



Research Article

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Research on the Development of the Digital Economy based on Blockchain Technology

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Abstract

As the digital economy becomes a key trend in the economic transformation and upgrading under the new normal of the world economy, a decentralized system, and distributed database technology, blockchain links relevant data in single blocks to form a central system in a cycled chain pattern by encrypted signature verification. The fusion of blockchain technology and big data technology can not only conquer the bottleneck of big data technology but also provide new methods and ideas for the development of the digital economy, upgrade the developmental mode of the digital economy, and promote the rapid growth of the digital economy. Through the popularization of blockchain technology, the traditional internet based on information is transformed into a value-based internet. The status of the traditional economy is mapped into the virtual world, further integrating reality and virtuality.

Keywords: Big Data; Blockchain; The digital economy; Industrial Integration

Introduction

As a key product of the fourth industrial revolution, the digital economy is a brand-new mode of economic development, which, relying on emerging internet technologies, such as big data, cloud computing, and IoT, reuses some social resources that cannot participate in economic production due to limitations of technology and commercial mode previously in social and economic operation. The mode of the digital economy breaks spatial and temporal limits, solves the problem of social and economic information asymmetry, and recombines idle resources in society and reuses them in multiple ways, to maximize social benefit. As a new commercial mode based on sharing of idle items and services in the age of Mobile Internet, its idea and developmental mode have penetrated various industries. The digital economy is a key trend in the economic transformation and upgrading under the new normal of the

Chinese economy, which is of great significance for the elimination of social and economic information asymmetry, the innovation of the mode of economic development, as well as rapid economic growth [1].

Since the strategy Internet Plus is brought up in 2015, the digital economy enterprises have flourished and gradually penetrated various industries, such as finance, lease, and medicine, with diverse modes of development. For example, the most well-known DiDi represents a typical mode of product sharing, which engaged in the flight of transportation and travel using equity financing. Zhouchou.com, Renrendai.com, and Lu.com have swept the whole country with the mode of finance sharing. Xiaozhu.com, E-Express, Ma3 Office, and SOHO 3Q grow rapidly through the mode of space sharing. The mode of promoting the digital economy through big

data technology is spreading into and integrating with various industries. Relying on big data technology, digital economy enterprises have achieved rapid growth. However, as many accompanying problems are increasingly prominent, such as information security, privacy protection, and supervision, it is difficult for the digital economy to sustain itself by only relying on big data technology. In virtue of its characteristics, such as encrypted sharing and distributed ledger, blockchain technology provides new methods and ideas for data circulation and sharing, complementing big data technology mutually. Therefore, this mode can not only conquer the bottleneck of big data technology but also serve the digital economy better. Besides, the gradually maturing big data technology also needs an application entity to embody its value. The complete integration of big data and blockchain, two independent internet technologies, will require the solving of technical problems, as well as a fusion of them by the government and enterprises through the market. As a kind of internet technology more advanced than big data technology, blockchain retains the openness, equity, and interconnection characteristics of the internet with higher security and accuracy. Therefore, when the development of the digital economy that relies on big data technology is stagnant, the future of the digital economy will be improved by the integration of blockchain technology into various fields of the digital economy (such as finance, medicine, and energy) to play the technical advantage of blockchain by the internal optimization, transformation, and upgrading of the developmental mode of the digital economy. Therefore, the integration of blockchain technology and big data technology will improve and upgrade the developmental mode of the digital economy and overturn the traditional business mode of the digital economy, creating brand new opportunities for the development of the digital economy [2].

The near-zero cost of information transfer is the epochal precondition for this blockchain movement. Through the popularization of blockchain technology, the traditional internet based on information is transformed into a value-based internet. The status of the traditional economy is mapped into the virtual world, further integrating reality and virtuality. In respect of economic nature, the popularization of blockchain is an asset transfer movement. Traditional economic behavior, including currency issuance, will be virtualized. Centralized and intermediate traditional organizations will retire step by step. AI will be combined with IoT, and the time for resource collaboration will come. Tokens will become the tool of value circulation in the age of AI and IoT. USD will gradually quit circulation in the future. The popularization and solution of blockchain technology are the results of the transition in respect of wealth from centralization to decentralization and collaboration since the industrial age. The maturity of quantum technology in the future will end this movement [3].

