



A Research on Improvement of Blockchain-Based Corporate Governance

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Abstract. The problem of high agency costs in traditional corporate governance has always been difficult to address due to a fundamental root cause, i.e. information asymmetry. Traditional solutions generally include mandatory provisions for protecting shareholders' and investors' right to know, or incentives to align the interests of managers and owners. But the effectiveness of both approaches has been unsatisfactory. After integration of blockchain into corporate governance, the problem of information asymmetry can be solved once and for all, and corporate governance can be carried out in a more scientific and democratic way. However, as a new technology, blockchain still rouses some doubts and challenges in terms of information protection. Therefore, on the basis of regulatory efforts, blockchain should be protected by the rule of law, so as to achieve the best governance effect, enable beneficial interaction between technological innovation and legal protection, and promote the modernization and legalization progress of the corporate governance system.

Keywords: Blockchain · corporate governance · information asymmetry · agency cost

In traditional commercial society, although the foundation of credit system had been laid by centralized organizations, a comprehensive and effective credit system was absent for many years, giving rise to many problems. Blockchain is a distributed ledger system built on a decentralized trust mechanism, which can overcome the shortcomings of traditional centralized trust mechanisms and is regarded as an invention with great revolutionary potential [1]. Currently, in the face of frequent principal-agent problems and scarce trust resources in corporate governance, blockchain can precisely enable the optimizing of corporate governance. Therefore, we intend to focus on the problem of agency costs from the perspective of corporate law, and systematically analyze the value increment, implementation methods, potential risks, and corresponding legal response measures that blockchain can bring to corporate governance. Our research aims to provide theoretical ground and practical guidance for effective application of blockchain in the field of corporate governance, and to promote the modernization, transformation, and upgrading of the corporate governance system.

1 Tough Problems and Difficulties in Corporate Governance

1.1 Agency Costs and Information Asymmetry

The work of Berle and Means (1932) pointed out that the structure which separates ownership and managers' rights in corporate companies inevitably leads to agency cost problems. Specifically, agency cost problems arise from the disadvantaged position of investors in terms of information acquisition, which makes it difficult for them to effectively oversee company operations. This in turn makes company managers liable to make decisions and take actions to maximize personal gains while harming the long-term interests of investors, such as: first of all, they achieve effective control of the company by a minority of people through legal means such as issuing non-voting stocks; secondly, the highly decentralized shareholding structure naturally gives company control to a few individuals; thirdly, in the absence of significant voting shareholders, the management easily gains actual control. Such models reflect the typical control allocation in modern large companies. In conventional large listed companies, it is relatively rare for the majority of shareholders to hold control (which is more commonly seen in small non-listed companies) [2]. In other words, the root cause of agency costs is the widespread existence of information asymmetry. This asymmetry not only exists between shareholders and company managers, but also is significantly manifest between controlling shareholders (or major shareholders) and minority shareholders. The former stems from managers' deep involvement and mastery of professional knowledge in everyday company operation, while shareholders often have difficulty obtaining the same level of direct information. The latter stems from the key position of controlling shareholders in company decision-making and their potential access to more comprehensive and sensitive company information. In contrast, minority shareholders stay at a disadvantage in terms of information acquisition.

1.1.1 Information Asymmetric Between Managers and Owners

Currently, managers usually have a deep involvement and mastery of professional knowledge in everyday company operation, while shareholders often have difficulty obtaining the same level of direct information. Such an advantage gives managers the opportunity to evade supervision and pursue the maximization of their own inapposite interests, which is known as "moral hazard". Specifically, in the context of information asymmetry, agents (managers) might take actions that harm the interests of principals (company shareholders) when pursuing the maximization of personal utility. The reason is that company shareholders pursue the maximization of capital gain and corporate value, while managers may be driven by diversified motives, including high compensation, career reputation, personal achievement, etc. Based on this, managers may use their information advantage to strategically withhold information or mislead shareholders, thereby harming their interests. They usually do it in two ways: the first one is "slacking", which occurs when the agent's efforts do not bring them satisfactory rewards, resulting in insufficient work efficiency. The second is called "opportunism", which means that the agent's efforts deviate from the original intention of maximizing the principal's interests. Instead, they seek personal gain, which is manifested as a negative effort.

1.1.2 Information Asymmetry Under the Presence of Major Shareholders

In small- and medium-sized companies, shareholding is relatively concentrated, and their major shareholders have significant influence on the company's business decisions and even access to more internal information. In order to maintain their control advantage, major shareholders are more willing to maintain the existing information asymmetry [3]. When major shareholders use their controlling position in the company to sacrifice the interests of minority shareholders for personal gains, through related party transactions, embezzlement, and kickback, significant agency costs are incurred. Such costs not only cause direct impairment to the equity of minority shareholders, but also may have a profound impact on the overall value, market reputation, and long-term growth potential of the company. However, due to the information disadvantage of minority shareholders, it is difficult for them to obtain sufficient company information, and they are often unable to successfully protect their interests. Moreover, as a result of information asymmetry, minority shareholders may make misjudgments and take further actions that might harm themselves, such as making extra investments at inappropriate times or choosing inappropriate exit strategies due to lack of confidence.

