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Blockchain in Capital Markets: A Revolution of the Trading System in Stock Exchange

Dian Kusuma Wardhani[1]*, Tjiptohadi Sawarjuwono[1], Sasongko Budisusetyo[2]

[1]*Universitas Airlangga, Surabaya, Indonesia*
[2]*Universitas Hayam Wuruk Perbanas, Surabaya, Indonesia*

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ABSTRACT

This study aims to explore the benefits of implementing blockchain technology as a basis for stock trading in Indonesia to improve the corporate governance of issuers. Two main factors that trigger the emergence of agency problems in corporate gov-ernance in traditional stock exchanges are differences in interests between principals and agents and the complexity of the investment chain. This research is a documen-tary research where the researchers search for references in the form of previous research using the keyword "blockchain" in the "publish" or "perish" application. Next, the researchers organize, make a written summary, and interpret the findings obtained based on the the researchers' thoughtd. Based on the interpretation of pre-vious research, compared to traditional stock trading systems, blockchain technology has several advantages, such as high information transparency, improved stock liquidity, high monitoring by various parties, and the availability of information in real-time, thereby creating better corporate governance. The implementation of blockchain technology can reduce information asymmetry in the relationship between principal and agent, which in turn can improve the quality of corporate governance due to transparency, accountability, and high trust between all parties involved in this blockchain technology network.

ABSTRAK

Tujuan penelitian ini adalah untuk mengeksplorasi manfaat penerapan teknologi block-chain sebagai dasar perdagangan saham di Indonesia guna memperbaiki tata kelola perusahaan emiten. Dua faktor utama yang memicu munculnya konflik keagenan dalam tata kelola perusahaan di bursa saham tradisional adalah perbedaan kepentingan antara principal dan agen dan kompleksitas rantai investasi. Penelitian ini merupakan documentary research dimana peneliti mencari referensi berupa penelitian sebelumnya dengan menggunakan kata kunci "blockchain" pada aplikasi "publish" or "perish". Selanjutnya, peneliti mengorganisasikan, membuat ringkasan tertulis, dan menginterpretasi temuan yang diperoleh berdasarkan pemikiran peneliti. Berdasarkan interpretasi penelitian sebelumnya, dibandingkan dengan sistem perdagangan saham tradisional, teknologi blockchain memiliki beberapa keunggulan, seperti transparansi informasi yang tinggi, perbaikan likuiditas saham, pengawasan tinggi oleh berbagai pihak, dan ketersediaan informasi secara real-time, sehingga menciptakan tata kelola perusahaan yang lebih baik. Implementasi teknologi blockchain dapat mengurangi asimetri informasi pada hubungan antara principal dan agent, yang pada gilirannya dapat meningkatkan kualitas tata kelola perusahaan dikarenakan adanya transparansi, akuntabilitas, serta kepercayaan tinggi diantara semua pihak yang terlibat dalam jaringan teknologi blockchain ini.

* *Corresponding author, email address: dian.kusuma.wardhani-2019@feb.unair.ac.id*

1. INTRODUCTION

Blockchain technology has developed so fast today. Blockchain technology was first introduced in 2008 by Satoshi Nakamoto as a method to validate virtual money ownership (Nakamoto, 2008). After six years of being successfully used to record virtual money ownership, blockchain technology was finally began to be developed as an alternative to triple-entry system accounting records because the features of blockchain technology could support the triple entry system concept developed by Grigg (2005) into a useful practice for the business world and into a game changer in the development of accounting systems (Tyra, 2014). Since then, the terms blockchain and triple entry system have come to be known as a single entity defined as a public ledger database (Sangster, 2016; Cai, 2019). In blockchain technology, groups of transactions are recorded and stored in data structures such as chains (Liu et al., 2019). The implementation of blockchain technology is growing, not only in the field of accounting but also in that of capital markets, especially stock trading, to overcome the complexity of agency problems that arise in the corporate governance of issuers (Lafarre and Van der Elst, 2018). Issuers are companies that offer securities to the public through the capital market based on the procedures of applicable laws and regulations (OJK, 2020).

There are two main factors that trigger agency conflict in corporate governance of issuers in the Indonesian capital market today such as the differences in interests between principals (shareholders) and agents (managers) and the complexity of the investment chain (Yermack, 2017; Akgiray, 2019). Contracts regarding share ownership made between principals and agents are, in fact, not fully able to overcome the problems due to the difference in interests. Shareholders' efforts to monitor the managers' behavior through corporate governance mechanisms such as hiring independent directors are also quite costly and not fully effective because the results depend on the awareness, commitment, and behavior of humans or parties involved in the governance mechanism itself (Lozano et al., 2016). The presence of intermediaries such as brokers or financial institutions, even exacerbates agency problems because it increases the complexity of the investment chain and creates a distance between investors as owners of money and companies as parties that manage money (Lafarre and Van der Elst, 2018). If these two problems are not immediately addressed, it is likely that investors will lose interest and withdraw their funds from the Indonesian capital market, which in turn will threaten the sustainability of issuers and the Indonesian capital market in the future.

In an effort to overcome management problems in the Indonesian capital market, this research offers a solution to improve the quality of corporate governance of issuers through the use of blockchain technology as a basis for stock trading. Blockchain technology can minimize agency problems related to differences in interests in the Indonesian capital market by redesigning the issuer's corporate governance model based on computerized transparency through smart contracts. On stock trading in Indonesia, smart contracts are used as blockchain-based computer protocols to facilitate, verify, audit, monitor, and enforce negotiations and execution of contracts between shareholders and managers of the issuer company. This is done in order to assure one party that the counterparty will fulfill its promise with certainty according to the agreed contract, thus guaranteeing that the interests of each party will be protected (Murray et al., 2019).

