

# *Blockchain: A Technical Support for the Modernization of the National Governance System and Capacity*

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**Abstract:** The modernization of national governance needs to be supported with modern technical tools to conform relations of production to productive forces and enable positive and orderly interaction between the two. Blockchain, as an emerging technology in the age of information, features distributed architecture, greater transparency, improved traceability and enhanced security. Blockchain's consensus mechanism can be introduced into community governance mechanisms, which, by virtue of its market-oriented operation nature, helps define the respective functions of the government and market in the modernization of national governance. The application of blockchain technology to the national governance system enables stakeholders to seek consensus and the largest possible common interests to improve the national governance system and better achieve the governance goal, reduce governance costs, improve governance performance and meet the development needs of the times. Through a proper top-down design, China can effectively integrate blockchain technology into its national governance system and thereby efficiently advance the modernization of its national governance system and capacity. Still, due attention should be paid to blockchain's possible technical risks and impact during the reform and modernization of national governance.

**Keywords:** blockchain, national governance, governance mechanism, information deepening, consensus mechanism

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**H**aving entered a new stage of reform and opening up, the Third Plenary Session of the 18th CPC Central Committee (in 2013) timely pointed out, “The overall goal of deepening the reform comprehensively is to improve and develop socialism with Chinese characteristics, and to promote the modernization of the national governance system and capacity.” The Fourth Plenary Session of the 19th CPC Central Committee (in 2019) further established a timeline for advancing the reform and modernization of the national governance system. This move has started a new chapter in the reform and modernization of national governance and indicated an increasingly urgent need to improve the capacity of modern governance practice.

In recent years, particularly since the Third Plenary Session of the 18th CPC Central Committee, domestic academic circles have put more effort into the study of governance theories. Scholars represented by Wang Dongsheng (2018) and Xue Lan (2015) made comprehensive reviews of China’s national governance system and capacity in terms of its connotations and research development. The existing studies mainly focus on expounding the governance philosophy and theoretic logic, without paying much attention to the operational levels of national governance modernization, although a few scholars have attempted to construct a governance index system through related research (Wang, 2016; Gao & You, 2016). Most studies, whether they are about theoretical exploration or evaluation practice, are logically grounded on governance theories which are attached to Western discourse systems and value judgments. Some studies, based on the actual development needs of China, argue that China’s setting of an overall goal of modernizing its national governance is determined by the “endogenous evolution of its social and economic development” (Xia & Li, 2019, p. 2). The essence of national governance is to adapt relations of production to the development of productive forces (Jing, 2016). “The modernization of national governance is an innovation of Marx’s theory of the state” (Yu, 2014a, 2014b, p. 15). Accordingly, the modernization of national governance should be understood based on China’s development needs and from Marx’s perspective of the relationship between productive forces and relations of production so that we can analyze the practical needs and routing arrangements of China’s modernization of national governance in a scientific way.

### **Modernizing the National Governance System and Capacity: An Endogenous Development Need**

#### **Adapting Relations of Production to the Development of Productive Forces: The Essence of Modernizing National Governance**

According to relevant studies, a national governance system comprises a series of institutions and procedures which are designed to supervise the operation of social power and maintain public order, and a series of institutional arrangements which are introduced to regulate the behaviors of subjects such as government authorities, market subjects and community organizations (Yu, 2014a, 2014b). National governance is a process in which the state continually adapts its relations of

