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The Concept of Blockchain-Based Triple Entry Accounting in Indonesia

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ABSTRACT

The business world, especially accounting and financial reporting, is experiencing disruptions due to a new technology called blockchain. By using blockchain technology in business, important information within the company becomes well integrated. However, in Indonesia, the development of blockchain both in concept and practice is still very slow. This paper aims to examine the blockchain-based triple entry accounting concept that exists and is developing in Indonesia using a literature review. Literature reviewed were carried out via Google Scholar with the keywords: "akuntansi triple entry" (triple entry accounting) and "akuntansi blockchain" (blockchain accounting). There were 15 articles published in Indonesian journals that could be studied. The process or stages of the literature review carried out in this paper are Identification / manual screening, Reading all titles, keywords, abstracts, publications, articles reviewed. As a result, Indonesia can apply blockchain-based triple entry accounting to increase transparency, reduce the level of fraud, and increase tax convenience. So, this paper provides regulation implications so that the government develops standardization of the application of blockchain technology.

Keywords: Blockchain-based accounting, Blockchain technology, Triple entry accounting

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INTRODUCTION

Indonesia is a country that is committed to increasing the adoption of industry 4.0 technology (Alamsjah & Yunus, 2022). One of the important technologies developing in the business world is blockchain. Blockchain has gradually influenced the business world, especially accounting and auditing, and has always been a hot topic in recent academic research (Bellucci et al., 2022; Du et al., 2023; Secinaro et al., 2022). Blockchain is a distributed database that can record financial transactions in real time. Due to its decentralized nature, research related to blockchain has given rise to the idea of a new technological system, namely triple entry accounting (Bellucci et al., 2022; Cai, 2021; Du et al., 2023; Gietzmann & Grossetti, 2021; Han et al., 2023; Maiti et al., 2021).

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Blockchain technology was developed to support disruption by realizing decentralization of information in data processing (Lardo et al., 2022; Secinaro et al., 2022; W. Setyowati et al., 2021). However, so far, not many literature studies have been carried out in Indonesia regarding this topic. Some of the only studies conducted by (Ahmad et al., 2022; Mahaini et al., 2022; Rahmawati & Subardjo, 2022; Wibowo & Christian, 2021) are also included in the study material in this paper.

Blockchain is a technology that has features, one of which is consensus. Consensus is an agreement between subjects in a network so as to enable real-time data updates (Secinaro et al., 2022). Blockchain shares, records, and transmits information by storing it in real-time and continuously in different locations across the network (Smith, 2018). Data decentralization through blockchain technology which increases transparency and accountability can be applied in audit systems to reduce fraud, in supply chain processes to increase customer transparency, and simpler bureaucracy with smart contracts (this concept will be discussed in the next section) (Lemieux et al., 2020).

This paper tries to develop a blockchain-based accounting concept that can be used in Indonesia to support transparent and reliable reporting activities. Today blockchain developers have developed several blockchain-based accounting projects, turning the concept into reality. Such as Request Network, Balanc3, Fizcal, bBiller, Ledgerium, zkLedger, and Pacio (Cai, 2021). In this way, the work carried out by the accounting profession becomes more efficient. Blockchain technology can also improve the quality of information produced so that data has a high level of integrity and the level of fraud (and errors) can be reduced.

In Indonesia, blockchain technology is starting to grow and develop, for example there are several companies that have formed the Indonesian Blockchain Association. This development attracted the attention of the Indonesian government to use this technology (Hartoyo et al., 2021). By conducting a literature review, the aim of this paper is to examine the blockchain-based triple entry accounting concept that exists and is currently developing in Indonesia. With the literature review method, the potential for blockchain technology to be applied in Indonesia, especially regarding accounting systems, can be developed (Lardo et al., 2022). Because literature studies can fill current research gaps, especially research in Indonesia. In the conclusion section, this paper presents a triple entry accounting concept based on blockchain technology which has the potential to be applied in Indonesia.