Connotation and Evolution of the Digital Economy

The fourth industrial revolution and the transformation of industries gave rise to the rapid change of the environment of new technology and have a great impact on the economy. New economies such as the digital economy and the digital economy evolve.

As a kind of internet technology more advanced than big data technology, blockchain retains the openness, equity, and interconnection characteristics of the internet with higher security and accuracy. With the development of the digital economy, digital storage and trade can be applied to any asset. Based on the function of blockchain and big data, the digital economy of current China will flourish and have a positive effect on the development of the digital economy.

Connotation of the digital economy

With the advent of the global digital era, the digital economy has not only become an important engine for promoting economic development, but also an important strategic foundation for a new round of scientific and technological revolution in various countries. Countries attach great importance to the development of the digital economy, accelerate the introduction of the digital economy strategy, promote regional digital economy cooperation, and gradually form a global digital economy development pattern in the new era. With the emergence and application of the internet, people's idle resources are utilized to the max extent, and their sharing lifestyles also develop. The digital economy emerges as a new economic model. With the continuous advancement of digital transformation and upgrading of traditional industries and the continuous development of emerging industries led by digital technology, the degree of digitalization of the global economy continues to deepen, and the digital economy, as a new economic form, has become an important engine to promote economic growth. The digital economy injects momentum into economic growth from three main aspects: First, the development of the digital economy drives the improvement of total factor productivity. As the contribution rate of traditional factors such as labor to economic growth gradually decreases, the digital economy has become an important way to improve total factor productivity. Second, the development of the digital economy promotes the optimization of resource allocation efficiency. The deep integration of digital technology and the real economy provides support for the digitalization of the real economy and promotes the gradual construction of cyberspace that presents the real world in the form of data. The intrinsic mechanism of cyberspace is the role of the time-space integration of production systems, natural systems, and living systems, which highly connects the subjects in economic activities through rapid information dissemination speed, so that the resource penetration, integration, and coordination capabilities in the economic system are greatly improved, thereby reducing the cost of market transactions and resource allocation, and continuously promoting and optimizing resource reorganization and aggregation. Third, the data elements generated by the digital economy further promote the improvement of total factor productivity and resource allocation efficiency. As a key factor of production in the digital economy, data overcomes the resource endowment constraints and marginal productivity reduction constraints of traditional production factors. On the one hand, the organic combination of data with other production factors such as capital and labor to enter the production, distribution, circulation, and consumption links can effectively change the input mode of traditional factors and optimize the efficiency of factor allocation.

tion. On the other hand, data elements have a wide range of applications and high penetration, and through the input and application of all walks of life and various production links, the input mode and structure of traditional economic activity factors are changed, and the industrial structure is driven to change to information-intensive, knowledge-intensive, and technology-intensive, thereby promoting the improvement of total factor productivity [4,5].

From the development of the digital economy, it can be found that the digital economy emerged through the transformation from information sharing involving no trading to online and offline resource exchange involving trading. Thus, the sharing business mode formed. Since 2010, the O2O business mode of Uber and Airbnb start to emerge and has gradually been accepted and demanded by the public. In both the taxi market and house lease market, it appears potential consumption and market inclusiveness. As the originator of business modes of the digital economy, they provided the referable theoretical basis and successful experience for the digital economy in other fields in this age of the digital economy.

Elements and types of the digital economy

Digital economy refers to a series of economic activities with the use of digital knowledge and information as key production factors, modern information networks as important carriers, and effective

use of information and communication technology as an important driving force for efficiency improvement and economic structure optimization. At present, the deep integration of general-purpose technologies represented by new-generation information technologies such as artificial intelligence, big data, cloud computing, Internet of Things, blockchain, and 5G with the real economy has promoted the rapid development of the global digital economy, driven profound changes in traditional production methods and industrial structure, and accelerated the formation of emerging industries. The digital economy has become a key force in reorganizing global factor resources, reshaping the global economic structure, and changing the global competition pattern [6,7].

