The Influence of Blockchain-based Triple-entry Accounting on Accounting Information – a Theoretical and Conceptual Perspective

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Abstract. *This paper examines the conceptual and theoretical foundations of blockchain-based triple-entry accounting (TEA) as a potential evolution of the traditional double-entry system. By analyzing relevant economic theories and accounting concepts, the study explores how TEA can enhance the quality of financial information through increased transparency, security, and verifiability. The analysis highlights TEA's potential to reduce fraud, improve auditability, and strengthen trust among stakeholders in financial reporting. The findings offer a theoretical basis for understanding TEA's implications for accounting practices and support its potential role in the digital transformation of financial accounting.*

Keywords. triple-entry accounting, blockchain, distributed ledger, financial reporting, accounting information quality

1 Introduction

Digital transformation, automation, data science, and artificial intelligence already play a significant role in accounting and finance and are expected to become even more prominent as digital innovations continue to promote efficiency, accuracy, and transparency in financial processes.

Financial accounting, through financial statements, is an important source of business information, primarily serving external users. Despite a comprehensive regulatory framework, financial information remains vulnerable to manipulation and fraud, as seen in scandals such as Enron, WorldCom, and more recently, Toshiba.

Blockchain technology has significant potential to enhance transparency and accuracy in recording business transactions and financial reporting while reducing the risk of accounting fraud.

Although business transactions have become more complex, requiring continuous improvements in financial reporting standards, the fundamental principle by which business events and transactions are recorded, and later reflected in financial statements, has remained largely unchanged. This principle is the double-entry accounting system. Technological advancements are expected to allow for the evolution of this system into a triple-entry accounting system with the aim of preventing accounting fraud. The term triple-entry accounting was initially used in that context by Grigg in 2005 (Grigg, 2024). Distributed ledger technology, based on blockchain, could enable this transformation by preventing the manipulation of financial information and accounting fraud.

Most existing studies on the topic are theoretical and focus on the potential benefits of blockchain-based triple-entry accounting (hereinafter: TEA) without examining its relationship with underlying economic theories or fundamental accounting concepts.

This paper addresses that gap by exploring the potential impact of TEA on financial information from a theoretical and conceptual perspective.

The main objectives of this paper are to examine:

- Which issues, as explained by selected economic theories and mitigated by accounting information, would be further addressed by TEA-based financial reporting.
- Which accounting concepts would be influenced by TEA and how this would affect the quality of financial information.

The most important economic theories and accounting concepts underlying financial accounting will be analyzed to justify the transition from double-entry bookkeeping (accounting) to triple-entry accounting based on blockchain distributed ledger technology. This analysis provides a theoretical foundation for understanding the contribution of TEA to financial accounting, particularly its impact on security, transparency, and efficiency of financial reporting.

The paper is structured as follows: section two presents a review of selected papers; section 3 provides theoretical analysis; and section 4 concludes.

2 Review of Relevant Studies

Research about the application of blockchain in accounting started to grow beginning in 2019, according to searches of the Web of Science and Scopus databases.

Bonsón & Bednárová (2019), in their literature review, argue that blockchain technology has the potential to significantly transform accounting and auditing. It can enhance data reliability, transparency, and automation through features such as immutability, smart contracts, and decentralized consensus. The authors suggest that private blockchains may offer solutions for better auditability and reduced fraud. However, there are challenges such as scalability, cybersecurity, and regulatory acceptance.

Thies et al. (2023), in their systematic literature review on blockchain-based triple-entry accounting (hereinafter: TEA), note that the existing literature is almost entirely theoretical. As a result, various proposals for the design of TEA have emerged. Thies et al. adopt the view that TEA is a blockchain-supported extension of traditional double-entry accounting. Most of the authors whose articles they analyze have a positive outlook on this technology and its potential contribution to accounting and auditing, particularly in terms of fraud prevention, as well as faster availability and greater transparency of financial information. The challenges likely to arise in this context relate to legal and regulatory issues, cybersecurity, costs, and the fact that blockchain technology is not standardized.