BLOCKCHAIN TECHNOLOGY

Blockchain was first introduced by Nakamoto in 2008 as bitcoin protocol technology (Nakamoto, 2008). However, today, blockchain implementation has become very varied and different in every field of science (Garanina et al., 2022), one of which is in the field of accounting and financial reporting. As an accounting technology, blockchain can transfer asset ownership and manage ledgers accurately. Blockchain is a distributed ledger technology or can also be said to be financial technology (Han et al., 2023). According to (Gietzmann & Grossetti, 2021), blockchain is:

"A blockchain is an open and permissionless distributed peer-to-peer system of ledgers that utilizes a software algorithm, called distributed consensus protocol, to validate and permanently (immutability) store every transaction in a timely ordered chain of blocks. Each block contains a set of valid transactions connected together by cryptographic algorithms such that the system maintains its integrity over time."

The primary characteristics of blockchain are transparency, decentralization, permanence, tamper resistance, strong authentication, synchronized network, and consensus (Han et al., 2023; Yermack, 2017). This consensus is realized in a smart contract, where each party provides authority over digital transactions. This smart contract is the most transformative application of blockchain, which can increase transparency for all parties involved, as well as reduce contract costs (Han et al., 2023). All authorization in blockchain-based transactions can be done without paper evidence.

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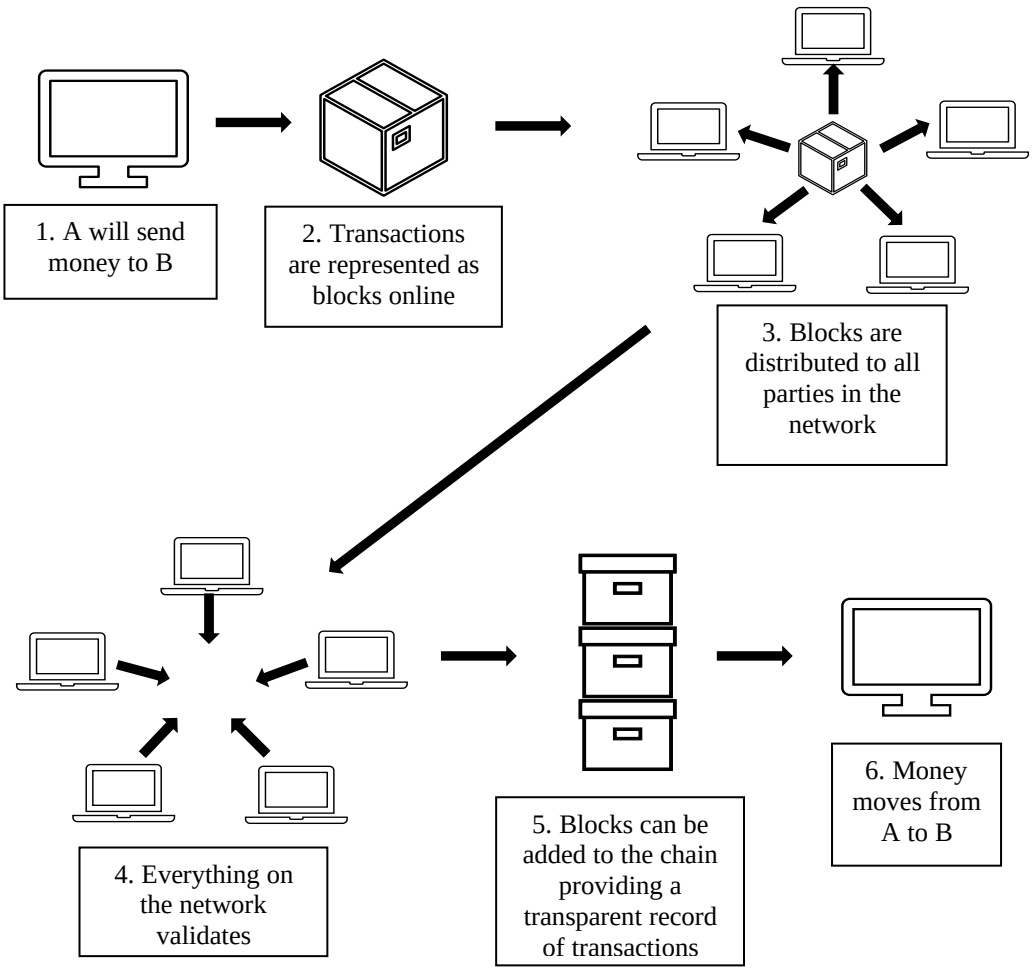