1.2 Challenges in Using Traditional Solutions

In addressing information asymmetry in corporate governance, traditional solutions, such as mandatory information disclosure based on legislation and technological control, have not been as effective as expected.

1.2.1 Mandatory Information Disclosure Based on Legislation

Legislators have enacted legal rules to force mandatory disclosure of corporate financial and governance information, in order to address information asymmetry in companies, thus enhancing corporate governance. This system not only has a deterrent effect in reducing violations by company executives due to concerns about legal consequences, but also has a supervisory function, enabling shareholders to promptly detect frauds and hold executives accountable [4]. As stated in the Guidelines for the Content and Format of Information Disclosure by Public Listed Companies No. 26: Major Asset Restructuring of Listed Companies (Revised in 2018) issued by the China Securities Regulatory Commission, the content to be disclosed includes multidimensional information from macro background of transactions to specific personal information of traders. Disclosure runs through the entire process from listing preparation to delisting, covering various report types such as pre-disclosure report, regular reports (annual reports and mid-term reports), and interim reports, so as to keep the continuity and transparency of market information.

However, two major challenges significantly constrain the effectiveness of mandatory information disclosure, making it fail to effectively address the problem of information asymmetry in corporate governance: first of all, information disclosure usually takes a significant amount of time, thus the timely reporting of major events required by China's Securities Law cannot be made possible due to the long time required for preparing annual and midterm reports, resulting in delayed information acquisition by investors. Secondly, information disclosure is susceptible to manipulation. Corporate

executives may take advantage of legal and regulatory gray areas to adjust disclosure information through specific means, such as earnings management, which compromises the authenticity and accuracy of information as well as investor confidence and market stability. Therefore, improving the promptness and controllability of information disclosure has become an urgent need to maintain the healthy development of capital market.

1.2.2 Technical Control Solutions

To effectively limit agency costs and reduce information asymmetry, some believe that internal controls should be strengthened technically, and external supervision and control should be implemented. However, the effectiveness of such solutions is unsatisfactory.

Firstly, internal controls mainly break information asymmetry through incentive compensation systems. To be specific, the company signs an implicit or explicit contract with managers in advance, linking manager compensation with verifiable indicators such as corporate performance, thus essentially linking managers' benefits with those of owners and thereby motivating managers to better fulfill their duties. Under this framework, in order to maximize their own interests, the principal (the company) not only needs to set up an effective supervision mechanism to make sure that the agent (operator) should behave for their benefits, but also needs to design a reasonable incentive mechanism to stimulate the agent's willingness and sense of responsibility. In addition, requiring agents to provide guarantee has become another risk control solution, which is designed to make sure that the agent's behavior does not deviate from the principal's interests, and to provide compensation for the principal in case of violations [5]. The incentive compensation system, as another key solution for addressing agency cost problems, is also subject to subjectivity and bias in its formulation process. Although this system has been widely trusted over the past forty years, it is still difficult to completely eliminate the effect of human factors in company operations.

Secondly, there are two major external control solutions. One is to transmit signals through market competition, based on which the efficiency and information of managers can be identified[6]. However, from an empirical perspective, this approach has not been truly feasible as the real market is always in the state of "imperfect competition" rather than "perfect competition", making it difficult to effectively judge the efficiency of managers. The second is to hire an external institution or let the government to control agency costs. But this solution can be actually more expensive and is not effective in curbing agency costs. On the contrary, it is better to facilitate marketization [7].

1.3 New Opportunities to Address Information Asymmetry

Many solutions have been developed to address agency cost problems arising from information asymmetry in corporate governance. However, none of them have been proved effective. Fortunately, the emergence of new technologies such as blockchain has brought new solutions to this dilemma. Through the sophisticated integration of big data, algorithms, artificial intelligence, and machine learning, companies are able to design more refined and customized executive incentive compensation plans, improve the objectivity and neutrality of decision-making, and publish information on blockchain,

so as to enhance transparency and traceability of information, reduce inappropriate behaviors, and provide strong support for the continuous optimization of compensation plans and shareholder supervision.