In overcoming the problem of the complexity of the investment chain in the Indonesian capital market, blockchain technology is able to eliminate the role of intermediaries by forming a new system called a decentralized autonomous organization (DAO). This is fully managed through computer protocols that are coded and enforced through smart contracts rather than human managers, thus eliminating the emergence of opportunistic behavior of managers (Kimani et al., 2020). The working mechanism of the computed blockchain technology will affect the way a stock trading contract is created and executed so that it will ultimately reduce agent-related costs and fundamentally change the issuer's corporate governance for the better (Yu et al., 2018). In line with the improvement in the quality of the issuer's corporate governance, it is hoped that investors will feel comfortable and confident in investing their capital in the Indonesian capital market so that IDX's market capitalization will also be even greater in the future.

This study aims to explore the benefits of implementing blockchain technology as a basis for stock trading in Indonesia to improve corporate governance of issuers. Utilization

of blockchain technology as a basis for stock trading offers a solution to overcome agency problems by establishing better governance through: 1) Greater transparency of ownership. This is because every copy of stock trading transactions that occur in the block-chain system will be distributed and can be seen by all stakeholders in the network so as to create transparency and minimal information asymmetry (Coyne and McMickle, 2017); 2) Liquidity improvement. Because stock trading using blockchain technology does not require an intermediary, cash flow will be directed directly to the company so that transaction times can be completed faster, thereby reducing costs related to share ownership (Holden et al., 2014); 3) Manager supervision by all parties. Because real time trading in the blockchain system is carried out transparently, the performance of managers gets closer supervision from the board of directors, shareholders, and regulators, thereby minimizing the chance for managers to act opportunistically (Yermack, 2017); 4) Real-time accounting. The entire company's general ledger will be immediately visible in real time by stockholders and other stakeholders so that they no longer need to rely on quarterly financial reports prepared by the company and its auditors (Liu et al., 2019).

In addition to the solution, the implementation of blockchain technology also provides advantages compared to traditional trading systems, such as cryptographic features with paired encryption keys that ensure the security of transaction data, speed of posting and reconciliation of accounts in real time in the general ledger, the use of smart contracts that protect the interests of all parties, and there is a consensus of approval and validation of transactions from all parties in the network so as to create high transparency. With these advantages, the implementation of blockchain technology as the basis for stock trading will also help issuers to better fulfill the OECD governance principles of transparency, accountability, responsibility and fairness so as to create high-quality corporate governance (IFC, 2018).

The advantages offered by blockchain technology have been recognized by many parties. Therefore, since late 2015 stock exchanges in various countries have adopted blockchain technology as the basis for their stock trading (Yermack, 2017; Derbali et al., 2019). The positive effect of blockchain technology on governance is demonstrated by the Singapore Exchange (SGX), which has implemented blockchain technology since 2018

Blockchain pilot project in Asian stock exchanges

In Asia, a number of stock exchanges have launched pilot projects dedicated to the integration of blockchain technology in their existing system. However to date, these have been largely concentrated on clearing and settlement as well as post-settlement activities.

Selected stock exchange blockcian pilot projects in Asia

Jurisdiction	Exchange	Project Overview
Hong Kong (China)	Hong Kong Stock Exchange (HKEX)	HKEX is working with the Australian Stock Exchange to develop a blockchain platform focused on over the counter trading and to upgrade their post-trade system
India	National Stock Exchange of India (NSE)	NSE, along with ICIC Bank, IDFC Bank, Kotak Mahindra Bank, RBL Bank and HDFC Securities have used Blockchain startup Elemental's blockchain to test know-your-customer procedures and real time information updates using blockchain.
Japan	Japan Exchange Group (JPX)	JPX collaborated with IBM in 2016 to explore blockchain's use in trade and settlement for low liquidity markets. JPX are also working with Nomura Research Institute to explore the reach of blockchain technology in security market processes.
Myanmar	Yangon Stock Exchange (YSX)	YSX are working eith Dalwa Securities Group to test and develop a fully blockchain-based equity trading stock exchange.
Korea	Korea Exchange (KRX)	KRX has launched a Korea Startup Market (KSM) where equity shares of startup companies can be traded in the open market, using blockchain-based document and identify authentication.

Note: selection drawn from publically available information as of July 2018.
Source: National exchange websites, public press releases, and coindesk.com

Figure 1
Blockchain Pilot Project in Asian Stock Exchanges

Source: OECD (2018)

and has proven that blockchain technology is able to reduce information asymmetry, provide more efficient transaction settlements, and standardize the management of issuer companies' shares, thereby increasing SGX market capitalization (Franedya, 2018). In July 2020, five Chinese stock exchanges (Beijing, Shanghai, Jiangsu, Zhejiang and Shenzhen) were authorized by the China Securities Regulatory Commission (CSRC) to use blockchain technology as the basis for their stock trading to facilitate stock trading transa (blockchainmedia.id, 2020). Apart from these two countries, there are several other countries that are developing blockchain technology in their capital markets (see Figure 1).

This research has implications in several ways. First, it provides an understanding and an overview to consider the implementation of blockchain technology as a basis for stock trading on stock exchanges in various countries, especially Indonesia. Second, it provides an overview of management for public companies that wish to offer their stocks on a blockchain-based stock exchange. Third, it becomes a reference for regulators to be taken into consideration in the formulation of policies related to blockchain. Fourth, it provides additional knowledge for the public and academics regarding the implementation of blockchain technology in the field of stock trading and corporate governance.

2. THEORITICAL FRAMEWORK AND HYPOTHESIS

How Blockchain Technology Works

Blockchain technology works in the mechanism of groups of transactions, called blocks. Each block contains a block header which is composed of the hash value of the previous block, timestamp, nonce in-formation, and hash value of merkle tree, where all records are based on transactions and recorded information for the current block. The blocks are then sorted on the chain based on the time the transaction occurred while maintaining the hash of the previous block (Yu et al., 2018). If data changes in one block, the hash value of that block and all subsequent blocks will also change (Ibañez et al., 2020). Each node (a computer connected to the blockchain network and responsible for validating and relaying information on the blockchain) in the blockchain network has a copy of the transaction ledger. If any information from a node in the blockchain is tampered with or altered, the final hash value of this node will be different from the node whose information has not been tampered with. This mechanism ensures that traces of tampering or fraud can be found immediately, thus ensuring that information on the network is transparent, secure, and irreversible (Yermack, 2017).