production to the evolution and development of productive forces. Over the past 40 years of reform and opening up, China has initiated and continued its market-oriented reform, expanded its scope of opening up, and deeply engaged in economic globalization. Thanks to these policies, China has significantly developed its productive forces, completed its industrialization and entered the age of information. Productive forces reflect the human capacity of harnessing and transforming nature. The introduction of new IT tools has substantially changed the existing models of commercial and social value creation. This is particularly true in the era of big data and artificial intelligence (AI). Relations of production are adjusted through changes in job market structures and product market structures. Alongside this process is economic and industrial restructuring. Accordingly, the national governance model is adapting to the new round of adjustments in relations of production. Market mechanisms are increasingly playing a decisive role in allocating social resources. Against such a backdrop, various market subjects are able to increase their presence in economic and social activities, helping to transform China's national governance model from the old government-led model to a modern model featuring the co-evolution of state, market and community. Thus, three types of national governance mechanisms have been formed in China, namely, government mechanisms, market mechanisms and community mechanisms, which respectively correspond to systems of government administration, systems of market economies and systems of social organization. Under the influence of economic marketization, both the systems of government administration and the system of social organization are adapting to the market economy so that the new relations of production can boost the development of productive forces. In essence, the modernization of national governance is to enable the superstructure of relations of production to meet the new development needs of productive forces.

### **Modern Technology: A Must for the Modernization of National Governance**

The modernization of national governance aims to enable effective national governance, which concerns “three basic questions, i.e., who governs (governance subjects), how to govern (governance mechanisms) and what results (governance effects)” (Yu, 2014a, 2014b, p. 15). Governance mechanisms determine the respective roles of governance subjects and subsequently determines the ultimate effects of governance. Thus, the choice of a governance mechanisms and corresponding governance tools are of crucial importance. Yet, the performance of a governance mechanism itself is determined by those governance tools. China's current national governance system still exhibits distinctive characteristics of the industrial age, and therefore fails to meet the requirements of the information age, during which various social subjects are closely connected and frequently interact with each other and the rapid iteration in technology results in an increasingly complicated and changeable social context for production. Under such circumstances, the existing governance system is confronted with prominent problems such as poor operational efficiency, high costs and accumulative potential risks, which make it difficult to maintain social development and economic growth in a sustainable way. The modernization of national governance involves meeting the development needs in the age of information and reducing the costs and risks of economic

and social development. To reform and modernize national governance, we should adopt modern governance tools that fit the development characteristics of the age of information. As an emerging underlying information technology, blockchain has multiple merits such as greater data openness and transparency, enhanced security and improved traceability. Blockchain can build and enhance trust among stakeholders. With its smart contract allowing corresponding governance mechanisms to govern and supervise automatically and intelligently, blockchain has become an effective governance tool for China to realize the goal of modernizing its national governance system and capacity. Wang Xiaojing, Luo Juan and Song Yanfei (2019) hold that from a Marxist perspective blockchain can help adjust relations of production and, more importantly, work as a major factor to boost the development of productive forces and promote quality economic and social development.

On October 24, 2019, the Political Bureau of the CPC Central Committee attended a group study session on blockchain technology. General Secretary Xi Jinping delivered a speech at the session, holding that China should seize the opportunity of blockchain technology fusion, function expansion, and industrial market segmentation to bring blockchain into full play in the promotion of data sharing, the optimization of business processes, the reduction of operating costs, the improvement of collaborative efficiency, and the building of a trusted system. Xi also encouraged people to explore the application of “blockchain + ” in the areas concerning people’s livelihood, urban management, and government affairs to allow blockchain to play a bigger role in building China into a major network player, developing a digital economy and boosting economic and social development (Xinhua News Agency, 2019). Xi emphasized that China, which had already laid a solid foundation for blockchain development, should accelerate the innovation of blockchain technology and the development of this new sector, and promote the integration of blockchain with economic and social development. According to Xi Jinping, blockchain is a disruptive innovation; China is well prepared for the further development of this emerging technology and is strategically capable of using blockchain as a technical and cognitive tool to support the reform and modernization of the national governance system and capacity.