Figure 1. How Blockchain Works
Source: adopted from (Alsalmi et al., 2023)

Previous technological developments recognized SQL, but blockchain is different from traditional distributed SQL systems, because blockchain has an authority system through smart contracts. Blockchain does not have central control like distributed SQL (Gietzmann & Grossetti, 2021). In blockchain, the transaction verification process is not managed centrally, but is decentralized, so that companies that use blockchain in their accounting information systems can reduce the risk of fraud (Garanina et al., 2022). Transaction traffic flow is transparent and well authorized.

In general, blockchain types can be divided into three, namely public blockchain, private blockchain, and federated blockchain (a combination of public and private) (Alsalmi et al., 2023). Public blockchain means that every company is integrated along the supply chain. Private blockchain means that blockchain technology is only integrated within the company. Figure 1 is how blockchain technology works in general.

TRIPLE ENTRY ACCOUNTING

One of the objectives of accounting is to record financial transactions to provide complete information regarding the activities and financial situation of an organization to stakeholders (Maiti et al., 2021). The existing accounting systems so far are single entry accounting (SEA) and double

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entry accounting (DEA). Then what is currently developing is triple entry accounting (TEA). The differences between these three systems can be seen in Table 1.

Table 1. Difference Between SEA, DEA, and TEA

	SEA	DEA	TEA
Entry	Records of financial transactions	Records of financial transactions by debit and credit into different accounts	Signature (transaction confirmation)
Self-checking mechanism	Nothing	Account balance	Advanced checking
General ledger control	Internal	Internal and external (audit)	Distributed
Economic organization	Traditional (no separation between owner and business entity)	Corporation (separate business entity from its owners)	Platforms and ecosystems (combination between different business entities)
Focus	Cash-based accounting	Accrual-based accounting	Real time-based accounting
Technology infrastructure requirements	Low	Medium to high	high

Source: adopted from (Maiti et al., 2021)

SEA today is still applied in small businesses because of its level of ease. But of course, it has many weaknesses so that almost no big companies use it. DEA has a higher level of accuracy than SEA because the system is accrual based. Large companies in the world generally use DEA, because accounting standards around the world regulate this. However, this DEA still has many shortcomings (Maiti et al., 2021), namely: (1) low level of transparency; (2) low quality control; and (3) unable to provide real time information to business operations. The DEA system still requires strict standard operating procedures (SOP) and a time-consuming audit process.

That's why the idea of TEA emerged. In TEA, if one party inputs a transaction, then the other party agrees, then the “joint” ledger operator will confirm. TEA can answer an organization's need for information on future financial position based on the current situation. In the future, accounting practice can use three case models as in Table 2.

Table 2. Potential of Future Accounting Practices

Case 1	Case 2	Case 3
Advanced DEA based accounting software	A combination of blockchain and TEA	Combination of blockchain and TEA with disruptive technology

Source: adopted from (Maiti et al., 2021)

