Chapter 13
Key Issues of Blockchain

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Abstract Blockchain has sparked passionate debates and even controversies. The "double-edged sword" aspect of technology is especially prominent in blockchain, and its uncertainty is extremely apparent. In this chapter, a few open questions about the nature and value of blockchain are discussed, with the aim of providing some ideas for understanding and grasping this technology.

Keywords Blockchain · Distributed ledger technology · Disruptive technology · Internet of value

13.1 Is It a Disruptive Technology?

Since Satoshi Nakamoto proposed the design of blockchain in 2008 [1], the technology has been developing rapidly, exhibiting disruptive characteristics, particularly in the application of cryptocurrency, also extending to more areas of the social economy, such as financial services, Internet of Things, supply chain.

Distributed Ledger Technology: Beyond Blockchain [2], a report released by the UK Government Chief Scientific Adviser, argues that "Distributed Ledger Technologies have the potential to be radically disruptive". The Blockchain Strategy of the German Federal Government proposes that Blockchain technology is "a building block for the internet of the future".

Disruptive technology is a term introduced by Clayton M. Christensen in 1997, referring to technologies that replace existing mainstream technologies in unanticipated ways [3, 4]. Disruptive technologies frequently begin in low-end or marginal markets, and are often initially characterized by simplicity, convenience, and low cost. They eventually replace old technologies, open up new markets, and create a new value system through constant improvement and perfection of performance and functionalities. For a long time, blockchain technology was only regarded as a supporting technology for cryptocurrency, but with the development of concepts like

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smart contract and consortium blockchain, it has progressively expanded its market and also created a new value system.

In terms of technology, blockchain has broken through the previous technology development track and opened up new technology domains, potentially altering the existing power structure, impacting the market patterns, and destroying and reconstructing the existing industrial ecology. In terms of application, blockchain has embodied significant permeability in its application and increasingly replaced traditional products in many industries as an alternative, exhibiting great development potential in many fields of social economy such as financial services, intelligent manufacturing, supply chain, public services, etc.

13.2 Blockchain and the Internet of Value [5]

The Internet of Value (IoV) is an emerging concept, an improved form of Internet that evolved from the Internet of Information (IoI) matured, particularly following the rise of the Mobile Internet. The interconnection of values such as money, contracts, and digital assets is a key component of the IoV. People will be able to transmit value on the Internet as easily, rapidly, reliably and securely as they do with information in the IoI era. The value attribute is added to the IoI eventually developing a new type of Internet that realizes both information and value transfer.

Broadly speaking, the IoV prototype can be traced back to the 1990s, when many financial institutions began to use Internet technology to expand their payment business, and models such as third-party payment, big data finance and online financial portals arose, and IoV-related industries represented by Internet finance continued to develop. The scope and degree of value interconnection has continuously risen, and the scale and functions of the IoV have had early development, particularly since 2010, with the rapid growth of Internet finance.

The emergence of blockchain has given the IoV a new development area and initiated a new stage. Before the introduction of blockchain, the IoV was in a very early stage, with a fragmented development model centered on a few intermediary institutions. Blockchain technology has the potential to facilitate the formation of a large-scale and universal IoV, and thus make it easier for the IoV to proliferate globally and injecting a new connotation.

The use of blockchain in various industries has derived a new type of value storage and delivery mechanism based on the IoI, which has accelerated the growth of the IoV. The use cases and models of blockchain in a variety of industries show that it can effectively boost the construction of IoV in terms of infrastructure, expand the user scale and reduce social transaction costs, and therefore is a critical technology for IoV's future development.

