A Study on the Regulatory Path at the Application Level of Blockchain Technology—A Legal-Economic Perspective

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Abstract

The application of blockchain technology is an extremely important development in the field of information technology. With the improvement of the technology itself and the passage of time, its acceptance is increasing worldwide, however, as its application becomes more widespread, it is still a challenge how its technical features such as decentralization and regulation with centralized characteristics can be interfaced. The common point between blockchain technology and regulation is trust mechanism, however, blockchain technology itself is not perfect and there are risks at all levels, and the decentralized feature does not mean that it needs to be free from regulation. How to make the application of blockchain technology and administrative supervision complement each other and make the innovation more efficient under the supervision is the effective path to solve this problem.

Keywords

Blockchain technology; Government regulation; Law and economics

Introduction

In 2009, using the Bitcoin cryptographic digital currency as the theoretical basis, Satoshi Nakamoto proposed the concept of blockchain and created a global sensation. Providing technical aspects to support digital currencies such as Bitcoin was the starting point for the establishment of blockchain, but in fact, the role of blockchain itself is also reflected in solving the trust crisis that has existed in human society for a long time. Some argue that blockchain is the technology most likely to change business models over the next decade (Tapscott & Tapscott, n.d.). Others see it as providing a safe haven for criminal activity (Zetter, n.d.). It is difficult to make an absolute right or wrong comparison between the two views, as there is indeed a polarization in the current application of blockchain technology. On the positive side, as an emerging technology, blockchain is revolutionary to the existing world order and industrial landscape, and its characteristics of "decen-

tralization" and "autonomy" can improve economic efficiency and reshape the credit system. On the negative side, blockchain technology is widely used in illegal crimes, because its "decentralized" feature is out of the traditional regulatory model, making its application difficult to regulate. The core of blockchain lies in the theoretical structure of "decentralization", while the traditional social structure is to have at least one authority as the core to support and supervise the smooth operation of the whole society. Under the social structure characterized by "centralization", if the "center" itself has problems, the stability of the whole structure led by the "center" will be difficult to guarantee, while the concept of "decentralization" advocates that all participants of blockchain applications are the regulators of blockchain applications. Of course, the essence of "decentralization" of blockchain technology application also requires the algorithm design, so that people can reach a consensus on the facts recorded in the blockchain and can carry out civil and commercial activities among strangers. It can be said that the application of blockchain technology is not only a technological innovation movement, but also a significant change in the way of social life. This paper analyzes the characteristics of the application level of blockchain technology and the value of the change, and then reveals that the application of blockchain technology is not perfect, and finally discusses how the application of blockchain technology can be combined with the centralized concept of administrative supervision under a decentralized framework, so as to promote the smooth and healthy development of the application of blockchain technology under administrative supervision.

Characteristics of Blockchain Technology at the Application Level and the Value of Change

Historical Evolution and Development of Blockchain Technology at the Application Level

From the history of the development of blockchain technology applications, in 2008, someone pseudonymously named Satoshi Nakamoto (2008) published an article entitled "Bitcoin: A Peer-to-Peer Electronic Cash System" on the internet, which first introduced the concept of blockchain. In January 2009, the first block of this cash system was born, marking the emergence of an emerging currency not controlled by any financial institution; after that, Bitcoin began to rapidly spread (Yuan & Wang, 2016). The chaos that accompanied the unprecedented growth of Bitcoin undoubtedly had a significant impact on the normal financial order, so much so that central banks had to introduce corresponding initiatives. In October 2014, the British Library held a seminar on the future of Bitcoin development, during which the underlying technology of Bitcoin—"blockchain" (Yang & Qu, 2016). In January 2015, the 2015 Bretton Woods System Bitcoin White Paper, released at the Bitcoin Conference in Miami, USA, provided the first comprehensive report on Bitcoin and blockchain technology. The white paper summarizes blockchain into three stages. Blockchain technology 1.0 is digital currency application, which mainly deploys cash-related cryptographic digital currency in blockchain, typically representing Bitcoin; blockchain technology 2.0 is smart contract application, which mainly refers to building trusted economic activities in financial or economic fields based on blockchain technology, such as stock, futures, notary, etc.; blockchain technology 3.0 is extensive blockchain applications beyond currency and contracts, involving government, health, Internet of things and other fields (Gautham, 2016). And the White Paper on the Development of Blockchain Technology and Applications in China (2016) issued by China's Ministry of Industry and Information Technology provides a narrow and broad interpretation of