2 How Blockchain Optimizes Corporate Governance

2.1 Basic Principles of Blockchain

The concept of blockchain can be traced back to Satoshi Nakamoto's paper in published 2008, namely, *Bitcoin: A peer-to-peer electronic cash system* [8]. It is a unique data structure that concatenates data blocks in chronological order, which is presented in a chain form, and maintains the immutability and authenticity of data through cryptographic means, thus forming a decentralized, distributed, and shared general ledger system where no trust foundation is needed[9]. Compared to traditional distributed databases that rely on a single central server for data maintenance, where other nodes only serve as data backups, the distributed structure of blockchain is significantly reflected in the dual distribution of data maintenance and recording, where all nodes operate jointly to make sure that any data change at one single node does not affect the entire system, thus greatly enhancing data security.¹

Blockchain uses data blocks and its chain structure to store data. A block consists of a block header and a block body, each corresponding to a unique Hash value as the block identifier. A block is connected to a previous block by storing the Hash value of the previous block, thus forming a chain structure. The block header contains a series of information such as the Hash value, timestamp, and Merkle root of the previous block. The block body stores transaction information, i.e. the data recorded on the blockchain, where each transaction is digitally signed by the trader to keep the authenticity and immutability of data. All completed transactions are permanently recorded in the block body, for all users to query. All transaction data is hashed through a Merkle tree to generate a unique Merkle root, which is stored in the block header. During the generation of blockchain, each new block is assigned a timestamp by its accounting node, so as to accurately record the creation time of the block. With the continuous stacking of timestamps, blocks are closely connected, constructing a chain of chronological contents. Such a feature enables data on the blockchain to be traced in chronological order, thus keeping data integrity and traceability.

2.2 Value of Blockchain in Corporate Governance

2.2.1 Effective Curbing of Information Asymmetry

Blockchain has brought revolutionary changes to information transmission with its unique distributed ledger and consensus mechanism. Once applied to corporate governance, it can solve the problem of information asymmetry within the company from three

¹ The data layer includes underlying data blocks and the chain structure where they are based on, supported by Hash algorithms, timestamps, Merkle trees, and asymmetric encryption, so as to protect the integrity and traceability of block data. The network layer includes data-driven propagation mechanism and transaction verification mechanism, supported by P2P network technology, to complete the transmission and verification of data between distributed nodes.

aspects: information sharing, authenticity, and instantaneity, thereby reducing agency costs.

First of all, the traditional corporate governance model is based on managers (operators), who manage information to make decisions. Only major resolutions will involve the shareholders' meeting and the board of directors. Over time, this model leads to the dilemma of shareholders not being able to obtain timely business information. The blockchain ledger records various types of transaction data in a secure and immutable way through a series of closely interconnected blocks. In a company, such transaction data can comprehensively reflect the company's operations and decision-making activities, making it easy for shareholders to quickly check the company's operating status and new trends.

Secondly, blockchain is based on a series of technologies such as Hash functions, consensus algorithms, Merkle Tree, and timestamps, which help maintain its immutability. Once company data is recorded on the blockchain, it will become almost unable to modify or delete, thus maintaining its stability and trustworthiness, especially when applied to certain areas such as financial data and audit process.

Finally, blockchain can effectively prevent tampering of internal information within the company, and make sure that shareholders can directly access the latest, unaltered information, thereby constantly offering real-time information. The blockchain ledger is able to promptly update itself and record the latest transaction information. From making a transaction to securely recording the transaction on blockchain, the entire process is efficient and fast, with significantly reduced time consumption. Taking the blockchain platform LINQ adopted by the NASDAQ stock exchange in the United States as an example, LINQ blockchain provides private companies with services to record the transfer of shares held by founders, early investors, and employees. As no third party is needed to verify and approve these transactions, the standard settlement time has been shortened from 3 days to 10 min [10].

2.2.2 Enabling Scientific and Democratic Decision-Making of the Company

In the era of Web 3.0, a more efficient solution has been provided for companies to solve their agency cost problem. Let us take the decentralized autonomous organization (DAO) driven by smart contracts as an example: DAO uses smart contracts to build a trust basis and governance framework, thus effectively eliminating the self-serving behavior of agents and making decentralization the core concept, which in turn reduces agency cost to almost zero as the process requires almost no human intervention or external supervision [11]. As the major executor, smart contracts enable strict adherence to all established guidelines, which are jointly verified and recorded by network nodes, thereby avoiding supervision loophole and agency loss costs that may arise in traditional principal-agent relationships.

