Development of Accounting Systems Using Blockchain Technology

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Abstract

Business organizations need adequate data transparency to produce real time and high quality information. The Double Entry accounting system is considered not enough to provide these things, so development of Triple Entry accounting system is needed. Triple Entry accounting system is closely related to Blockchain. This study uses a systematic literature review that leads to development of accounting systems using blockchain technology. This is because the implementation of the Triple Entry accounting system to store transactions permanently on the blockchain ensures that the sender has the authority to carry out non-reversible transactions using public key cryptography.

*Keywords: Double Entry Accounting, Triple Entry Accounting, Blockchain*

INTRODUCTION

The important role of the accounting process should not be underestimated because it is a source of data for economic activity (Renes, 2020). Accounting practices have existed for a long time and have evolved over the last 5000 years. The evolution of accounting is related to the development of civilization where accounting practices are developed according to the needs of each civilization in its time (Saidu, 2014). The simplest form of accounting practice is single entry accounting (Gamage et al., 2020). A list of all entity transactions is kept on a periodic basis using single entry accounting. (Cai, 2021).

Information on cash balances and related transactions that impact the last transaction in a day is presented by single entry accounting but does not provide complete information about the company's operations in its cash flow information. Single Entry accounting system is not suitable for large companies that have large assets and liabilities. When the company takes a loan, in the Single Entry accounting system it will be recorded as income so that it is not able to provide the company's overall financial position. In addition, records in the Single Entry accounting system are error-prone and difficult to track, if recorded fraudulently (Gamage et al., 2020).

The single entry accounting system has been revolutionized by double entry accounting. For more than 600 years, the double entry accounting system has become the foundation for today's modern financial accounting practices (Cai, 2021). Debit and credit in every transaction that occurs is applied by double entry accounting. Transactions in the Double Entry accounting system must be recorded twice to balance assets with liabilities and equity in the statement of financial position. Double Entry accounting system discloses the
impact (if any) of each transaction on equity, changes in net assets or profit or loss (Bryer, 1993).

Double Entry accounting system allows for a barrier to protect the organization from mistakes but still can be penetrated by fraud. However, fraud still occur even though debit and credit are balanced and a balance check has been carried out on the double entry system. The potential to create fraudulent transactions persists even when transactions are fully, independently and privately recorded (Cai, 2021).

Several studies discuss how accounting practices can be implemented using the latest technologies such as blockchain. Blockchain functions as a decentralized database and is a digital ledger that records transactions between multiple parties in real-time. Blockchain allows users to carry out transactions without trusted third-party intermediaries due to its peer-to-peer network infrastructure and cryptographic capabilities. Blockchain allows each participant to keep an identical copy of the ledger. (Bonyuet, 2020). Blockchain technology significantly increases financial visibility and enables more timely interventions (Moll & Yigitbasioglu, 2019a).

Triple entry accounting is the most innovative concept related to blockchain. In reducing fraud and the risk of error, triple entry accounting developed from double entry accounting (Faccia & Mosteanu, 2019). Triple entry accounting contributes to transparency, future reference, reconciliation, assurance and auditing (Gröblacher & Mizdrakovic, 2019). Blockchain technology is needed to support triple entry accounting. Blockchain stores accounting information. Accounting is built on bookkeeping which helps the flow of information for the organization's decision-making process. Bookkeeping and accounting are different things. Bookkeeping is limited to journals, while accounting takes place in ledgers (Ibañez et al., 2020) (Ibañez et al., 2021).

Triple entry accounting is a potentially applicable system. Bookkeeping must be owned by both private and public agencies. Transparency in the procurement and sale of goods and services, budgeting and presentation of their accounts is mandatory for any business (Faccia & Mosteanu, 2019). This study aims to identify possible future accounting practices using blockchain technology and highlight triple entry accounting on accounting practices in providing useful real-time information.

**LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT**

The role of accounting is needed by the organization in carrying out business processes in every activity within its department (Stanescu S et al., 2018). The evolution of accounting practices in the past has occurred from single entry accounting to double entry accounting. Single entry accounting is still used by small firms. Entities use single entry accounting because of its simplicity and widely used practice (Quinn, 2022). Since double entry accounting is applied, most people only enter values (debit and credit) out of habit without having to understand the reason why the entered value must be on the debit or credit side of the T-Account (Faccia & Mosteanu, 2019). Double entry accounting can be represented by debit and credit as an arc connecting two nodes as journal entries and nodes in the graph representing T-Accounts (Fellingham, 2018).