blockchain from the technical level. As of November 2020, a total of 50 blockchain policy information was published at the national level, and more than 190 blockchain-related policies in various regions, and 22 provinces and municipalities, such as Guangdong Province, Shandong Province and Beijing Municipality, have introduced blockchain-specific policies, mainly to actively promote the integration of blockchain with big data, artificial intelligence and other information technologies.

The Changes Brought by the Application of Blockchain Technology

From the perspective of financial system, blockchain is a kind of application technology of transaction system, which encrypts the real and valid transaction information and makes each user in the blockchain network process all the transaction information in a "decentralized" way, so as to build a new transaction management system. From the viewpoint of management system, blockchain forms blocks by encrypting the information of registration and transfer of ownership within a certain period of time, and the blocks are interlinked with each other, and it is difficult to realize unilateral tampering unless all blocks change a transaction information together, thus forming a safe and complete asset management system. From the perspective of the underlying protocol, blockchain is a kind of data record that multiple parties reach consensus (Xu, Liu & Duan, 2016). In other words, although there is no "central" scheduling, individuals can keep a copy of the ledger that is automatically updated and remains unchanged. This approach has two major advantages: First, users can have complete peace of mind about transactions without fear of being subject to negative externalities from any individual or even the government. A distributed ledger ensures absolute trustworthiness of a particular activity, without the need to trust a particular subject (Fairfield, 2014). This largely restores the psychological expectations of both parties to the transaction. Second, a single distributed ledger replaces private ledgers that require reconciliation, greatly reducing transaction costs, which include not only negotiation costs, but also the costs of post-event mediation and even litigation costs based on breach of contract or product infringement. Enforcement costs, for example, are an important element of transaction costs, and they arise when time is needed to reach cooperation. It is easy to imagine that for a complex transaction, for example, if both parties conscientiously abide by the agreement established, the execution time and execution costs would be manageable. However, complex transactions often involve multiple parties, and any breach of the agreement by one of them (which is usually unavoidable) may result in uncontrollable execution costs, and the cost of monitoring the parties to the transaction and the cost of punishing one or more parties for breach of the agreement is high. However, smart contracts in blockchain application technology effectively solve these problems. In addition, the software operation mechanism based on digital encryption technology and game theory incentive mechanism makes it extremely costly to cheat the system. Specifically, unlike the traditional way of recording under the regulator, the application of blockchain technology is recorded by all members, and any change or modification of information must be agreed by all members before it can be recognized. Therefore, if the intention is to tamper with the data, the actual operation will require 51% or more of the recorders of the whole network to cheat together, which will bring extremely high cost. This shows that blockchain technology has higher security and accuracy than the previous data storage.