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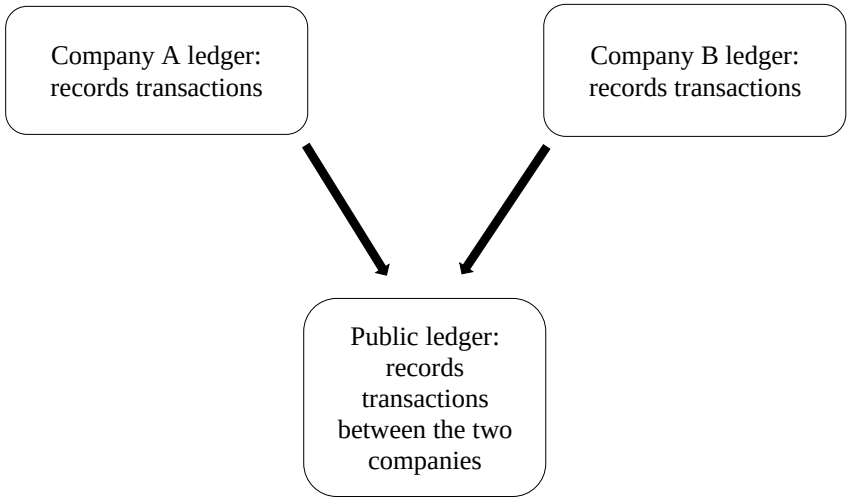

Figure 2. Triple Entry Accounting
Source: adopted from (Maiti et al., 2021)

METHODS

This paper uses a literature review to explore and analyze the concept of triple entry accounting in Indonesia. Article searches were carried out via Google Scholar with the keywords: "akuntansi triple entry" (triple entry accounting) and "akuntansi blockchain" (blockchain accounting). Google Scholar and these keywords were used to find articles in Indonesian and/or published in Indonesia because the aim of this paper is to examine concepts that have developed in Indonesia.

The search was carried out on February 17, 2023. Because in Google Scholar there are lots of search results, if you sort them based on relevance on the search pages, articles that are not relevant to the keywords also appear. So manual screening must be carried out to select articles that really discuss triple entry accounting and/or blockchain accounting. Of the thousands of search results that appeared, manual screening was carried out to find out which articles were relevant to triple entry accounting, the results only found 27 articles. Of the 27 articles, they were read as a whole and eliminated articles that were not relevant to the objectives of this paper. The results obtained were 15 articles published in Indonesian journals that could be studied. Of the 15 articles, 5 of them do not discuss triple entry, but there are triple entry claims in them. The other 10 articles focus on discussing topics related to triple entry accounting and blockchain technology, 5 in English and 5 in Indonesian.

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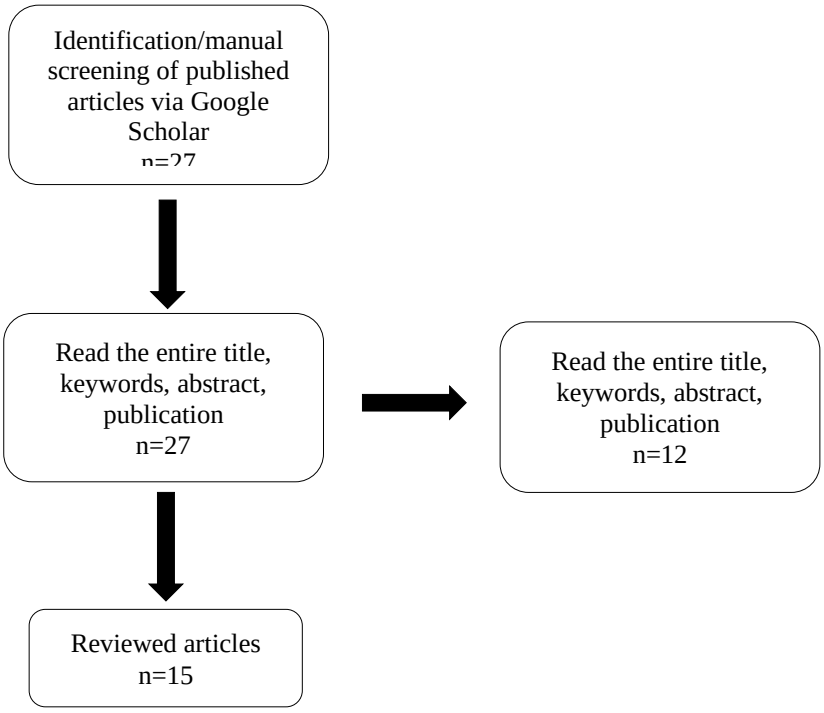

Figure 3. Stages of Literature Review
Source: adopted from (Han et al., 2023)

The process or stages of the literature review carried out in this paper were adopted from (Han et al., 2023), as can be seen in Figure 3. Based on the study process, 5 major themes were found, namely: (1) traditional triple entry; (2) blockchain as an integrated database; (3) blockchain-based triple entry; (4) blockchain for auditing and control; and (5) blockchain for tax administration (see Table 3).