Rapid development of the digital economy

After the financial crisis, the digital economy grew rapidly in the world, especially in the US. It constantly expanded to over a hundred countries in Asia-Pacific, Africa, and other regions. The digital economy quickly penetrated from the original fields, such as auto and housing, to many other fields and segments, such as catering, space, logistics, education, medicine, and infrastructure. Besides, it also accelerated the expansion to more fields, such as agriculture, energy, production, and urban development. A batch of representative enterprises and platforms of the digital economy has grown up (Figure 1).

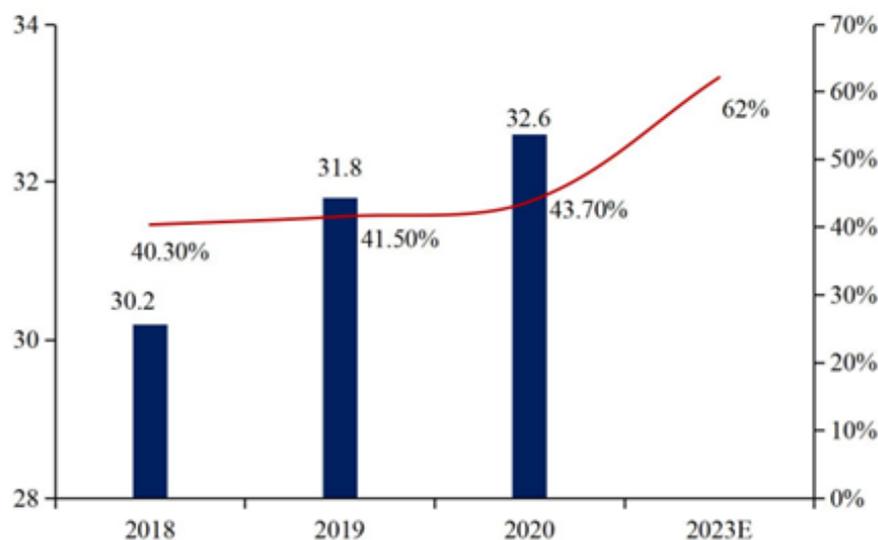


Figure 1: The Scale and Proportion of Digital Economy in Major Countries in the World from 2018 to 2023

Sources: CAICT; IDC

As there is no uniform official data, various institutes estimate the total volume of the digital economy mainly by two indexes: trading volume and financing volume. As in its research report, the scale of the digital economy in China reached RMB 45.5 trillion. The report shows that at present, China's digital economy has spawned nearly 100 kinds of just-in-demand occupations, mainly distributed in agriculture, manufacturing, service, and other fields, and the in-

dustry talent gap exceeds 10 million, taking digital twin application technicians as an example, related occupational recruitment enterprises have increased by 225.52% in 3 years, and digital careers have broad prospects and have become emerging hot occupations. CAICT also previously released the Global Digital Economy White Paper (2022). The white paper points out that the digital economy provides important support for global economic recovery. In

2021, the estimated added value of the digital economy in the 47 countries was 38.1 trillion US dollars (about 265.94 trillion yuan), a nominal increase of 15.6% year-on-year, accounting for 45.0% of GDP. With the prevalence of the digital economy, a great deal of newly established enterprises grew rapidly, and many “unicorn companies” emerged [8].