Dai & Vasarhelyi (2017), in their theoretical work, argue for the significant potential contribution of blockchain to financial accounting, which still makes limited use of advances in information technology. They explore the idea of integrating Enterprise Resource Planning (ERP) systems with blockchain to create a triple-entry accounting system, enable real-time data processing and auditing, and transform the professional roles of accountants. The type of blockchain envisioned is a permissioned blockchain, in which only pre-approved entities can verify transactions. The triple-entry accounting system is seen as an enhancement of traditional double-entry accounting by adding a third entry—recorded on the blockchain—that creates immutable and transparent accounting data entries. This allows for real-time auditing and immediate availability of financial information to all relevant stakeholders. As a result, financial information becomes more transparent, and the risk of manipulation is reduced. These developments will influence accounting and auditing professionals, who are expected to take on more advisory roles while also requiring new knowledge in the field of information technology. To assess potential challenges, the authors apply the Technology-Organization-Environment (TOE) framework developed by Tornatzky and Fleischer (1990). From a technological standpoint, they highlight storage and computing resource costs, which necessitate adapting blockchain for accounting purposes. Organizationally, significant changes to business processes would be required, while from an environmental perspective, regulators would need to provide guidance and oversight regarding the application of blockchain in accounting.

Empirical research on the application of blockchain in accounting, as well as on the organizational factors influencing the decision to adopt blockchain in accounting, is still scarce.

Akter et al. (2024) investigated organizational factors that either promote or hinder the adoption of blockchain in accounting, as well as perceptions of the benefits of blockchain in this context. Semi-structured interviews were conducted with 19 accounting and blockchain experts, although none had actual experience with implementing blockchain-based accounting solutions. The researchers applied the Technology-Organization-Environment (TOE) framework. Among the key findings were challenges and a general lack of knowledge regarding the application of blockchain in accounting. The study identified nine organizational-level factors that either facilitate or hinder the intention to adopt blockchain in accounting. These include:

- Technological factors: perceived benefits, trialability, complexity, expected costs, and privacy risk
- Organizational factors: lack of knowledge, organizational innovativeness, and top management support
- Environmental factor: external pressure.

These insights highlight the multifaceted nature of blockchain adoption and the need to address both technological readiness and organizational capacity.

Cai (2021) uses case studies to explore triple-entry accounting. The selected cases focus on start-up projects aiming to establish blockchain-based triple-entry accounting systems. One case involves a public decentralized ledger project targeting clients with many customers and suppliers. The project is based on a cloud platform that could improve the efficiency and transparency of business processes related to customers and suppliers. However, potential issues include data privacy and the scalability of such a ledger. The main conclusions of the study are that, with the use of blockchain, data entry into the accounting system can become more efficient, while trust and transparency within the accounting system can be enhanced. The author emphasizes the need for further research into the conceptual and theoretical foundations of triple-entry accounting to strengthen the basis for its practical development.

Fang et al. (2023) conducted an empirical analysis on a sample of companies listed on Chinese stock exchanges to examine the impact of blockchain adoption on the quality of accounting information for the period from June 2016 to August 2020. The research shows that the adoption of blockchain significantly improves the quality of accounting information, as blockchain enhances corporate governance and creates synergy with large auditing firms, thereby improving the overall quality of financial reporting. A decentralized accounting information system strengthens internal controls and ensures the immutability of transactions, which helps prevent fraud. Furthermore, the study highlights that these positive effects are more pronounced in industries with less developed IT infrastructure and in cases where there have been no recent changes in auditing firms.

A study conducted by Oladejo et al. (2024) using a questionnaire at the end of 2020 and the beginning of 2021, involving 44 respondents, revealed that a majority of participants were skeptical about the potential of blockchain in the field of accounting. However, most of these respondents, although from the accounting or auditing domain, were not actively engaged with blockchain-related activities.

Busulwa et al. (2025) examined the knowledge of accountants in Australia and New Zealand regarding digital technologies during the period from mid-December 2021 to the end of March 2022. When it came to emerging technologies such as blockchain and other distributed ledgers and databases relevant to accounting, respondents rated their knowledge or understanding very low on a 1–5 scale, with both the median and mean values around 2. This underscores a key barrier to the adoption of emerging technologies in accounting.