## **Blockchain-enabled New Choice of National Governance**

### **The Inevitable Emergence of Blockchain Technology**

#### **Blockchain technology represents the latest stage of IT development.**

The origin of blockchain can be traced back to Diffie-Hellman key exchange, which is a method of securely exchanging cryptographic keys over a public channel. Named after Whitfield Diffie and Martin E. Hellman in 1976, Diffie-Hellman key exchange is arguably the earliest practical example of public key exchanges implemented within the field of cryptography and it offers crucial technical support for blockchain development. Following the invention of Diffie-Hellman key exchange, a range of cryptographic algorithms and distributed computing and storage technologies were

invented and improved, laying a solid technical foundation for blockchain applications. Among these algorithms and technologies are the Rivest-Shamir-Adleman (RSA) algorithm, the Merkle Tree and corresponding algorithms (designed to verify the correctness of data synchronization in distributed networks), the Byzantine Generals Problem (also known as the Byzantine fault, which boosted distributed computing and reliability theory and practice into a substantial stage), the elliptic curve cryptography (ECC) algorithm, the proof-of-work (PoW) system, the secure hash algorithm 2 (SHA-2), and BitTorrent (a communication protocol for P2P file sharing).

The development of cryptographic algorithms is driven by a need for secure communications in the age of information. Likewise, the development of distributed computing and storage technologies is driven by a need for large-scale information sharing. That is to say, blockchain, as an underlying technology, is designed for information acquisition, exchange and sharing. Blockchain exhibits distinctive characteristics of the age of information and also represents the latest stage of IT development. The decade-long successful application and reliable operation of Bitcoin has exerted far-reaching influence on society, confirming that the application of blockchain is socially feasible and acceptable. Over the past three decades, blockchain technology has undergone continued development. This development highlights the efforts made by human societies on their way towards the age of information and is the outcome of information deepening during social development.

#### **Change in the model of social cooperation becomes inevitable in the age of information.**

The extensive application of computers and the internet has given rise to an explosive demand for information production and flow and enabled the rapid development of big data and AI for storage and analysis purposes. A massive amount of information, being diverse, complicated, changeable and hard to verify, makes information interaction (such as information verification, information security and information value transfer) a new challenge in the age of information, and also restricts the economic system's process and performance of value creation. Due to the widespread application of the internet, information production and use exhibit a distributed feature, involving massive and extensive information with varied values. The development of Internet technologies and cloud computing has further enabled the socialization of information, making information an increasingly essential factor of production in economic and social fields and also a crucial guide that directs the flow and distribution of other economic resources. To produce, develop, utilize and exchange information more effectively, we need a brand-new model of social cooperation. The existing form of information organization is centralized, with information dispersed on various platforms. The integration of the dispersed information can generate huge costs. As a result, information has to be processed in accordance with the centralized organization architecture. Under such circumstances, the personnel of a relevant organization are given too much access to data, bringing about a series of network security risks such as data tampering and hacking. Conventional capital-dominated corporate system and finance-driven economic growth can no longer fully satisfy the needs of the rapidly developing economy and society. And a new organizational model of social cooperation and a corresponding mechanism of resource allocation are in urgent need. This new model of cooperation

must be more socialized and more efficient in resource allocation and integration. In this sense, the distributed model of information sharing, information processing and value transfer is exactly a highly socialized and efficient model of cooperation.

Blockchain is a disruptive innovation because, being an underlying technology, it solves reformulation-related problems (data islands, confirmation of data ownership, secure data storage and transmission, etc.) that stand in the way of the development of Internet technologies in this age of information. Blockchain offers a new model of social cooperation that enables information integration, processing, and analysis which thereby helps develop a new trust model. The shift from trust in “man” and man-built organizational platforms and institutions to trust in mathematical algorithms, objective facts and science has technically paved the way for building a more reliable cooperative mechanism of trust. Such a blockchain-enabled cooperative mechanism of trust is significantly different from all previous cooperative mechanisms of trust among human societies. Since ancient times, human societies have been building trust, seeking cooperation and thereby founding various social organizations through shared myths, religions, doctrines and beliefs. Those forms of organizing are all built on intersubjective consensus. In the age of big data when information keeps deepening, however, the increasingly complicated information environment forges multi-cognition and brings a major challenge to the existing consensus, which is unitary, subjective and basic in many areas. In particular, capital’s pursuit of equality has fostered shared values such as individual equality and freedom. Influenced by such shared values, cooperation models based on subjective consensus are faced with rising operating costs. In such a context, it is imperative for human societies to work together to build a new consensus mechanism and a corresponding form of organizing in the age of information. Blockchain technology can help build objective consensus. Blockchain-enabled social governance systems and social credibility systems, featuring objective basis and equal participation, are quite different from previous systems and will bring profound changes to the two systems. The blockchain-enabled consensus, which is supported by a top-down design of independent consensus mechanisms and encryption algorithms, is an inevitable choice to tackle information overload.