**A. Double Entry Accounting**

Double entry accounting allows all financial transactions to be recorded more accurately compared to single entry accounting. Littleton and Yamey (De Roover, 1956) have learned that double entry accounting has advantages over single entry accounting. Double entry accounting makes records more precise and complete than single entry accounting.
Ledgers consisting of multiple accounts are more accurate and complete because of the simultan registration of one transaction in two places. (Grigg, 2010a)(Maiti et al., 2021). Thus business management has a new approach with the nature of accounting which was previously just a simple registration of operations to be able to control the organization's capital (Edwards, 2012). Changes in the nature of accounting need to be understood to support innovative businesses that cannot be separated from the technology used in accounting. Real time insight is still not sufficiently presented by double entry accounting even though it has the advantages of single entry accounting in terms of transparency and mutual control (Gamage et al., 2020)(Bonyuet, 2020).

B. Triple Entry Accounting

The idea of triple entry accounting was introduced to address various issues regarding previous accounting practices. Triple entry accounting with layered journal entries can link economic activities by recording all accounting activities on the blockchain (Chen et al., 2021). The single join entry form is owned by all parties so that all parties have the same information about the transaction (Ibañez et al., 2020)(Ibañez et al., 2021). Triple entry accounting differs from single and multiple entry systems. The difference is the rules for recording transactions. Transaction confirmation is carried out by all parties involved. The recorded financial transactions are entries that have been successfully executed (Maiti et al., 2021).

Triple entry accounting is proposed to solve accounting problems by reducing the possibility of fraud because it is guaranteed by a third party who has exact information and no party can reveal unauthorized information. Proof of transaction is cryptographically secured with a single record. Digital signatures from all parties involved guarantee receipts as evidence to ensure that the transaction is legal (Simoyama et al., 2017).

The adoption of new technologies to make the work of accountants more efficient is met with a pessimistic approach to triple entry accounting. The future scenario is still a question that is trying to find the answer. The marriage of blockchain and triple entry accounting could lead to a disruptive digital transformation of accounting. Can the marriage revolutionize accounting practice? At least just to adopt blockchain into accounting to increase the efficiency of double entry system (Maiti et al., 2021).

Triple entry accounting using blockchain technology is useful in the recording of economic transactions which is considered to reduce the associated costs but does not completely eliminate the risk (Alboaiie et al., 2018). Blockchain can be a new accounting technology. Control solutions with a high level of data security can define their level of transparency. Private and public keys make it possible to define the registry and ledger for multiple users with private and public scalability. Triple entry accounting is supported by entering an external party into the accounting information system (Halil, 2022). Accuracy and utilization of real-time data are fundamental to the basic objective of triple entry accounting enabling a better strategic decision-making process. (Maiti et al., 2021).

RESEARCH METHODS

This study uses a systematic literature review that leads to development of accounting systems using blockchain technology. Systematic literature review is a study conducted using secondary data in the form of a well-defined methodology to identify, analyze, and interpret all available evidence related to a particular research question objectively and impartially (Kitchenham & Charters, 2007). A systematic literature review is carried out through several stages, including planning, searching for scientific papers related to the topic, then screening the selected scientific papers.
The author formulates research questions in the planning stage. The planning stage is carried out by formulating research questions. This research question is "How can the development of accounting systems using blockchain technology be applied in the future?". The next stage is to search for scientific papers through Google Scholar and identify around 400 articles in the search database related to blockchain. The third stage is a screening of 400 scientific papers to find scientific papers that are relevant to the development of accounting systems using blockchain technology, which resulted in 36 observational papers.

RESULTS AND DISCUSSION

A. The Development of Accounting Techniques

The evolution of accounting practices is described into three substantial periods that have been identified (Faccia & Mosteanu, 2019). The first period is reflected in the accounting reference written by Luca Pacioli in 1494 which explains the origins of accounting scientifically. Pacioli met business needs by introducing double entry bookkeeping that was able to capture business realities (Favier, 1998). All accounting systems, both manual and computerized, to date rely on the accounting principles described by Pacioli. Pacioli teaches the principles of double-entry bookkeeping as well as presenting a unique teaching approach (Sangster & Scataglinibelghitar, 2010).

The influence of Muslim accounting practices implemented by the Venetians probably influenced Pacioli in explaining the double-entry bookkeeping system amidst the intensity of trade in the Mediterranean in the 15th century (Pryor, 1977). The expansion of businesses at that time forced traders to provide detailed reports through advanced accounting practices for determining the final profits that will be shared among the capitalists (Faccia & Mosteanu, 2019).