Seshadrinathan & Chandra (2025) explored the impact of trust in blockchain technology on its adoption in accounting using the Technology-Organization-Environment (TOE) framework. In their model, TOE factors (firm-level influencers) mediate the relationship between trust in blockchain and the acceptance of blockchain for accounting purposes. The model was validated through qualitative interviews and quantitative surveys with accounting professionals.

3 Theoretical and Conceptual Foundations for Transitioning from Double-entry to Triple-entry Accounting

In line with Thies et al. (2023), TEA is in this paper considered as an enhancement of the traditional accounting system based on the concept of double-entry accounting (hereinafter: DEA), utilizing blockchain technology. In TEA, the traditional debit-credit recording in individual business ledgers is supplemented by a third entry: a cryptographically signed transaction receipt stored on a distributed ledger that is immutable and verifiable.

The key differences between DEA and TEA that are traced in literature are summarized in Table 1.

Table 1. Key differences between DEA and TEA

Feature	Double-Entry Accounting (DEA)	Triple-Entry Accounting (TEA)
Ledger Ownership	Internal	Distributed
Transparency	Limited (internal records)	High (shared, verifiable ledger)
Security	Prone to fraud and manipulation	Immutable and cryptographically secure
Auditability	Requires external audits	Real-time, automated external audits

Although accounting is heavily regulated, manipulation and fraud continue to undermine the value of accounting information.

This section explains how TEA could enhance financial accounting as a source of reliable financial information. It explores relevant economic theories and accounting concepts in this context.

3.1 Economic Theories Relevant to Accounting and TEA

To justify the transition from DEA to TEA, several economic theories can be applied. In this section the following theories are considered: efficient contracting theory, agency theory, stakeholder theory and fraud diamond theory.

3.1.1 Efficient Contracting Theory

Conceptual Framework for Financial Reporting, 2018 (hereinafter: CF) specifies that financial information must be decision useful since its primary users are investors, lenders and other creditors. Decision usefulness is one role of accounting information. Creditors and investors undertake financial statement analysis and use accounting information to predict cash flow and to make their decisions (Van Horne & Wachowicz, 2008, p. 128). They use accounting information to make decisions about investing in or lending to a firm. Subsequently, this information serves as credible evidence of past performance, allowing comparisons with forecasts and supporting the enforcement of contractual provisions, such as those stipulated in debt covenants within debt contracts.

Financial information also plays a stewardship role since it is used to assess if management fulfilled its goals or promises thus aligning the interests of managers and shareholders. If managers can

manipulate financial information trust is compromised (Scott, 2015, p. 16-17).

Efficient contracting theory explains how contracts are structured to maximize efficiency by aligning the interests of conflicting parties involved (Scott, 2015, p.313) - usually under conditions of asymmetric information and incomplete contracts. Applied to accounting i.e. financial reporting, this means debt or managerial compensation contracts that depend on accounting variables are the main reason why trustworthy accounting information is needed. Use of accounting information limits opportunistic behavior and enhances contracting efficiency by lowering contracting costs (Watts & Zimmerman, 1990).

TEA could promote contracting efficiency by reducing agency costs that are included in contracting costs, particularly in the following ways:

- Real-time availability of information
- Mutual confirmation of transactions (for transactions that involve other parties like suppliers or customers)
- Enhanced verifiability and auditability of information.

3.1.2 Agency Theory

Agency theory is characterized by agency relationship which consists of conflict of interests and asymmetry of information between principals and agents, like a firm and its creditors/investors (Wagenhofer, 2015).

Agency theory, when applied to financial accounting, helps explain why financial reporting standards, auditing practices, and corporate disclosures exist, all of that leading to reliable financial information. It focuses on how accounting information reduces the agency problems between agents (a firm or management) and principals (investor/creditor, shareholders or other stakeholders). Moral hazard represents hidden action taken by an agent that is not in the principal's interest; adverse selection is when an agent has more information than principal (Scott, 2015, pp 22-23).

Traditionally financial statements provide verifiable, standardized information that principals can use to evaluate agent's performance. However, basing compensation or debt contracts on accounting numbers gives managers an incentive to get involved in earnings management thus distorting accounting information (Wagenhofer, 2015). Auditing, conservatism integrated into accounting standards and disclosure requirements serve to deal with agency problems. TEA could further reduce both moral hazard and adverse selection problems by lowering agency costs via the following mechanisms:

- Immutable and secure transaction records that lead to more reliable financial information
- Decentralized and shared records that promote transparency and trust
- Enhanced auditability that prevents or diminishes incentives to manipulate.