Evidently, the application and emergence of blockchain technology is an inevitable trend in a world where people are busy tackling information overload and manual verification difficulties and seeking a new model of social cooperation. Blockchain technology will become a major alternative tool for reshaping the governance structure in the age of big data.

### **Blockchain Technology’s Potential to Enable a New Mechanism of Social Cooperation**

According to blockchain technology’s development level and application extensiveness, the history of blockchain development can be divided into three stages. The first stage is about innovative applications of blockchain technology, which is marked by the invention of digital currency. At this stage, substantial digital currencies emerged, primarily serving as a medium of exchange. Among them is Bitcoin, an innovation known as “programmable money”. The second stage is about commercial applications of blockchain technology in practice. This stage is characterized by



the launch and application of Ethereum, a computing platform featuring smart contract (scripting) functionality. At this stage, blockchain has been found capable of enhancing trust, for which it is innovatively applied to business domains to form “programmable commercial applications”. Explorations in this respect are now in full swing. The third stage is about comprehensive promotion and deepening of blockchain technology. As blockchain is becoming mature, this technology will be further applied to more areas of human societies to help reform their forms of organizing and transform human societies into fully “programmable societies”. Blockchain development is now at the second stage. Through further promotion and deepening, blockchain will exert far-reaching influence on human interactions and cooperation and bring about groundbreaking changes to social governance approaches and tools. That is to say, blockchain technology will serve as a strategic technical support for China to realize the goal of modernizing its national governance, and an effective carrier of this cause. It can help adapt the national governance system and capacity of China to the current context and also to future trends of development.

#### **Blockchain technology promotes change in the cooperation model.**

Blockchain technology has taken one big step in facilitating multi-party cooperation and trusted processing. Although this emerging technology does not overthrow the process of social value creation, it does reshape the original model of cooperation in social value creation. Since the Industrial Revolution, the structure of the world economy has been increasingly complicated and economic uncertainty has been on the rise. Accordingly, the cooperation between economies has become more and more complicated, giving rise to higher risks. To deal with rising economic cooperation costs and potential risks, economic systems have founded a number of intermediary organizations and agencies with a staff of dedicated professionals (consultants, lawyers and bankers). Such organizations and agencies themselves do not create value but play a critical role in ensuring the effective operation of those economic systems and also represent a new model of social cooperation driven by industrialization.

In the age of information, through in-depth development, information has become an essential factor of production and a key booster of productive forces. As information technologies like big data and AI mature, the established intermediary organizations and agencies are on the wane and the model of social cooperation is being reshaped. Blockchain technology, through constant development, has taken human socialization to a new height and has accorded with the reshaping of the social cooperation model. Its distributed architecture allows any individual to access a particular blockchain network and thereby engage in the division of social labor. Thanks to support from the blockchain network, cooperation between and among individuals can integrate into the process of social value creation without continuously relying on any costly organizational platforms. Blockchain technology, featuring encryption and address uniqueness, can facilitate precise confirmation of data ownership to define an individual's contribution to a participating system and society. Through an incentive and restraint mechanism, a blockchain network can screen individuals and select appropriate stakeholders and participating groups, avoid external generation, and internalize individuals' actual contributions.