The Risk Analysis of the Application Level of Blockchain Technology

The Risk Logic of Smart Contracts

We have already mentioned earlier that participants under a blockchain network can all keep copies of the same ledger with the same content, which is determined by the blockchain technology application itself. Some investors have pointed out that blockchains are logically centralized (because there is only one distributed ledger), but organizationally decentralized (multiple entities keep copies of that distributed ledger) (Wenger, n.d.). The risks associated with the shortcomings of a "centralized" ledger are more obvious. First, if a single node maintains the master ledger, it is difficult to internalize risks at that node, so users at other nodes will bear the risk of externalization due to information asymmetry. Second, if each organization keeps its own master ledger, there will be double-checking of the master ledger kept by each organization at the time of transaction, which may result in time efficiency loss or even transaction delay. Before the application of smart contract technology, it was difficult to avoid the above disadvantages. Smart contracts not only record the information passed, but also instantly reconcile and reach consensus transactions, which means that rights and obligations are defined and contractual agreements are enforced on the platform. For the smart contracts that guarantee the smooth operation of the blockchain architecture, there are also risks, and in fact, there are obvious loopholes in Ethereum's smart contracts (Wen & Miller, 2016). Ethereum faces many practical limitations by running software on the blockchain instead of executing protocols manually. According to the DAO, if the theft of funds in the practical sense is carried out through normal operations, it will be no different from normal transactions and will have the same enforcement effect under the regulations, and the risk is difficult and costly to avoid.

Operational Risks of Blockchain Technology Application Service Providers

Not only does its safeguard mechanism have the above-mentioned risks, but the service providers of blockchain technology applications also have risks, which are mainly reflected in the fact that ordinary users realize their transactions for cryptographic digital currencies including bitcoin through the private key custody services of external service providers. While this mitigates the impact of technical barriers to ordinary users and makes transactions convenient. Even though blockchain technology is "decentralized" at the application level to ensure its security, the service company that holds the keys is centralized, making it difficult to guarantee security in comparison. 2014 saw the collapse of Mt. Gox after hackers stole $400 million worth of bitcoin from the exchange (Xu, 2014). Despite suggestions that cryptocurrency exchanges should be authorized to operate under administrative licenses (such as New York's Bitcoin license), the global nature of the cryptocurrency market dictates that most exchanges remain unregulated today (Liang, 2019). In addition to the lack of regulation of exchanges, exchanges do not have any screening criteria for the underlying of cryptocurrency transactions, and there is no way to regulate whatever transactions are made in cryptocurrencies. This is reflected in the fact that transactions do not go through any banks or payment platforms, making it difficult for the government to effectively regulate them. However, if a user transacts through an outreach service provider, he or she is subject to government regulation.

The Administrative Supervision of Blockchain Technology Application Level

Blockchain Technology Application Level Regulatory Logic

The regulatory logic for the current blockchain technology application level revolves around the legality or otherwise and legal validity.

First, the illegitimacy of blockchain technology at the application level involves the use of crypto-digital currencies to commit illegal acts or to steal crypto-digital currencies by hacking private key holding companies. One issue we need to clarify is that the use of crypto-digital currencies for illegal acts does not inherently carry a risk beyond the use of fiat currency for illegal activities, just as paper money can be used for criminal activities. A crime occurs when the expected benefits of the crime outweigh the expected costs, and the expected costs depend on two things: first, the likelihood of being arrested and sentenced to a penalty; and second, the severity of the penalty. Thus, the expected cost of a crime can be defined as the product of the likelihood of receiving a penalty and the severity of the penalty (Becker, 1968). If the effect is assessed in terms of economic efficiency. When the likelihood of receiving a penalty decreases and the severity or intensity of the penalty increases, resulting in an increase in the former offsetting a decrease in the latter, the expected cost of the crime remains constant for the offender. The point is that "decentralized" cryptocurrencies greatly reduce the likelihood of perpetrators being discovered for their violations, and thus reduce the probability of criminal liability.

Second, in terms of monetary validity, most major Western governments have not banned cryptocurrencies for this reason, which only means that the act of trading in cryptocurrencies is not prohibited per se. However, their "decentralized" nature makes administrative review and intervention more difficult. Therefore, the regulatory logic is to build a regulatory scheme for the code itself without denying the effectiveness of the technology at the application level, and to consider regulating the exchange of cryptocurrencies if the technical barriers to "decentralization" are difficult to break through in the short term.