3.1.3 Stakeholder theory

This theory emphasizes the importance of values in business, advocating for the creation of relationships of managers with not only shareholders but other stakeholders (for ex. employees, suppliers, customers, regulators etc.) to enhance value creation and rejecting the separation thesis between business and ethics. Shareholders and profits are important, but profits are the result of the value creation process. (Freeman et al., 2004)

In this view, accounting becomes a tool for accountability and transparency not only to investors but to all parties affected by a firm's actions. Stakeholder theory emphasizes ethical obligations in reporting, not just legal compliance. Traditionally different stakeholders (investors, auditors, regulators, business partners) depend on centralized financial records that may be altered or manipulated.

TEA supports ethical reporting by enabling transparent, verifiable access to information for multiple stakeholders. Access to a shared ledger would make transaction verifiable by all relevant parties thus reducing information asymmetry and enhancing transparency and trust.

3.1.4 Fraud Diamond Theory

This theory (Wolfe & Hermanson, 2004) attributes fraud occurrence to four factors: incentive, opportunity, rationalization and capability.

TEA addresses the "opportunity" component of the fraud diamond by ensuring transaction records are cryptographically verified, immutable, and transparent, thereby reducing the likelihood of fraudulent behavior.

3.2 Impact of TEA on Accounting Information Quality

3.2.1 Faithfull Representation

According to CF (2018), financial information must be relevant and faithfully represent economic transactions of an entity if it is to be decision useful primarily for investors and creditors, but also for other stakeholders. Faithfully represented information is the one that is maximally complete, neutral and free from error.

TEA would improve the last characteristic by reducing errors through automated, verifiable entries.

3.2.2 Qualitative Characteristics that Enhance the Usefulness of Information

Relevance and faithful representation, these two fundamental qualitative characteristics of financial information, are improved if financial information has additional characteristics of comparability, verifiability, timeliness and understandability. Comparability enables users to identify and understand similarities and differences among items. Information is verifiable if different knowledgeable and

independent observers can reach consensus that it represents what it purports to represent. Timeliness refers to information that is available in time to influence decisions. Information is understandable if presented clearly and concisely, allowing users to comprehend it. (Conceptual Framework for Financial Reporting, 2018)

TEA could positively affect some of these characteristics (see Table 2).

Table 2. TEA impact on financial information

Characteristic	TEA impact
Comparability	Improved through standardization and consistency
Verifiability	Strengthened through cryptographic proof and shared access
Timeliness	Enhanced via real-time recording and instant visibility

Firstly, standardized transactions structures and shared ledgers reduce inconsistencies between entities thus enabling better comparison of information of one entity with similar information about other entities.

Additionally, distributed ledger technology based on blockchain provides cryptographic proof of transactions and thus reduces dependence on subjective judgment or trust in internal systems so that other parties like auditors or regulators can verify transactions directly from the blockchain without needing company-specific access.

Finally, with TEA transactions would be recorded in real time and instantly visible to authorized stakeholders (suppliers, investors, auditors, …) improving timeliness.

4 Conclusion

This paper has examined the transformative potential of blockchain-based triple-entry accounting (TEA) through the lens of foundational economic theories and core accounting concepts. The analysis suggests that TEA, as an extension of traditional double-entry accounting, can enhance the transparency, accuracy, and reliability of financial information by leveraging blockchain's immutability, decentralization, and consensus mechanisms. Analyzing TEA through theories such as agency theory, stakeholder theory, efficient contracting, and the fraud diamond theory, the paper demonstrates how TEA could reduce information asymmetry, mitigate agency costs, and deter fraudulent behavior in financial reporting. Furthermore, it shows that TEA enhances key qualitative characteristics of financial information - particularly verifiability, timeliness, and faithful representation - offering a compelling theoretical basis for its potential integration into future financial accounting practices.

Further research and practical development will be essential in translating the theoretical advantages of TEA into real-world accounting practices.

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