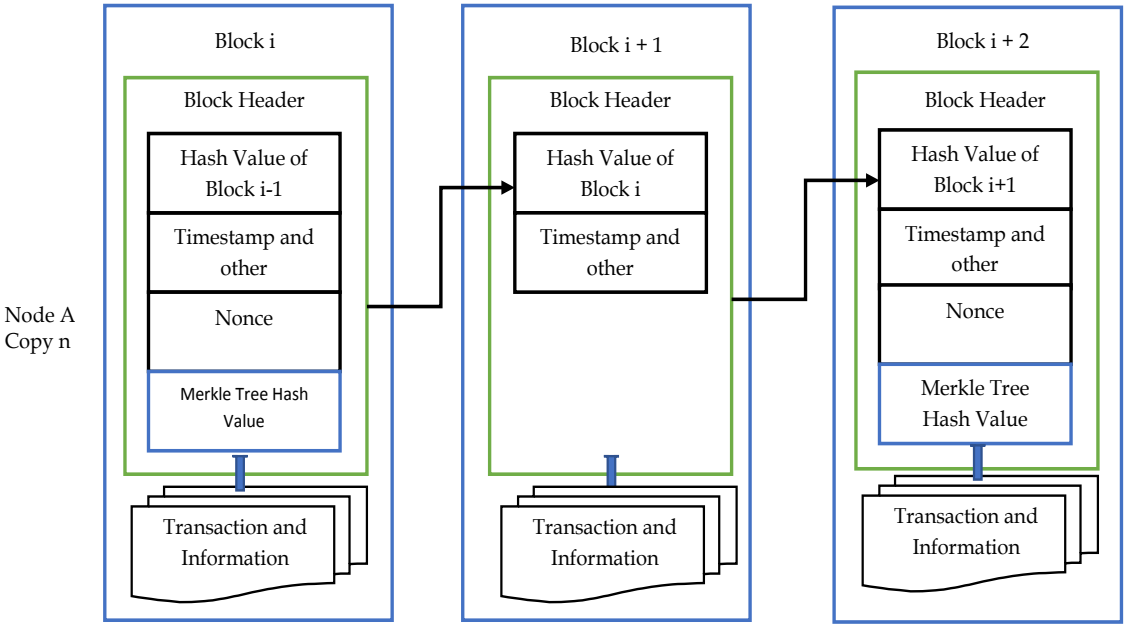

Figure 2
Blockchain Technology Mechanism

Source: Yu et al. (2018)

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In traditional databases, data is stored in a centralized location or central data so that it is vulnerable to hacking by "unscrupulous people" or hackers. Meanwhile, in blockchain technology, data is replicated and stored on multiple nodes (Lewis, 2018). The data stored on these multiple nodes makes it difficult for hackers to attack the database so that data storage with blockchain technology is more secure than that with traditional systems (Kimani et al., 2020). In addition to security in data storage, another advantage of blockchain tech-nology is that information is integrated in the network. Information in the blockchain network flows between participants. This is in contrast to traditional databases, where the flow of information is limited to servers and clients only. A node in a blockchain network is connected to several peer nodes, and these peer nodes will in turn be connected to a number of different peer nodes, thus forming a network of connected or peer-to-peer nodes (Derbali et al., 2019). Each node will validate and keep records of transactions and communicate the records with other people. Based on the blockchain consensus protocol, all transaction data is synchronized to maintain the updating and general dissemination of information in the network. Therefore, this technology does not rely on central authorization which usually holds power and monopolizes information in a centralized database (Dinh et al., 2018).

Potential Benefits of Blockchain Technology

Factors that trigger agency conflicts in the capital market in Indonesia today are the difference in interests between principals (shareholders) and agents (managers) and the complexity of the investment chain. Referring to agency theory, this problem is an agency problem of type one where the difference in interests between the principal-agent makes agents tend to prioritize their own interests because they feel they have power over the management of the company (Jensen and Meckling, 1976). To overcome the agency problem of type one, a good corporate governance role is needed to control the agent's power, or in this case, the manager of the issuer company has a control limit so as not to harm shareholders. According to Yermack (2017), one of the efforts that can be taken to improve the corporate governance of issuers is to use blockchain technology as a basis for stock trading on the stock market. Based on these findings, this study seeks to explore the advantages of using blockchain technology as a basis for stock trading in the Indonesian capital market to overcome the problems of managing issuer companies that investors complain about in order to create high-quality improvements and can add value to the issuer's corporate governance in the eyes of investors.

There are several superior features that are offered and form the basis of the strength of blockchain technology. First, the use of cryptography, where stock trading transactions are recorded on a blockchain network encrypted using a paired key, thereby increasing data security (Stein Smith and Castonguay, 2019). Second, when a transaction occurs, the system immediately posts it to the blockchain, thus providing real-time transaction records and account reconciliations (Akgiray, 2019). Third, the use of smart contracts by embedding computerized programming code, thus guaranteeing the processing of transactions and ledger entries in accordance with contracts made and agreed in advance (Murray et al., 2019). Fourth, there is a consensus where all parties agree and validate transactions that occur on the network so that all parties know all information in the network and create openness (Liu et al., 2019). The four advantages offered by blockchain technology can be a solution to overcome management problems in the current Indonesian capital market. This will be discussed further in the discussion of this research.

3. RESEARCH METHOD

This research is a documentary research. The research population is past articles that cover similar topics related to blockchain and corporate governance. The method used to find previous articles as references for this research is to use the keyword "blockchain" in the "publish" or "perish" application. The author then organizes and makes a written summary of the findings obtained (Creswell and Poth, 2016). The written summary is then analyzed descriptively and provides understanding and explanation based on the author's personal interpretation of the findings so that several benefits are obtained from the application of blockchain technology to improve corporate governance of issuers according to the objectives of this study (Habsy, 2017).