Through the development of a new type of social trust mechanism and the promotion of the application mode with highly generic value storage and value transfer mechanisms, blockchain is gradually triggering a fundamental change in the way value is transferred, as well as the way of social collaboration, which is critical to

the development of the IoV. Firstly, blockchain can serve as the infrastructure for IoV. Blockchain-based identity authentication can authorize value carriers, determine the safe and reliable transmission of value through encryption and privacy protection mechanisms, provide basic value transmission protocols in combination with consensus mechanism and other technologies, and thus offer a trust foundation and value transmission mechanism for IoV. Second, the deployment of blockchain lowers the threshold of IoV. More users in a variety of sectors, such as financial services, supply chain management and IoT, are incorporated into the IoV system as a result of the ability to realize assets digitization. This effectively expands the scale of users of IoV and increases its value. For example, blockchain has the ability to accelerate the process of financial inclusion by bringing more citizens from underdeveloped areas into the financial system, hence enhancing the value of IoV. Third, by realizing intermediation and other ways, blockchain can optimize the assets-related business collaboration mechanism and process, which can help to improve social transaction efficiency, lower social transaction costs and hasten the construction of IoV. For example, blockchain can save a significant amount of transaction costs in cross-border remittance on a worldside scale. With the advancement of blockchain technology and applications, and the transition from blockchain 2.0 to blockchain 3.0, it's expected that the IoV's scale will gradually grow, its operation mode will innovate, and its impact on social production and life will gradually deepen.

13.3 Blockchain and Digital Economy [6]

According to G20's definition, the digital economy is a broad range of economic activities that include using digitized information and knowledge as the key factor of production, modern information networks as an important activity space, and the effective use of information and communication technology (ICT) as an important driver of productivity growth and economic structural optimization [7]. The trust mechanism provided by blockchain can promote more efficient and convenient collaboration among enterprises, push social division of labor and collaboration to a higher level, enable more effective sharing and allocation of social resources, lower social division of labor and transaction costs, and improve digital economy benefits. Furthermore, blockchain technology has the potential to profoundly transform numerous industries and assist in improving their digitalization levels, stimulating the development of new business models, and is expected to generate more social value through industry innovation.

Blockchain can facilitate the marketing of data elements. In view of data quality issues and a lack of guarantee of data asset rights and interests, blockchain can improve the quality and security of data by ensuring the trustworthiness, anti-forgery, anti-tampering and traceability of data through consensus mechanism, blockchain data structure and encryption algorithm. It can provide effective solutions for scenarios such as open government data sharing, data asset identification

and trading, as well as strong technical support for the data flow and effective data usage.

Blockchain can facilitate the improvement of the digital economy's ecology. With the growth of the digital economy, virtual space has gradually become one of the most importance places for people to engage in social production and life. However, obstacles related to trust issues exist almost everywhere, such as the difficulties in defining the identity of subjects in virtual space and tracking the behavior trajectory, online illegal criminal activities and dishonest phenomena Blockchain provides an technology-based trust mechanism that can serve as a solid technical foundation for the establishment and maintenance of multi-party collaborative relationships. Blockchain can also be used to track network behavior and collect credit. It also provides the required trust backing for numerous economic activities in virtual space, making it extremely valuable in the creation of a healthy digital economy ecology.

Blockchain can promote the innovation of digital economy models. The interaction between individuals, enterprises and other subjects, flows of factors, resource allocation, are increasingly frequent. The trend of real-time information interaction and accurate supply–demand matching has grown crucial, spawning a number of new business models such as platform economy, sharing economy and new retail. Blockchain technology can provide effective trust support for these new business models, and smart contracts can help to enhance the intelligence of related applications. Combing with another characteristics of blockchain technology which emphasizes a peer-to-peer cooperative production relationship, new models such as distributed commerce are emerging.

13.4 Blockchain and the Real Economy

The integration of blockchain with the real economy has become an important trend in many industries' development. The implementation of blockchain in the real economy has attracted the interest of many countries all over the world. In China, the Guidance on Accelerating the Application and Industrial Development of Blockchain Technology [8] highlighted blockchain applications in real economy. In the areas such as product tracking, healthcare, transportation and logistics, supply chain management, energy management, there are a number of blockchain application projects. The impact of blockchain on the real economy has begun to appear.

Blockchain technology has become an important grip for the deep integration of the digital economy and the real economy. The innovation in the integration of blockchain and the real economy is particularly active, and there are more use cases in product traceability, supply chain management and copyright protection, and other fields. Blockchain applications have also been explored in manufacturing, healthcare, transportation and logistics, commercial circulation and other industries.