For example, via blockchain technology, people can vote on matters relevant to them and ignore those irrelevant to them. “This will involve many factors and will certainly keep the parties with the most at stake with the most power but will ensure that everyone has representation on issues that affect them” (Young, 2018, pp. 62-63). In this way, on the one hand, individuals can participate in social cooperation at low costs. On the other hand, the society can effectively screen individuals for needed value creators, ensure the operation of social value at low costs and high efficiency, and form a mechanism of community governance. While facilitating efficient cooperation, blockchain technology also brings higher requirements for socialization and professionalism to each individual competing in the workplace.

**Blockchain technology promotes changes in national governance models.**

A national governance system comprises a series of institutions and institutional arrangements which are designed to ensure stable and orderly operations of social power. As blockchain technology is further deepened and promoted, cooperation among social groups is experiencing a significant change, which puts forward new requirements for national governance modernization.

Fully distributed architecture is not the only pattern of blockchain architecture, and decentralization is not the defining feature of blockchain technology. The core of blockchain technology lies in its encryption-enhanced trust and rapid interaction-enabled high efficiency. According to participants' position in the network, blockchain applications fall into three patterns, i.e., public chains, private chains and alliance chains. Public chains adopt a fully distributed architecture which guarantees equal participation and full disclosure of information and allows anyone to access the network and engage in system maintenance. Private chains and alliance chains are enabled by introducing a licensing mechanism to the public chains. A private chain is maintained by one administrator by means of various internal restrictions and may be for internal use only. An alliance chain is maintained by all stakeholders, with restricted access to participants. Limited information disclosures can be made as required by specific applications.

The three application patterns allow blockchain technology to realize social cooperation at different levels of socialization, and adapt its major characteristics (automation, transparency, auditability and low costs) to different application scenarios. The application patterns are expected to enhance blockchain technology's adaptability, reduce management costs and foster disruptive innovations in social cooperation. To promote innovations in an effective and orderly way, we need a more resilient and stronger national governance capacity and a more efficient governance system. To this end, we should reform the existing government-centric mechanisms of administrative governance to fit in with the diverse interactions which are driven by technology-based trust.

Blockchain-enabled models of social cooperation give more equality and autonomy to participants, exhibit a more obvious feature of self-organizing, and are in contrast with a centralized, authoritarian governance style. The change in the model of social cooperation, which is driven by blockchain technology, has redefined the functions and boundaries of the state, markets and society. As the role of market mechanisms is further enhanced and social autonomy is increased, national



governance no longer needs to rely entirely on administrative measures. Blockchain technology fosters a new governance model which can invigorate the markets and the society and institutionalizes and systematizes the new model. Blockchain technology helps facilitate interactive governance for administrative mechanisms, market mechanisms and community mechanisms to better coordinate national governance (Gu, 2019). In short, blockchain technology promotes changes in the national governance model.

## **Blockchain-enabled Reform and Modernization of the National Governance System and Capacity**

### **The Necessity to Introduce Blockchain into the Reform and Modernization of National Governance**

#### **Defusing risks in information deepening.**

In this age of information, digitalization has become the most important way of information storage. Yet, digital data can be easily tampered. Given this, precautions against data tampering is a prerequisite for realizing information value and ensuring the smooth and orderly operation of society. Also, the popularization of the internet has further intensified the risks of digital data leakage and falsification, posing a new challenge to the orderly operation of the society. Under such circumstances, new technical tools for preventing data tampering and leakage and ensuring the orderly operation of society are in urgent need.