4. DATA ANALYSIS AND DISCUSSION

Before discussing the potential benefits of blockchain technology in stock trading and corporate governance, it is necessary to understand the relationship between blockchain and accounting, because basically blockchain was born from the development of accounting systems. Blockchain was born from the development of a double entry accounting system which is considered to have a weakness in transparency. Therefore, researchers have begun to initiate the concept of a triple-entry system implemented in blockchain technology.

Development of Accounting System

The first accounting system known to the public was the single entry system. This system is very practical and easy because journaling is only done once. However, this system has a high risk of error and fraud and it is difficult to track where the error occurred (Carlin, 2019). Furthermore, in the 15th century, Lucas Pacioli wrote "*Summa de Arithmetica Geometrica Proportiony et Proportionalita*" which discusses double entry bookkeeping in the chapter "*Tractatus de Computis et Scriptoris*" (Sangster, 2018). Double entry system was created to overcome the weakness of single-entry system. The double- entry system is believed to minimize the risk of human recording errors, such as the practice of intentional deletion of transactions. The double entry system eventually became a modern accounting system that is still used today. However, the system is also not completely perfect because it has not been able to provide comprehensive guarantees for the fairness of information in the company's financial statements (Houdet et al., 2020). To overcome the shortcomings of the double entry system, the role of the auditor as an independent party is needed to check the fairness of the information in the company's financial statements and provide guarantees for the conformity of the company's operations with applicable standards (Dai and Vasarhelyi, 2017).

In the current industrial environment that emphasizes the speed of information availability, all public companies are required to have high accountability and transparency of information. Therefore, triple entry systems were finally introduced to increase the reliability of information in the company's financial statements and improve the quality of corporate governance (Cai, 2019). The concept of the triple entry system is actually not entirely new because it was first introduced by Yuji Ijiri in the book, "Triple Entry Bookeeping and Income Momentum" in 1986 (Ijiri, 1986). The triple entry system initiated by Ijiri (1986) states that there are three recording entries: debit, credit, and trebit. This additional account "trebit" serves to provide an understanding of where income is generated or indicate the source of income (Dai and Vasarhelyi, 2017). The purpose of triple entry systems is to give organizations more momentum of financial information and enable better strategic decision making (Bonsón and Bednárová, 2019). The momentum referred to by Ijiri (1986) shows the level of income gain measured in monetary units per period, such as dollars per month. Although intellectually interesting, Ijiri's idea of a triple entry system has been criticized because it is considered to have no use case, is difficult to implement, and tends to lead to disputes (Ibañez et al., 2020).

The next triple entry system idea came from Grigg (2005) in his work, "triple entry accounting". Grigg shows the concept of a triple entry system that is different from Yuji Ijiri's, where he raises the new concept of "the receipt is the transaction", which means that the triple entry system requires authorization or receipt of transactions in the third entry to avoid fake transactions and reduce redundancy in internal recording (Cai, 2019). Grigg added that to ensure the credibility of the transaction, it requires an independent third party who can be a guarantor to record, validate, and control the public ledger. Despite the positive response, several researchers also revealed that entries stored by independent intermediaries are prone to misuse if the indi-vidual lacks integrity (Ibañez et al., 2020).

Practice of Grigg's Triple Entry System

Illustration: Andy and Berta are parties to a transaction, where Andy has to pay $200 for services provid-ed by Berta. In the double entry system, the records are only in Andy's ledger and Berta's ledger, where Berta records cash receipts as debits and Andy records cash disbursements as credits. In Grigg's triple entry system, Berta has to write a 'receipt' on the ledger along with the three by giving her signature. Meanwhile, at the same time, Andy sees the receipt, agrees, and signs it (see Figure 3). If a third entry, such as the mechanism, is permanently recorded in a shared ledger that is open to the public, neither Andy nor Berta can modify the transaction.

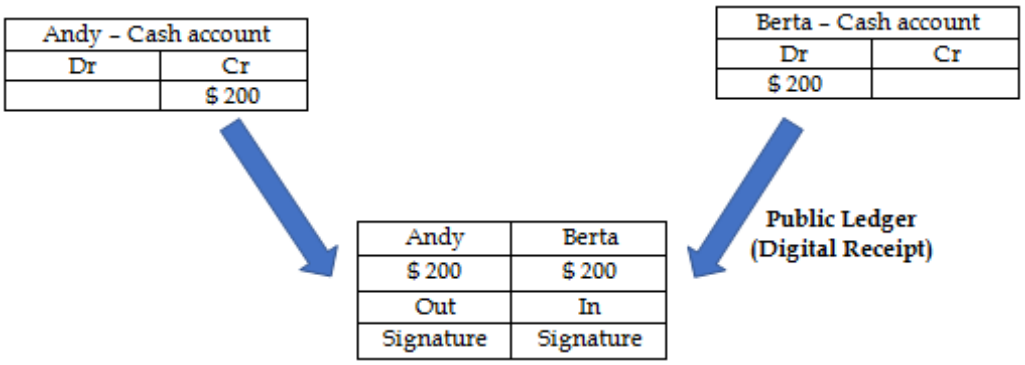

Figure 3
Concept of Grigg's Triple Entry System

Source: Grigg (2005)