The number of global unicorns is at a record high, and China and the United States maintain leadership. In terms of total volume, according to CB Insights, as of February 2022, the total number of unicorn companies with a valuation of more than \$1 billion in the world exceeded 1,000. By region, the top five unicorns are in the United States, China, India, the United Kingdom, and South Korea, of which the number of unicorns in China and the United States accounts for more than 70%. Global unicorn valuations have reached a new level, and the head effect is emerging. The total valuation of global “super unicorns” of more than \$20 billion accounts for 23% of all unicorn valuations, and the overall valuation of unicorns of

more than \$10 billion accounts for more than 35%. In terms of geographical distribution, the United States and China still have the largest number of head unicorns. Among the 40 most valued unicorns in the world in 2021, there were 20 in the United States and 10 in China; There are 3 in the UK; 2 in India; The remaining Australia, Brazil, Germany, Singapore, and Sweden have one each. Compared with traditional industries, the development of the digital economy is more rapid and easier. By comparing the housing lease and auto rent industries with traditional hotel and taxi industries, it can be found that the market of traditional industries kept increasing its saturation as a result of higher trading and time cost and various limitations forming by these industries. However, the digital economy emerged. For example, Airbnb achieved great success in the past few years and such success of operation attracted new financing constantly, see Table 1. Through the development in five years and 10 months, the valuation of Airbnb has reached USD 30.1 billion, making it a non-listed company with the highest valuation.

Table 1: Summary of the Function and Future of Blockchain Technology.

Elements	Function	Future
Policies and Measures of Government	Support the research and development	Promote regulation and public policy
Research of Academic Circles	Conduct in-depth research on the theoretical basis	Find potential problems and new application
Application Experience of Industries	Establish and apply blockchain technology	Detect a technical defect and improve the possibility of application in practical fields

The huge gap between global digital infrastructure construction and core technology fields has led to the global digital divide still obvious. From the perspective of the scale of the digital economy, high-income countries and developed economies account for most of the global digital economy. In 2020, the added value of the digital economy in 47 sample countries around the world was 32.6 trillion US dollars, and the added value of the digital economy in the United States was 13.6 trillion US dollars, ranking first in the world for many consecutive years, and the added value of China's digital economy was 5.4 trillion US dollars, ranking second in the world. The countries with an added value of the digital economy exceeding trillion US dollars are the United States, China, Germany, Japan, the United Kingdom, and France, with a total scale of 26.9 trillion US dollars, accounting for 82.4% of the total scale of the 47 sample countries in the world, and the head effect is significant. According to forecasts, the total size of the 47 sample countries will reach 85% by 2025. From the perspective of different income levels and development levels, in 2020, the size of the digital economy in high-income countries exceeded 25 trillion US dollars, about 4 times that of upper-middle-income countries and 36 times that of low- and middle-income countries. The scale of the digital economy in developed countries is about 74.8% of the total global scale, and the proportion of developing countries is 25.2%, and high-income countries and developed countries have obvious advantages in the field of the digital economy [9-11].

From the perspective of the growth rate of the digital economy, the digital economy in middle- and high-income countries has grown rapidly, and low-income countries have experienced

negative growth in the scale of the digital economy during the epidemic. The least developed countries are moving away from the center of the world at an accelerated pace. Although the national economies of developed economies, high-income countries, and middle-income countries have suffered negative growth, the scale of the digital economy has maintained growth, which has played an important supporting and buffering role in the traditional economy and shown stronger resilience. Low- and middle-income countries faced the twin shocks of digital economy regression and traditional economic contraction during the pandemic, falling into a vicious circle. The scale of China's digital economy grew by 9.6% year-on-year in 2020, ranking first in the world, and the scale of GDP increased by 2.3%.

Developmental Barriers to The Digital Economy Relying on Big Data

As the Chinese economy has stepped into a new normal, the demographic dividend has disappeared and environmental pollution is aggravated, the digital economy is an inevitable trend in the transformation and upgrading of the Chinese economy. Especially after the strategy Internet Plus was proposed, the developmental mode of driving the digital economy by big data is diffusing and integrating into traditional industries. The digital economy enterprises relying on big data have grown rapidly but still face many barriers.