Table 3. Themes in Blockchain-Based Triple Entry Accounting

Tema	Referensi
Traditional triple entry	(Akib & Iswandy, 2019; Mokoginta et al., 2017; Surjono & Firdaus, 2017; Suwandi, 2016; Yulistia et al., 2017)
Blockchain as an integrated database	(Ahmad et al., 2022; Amirya, 2022; Bandaso et al., 2022; Hartoyo et al., 2021; M. S. Setyowati et al., 2022; Wibowo & Christian, 2021)
Blockchain-based triple entry	(Ahmad et al., 2022; Bandaso et al., 2022; Fartika & Septiawan, 2022; Hartoyo et al., 2021; Mahaini et al., 2022)
Blockchain for auditing and control	(Ahmad et al., 2022; Amirya, 2022; Bandaso et al., 2022; Fartika & Septiawan, 2022; Rahmawati & Subardjo, 2022; Wibowo & Christian, 2021)
Blockchain for tax administration	(Lubis & Pratama, 2023; M. S. Setyowati et al., 2022)

Source: processed data

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RESULTS AND DISCUSSION

Traditional Triple Entry

In the regional government accounting system in Indonesia, the term triple entry often appears. However, the term triple entry does not refer to blockchain-based triple entry accounting which is input into a distributed ledger in the form of trebit, but rather into the budget book (Akib & Iswandy, 2019; Mokoginta et al., 2017; Surjono & Firdaus, 2017; Suwandi, 2016; Yulistia et al., 2017). The system they run is actually a double entry system, only the cash holder inputs cash transactions into the budget book, thereby affecting the budget cash balance. Even though triple entry accounting is a transaction that is recorded chronologically in the blockchain system (Bandaso et al., 2022). So it produces new columns besides debit and credit.

This system of recording in the budget book is required in regional regulations (Akib & Iswandy, 2019) which is considered a triple entry even though the ledger is not distributed. And this triple entry claim appears in at least 5 published articles netted in Google Sholar searches, with the exact same meaning as explained above. Even though the budget system is a management accounting system that is different from the financial accounting system. So inputting into the budget book is not a triple entry. The budget book is not a distributed ledger or public ledger. So, we eliminate the ideas that appear in these articles because they are different from current developments in science and technology.

Blockchain As An Integrated Database

Blockchain can be said to be an Accounting Information System, some call it a global ledger (Hartoyo et al., 2021), distributed ledger (Wibowo & Christian, 2021), or public ledger (Ahmad et al., 2022). Blockhain can be an accounting information system technology because it can track every form in a company's business activities in real time. An accounting system with blockchain as its data center will reduce data errors because the system that issues authority is more reliable than paper-based evidence. Supply chain systems that use blockchain technology can also reduce reconciliation activities between companies because the database is integrated (Hartoyo et al., 2021). In terms of financial reporting, blockchain can ensure that the input data is valid and cannot be manipulated. All data entered into the blockchain is automatically detected if changes occur.

Blockchain can indeed carry out calculations in real time, but that does not mean blockchain can carry out all accounting processes. Blockchain can add value to the accounting system if combined with other technologies. For example, blockchain only helps with recording, while input is carried out through the ERP system (Hartoyo et al., 2021; M. S. Setyowati et al., 2022). This means that blockchain can be useful as a database in the form of a distributed ledger. If used as a database, blockchain technology is very useful, especially if used for large companies that have many divisions.