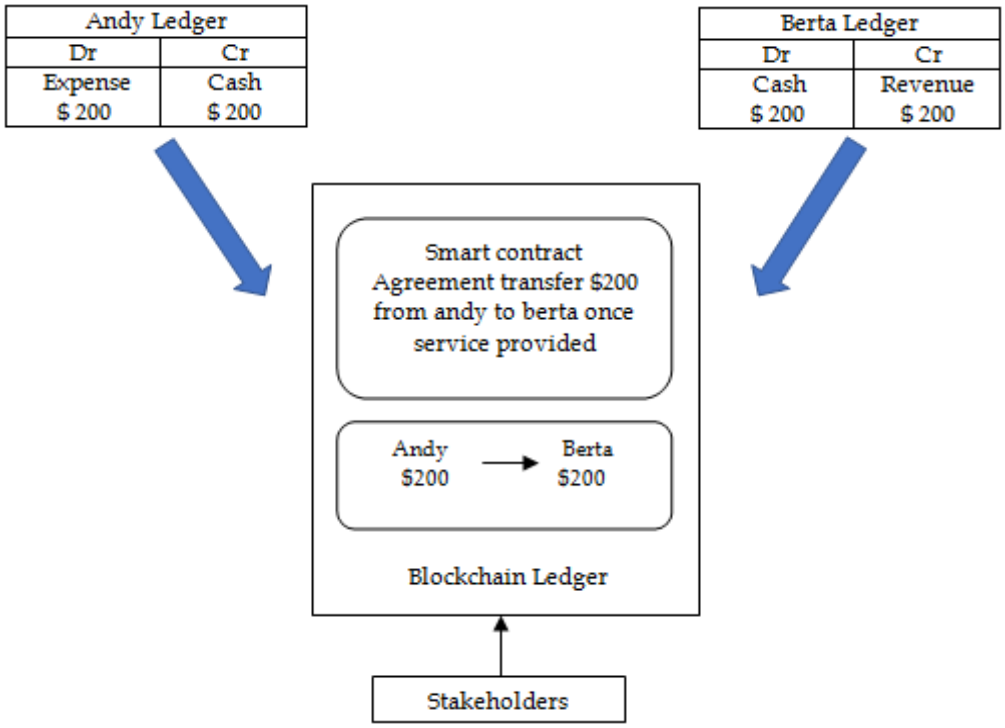

Figure 4
Concept of Triple Entry System with Blockchain

Source: Cai (2019)

Blockchain Technology and Triple Entry System

According to Tyra (2014), blockchain technology is very likely to be used to support Grigg's triple entry system concept into a practice that can be implemented in today's business world. Since Tyra's idea became known to the public, the triple entry system has always been associated with blockchain technology and has become a unit that is generally accepted by the public as a public ledger database (Sangster, 2016; Cai, 2019). After 2014, there were at least seven blockchain projects related to the triple entry system: Request Network, Balance3, Fizcal, bBiller, Ledgerium, zkLedger, and Pacio (Cai, 2019). Blockchain technology has the potential to increase information disclosure and reduce problems in Grigg's triple entry system by acting as an inter-mediary that records, validates, and distributes information to all participants and provides guarantees for the prevention of foreign or irregular transaction entries (Dai and Vasarhelyi, 2017).

In the working mechanism of blockchain technology, once a transaction is added and confirmed to the chain, it cannot be changed

because of the encryption feature or tokens. If there are attempted fraudulent practices, the transaction chain will be destroyed. This is because of the smart contract feature that can verify transactions quickly by referring to previously coded accounting standards (Carlin, 2019). All information recorded in the blockchain will be accessible to stakeholders in it. This allows for tight control over management by many parties and minimizes the gap for managers to practice fraud (see figure 4) (Ibañez et al., 2020). Based on these reasons, the triple entry system with blockchain technology has finally been widely adapted in today's business world because it is able to provide high transparency and accountability of in-formation so as to minimize information asymmetry in agency relationships by creating fairness, supervision by many parties, traceability, and guarantees of accountable information (Dai and Vasarhelyi, 2017; Cai, 2019). Blockchain technology as the basis for the triple-entry system is considered better because it replaces the role of humans who have a tendency to commit fraud (Sangster, 2016).

Blockchain Technology and Stock Trading

In addition to accounting, blockchain technology can also be implemented in the capital market sector, especially stock trading, to overcome the complexity of problems in the practice of traditional stock trading systems that are still used today. Stock trading on the Indonesia Stock Exchange (IDX) currently uses the JATS NEXT-G facility, where trading transactions can only be carried out by exchange members (brokers) who are also registered as the members of Indonesian Clearing and Guarantee Corporation / KPEI (BEI, 2020). There are many members of the stock exchange in the market, and each member of the stock exchange is responsible for all transactions carried out on the exchange, both those involving their own interests and those of their customers or investors. In the IDX stock trading mechanism (see Figure 5), investors who want to in-vest in stocks must make a stock offering through the selected exchange member, and then the stock exchange member will enter the investor's offer into the JATS NEXT-G facility. The transaction process in this facility pays