As shown in Fig. 1, DAO can actually solve a series of problems including unnecessary procedures and opaque information in traditional corporate governance meetings. Token holders can obtain more democratic results through on-chain voting, which can significantly solve the problem of "free riding". Meanwhile, smart contracts, depending on their certainty, promptness, autonomy, high transparency, and verifiability, not only

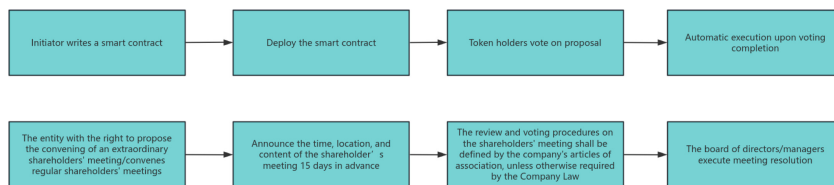


Fig. 1. Comparison between DAO Online Voting and Traditional Shareholders' Meeting Resolution

eliminate the intermediary links in traditional contracts, but also significantly improve transaction efficiency and security[12].

3 Blockchain Risks and Legal Solutions

3.1 Risk of Leakage and Legal Solutions

A series of risks arising from providers of blockchain information products, participation nodes, central institutions, and hackers are now threatening current blockchain applications.

Currently, the security of blockchain systems has always been the most concerning issue for the public. Different from the use of other blockchain products, the integration of blockchain into corporate governance means that all important information of the company is stored on blockchain. Therefore, if hackers take advantage of flaws or defects in the company's blockchain system to disrupt its normal operations (such as cracking the private keys to participation nodes and stealing their equity tokens and voting tokens), it will likely lead to major accidents such as the leakage of the company's trade secrets and the loss of key information. The DAO attack that shocked the entire blockchain community in 2016 reflected the above type of risk.² Generally speaking, in China, once a company's blockchain is hacked, it may claim private law relief based on Article 127 of the Civil Code.³ However, some believe that the aforementioned private law relief model is ineffective, mainly due to the imperfect system of virtual property system on the internet and the inability to identify hackers[13].

We believe that China's legislators should enact independent laws for the governance of blockchain. In addition to the above rule in the Civil Code, the State Internet Information Office issued a departmental regulatory document in 2019, namely, *the Regulations*

² On June 17, 2016, a hacker identified a recursive call loophole in DAO smart contracts, and took advantage of it to launch an attack on the DAO platform. The hacker first created a sub-DAO and transferred some Ethereum tokens to it. Then, the hacker called the splitDAO function, requesting it to separate their money from the DAO and transfer it to the sub-DAO. During this process, the hacker tried to take advantage of a recursive call loophole by repeatedly calling the splitDAO function, thereby continuously separating more Ethereum tokens from the DAO fund pool and transferring them to the sub-DAO. The hacker's attack lasted for several hours, resulting in the separation of 3.6 million Ethereum tokens, accounting for one-third of the total Ethereum tokens raised by that DAO, which was worth approximately \$60 million.

³ According to Article 127 of the Civil Code of the People's Republic of China, certain data and virtual properties on the internet are under legal protection.

on *Blockchain Information Services*, to help oversee blockchain products. The main feature of this document is that blockchain products are required to be registered for supervision and protection. However, due to the lower position of blockchain in China's legal hierarchy, specific protection can only be made based on the Cybersecurity Law, which is more generalized and unable to provide targeted protection for blockchain.

3.2 Regulatory Risks and Legal Solutions

Currently, China has no clear regulations over blockchain, which leads to uncertainty in the application of blockchain in corporate governance. Regulatory attitude may have a significant impact. Looking ahead to the future, there may be more flexible regulatory approaches, as blockchain has a series of features including decentralization, high transparency, and good traceability that could bring convenience and efficiency to corporate governance, enhance transaction efficiency and security, and provide clear and efficient supervision channels for regulators.

Some experience in foreign countries may be useful. For example, on August 1, 2017, the state of Delaware in the United States passed a regulatory amendment allowing companies to use distributed ledgers to record and track stock transactions, marking the latest effort of the state to seek opportunities in the field of blockchain. To be specific, the entire process of share trading, including share issuing, share transferring, regulation, communication and share redemption, can be seamlessly integrated into a blockchain platform, thus greatly simplifying the complex traditional financial systems. Delaware's new amendment heralds potential changes in the global securities market and may reshape the online world. Based on the above experience, China may strengthen international cooperation and coordination, build a virtuous cycle of technological innovation and compliance, and promote regulatory efficiency and transparency. The above solutions are expected to promote the healthy growth of China's digital asset market and lay a solid foundation for the prosperity of China's digital economy.

4 Conclusion

Blockchain, with its unique advantages, can significantly enhance information transparency in specific fields, effectively address the problem of information asymmetry, and build a solid trust basis. By facilitating the sharing of internal information within the company and maintaining the authenticity and promptness of information, the problem of information asymmetry in corporate governance could be solved once and for all, thus promoting corporate governance. However, nowadays the Company Law still needs to be gradually refined to respond appropriately to technological progress and enable the sophisticated integration and harmonious coexistence of technology and corporate governance.

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