Historically, China has based its governance model on administrative mechanisms, which prevents possible information risks through the efforts of public servants and corresponding rules and regulations. Such a governance model, however, cannot prevent the risks of data tampering and leakage or ensure a secure and reliable Internet environment for data operations, and is prone to accumulate a large amount of idle information. Unable to play its due role, this management model cannot satisfy the further needs of information deepening. Blockchain technology, by virtue of its characteristics such as distributed architecture, convenient information interactions and reliable encryptions, allows stakeholders to access data on relevant systems, prevents possible information risks, accelerates information flow and value transfer, and explores the value of information deepening to the maximum. In this way, blockchain technology can help build a new mechanisms which are capable of preventing risks in informatization, accelerating the transfer and discovery of information value and improving community governance. This new mechanism is expected to boost the reform and modernization of national governance.

#### **Enabling changes in the perceptions and thinking of national governance reform.**

Blockchain technology makes a new model of social cooperation possible, brings change to the established patterns of perceptions and thinking, provides an alternative choice for social production and living, and creates a new driving force or opportunity for the reform and modernization of

national governance. One big challenge facing the reform and modernization of national governance is the rigid perception and thinking shared by implementers within the traditional governance system. Traditional systems (or models) of national governance are dominated by administrative governance mechanisms. In such a system, state actors govern the state through top-down command and control (Gu, 2019), the role of market governance mechanisms are limited, and the value of community governance can hardly be recognized. Today's diverse perceptions and interests have made the traditional national governance model increasingly costly. As a new technical tool, blockchain can use its consensus mechanism to promote interactions among relevant stakeholders, represent the biggest common understandings and interests of all stakeholders through effective interactions, and overcome rigid perceptions and thinking rooted in a traditional system of national governance. By developing the perceptions of decentralization, community sharing and distributed cooperation, we can effectively introduce and integrate market governance mechanisms and community governance mechanisms into the national governance system under construction. Via a blockchain network, relevant stakeholders can build mutual trust and form "a new type of relational contract" (Torfing, Peters, Piere & Sorensen, 2012, pp. 15-16). In this way, a modern mature model of national governance which can satisfy the needs of information deepening is gradually taking shape in the age of information.

#### **Increasing governance efficiency while reducing governance costs and risks.**

As was pointed out at the Third Plenary Session of the 18th CPC Central Committee, "Economic system reform is the focus of deepening the reform comprehensively. The underlying issue is how to strike a balance between the role of the government and that of the market." Likewise, the underlying issue of the modernization of national governance is also how to strike a balance between the role of the government and that of the market. Thus, the modernization of national governance should focus on giving full play to the basic role of markets in resource allocations. Over the past 40 years of reform and opening up, the continuous improvement of national governance has transformed the role of the Chinese government from a "rounded manager" to a "service provider". Yet, China's market mechanisms are still confronted with prominent problems such as structural imbalance and a lack of innovation during the running process. Such problems prevent its market mechanisms from functioning efficiently and from contributing fully to national governance. In fact, market mechanisms are essentially a system of distributed information processing, although there are systemic flaws in its information transmission and falsifiability. In China's traditional system of national governance, market mechanisms' governance costs and risks seem to be higher, while its governance efficiency is far from satisfactory. Blockchain is a useful technical tool that can give play to market mechanisms. In particular, its distributed architecture, with strong capacities of data encryption and anti-counterfeiting, allows stakeholders to conveniently participate in the design of governance mechanisms and the process of governing. Also, blockchain-enabled community governance mechanisms can help market mechanisms to improve individuals' participation in governance through better technology empowerment to reach consensus and achieve the goal of

efficient governance at relatively low costs.