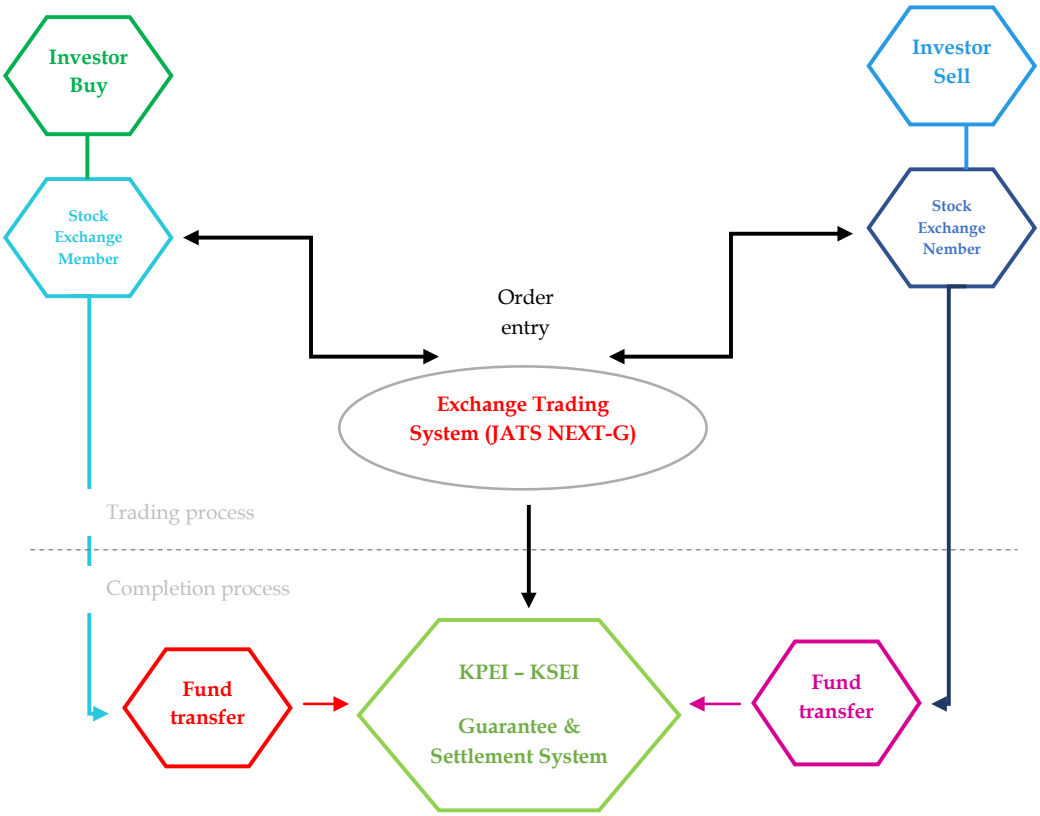

Figure 5
Stock Trading Mechanism on the IDX

Source: IDX (2020)

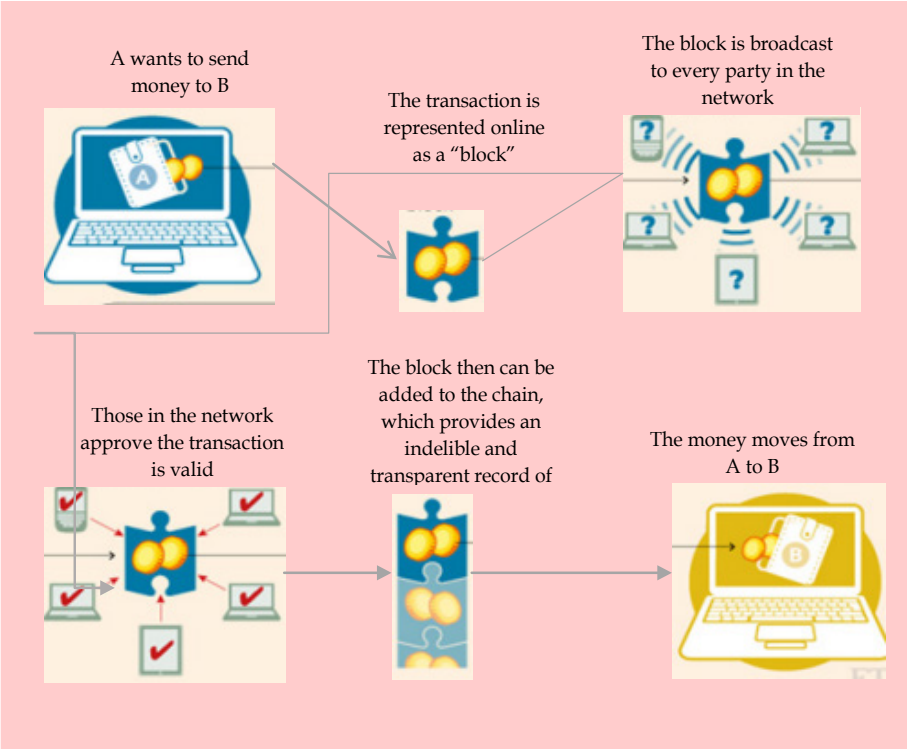

Figure 6
Flow of Funds on Blockchain Technology

Source: Kimani et al. (2020)

attention to price priority and time priority, meaning that the number of offering and the timing of the offering of investors' stocks will affect the speed of transaction settlement.

The problem that investors complain about in the IDX system is the length of time for transaction settlement, while in the JATS NEXT-G system, stock trading transactions are generally completed within 2 days or T+2 (Maulana, 2020; Pransuamitra, 2019). In addition, the flow of funds from investors also does not go di-rectly to the target issuer company during a purchase transaction, nor does it go directly to investors' accounts when they sell shares. The transaction funds are held through the account of a member of the stock exchange or known as a customer fund account (RDN) first, and involves many parties, such as the Indonesia Clearing and Guarantee Corporation / KPEI, the Indonesia Central Securities Depository / KSEI and IDX, for transaction settlement (Audriene, 2018). Both issuers and investors have complained about this. The grace period and detention of the flow of funds have a high business risk because the stock market fluctuates at any time and there is a risk of misuse of funds (Yermack, 2017).

The problems in the IDX capital market can be overcome by implementing blockchain technology as the basis for stock trading. In blockchain technology, stock trading transactions will be processed using pre-programmed algorithms and protocols to monitor input from transactions automatically, respond to changes, enforce rules, and trigger user responses (Yermack, 2017). The advantage of using blockchain technology also occurs in investment cash flow where stock trading funds flow directly to the issuer company, without going through a broker. Therefore, the use of blockchain technology can remove the role of intermediaries so that stock trading transactions are completed faster and even occur in real time, eliminate the possibility of misuse of funds by intermediaries, and break the complexity of the investment chain so that the investment chain becomes simpler (see Figure 6).