Indonesia currently still does not use blockchain technology widely. Only a few companies have used it, for example blockchain is used by a platform called Tokoin (Amirya, 2022; Hartoyo et al., 2021). Tokoin helps solve MSME problems in terms of: (1) building MSME digital identity; (2) accommodating MSMEs to obtain funding opportunities; (3) helping the growth of MSMEs to build business partners. Tokoin can do this by providing technological infrastructure that can manage transaction data. All transactions via the Tokoin platform are stored digitally in the digital ledger. If in Indonesia there were more platforms like Tokoin and they were integrated with each other and MSMEs throughout Indonesia, then the implications would be huge for the Indonesian business world.

Apart from Tokoin, in Indonesia blockchain technology has also been used by PT Bank Central Asia Tbk (BCA) and PT Pos Indonesia, as well as a tax application service called Online Tax (Ahmad et al., 2022). At BCA, blockchain is used in the internal system to speed up payment transactions by

reducing the complexity of back office transactions. Then at PT Pos Indonesia a giro service called Digiro.in was developed.

With the development of blockchain technology in business, it will gradually have an impact on accounting work. The accounting profession will benefit greatly from this blockchain technology (Hartoyo et al., 2021). Because even though this technology has developed widely and is used throughout Indonesia, it still requires humans to operate it and the expertise of accountants to analyze data according to the needs of interested parties. No matter how sophisticated an accounting system is, accounting work still requires humans because transactions must be input, for example, into the ERP system, which can only be done by humans, after that the data will be recorded automatically into the blockchain (Ahmad et al., 2022; Hartoyo et al., 2021). Among the many advantages of blockchain when used as a database, this technology has several weaknesses if it is to be implemented in Indonesia, namely that it requires a large storage system and requires professional staff to implement it (Bandaso et al., 2022).

Blockchain-Based Triple Entry

The following is an illustration of triple entry recording which has become a popular example in scientific articles. Bob provides services to Alice for $100. Alice pays Bob $100. If using a double entry system, Bob would debit cash for $100 and Alice credit cash for $100. When an audit is carried out, the auditor will verify the transaction, the auditor will verify with the bank the transactions carried out by Alice and Bob, because there is a possibility that Alice did not record $100 in her ledger. If with a triple entry system, Alice and Bob sign a contract digitally (or known as a smart contract) when a transaction occurs, then the smart contract will verify and connect it to the blockchain, then the computer program will send $100 to Bob. These payment transactions are recorded chronologically and permanently in the blockchain system (Bandaso et al., 2022; Fartika & Septiawan, 2022).

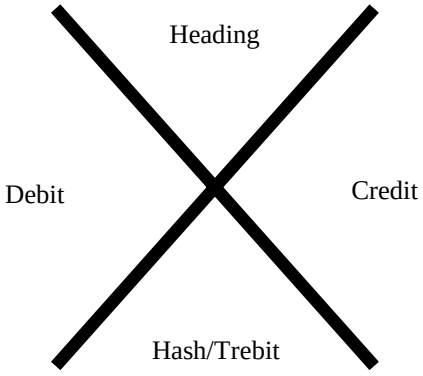

Figure 4. Form X Account in Triple Entry
Source: adopted from (Ahmad et al., 2022)

In the double entry recording system there is no independent authority to supervise the recording process, in contrast to the triple entry concept which was first introduced by Yuji Ijiri (Ahmad et al., 2022). The blockchain-based triple entry system is basically the same as double entry, only there is an additional trebit column generated from the smart contract authority. Through this trebit column, you can also find out where income and expenses arise (Mahaini et al., 2022).

The use of blockchain for triple entry has several concepts, including: (1) purely using blockchain only; (2) combining blockchain and ERP (Hartoyo et al., 2021). The second is what is possible to implement in Indonesia, blockchain is only used as an integrated database, because the currency used in Indonesia is also not cryptocurrency.

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Then the type of blockchain that can be used in Indonesia is private blockchain, that is, it does not distribute information to parties outside the company (Hartoyo et al., 2021). In contrast to public blockchain which is integrated with interested parties outside the company. With public blockchain technology, a triple entry accounting system can be used to increase the reliability of financial reporting. The triple entry accounting system requires authority over the transaction process from a neutral party, namely the blockchain.