## **How to Effectively Promote the Modernization of the National Governance System and Capacity via Blockchain**

### **Boosting the Application of Blockchain Technology to Accelerate Changes in the Government's Perceptions and Thinking**

As an emerging technical tool, blockchain has boosted a major reform in relations of production, and is expected to change the production status and benefit structure of participants in value creation, and adjust the social responsibilities of the government as the leader and guarantor of credit in a traditional system of national governance. Blockchain will impel social cooperation to gradually shift from a trust-driven model based on man-built organizations and institutions to a trust-driven model based on mathematical algorithms to reach objective consensus in a scientific way. As blockchain technology is more and more extensively applied to administrative affairs, its distributed architecture and way of information interactions can bring change to administrative governance, flattening the originally hierarchical structure of the government step by step, making administrative governance and the process of government services more transparent, thus improving governance efficiency. The flattening of government structures involves transferring some traditional government functions to market mechanisms or community mechanisms, treating all participants in multi-governance on an equal footing, and abolishing the government sector's role as a centralized dominator. The purposes of this structure flattening are: First, to better help relevant government authorities change their ways of perception and thinking and turn the new governance model into a cognitive paradigm; second, to better explore the potential of blockchain in modernizing national governance and define the boundaries of the administrative governance mechanisms; third, to provide technical support for clarifying government functions and market functions.

### **Enabling the Government to Transform Its Model of Social Governance via Blockchain Technology**

The modernization of national governance is essentially about clarifying the respective functions of the government and the market, improving the established institutional systems, and including all social aspects into a well-functioned complete institutional framework to avoid being influenced by others. In particular, the transformation of government functions is the key. The government should echo the call of information deepening and modernize the models of social governance. Compared with the industrial age, the information age attaches more importance to the technological empowerment of individuals. For both individuals and organizations alike, Internet technologies have equipped them with unprecedented influence and capacity. Thus, it is necessary to treat all stakeholders in the national governance system on an equal footing. Otherwise, the costs and

risks of national governance will increase accordingly. In a blockchain network, the government sector loses its dominance and becomes a key node which is equal to other participants. Thus, the role of government in the national governance system will be transformed from a dominator and administrator to an active coordinator and service provider. The government is working with other participants to build a platform for resource sharing, creating a smart governance model via smart contracts and offering targeted public services (Wang & Ding, 2017).

Blockchain technology, featuring distributed architecture, greater transparency, improved traceability and enhanced security, can be applied to help flatten the government structure, make administrative governance and services more transparent, enhance the security of government data, and build a smart and reliable government (Wang & Lu, 2018). By virtue of such merits as distributed architecture, real-time data streaming and reliable transmissions, blockchain can help solve problems concerning information exchange between upper and lower administrative levels, and between government authorities at the same level. From the perspective of higher authorities, such merits allow them to gather authentic information from community-level units in a more effective and faster way. From the perspective of authorities at the same level, blockchain's encryption enables the exchange of authentic information in real time while its distributed architecture improves the efficiency of information interactions and administration and avoids time-delays. Moreover, blockchain, as a database of timestamps, confirms the existence of digital content independently timestamped at a particular time, thus eliminating the risk of data tampering during the process of data transmission and saving the costs arising from the supervisory verification of government information authenticity. Blockchain can flatten the hierarchical structure of the government, reduce costs of institutional arrangements such as supervision, provide checks and balance among authorities at the same level, and thereby streamline the government's organizational structure. A streamlined organizational structure, which relies heavily on the functions of market mechanisms and community mechanisms, can avoid interventions in the two mechanisms. Also, this streamlined structure can help clarify the relationships among state, market and community and their interaction mechanisms during the modernization of national governance, define the boundaries of the three mechanisms, and modernize the national governance system and capacity for mutual benefits, reciprocity and orderly interactions.

As aforementioned, blockchain technology can improve data transparency, which helps build an image of "sunshine government" (clean government), makes government affairs public and thereby enhances the government's credibility. The application of blockchain to government affairs can transform people's trust in government authority to a trust in mathematical algorithms, which are more reliable and conducive to the fight against corruption. The application of blockchain's smart contracts can facilitate smart contract-based automatic execution and supervision and make the government's governance and services smarter and more efficient. In this way, many government authorities can automate their routine functions, prevent possible losses and risks arising from human error, reduce the role of human workflow in administrative governance, cut corresponding running costs, increase governance efficiency, and provide quality public services to pave the way for a

“programmable society” and achieve the goal of comprehensively modernizing national governance.