In practice, there are two types of blockchain technology: permissioned and public. The choice of this type of blockchain technology will depend on an agreement between exchanges, investors and regulators to determine the best type for their stock

trading environment because each type will have its own consequences in terms of benefits and costs (Kokina et al., 2017). On a public blockchain, each user or participant can read, write, update and monitor other users so that this system is not owned or controlled by one party. Mean-while, in permissioned blockchain technology, each user has their own limitations because different types of membership have different authorizations and access controls (Yu et al., 2018). Based on their accessibility, permissioned blockchains have a greater potential to protect the privacy of their users than public blockchains. However, granting limited access to permissioned blockchains can sometimes damage the credibility of the blockchain technology itself (Derbali et al., 2019). According to Appelbaum and Smith (2018), there are several factors that issuers and stock exchanges must consider in adopting blockchain technology as the basis for their stock trading, such as:

a. Blockchain implementation and maintenance costs.
b. Competition between issuer's ERP systems and blockchain technology.
c. Reconciliation between records recorded on the blockchain network and the physical reports as well as other reports.
d. Potential leakage of information to outside parties, including business competitors and customers.
e. Barriers from the manager of the issuer company due to the externality of increasing transparency.

Blockchain Technology for the Improvement of Issuer's Corporate Governance

Issuer's corporate governance includes a series of enterprise-level monitoring mechanisms aimed at in-creasing the accountability and transparency of corporate entities (Dulani and Sims, 2020). The corporate governance mechanism for companies listed on the IDX, according to IFC (2018) includes: (a) general meeting of shareholders (GMS); (b) the board of directors; (c) the board of commissioners; (d) the audit committee; (e) nomination and remuneration committee; (f) company secretary; and (g) internal auditors.

In capital market practice, the GMS is a tool for the stock exchange to monitor the business practices of issuer companies because the quality of communication between the company and shareholders is reflected in the holding of the GMS (Stein Smith and Castonguay, 2019). The holding of the GMS requires a quorum of at least half plus one person from the total number of shareholders who have voting rights, and if the quorum is not met, the GMS will be held again within a period of ten days after the first GMS up to twenty-one days (at the latest) since date of the first scheduled GMS (IFC, 2018). This GMS is an important agenda for minority shareholders because only through the GMS, they have the opportunity to obtain detailed information about the company's operations and meet with the board of commissioners and directors of the company (Yu et al., 2018). Unfortunately, in the traditional GMS practice, the willingness of minority shareholders to participate and exercise their voting rights tends to be low due to the costs that must be incurred if they have to attend the GMS, for example, costs related to transportation and time which are considered material for the minority shareholders. This low participation is also exacerbated by the lack of fairness and transparency of information for them in the GMS (Yermack, 2017).

Blockchain technology can be a solution to overcome the problem of low participation and shareholder voting in traditional systems. On stock exchanges that apply the basis of blockchain technology, GMS voting can be done through the blockchain platform and provides several benefits, such as reduced shareholder participation costs because there is no need to come to the GMS manually, traceability of voting, and transparency of information, where all data and rights of each shareholder as well as their voices will be recorded and distributed evenly to all participants in the network(Kimani et al., 2020). The positive effect of blockchain technology-based shareholder voting was demonstrated in 2017 by Estonia's NASDAQ Talinn Stock Ex-change. They show that with this technology, voice recording is faster because the process is streamlined and more secure because voice recording data cannot be changed (Yu et al., 2018). In addition to shareholder voting, the use of blockchain technology in stock trading will also offer solutions to overcome other agency problems by establishing better governance in the issuer company through:

a. Greater transparency of ownership
   Every copy of stock trading transaction records that occur in the blockchain system will be distributed to all users in the network, making it possible for each participant or user on the blockchain

network to see and know who the owners of the company are (Stein Smith and Castonguay, 2019). In public or permissioned systems, blockchain shows a real time archive of company ownership transactions, thus creating more up-to-date information that is presented completely and transparently because every user can access that information (Coyne and McMickle, 2017).

This transparency of ownership in blockchain technology allows issuers to know who their ultimate ownership is, which is difficult to know in traditional systems (Lozano et al., 2016). The clarity of the company's ownership structure will also provide a sense of information disclosure between the company and shareholders as well as between majority and minority shareholders because they know who is at the top of the ownership pyramid (Villalonga, 2019). Finally, the greatest perceived effect of ownership transparency is the reduction in agency conflicts of type one and two regarding the complexity of ownership structures.

b. Liquidity improvement

Liquidity is the ability to trade a large number of stocks at low costs in a short time (Holden et al., 2014). Blockchain technology offers increased liquidity due to its potential to reduce costs and shorten the time required to complete stock trades (Kimani et al., 2020). As previously explained, the settlement of stock trading transactions on the IDX occurs during T+2 or 2 days after the offering by the exchange members (IDX, 2020). The time lag between the date of the stock offering and the completion of trading transactions in the traditional system is often complained of by both investors and issuers because it can trigger the potential for misuse of funds, where at that time lag, the flow of investor funds is in the account of an intermediary or broker (Huang et al., 2020).

On a stock exchange using blockchain technology, stock trading does not require an intermediary or broker. Trading transactions only occur between investors and the issuer company and the flow of funds will also be directly directed at the issuer company so that transaction times can be completed much faster and even in real time (Yu et al., 2018). The speed of transactions and the elimination of the role of intermediaries will be very beneficial for investors because they can reduce costs related to share ownership, such as brokerage fees, so they can maximize the use of their funds for stock investments or other needs (Yermack, 2017; Kokina et al., 2017). The implication is that the use of blockchain technology in stock trading will increase liquidity and allow for an increase in the frequency of stock trading. This is evidenced by the Singapore Stock Exchange (SGX) which experienced an

Figure 7
SGX Market Capitalization 2018 – 2019 in Millions of Dollars

Source: The Global Economy (2020)

increase in market capitalization after the implementation of blockchain technology as a basis for stock trading in 2018 (see picture 7) (Franedya, 2018).

