

**Blockchain Center**

Blockchain-based Stock exchanges system

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Date

**ABSTRACT**

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# Introduction

We propose that the stock exchanges process can be done on blockchain technology to avoid some problems, such as brokerage employees altering sequences of orders in favour of themselves and their relatives, and to derive some financial benefits, eliminating brokerage fees in particular. Stock exchange system has to be implemented on the specific platform (Ex. Ethereum) which means all listed firms (companies listed on the stock market) have to be convinced to be a participant of BC.

These days, shareholders specially minority ones suffer from some predicaments when it comes to exchanging their stocks or receiving dividends at the end of fiscal year. These include the following:

Not having equal priority to order a stock transaction in comparison with majority ones and stock market employees, having more convenient access to the stock exchange system.

Not receiving dividends conveniently. They have to go to the bank and fill out some forms to receive their dividends. A smart contract can provide effective assistance to them which is after holding annual general meetings of companies and making a decision about the amount of dividends, this amount is going to be withdrawn from companies’ bank accounts and deposited to shareholders’ bank accounts automatically\*.

\* A connection is required between monetary system and BC-based transactions.  
Paying brokerage fees for all transactions regardless of being profitable or unprofitable. So, utilizing blockchain technology, brokerage fees will be eliminated at the expense of removing brokerage companies as intermidiators.

# BACKGROUND

Insider trading is a behavior that seriously damages the order of the securities market. It violates the principle of "openness, fairness and justice" of the securities market, seriously affects the function of the securities market, and makes the formation of securities prices and indexes lose timeliness and objectivity. And although prohibited by law, insider trading or helping others on the basis of insider information still cannot be completely avoided.

In addition to employees who work in securities companies may provide their relatives and friends with some advice on buying stocks or analysis of market situation in daily life, some senior executives and even directors with great authority in the company may also commit such illegal acts in order to obtain more benefits. For example, in 1994, a female secretary of IBM learned the insider information about the company's pending acquisition of Lotus Company while copying materials for her boss. Then, she spread the information so that a total of 23 people obtained the insider information and made profits through stock trading. Finally, it took 4 years to find out the insider trading case. There are many such cases, which have all caused a very bad impact on the internal ecology of the securities market.

The above problems are mainly caused by the imperfect supervision chain, insufficient legal basis for taking administrative supervision measures and the listed company's own reasons.2 First of all, daily supervision is mostly post-supervision, and it is difficult to verify the accuracy and completeness of the registration of insiders with inside information. So many basic data are in the state of missing. Secondly, the technical means in the traditional response plan are relatively backward, and the efficient and convenient supervision platform is not enough to establish. And in the process of information transmission, all parties are generally linked. Any delay or information error in any link may lead to errors in the final result, so it is difficult to supervise. Moreover, the most important thing is that the scope of insider information is wide and the nature is complex. The registration and supervision of insiders and how to better carry out the cooperation between the exchange and the agency need to be considered and improved, which may lead to some mistakes in the post verification. In addition, imperfect laws and regulations, intimely and inaccurate internal registration information of companies will also make many people take advantage of loopholes and engage in insider trading with less money.

Now, with the continuous progress of society, in order to better avoid the occurrence of insider trading, researchers have been developing a lot of new models and applying new technology to react or avoid the abnormal situation of trading more quickly, but they still cannot completely stop the occurrence of this unfair behavior from the source. The blockchain technology has the characteristics of openness and transparency, and can also protect the privacy of users' personal information, some listed companies are also trying some blockchain stocks. The U.S. Securities and Exchange Commission (SEC) also approved the use of blockchain technology for stock trading and settlement services at the end of 2019. A project of Paxos, a blockchain company, which allows the use of blockchain technology to settle stock transactions of listed companies such as general electric and at & T, was also approved in October 2019 and received widespread attention.

Besides, the blockchain technology in this project also has the following theoretical advantages:

1. With possible lower latency in transactions on a Blockchain, trading can be faster and more efficient. APIs can also be written to allow integration with the old system.
2. Blockchains are immutable and transparent, which raises trust in the financial instrument. People will have less concern and can promote the development of the securities market. Also, some unusual trading can be detected more quickly.
3. Market costs and barriers to entry will be reduced through blockchain.

Therefore, both theoretically and practically, we have reasons to believe that the application of blockchain technology is likely to prevent insider trading from the source more effectively.

# TECHNICAL SOLUTION

## Select Platforms

The platform of choice for implementing the blockchain-based stock exchange proposed in this project is Ethereum. Ethereum is a platform that extends Bitcoin technology which is the initial cryptocurrency using distributed ledger to enable transactions through smart contracts and distribution of decentralized applications.