### **Preventing Possible Risks Arising from the Application of Blockchain Technology to the Reform and Modernization of National Governance**

Modernizing the national governance system and capacity is the mid- and long-term development goal of China. And blockchain will play an indispensable role during this process. After all, the national governance system, being a representative superstructure of relations of production, needs to effectively combine technical logic with the goal of modernizing national governance to adapt relations of production to the development of productive forces.

Still, blockchain is an emerging technology, for which we should guard against its possible operational risks while applying it to the reform and modernization of national governance.

By integrating blockchain technology into the national governance system, we can use its distributed architecture to introduce a variety of stakeholders and use its features of data encryption and verifiability to enable information exchanges and value transfers. Thus, blockchain can serve as an important carrier to modernize national governance. Yet, the introduction of such a new technical tool exerts a comprehensive impact on the national governance system. On the one hand, the existing laws and regulations do not support the confirmation of the ownership of blockchain value. It is necessary to define the ownership of blockchain through legislation. Otherwise, blockchain technology remains legally groundless in the national governance system. On the other hand, the distributed architecture of blockchain technology can send shockwaves through the established government-centric administrative governance system. Besides, the blockchain-enabled market-based mechanisms of community governance do not yet accord with the government's existing organizational structure and division of functions. To solve this problem, adaptive internal adjustments need to be made in the government-centric hierarchical structure. In brief, we should strive to strike a balance among all institutional aspects, attach more importance to top-down design, promote the application of blockchain technology to government affairs step by step, and allow plenty of time to adapt the government's organizational structure to the changing context of today.

With the introduction of blockchain technology, it becomes increasingly clear that the mechanisms of market governance and community governance, which are driven by blockchain's intrinsic characteristics. Blockchain technology, which is more than an innovative tool, can also bring significant change to people's perceptions, behavior and social relations. Accordingly, more importance should be attached to the top-down design of national governance to ensure the rationality of its mechanism's design. We should build a special mechanism that can help participants balance self-motivation and self-discipline and prevent possible system crashes resulting from any bugs in consensus mechanisms during the application of blockchain technology.

Organizational supervision is an important means and tool of traditional national governance. With the introduction of blockchain technology into national governance, however, a new tool for supervision will be needed. Technical supervision will become an important part of the national

governance system. With some potential risks hidden in its technical code and mechanism designs, however, technical supervision can jeopardize national governance or even bring a systematic blow to it. To avoid its negative impact, we should strike a balance between technical supervision and organizational supervision, design a sufficiently clear and reliable firewall mechanism, introduce regulatory nodes, and perform penetrating supervision to ensure that information exchanges and value transfers can be carried out in a reasonable, autonomous and sustainable way.

### **Conclusion**

This study indicates that as China's reform and opening up has entered a new stage, further reform and modernization of the national governance system and capacity is needed in order to conform relations of production to productive forces. And such a reform should be supported with modern technical tools. Blockchain, as an emerging technology in the age of information, features distributed architecture, greater transparency, improved traceability and enhanced security. The successful application and reliable operation of Bitcoin, the first decentralized digital currency, has showcased the potential value of blockchain technology in national governance. With the application of blockchain technology to the national governance system, community governance mechanisms will subsequently be able to be introduced into the national governance system; stakeholders can exercise self-governance via a blockchain-enabled platform; regulators can perform penetrating supervision to help the government reduce governance costs, improve governance performance and meet the development needs of the times.

Still, it is noteworthy that blockchain technology is not without intrinsic technical risks that can also exert an impact on a traditional national governance system and its organizational structure. Given this, we should cautiously guard against such technical risks when applying blockchain to the national governance system. More emphasis on top-down design can properly bring into full play the potential of blockchain technology in national governance. It is believed that the effective integration of blockchain technology into the national governance system can help complete the modernization of the national governance system and capacity in a more efficient and faster way.



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