Blockchain Technology Application Level Regulatory Measures

Countries are currently studying the regulatory path at the application level of blockchain technology. Among the regulation at the application level of blockchain technology, the Bitcoin Operating License of the U.S. State of New York is considered a global model for the regulation at the application level of blockchain technology. In the regulations for the issuance of the Bitcoin Operating License, the U.S. government legalized the crypto-digital currency industry by requiring legal entities engaged in the Bitcoin industry to hold a government-authorized "license". The bill strengthens the level of regulation for startups in the cryptographic digital currency industry. In addition, the bill allows for the granting of "conditional licenses" to cryptocurrency startups that are unable to meet the requirements of the bitcoin license, but such companies that are granted conditional licenses will face more stringent scrutiny, primarily in terms of the scope and frequency of the review. Overall, the Bitcoin license redefines cryptocurrencies, recognizing the validity of cryptocurrencies and providing different levels of regulatory requirements for different types of cryptocurrency companies. However, given the limited number of companies currently obtaining the appropriate licenses, the Bitcoin Operating License, as a market access business license, will inevitably restrict small start-up companies, which may then trigger a natural monopoly within the industry in the future, yet a monopoly arising from access reasons or legal restrictions will create new incentives for government regulation.

Apart from business licenses, returning to regulation itself, since it is impossible to make blockchain technol-

ogy a complete substitute for legal or administrative regulation, while complex regulatory measures will also limit the development of the emerging industry to a certain extent, market regulation under full competition should be limited and prudent. Specifically the Silk Road hacker chase shows that blockchain does not completely circumvent the implementation of regulation, while the DAO attack reflects the governance limitations of purely algorithmic systems (Werbach, 2018). However, based on the original design of blockchain, regulation cannot manage algorithmic systems in the same way as centralized systems. In this regard, from the regulatory level analysis, the following suggestions may overcome the limitations of the lack of regulation at the application level of blockchain technology. First, from the perspective of the application of blockchain technology for the guarantee of the regulatory system. If the existing trust structure is generally applicable, the application of blockchain technology can serve as an additional guarantee for the trust system according to the existing rule system. In this case, the main value of a distributed ledger lies in improving the speed and efficiency of a single shared data record. In this context it is not intended to disrupt the existing industrial structure. For example, since the registration of property rights mostly uses paper records and must flow between multiple parties, the system is severely inefficient. In this case, the existing centralized regulators take the primary responsibility of maintaining the security of transactions, and the application of blockchain technology can participate as a better recording mechanism as an aid. In this case, the role of blockchain is limited to protecting the integrity of the shared ledger data. This application approach will not require regulators to change their functions, and the application of blockchain technology as a supplement to the current regulatory system improves efficiency and reduces transaction costs to some extent, but it is difficult to transform the industry structure and stimulate innovation from the bottom up. Second, from the perspective of the application of blockchain technology to fill the regulatory failure or lack of regulation. This happens mainly in the case of regulatory failure or deficiency. Unlike the above-mentioned auxiliary functions, the application of blockchain technology assumes a substitute function in the case of regulatory deficiency or regulatory failure. Take the issue of unclaimed works in copyright law as an example. Smart contracts are used to ensure that users of unowned works pay royalties to the legal rights holders. It both avoids the marginalization of unowned works due to potential infringement damage issues, reverses the negative incentives for potential users, and helps copyright law break through previously untouchable territory.

Conclusion

We need to reach a consensus that regulation itself is not the main obstacle at the application level of blockchain technology. While excessive regulation will affect the development efficiency of the emerging industry to a certain extent, the lack of regulation will cause the disorderly development of the industry, which will have a more serious detrimental effect on social welfare. The developers of blockchain technology cannot ignore the regulation, and the government cannot ignore the growing importance of blockchain, otherwise the corresponding institutional structure may lag far behind the development of the technology, which may further lead to the lack of timely institutional regulation of the civil and commercial activities related to the application of blockchain technology, which will increase the overall risk of the smooth operation of society. Therefore, a complementary and efficient institutional structure between the two and an efficient supervision of external service providers under the existing system will be indispensable.

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