Unimproved basic data and big data technology

The key to the development of the digital economy is the accu-

racy of the collection and analysis of credit data. In the mode of a traditional digital economy, basic data is mostly subject to oligopoly. The ability of enterprises to real-time dispatch and control data shall be enhanced. Even if some small enterprises have new and innovative modes of the digital economy, it is hard to realize such modes. Therefore, the lack and deficiency of credit data have greatly hindered the development of financial institutions. In addition to different informatization degrees in various industries and the severe lack of basic data, original data is inaccurate, because the big data sharing and transmission mechanism among industries is undefined and there is no specific and uniform standard for data information between industries, resulting that collected data cannot be used directly before further processing and translation. Therefore, we need new technology to start a data reform, making data a social public resource and infrastructure like water and electricity in daily life. Such technology is blockchain. The maturity and security of big data, an underlying technology for the operation and development of the digital economy, needs to be improved [12].

Different informatization degrees in various industries and the severe deficiency of credit data

As an underlying technology for the operation and development of the digital economy, the maturity and security of big data will determine the sound development of the digital economy, because the key to the development of the digital economy is accuracy during the collection and analysis of credit data. Especially, the lack and deficiency of credit data have greatly hindered the development of financial institutions. From a macro perspective, although there are various data in society in the age of the internet, original data is inaccurate because there is no specific and uniform standard for data information between industries, resulting that collected data cannot be used directly before further processing and translation. Meanwhile, as the big data sharing and transmission mechanism among industries is undefined, data may be lost during transmission, which will also prejudice the accuracy of data. From a micro perspective, those enterprises with data advantage are not willing to make public their data due to interest since more data means more opportunities to earn profits. Besides, as individual, and corporate privacy may be included in data, they do not like to make data public due to security. As shown above, currently, the maturity and security of big data are unimproved, which has greatly hindered the further development of the digital economy [13].

Data of the digital economy cannot guarantee information security and safety regulation needs to be enhanced.

The right of use for commodities is complete in the traditional economy, which is obtained by purchasing and can be separately utilized by the owner. While the digital economy collects and centralizes scattered resources in society and achieves additional benefit by transferring the right of use for commodities at a certain time. When the right of use and the ownership is combined, information data is occupied only by the owner, so the security of such information data can be guaranteed. When the right of use and the ownership are separated, they will be shared by many persons, which will lead to the leakage of the information and privacy of custom-

ers. With the increasingly growing data size of sharing data systems, excessively centralized data is easy to suffer theft and loss. The information and data of customers are increasingly grasped by others. As the owner of the information, the customers don't know how their information and data will be used and where it will go after collection. Besides, in the age of the digital economy, scattered social resources will be efficiently used by various combinations and distributions, and the right of use for data, information, and commodities is shared by many persons. For example, the use of bike sharing requires the user to scan the QR code and fill in personal information via social software. However, because of the lack of regulation, the data of the digital economy cannot guarantee the security of personal information, and the leakage risk of customers' privacy increases accordingly.

Feasibility Analysis of the Application of Blockchain Technology in the Digital Economy

The value of blockchain technology

Blockchain is a kind of digital, decentralized, and distributed ledger. As a decentralized system and distributed database technology, blockchain is a kind of technology that links relevant data in single blocks to form a central system in a cycled chain pattern by encrypted signature verification. In a blockchain system, each single block node has complete information about the system and all information is traceable. The technology of blockchain can help eliminate information isolated islands and improve the efficiency of resource utilization. The traditional big data sharing form has a high requirement for hardware, while the data sharing of blockchain adopts the mode of node synchronization. As long as the data storage is finished at a node, all other nodes in the blockchain system can query the new data. Relying on the ability of big data technology to collect and analyze data, plus the storage mode, confidentiality, and low use cost of blockchain technology, the collection and updating of data will be accelerated, ensuring real-time sharing of data [14].