Blockchain can serve as a foundation for credible industrial data sharing, a link for division of labor and collaboration within the industrial ecology, and an important carrier for industrial value circulation. It also plays a significant role in product and

service quality improvement, supply chain optimization and industrial model innovation. The application of blockchain in the real economy can be combined with the Internet of Things (IoT), edge computing, artificial intelligence and other technologies, which can improve industrial digitization and facilitate the cultivation of smart industries. In agriculture, blockchain-based anti-counterfeit traceability of agricultural products can connect farmers, sellers, consumers and other related parties, ensuring the safe supply of agricultural products and the safe use of consumers through sharing data on production, circulation and testing of agricultural products that can be traced throughout the process. In forestry, blockchain technology can be used to realize the entire life cycle management of forestry resources such as seedlings, as well as to strengthen the management of afforestation funds, etc. In manufacturing, blockchain can be used in industrial collaborative manufacturing, supply chain, information sharing, industrial security and supervision, and collaboration of internal resources involving the integration and flow of various industrial production factors such as data, capital, technology, as well as interconnection between industrial equipment, production and data between enterprises. In Industrial finance, blockchain provides effective solutions for management and transaction of physical assets and supply chain finance, which can effectively reduce the financing cost of small and medium-sized enterprises in the real economy and assist the innovative development of industrial finance.

However, blockchain has yet to establish large-scale commercial applications in the real economy. The applications are rarely related to core business, and most enterprises are still waiting to see the effect of of blockchain technology. First, the level of informationization in some real economy industries is insufficient to allow large-scale blockchain applications. For example, in many regions of the world, there are few information infrastructure and information system applications that can realize data collection, transmission, storage and sharing in agriculture, and blockchain applications typically require linking multiple enterprises' information systems, making them more difficult to implement. Second, the threshold of application transformation is high in manufacturing, commerce and other real economy industries, due to the long industry chain, complicated infrastructure and business systems, and the application scenarios are yet to be clarified. For example, in manufacturing, the differences in equipment, processes, protocols and networks are significant, and the application of blockchain may necessitate a large transformation of the original system. Additionally, the scenarios in manufacturing are mostly large-scale scenarios with difficulty in data collection and high data storage and transmission requirements, while the current support of blockchain technology for large-scale applications is still limited. Finally, the key to a blockchain application is multiple related parties' willingness to share their data and resources, while current organizational forms still fail to keep up with the needs of application development, and the lack of mature privacy protect solutions for on-chain data causes related enterprises to be more cautious in promoting blockchain applications.

13.5 Blockchain and Social Governance

Blockchain can help promote new mechanisms for social cooperation, address equality through social empowerment, and improve governance efficiency while also lower governance costs and risks [9, 10]. The value of blockchain in helping modernize the national governance system and governance capacity has been further highlighted in recent years, with the accelerated application of blockchain in the fields of government data sharing, judicial deposition, people's livelihood, environmental protection and international trade. In China, many government departments in cities such as Beijing, Chongqing, and Tianjin have implemented cross-departmental government data sharing exchange based on blockchain, which has proven to be effective in streamlining public workflow and improving administrative efficiency. The Supreme People's Court and the Internet Courts have developed blockchain-based blockchain platforms to enable electronic evidence data sharing and administration among courts, as well as between courts and judicial expertise centers, notary public offices and other institutions. The Supreme People's Court has clarified the legal validity of data on the blockchain as electronic evidence in documents such as "Provisions on Several Issues Concerning the Hearing of Cases in Internet Courts", "Provisions on Several Issues Concerning the Online Handling of Cases in People's Courts ", "Rules for Online Litigation in People's Courts" and "Opinions of the Supreme People's Court on Strengthening Blockchain Application in the Judicial Field". The application of blockchain in the field of people's livelihood is highly active in food traceability, social welfare, precise poverty reduction, social security, education and medical care, etc. The advent of blockchain enabled multiparty governance, sharing and win–win situation, all of which have helped to protect and improve people's livelihood.

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