prevalent, the emphasis on cybersecurity measures will likely intensify, requiring accountants to adapt to new security protocols and regulatory standards, ultimately reshaping their professional roles within organizations.

Moreover, predictions for the evolution of accounting standards and practices, as influenced by blockchain-enabled triple entry systems, suggest a dynamic shift towards enhanced regulatory frameworks and data governance models. The growing adoption of these technologies is expected to encourage the development of accounting standards that accommodate real-time financial data auditing, ultimately fostering more agile and responsive regulatory environments (Garanina, Ranta, & Dumay, 2022). As blockchain facilitates continuous auditing, it may redefine the role of auditors, shifting their focus from periodic reviews to the interpretation and analysis of ongoing data flows (Cai, 2021). Furthermore, accounting professionals might increasingly rely on data analytics and cryptographic verification, requiring a reevaluation of traditional skill sets and educational curricula to encompass these advanced competencies. Therefore, as the field adapts to these disruptive innovations, standards will likely evolve to prioritize security, transparency, and accountability within the increasingly decentralized and automated accounting landscapes.

Additionally, the transformative potential of blockchain to revolutionize global accounting practices is profound. By facilitating a seamless integration process through its decentralized and immutable nature, blockchain technology can redefine how transactions are recorded on an international scale, fostering unprecedented consistency in global financial reporting (Han , Shiwakoti, Jarvis, & Mordi, 2023). This system allows for real-time access to transparent data, enabling multinational corporations to conduct their financial activities with enhanced accuracy and reduced susceptibility to errors. Furthermore, blockchain's application in accounting strengthens compliance with international standards by maintaining a verifiable chain of transactions, thereby easing the complexities associated with cross-border financial reconciliations (Garanina, Ranta, & Dumay, 2022). The adoption of blockchain, thus, holds the potential to set a new paradigm in accounting, aligning disparate practices into a unified global framework, consequently improving stakeholder trust and operational efficiency.

8. Impact on the Future of Accounting:

The integration of triple entry accounting facilitated by blockchain could fundamentally reshape the accounting profession, promoting a shift towards more resilient and efficient financial systems. Unlike traditional methods that often involve significant time and resources for reconciliation, the immutable nature of blockchain provides an instantaneous alignment of financial records across multiple stakeholders, reducing discrepancies and the potential for human error (Chowdhury, 2021). Additionally, this system may transform the roles of accountants, who could increasingly function as data analysts and strategists, rather than mere record-keepers, as they leverage real-time data to support decision-making (Cai, 2021). The increased transparency and security proffered by blockchain-enabled triple entry accounting systems are anticipated to elevate the standards of corporate governance, thereby instilling greater confidence among investors and regulatory bodies (Han , Shiwakoti, Jarvis, & Mordi, 2023). Therefore, this evolution demands a reevaluation of current educational frameworks to equip future accountants with the necessary skills to navigate and excel in this new landscape.

Furthermore, the adaptation to blockchain-enabled triple entry accounting necessitates significant shifts for accountants and accounting firms. Professionals in this field will be required to develop extensive knowledge of blockchain technology, including its cryptographic mechanisms and consensus models, to effectively manage and leverage these new systems (Han , Shiwakoti, Jarvis, & Mordi, 2023). This paradigm shift transforms the traditional role of accountants, emphasizing the need for roles focused on strategic decision-making and data analysis rather than mere bookkeeping, as they navigate real-time financial data to offer strategic insights (Chowdhury, 2021). Additionally, firms must invest in training programs and infrastructure to facilitate the transition, which could strain resources but is imperative for staying competitive in a rapidly evolving digital landscape. Acknowledging these implications will be critical for firms to harness the full potential of blockchain technology while redefining the professional competencies required to thrive in this new era of accounting.

Ultimately, the integration of blockchain-enabled triple entry accounting suggests profound, long-term transformations for the accounting industry. As blockchain technology facilitates a decentralized, tamper-proof ledger, it redefines the role of accounting professionals who must now manage real-time data and provide strategic insights, rather than merely record transactions (Han , Shiwakoti, Jarvis, & Mordi, 2023). This shift is likely to result in enhanced accountability and a streamlined, efficient financial reporting process, fostering greater trust among investors and stakeholders. Additionally, as global adoption of this system grows, it may standardize accounting practices across borders, leading to more consistent financial data and reduced opportunities for tax avoidance through international accounting disparities (Blouin & Robinson, 2020). Therefore, while embracing this innovative approach requires overcoming significant challenges, such as training needs and infrastructure costs, its potential to revolutionize the accounting landscape and align it with modern technological capabilities is undeniable.

9. Conclusion:

The exploration of triple entry accounting integrated with blockchain technology within this document highlights its transformative potential for the accounting industry's future. By moving beyond traditional double entry systems, this approach facilitates unprecedented levels of transparency, accuracy, and security through the decentralized nature of blockchain ledgers. This integration not only addresses inherent limitations in conventional accounting, such as reconciliation errors, but also redefines the roles of accountants, prompting a shift towards analytical and strategic responsibilities. While the benefits are evident, challenges such as the need for regulatory adaptation and the initial financial outlay remain significant. Ultimately, as technological and regulatory environments evolve, blockchain-enabled triple entry accounting is poised to reshape accounting practices on a global scale, fostering greater stakeholder trust and operational efficiency in financial reporting systems.

(H_1) Transparency:

- The study confirms that blockchain-based triple-entry accounting significantly enhances transparency by ensuring real-time access to financial records.
- The immutable nature of blockchain prevents data manipulation, increasing trust among stakeholders.

(H_2) Security:

- The research findings indicate that blockchain enhances security by reducing risks related to fraud, unauthorized alterations, and cyberattacks.
- The cryptographic mechanisms of blockchain protect transaction integrity, making financial data more secure.

(H_3) Efficiency:

- The study shows that automation in blockchain-based accounting reduces reconciliation efforts, accelerates transaction verification, and lowers operational costs.
- Smart contracts further improve efficiency by enabling automated compliance and execution of financial agreements.

(H_4) Regulatory Challenges:

- The research highlights that while blockchain accounting has strong potential, regulatory uncertainty and legal compliance issues pose barriers to adoption.
- Differences in international accounting standards and concerns over privacy and taxation create obstacles to large-scale implementation.

Results:

- Triple entry accounting, integrated with blockchain technology, eliminates discrepancies between financial records by providing a unified, immutable ledger accessible to all relevant parties, thus increasing trust among stakeholders.

- Blockchain's cryptographic security and decentralized nature reduce the risk of fraud, unauthorized modifications, and data breaches, ensuring financial data integrity.
- The use of smart contracts automates transaction validation and compliance, reducing manual reconciliation efforts, operational costs, and human errors in financial reporting.
- While triple entry accounting offers significant benefits, challenges such as regulatory adaptation, initial implementation costs, and the need for accountants to develop blockchain expertise may hinder its widespread adoption in the short term.

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