c. Supervision of managers by all parties
Management and company owners can provide incentives to managers through compensation in the form of company shares. This is a common practice in the business world (Chu et al., 2020). The purpose of providing incentives in the form of shares to managers is to create a sense of owner-ship of the company, so that they are motivated to make maximum efforts to produce high performance to maximize profits for shareholders where they are involved. In addition, the provision of incentives in the form of shares is also a control tool for shareholders to obtain information about company management (Biggerstaff et al., 2019). Unfortunately, in traditional practice, the function of incentives as a control tool is less effective due to the difficulty of knowing how managers manage their own shares and limited access to know whether they still own or have sold the shares (Yermack, 2017).
On the other hand, the function of incentives as a control tool works well on a blockchain sys-tem. All parties can monitor stock trading transactions carried out by managers in real time. This can be used by shareholders and investors to find out when managers receive or liquidate their own company shares and manager transactions will be a sign of information in the company (Derbali et al., 2019). Real time trading transparency in this blockchain system will allow managers to get closer supervision from the board of directors and shareholders, thus causing managers to trade less often for fear of sending detrimental signals to the market (Yermack, 2017). Another benefit is that the transparency of this blockchain system can also show our manager's share ownership in another company, or vice versa, another manager's share ownership in our company so as to create a high quality of supervision.

d. Real time accounting
In the double entry system, transactions are recorded in the order in which they occurred, but they are not permanent so that fraudulent practices may still occur, such as changes in transactions, additions and or subtractions of transactions, or even earnings management practices by managers (Lin et al., 2016). These problems can be overcome through the implementation of a triple-entry sys-tem based on blockchain technology, where all financial transactions on the blockchain system are recorded permanently based on the order in which they occur and the data that has been recorded in the network is sealed with an encryption key so that it cannot be changed (Stein Smith and Castonguay, 2019). The blockchain mechanism through this encrypted transaction can prevent fraud, such as earnings management due to ex-post changes. However, if there is an attempt to commit fraudulent practices, it will be detected immediately because the hash value will change. Traceability of changes in value or fraud can be seen quickly by all participants in the network through smart contract detection which is fair and not subjective because the process is based on a series of previous codifications (Kokina et al., 2017).
Every transaction uploaded to the blockchain network will be reconciled and recorded through-out the company's transaction ledger and at the same time distributed to all participants in real time (Yermack, 2017). This mechanism allows shareholders, regulators, and other stakeholders to get the real time company's financial information with a high level of information accuracy due to infor-mation transparency and smart contract guarantees. Thus, they no longer need to rely on quarterly financial reports prepared by the company and its auditors as in classical corporate governance mechanisms (Liu et al., 2019).

The four solutions reflect the potential offered by blockchain technology to support the basic principles or values of OECD corporate governance, which consist of transparency, accountability, responsibility and fairness, in order to create future governance improvements (IFC, 2018). *Transparency* means that the corporate governance framework or mechanism must ensure that everything related to the financial status, governance structure, performance, and ownership structure of the company is disclosed accurately and in a timely

Table 1
The Potential of Blockchain Technology to Fulfill the Basic Values of Corporate Governance

Basic Value of Corporate Governance	Blockchain Technology Potential
Transparency	Shared distributed ledgers
Accountability	Irreversibility of records
Responsibility	Peer to peer communication
Fairness	Smart contracts

Source: Akgiray (2019)

manner because it is material to the company. *Accountability* principle requires the corporate governance framework to provide strategic guidelines to monitor the performance of the company's management so that it runs effectively (Utama et al., 2017). *Responsibility* means that all governance frameworks must recognize matters related to stakeholders as stipulated by law and encourage active collaboration between management and stakeholders to ensure the company's going concern (Duh, 2017). Finally, *fairness* means that the corporate governance mechanism must protect the rights of both majority and minority shareholders to get fair treatment (Kholmi, 2020).

Table 1 shows the potential offered by blockchain technology as an effort to fulfill the basic values of corporate governance, where conceptually, all records of information distributed in the network (shared distributed ledgers) cannot be changed (irreversibility of records) by anyone. This is an effective mechanism to en-sure transparency and accountability of company information. The clarity and accessibility of peer to peer network communications helps identify individual responsibilities and their fulfillment. Finally, the value of fairness that is often abused by humans can be minimized through smart contracts which are difficult to break because the process has been codified by the network (Akgiray, 2019).

Blockchain technology can facilitate improved corporate governance through transparency of corporate ownership, fair shareholder voting, and improved communication with shareholders through improving the quality of financial reporting (Kimani et al., 2020; Yu et al., 2018). The use of blockchain technology on the stock exchange will also eliminate problems related to stock manipulation, insider trading, and backdating stock options (Yermack, 2017). Transparency and accountability are important functions of corporate governance and blockchain technology will further enhance the quality of accountability and transparency in companies listed on the stock exchange.

5. CONCLUSION, IMPLICATION, SUGGESTION AND LIMITATION

This study aims to explore the potential benefits of implementing blockchain technology as a basis for stock trading in Indonesia to improve corporate governance of issuers. The use of blockchain technolog-with a computed mechanism through smart contracts as the basis for stock trading on the Indonesia Stock Exchang-can affect the way a stock trading contract is created and executed. Therefore, it can also reduce agency costs and fundamentally change the management model of issuer companies for the better. This is because the use of blockchain technology guarantees high transparency, improved liquidity, high supervision, and real time accounting (Yermack, 2017; Kimani et al., 2020). These four advantages also help issuers comply with the principles of corporate governance according to the OECD rules, which consist of transparency, accountability, responsibility and fairness, in order to create improved corporate management in the future (IFC, 2018).

This research contributes to agency theory that the implementation of blockchain technology as a basis for stock trading can be used to minimize type one agency conflict that occurs in the capital market because the implementation of this technology will increase trust between shareholders and managers regarding the management of issuer companies.

This research is a documentary research that is based on the researchers' interpretation and subjectivity and, therefore, it is the limitation of thioi study. Future research is expected to improve the quality of this research by using other methods, for example interviews with related parties such as the IDX, managers of public companies listing on the

IDX, and investors in the Indonesian capital market. This is intended to clearly identify the practices, weaknesses, and challenges in implementing corporate governance of issuers in the Indonesian capital market and to find out how they respond to the implementation of blockchain technology as a basis for stock trading.

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