This triple entry system, because it is integrated with parties outside the company, will facilitate many processes in financial reporting. Input transactions that have a minimum error rate, guaranteed authorization, and facilitate the audit process by external parties.

Blockchain For Auditing And Control

In the double entry recording system, there are no cross signatures as in the triple entry recording system, thus allowing errors and fraud to occur which must be verified by the auditor. This is different from triple entry where the signed public ledger will be distributed to the parties. This means that the possibility of errors and fraud is very small (Ahmad et al., 2022).

Blockchain as a general ledger offers transparency to its users. In the blockchain, all transfer or transaction records are stored and are continuous. This means that all transactions cannot be changed or cancelled, nor can backdated transactions be made, so that all types of fraud or misappropriation can always be detected (Rahmawati & Subardjo, 2022).

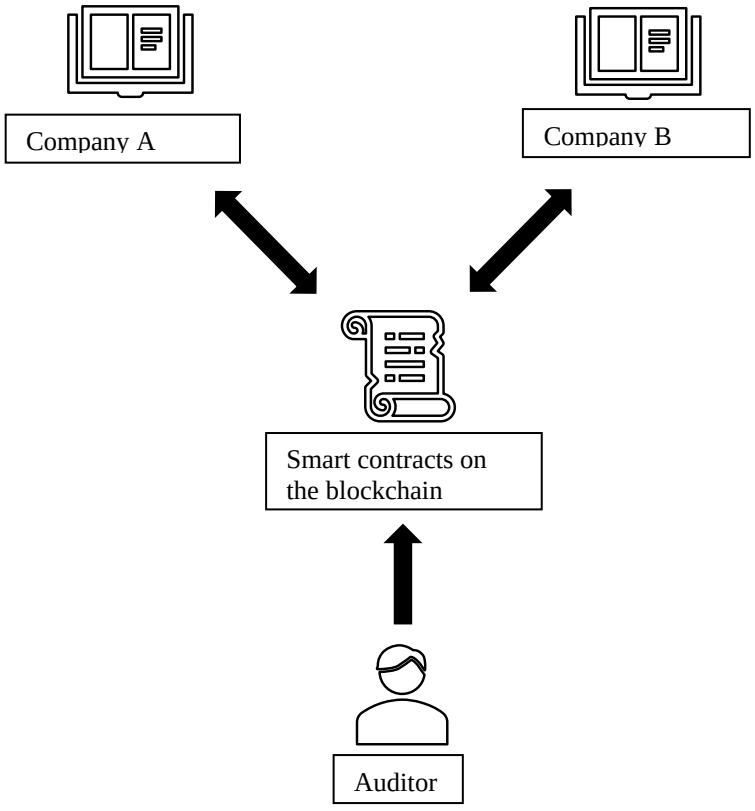

Figure 5. Transaction Recording with Blockchain
Source: (Rahmawati & Subardjo, 2022)

Transaction records using blockchain are only recorded if they match the code embedded in the smart contract (Rahmawati & Subardjo, 2022), so auditors only need to check the transaction records in the smart contract. The more companies involved in a blockchain network, the smaller the possibility of fraud. In this way, operations in a supply chain run better because the use of blockchain can increase transparency and prevent fraud.

Triple entry based on blockchain technology provides the benefits of easy tracking, timeliness, increased transparency, and protects against manipulation (Fartika & Septiawan, 2022). With this system, accountants will focus more on planning and assessment, no longer spending a lot of time on reconciliation and verification. Apart from that, it also reduces the time it takes to carry out an audit and the costs that accompany it, especially if conducting an audit for a large company. Therefore, large companies with many internal divisions are suitable for using this technology (Amirya, 2022; Bandaso et al., 2022).

For auditors, financial audit work will become very efficient. A distributed data system will reduce the costs of the audit process for carrying out verification because the data is more reliable. Financial data has high integrity, thereby reducing doubts among users of financial reports (Wibowo & Christian, 2021).