The second period identified by (Faccia & Mosteanu, 2019) was the application of accounting to perpetual business, with the introduction of adjusting journals and the study of the nature of accounts. Household-based reallocation of resources in the industrial revolution era accumulated commodities and labor so that demand for marketed goods increased (De Vries, 1994). Accounting is becoming increasingly complex, in essence the balance sheet will be closed when the trader finishes his business affairs and shares his profits with partners at the end of the contract or agreement period (Faccia & Mosteanu, 2019).

![Figure 1. Three Dimensional View of Account (Faccia & Mosteanu, 2019).](image-url)
The third period identified by (Faccia & Mosteanu, 2019) is the use of blockchain in the implementation of triple entry accounting practices. As a decentralized ledger technology, blockchain has the characteristics of being transparent, permanent, secure and immutable which are currently widely applied in various fields such as cryptocurrency, equity financing and corporate governance (Yu et al., 2018).

Blockchain is an alternate ledger (Cai, 2021). The concept of triple entry accounting is fundamentally different and has nothing to do with blockchain. Triple entry accounting is considered a key development in accounting but it is not blockchain. The notion that blockchain is a third entry is a misunderstanding. However, its application in almost all sectors in real life in recent years has entered the mainstream (Javaid et al., 2021).

![Figure 2. Triple Entry Bookkeeping (Faccia & Mosteanu, 2019)](image)

A major transformation is needed considering that products and services were previously considered expensive and inefficient (Chang et al., 2020). The effective implementation of blockchain and its value to industry needs to be understood because of its prospective advantages in many fields. Blockchain is one of the technologies described as an enabler in the context of the industrial revolution 4.0 (Baber, 2019).

Double entry accounting, which has existed since the 16th century, was further developed into triple entry accounting (Grigg, 2010b). Triple entry accounting is considered capable of minimizing the possibility of fraud compared to double entry accounting. The triple-entry account system via blockchain can be programmed to follow accounting standards and regulations automatically using smart contracts and synchronize with taxes on an ongoing basis (Faccia & Mosteanu, 2019). Double entry accounting which is identical to debit = credit expanded horizontally along the same measurement unit becomes debit credit trebit (Ijir, 1986).

Triple-entry accounting using blockchain technology ensures that all three parties involved in this system get exactly the same information and cannot input unauthorized information (Simoyama et al., 2017). Cryptographically, complete receipt and proof is provided by the digital signatures of the author, payer and recipient issuer so that no party is able to pass through an unauthorized transaction as legitimate (Faccia & Mosteanu, 2019).

B. Blockchain technologies and beyond

Companies convert capital, labor, information and materials into products and services of greater value using technology. One of the technologies currently being developed is blockchain. Blockchain initiates triple entry accounting for company bookkeeping. Blockchain technology can significantly improve financial visibility with more timely interventions relevant to the immutable nature of accounting (Moll & Yigitbasioglu, 2019b). The transition to a triple entry accounting system is a challenge for accounting developers.
A real-time, verifiable and transparent accounting ecosystem can be created using blockchain technology. Blockchain can disrupt current audit practices by providing a guarantee of timely information for its users (Dai & Vasarhelyi, 2017). Access restrictions can be implemented using blockchain so that it only displays certain information to parties who have access (Faccia & Mosteanu, 2019). Integration of various aspects is needed to make triple entry accounting more real.

**Figure 3. Trial Balance and Journal Entries (Ijir, 1986)**

**Figure 4. Impacts and challenges related to the transformation of Triple Entry Accounting using blockchain technology (Maiti et al., 2021).**

**CONCLUSIONS**

Blockchain helps resolve disputes quickly through adjustments in terms of commercial finance, supply chain activities, operations management and other related areas by
minimizing a huge of manual work (Javaid et al., 2021). Triple entry accounting reduces accounting problems with the presence or other types of receipts guaranteed by sharing copies with all parties involved (Faccia & Mosteanu, 2019). Timely accounting checks for potential errors or fraud in transaction entries such as duplicate payments are very possible using blockchain technology so that control of the recording process becomes efficient (Dai & Vasarhelyi, 2017). However, just using blockchain technology is not enough to present a real triple entry accounting system (Morkunas et al., 2019). Big data, Machine Learning (ML), Artificial Intelligence (AI) and Blockchain which are deeply integrated are considered a combination capable of bringing big changes to the accounting profession (Zhang et al., 2020).

REFERENCE