 Smart contract is a system that allows written contracts to be made between the parties digitally without any third party. Smart contracts are written in the language of Solidity, and the contract is automatically executed when all the conditions of the contract are satisfied. Therefore, it has the advantage of saving time and cost because the contract is made without an intermediary.

 The decentralized application (DApp) is an application which runs on a blockchain basis. Blockchain based platforms on which DApp runs are not only Ethereum, but also Steam, Neo, Stellar, etc. Among them, Ethereum is the traditional blockchain based platform with the most DApps.

 Ethereum with these features was chosen because it can be operated by applying not only blockchain technology but also including smart contracts and distributed apps. The stock exchange will be implemented so that transactions can be made using a smart contract without a third party. In the future, we plan to implement the process of building a blockchain based stock exchange program with smart contracts as DApp and distributing the DApp that can be used by many people.

## Critical Evaluation

The Ethereum platform we chose is very innovative, but it has some disadvantages. Ethereum is a relatively early stage of platform and is an extension of Bitcoin technology, so it has problems like of Bitcoin has.

 The mining method cryptocurrency Ether used in Ethereum is a proof of work method thus it requires high performance and memory capacity. This is not efficient because it can be a way to waste a lot of energy unnecessarily. On this issue, Ethereum is planning to change to a proof of stake, but it is currently inefficient because it currently uses a proof of work method as a mining method.

 Another problem is the use of Solidity languages to implement smart contracts. First, because Solidity is used to write smart contracts, developers must learn the Solidity language. Second, since developers have to implement smart contracts themselves, human errors can occur depending on the code writers, then malicious hackers can exploit those errors.

 Therefore, when a smart contract is written by Solidity by the developer, the disadvantage of choosing the Ethereum platform is that the developer who does not know how to use the Solidity language needs to learn a new one, and there are human errors that can be made by humans. In addition, there are some more disadvantages to the Ethereum platform, but our project was implemented through the most common and familiar platform, Ethereum.

## Store Data in the Blockchain

 This project proposes a stock exchange platform based on blockchain where companies, shareholders or investors trade stocks with having all the same information.

 In order to trade stocks on the Ethereum blockchain, the company must first be listed. In the stock exchange, information about companies is disclosed for fair trade so that they can compete fairly. The stock exchange platform to be created on the Ethereum blockchain should also be designed to provide transparent and trustful information in real time by publicly disclosing the company. Information that can represent the company's value, such as how much the company's debts, what business plans it has, and what changes in income should be stored on the blockchain. Information on company disclosures can be designed to add content by the company when it is first listed on the Ethereum Stock Exchange platform. If changes are made later, a transaction is generated and added to the contents, or the stored smart contract is changed to the new smart contract in the blockchain.

 In this project, stock trading can be implemented as a smart contract that occurs between the buyer and the seller. When each identity is verified and the seller is verified that the stock is held, the buyer pays and the purchase is made. When a stock trading transaction occurs, information on who has placed a buy/sell order, whose buy/sell order has been signed, and how much stock has been traded should be stored in the blockchain. It can also be implemented a list function to manage shareholders whenever a transaction is made by adding an identity variable to the smart contract. Implementing the designed function allows network participants to store stock transaction records in a distributed ledger technology, so that executive's stock transactions can be audited, and insider trading history can be monitored.

 With applying blockchain technology, all securities transactions in the stock trading market are stored, verified and recorded in a distributed ledger by all participants in the network, so that all information can be managed transparently. It means it's not only to know the information inside the company, but also for investors to understand the shareholding ratio and transaction statements of executives. Through this, it is possible to solve the problem of asymmetry information that may occur when trading stocks and to prevent issues about unfair insider trading.

# OUTLOOK

## Terminology and Symbols

Authors should use approved terminology and symbols, which are relevant for their research area. Keep it consistent through the complete document.

# summary

The summary may be placed in the beginning of the article or in the end before the references.

# Author contributions

All authors conceived and designed the project idea. P.M. and C.J.T. developed and wrote the business model. B.S. worked on the regulatory implications.  Y.Z. and X.Y. developed the technical implementation and wrote the technical section. Y.Z. wrote the critical overview of the platform selected. All authors revised and accepted the final version of this document.

# References

Wood, Gavin. "Ethereum: A secure decentralised generalised transaction ledger." Ethereum project yellow paper 151.2014 (2014): 1-32. 양식의 맨 위

양식의 맨 아래