Adopting blockchain technology in Indonesia requires special attention to data integrity issues (in addition to implementation cost issues). It must be ensured that the data in the current traditional system has integrity, so that it will be easier if a company later implements a blockchain-based triple entry system. Apart from that, in order for audits to be carried out ideally in a triple entry system, the current accounting information system must be developed to be able to be combined with blockchain technology. And the most important main factor is that there must be standardization from the government for the use of blockchain as has been done in Australia, India and China (Wibowo & Christian, 2021). If the implementation of blockchain starts from regulations, accounting and financial reporting systems will develop rapidly following the development of industry 4.0.

Blockchain For Tax Administration

The way the tax administration system works can be updated with blockchain technology. Tax administration can run transparently, efficiently, with integrity and safely (Lubis & Pratama, 2023). Many countries have updated their tax administration systems with blockchain technology. These countries include: Brazil, Uruguay and Argentina with b-CONNECT; Finland and Nigeria with Avant Smart Card and eNaira; Estonia with e-Estonia; Chile with SII; Thailand with VRT Digital.

Blockchain technology has great potential for progress in tax administration because of its very high level of transparency. The level of tax avoidance can be mitigated by blockchain. This is done by registering the Ultimate Beneficial Owner (UBO) or registering asset ownership into the blockchain system. With UBO registration, transaction activity data will be permanently recorded on the blockchain (M. S. Setyowati et al., 2022).

The tax system is a policy instrument for the government to redistribute income, stabilize the economy, and provide public goods (Amir et al., 2013). Most tax reporting systems in Indonesia still use the self-assessment principle (such as income tax). Even though with blockchain technology, it is very possible for the taxation system in Indonesia to become more efficient as explained above. If the infrastructure in Indonesia is adequate to use blockchain technology, the government can create a policy to require all taxpayers to join the general ledger. In this way, all transactions will be monitored automatically, which in turn increases state income, reducing economic inequality, and increasing economic growth.

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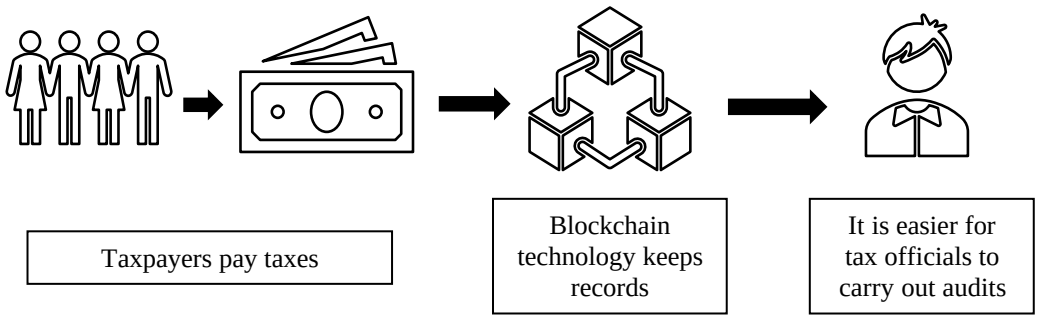

Figure 6. Blockchain-Based Tax Administration
Source: adopted from (Lubis & Pratama, 2023)

CONCLUSION

Triple entry accounting based on blockchain technology is very possible to be implemented in Indonesia. Blockchain can be used as a database and combined with ERP as an input system. Small companies can use a private type of blockchain to integrate with their supply chain, but larger companies must use a public blockchain because it can facilitate the financial audit process from external auditors. By using blockchain technology, transparency within the company is very high so that the company's internal control is very good. The risk of recording errors and fraud is very small. In addition, the audit process is very efficient because it only needs to check the smart contract.

Blockchain technology can also be used to modernize tax administration systems. Each beneficial owner must register ownership of their assets on the blockchain. This will certainly increase tax compliance and make things easier for tax officers, which will ultimately increase state revenue. The most important thing in implementing blockchain technology in Indonesia is standardization from the government. So the conclusion of this paper provides regulatory implications for the government to develop standards regarding the application of blockchain technology in Indonesia.

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