In addition, the traditional development mode of the digital economy relies on internet technology which is featured by the high speed of information transmission and low cost, which can collect idle resources in society. As additional resources are used to create value, the cost of value creation is much less than the cost for enterprises to provide products and services. As an internet technology more advanced than big data and in virtue of many characteristics, such as decentralization, trust-free, reliable data, and non-tampering, blockchain can not only help eliminate information isolated island, improve the credit system, improve the industrial ecological system, and improve resource utilization rate. In virtue of trust-free, decentralization, reliable data, and other features, the fusion of blockchain technology and big data technology can not only conquer the bottleneck of big data technology but also provide new methods and ideas for the development of the digital economy, to upgrade the developmental mode of the digital economy and promote the rapid growth of the digital economy. In other words, the fusion of blockchain and big data technology has greatly promoted the development of the digital economy and improved the

commercial mode of the digital economy. Therefore, the mode of the digital economy "Blockchain + Big Data" will help more efficient utilization of resources, solve the problem of information isolated island and information asymmetry, and improve resource utilization efficiency.

Feasibility of the application of blockchain technology in the digital economy

By digital encryption and non-tampering of data, smart contracts based on blockchain technology can achieve efficient management of assets. Given the technical characteristics of blockchain technology, if blockchain technology is applied to the actual economy, it will link up the social economy, improve asset management efficiency, and intelligent social assets, optimize the social structure, and create many other business values.

First, in virtue of its characteristics of being trust-free and open, blockchain technology may optimize the social structure and help improve the credit system. This technology distributes data in each node inside the blockchain, so it is hard to steal such data. With the technology of blockchain, the uploading and query of data adopt the mode of P2P, namely point-to-point. Both sides of a trade can query the credit record of the other side in the blockchain system, which can help eliminate the defects of traditional credit collection and improve the reliability of credit information. The authority of data query can be set for each node in the blockchain. If one needs to query data in this node, he shall have the key and address to access the data, which can ensure the security of data. Besides, in a blockchain system, one can freely browse the information in the node when he has obtained the key of such node, facilitating the search for information. The technology of blockchain can ensure that all credit data is public and transparent without any forgery, which can be used as credit endorsement. In addition, as for public decision-making, the traditional mode of voting may lead to favoritism and fraud. However, if the voting is conducted by the distributed ledger with complete trust-free in the blockchain system. Voters can completely trust the result of the voting, to optimize the social structure. Therefore, the blockchain is a kind of reliable database that executes commands completely according to machine language. In virtue of its feature of being trust-free, it can effectively solve the problem of credit in economic trading, and thus improve the efficiency of social and economic management [15].

Second, in virtue of its characteristics of being trust-free and open, blockchain technology may optimize the social structure and help improve public policy. The trust-free and openness of blockchain technology make possible decentralized autonomy of the society, namely social participants have the same right and duty in a standard system of circulation. The advantage of blockchain is that its information recording and reading require verification each time. Since an actual trade process requires many times of information recording and reading, trading in the blockchain system requires much verification to achieve the final purpose of the trading. Therefore, the technology of blockchain that executes commands completely according to machine language is a reliable database, which can effectively solve the problem of credit in economic trading. The data and information in a blockchain system are non-tam-

perable. The data sharing of blockchain adopts the mode of node synchronization. As long as the data storage is finished at a node, all other nodes in the blockchain system can query the new data, ensuring real-time sharing of data. Based on the design idea of the blockchain system, any modification of data information in the system requires the grasping of over 51% of nodes in the system. As for nodes in a single participating block, it will be impossible for them to grasp 50% of the data information in the blockchain system. Therefore, in virtue of its characteristics of being trust-free and open, blockchain technology may optimize the social structure and help improve public policy [16].

Besides, in virtue of its feature of non-tampering, the technology of blockchain can improve the efficiency of social and economic management. This technology of blockchain will establish a new value network. In virtue of its feature of non-tampering, blockchain can establish a value network that is safer than the current internet. In a value network based on blockchain technology, enterprises can freely enjoy their products and services, and consumers can also share their extra resources. Compared with the economic market, the value network of blockchain has no absolute monopolist. Each participating node in the blockchain system has the same advantage in respect of the information, which is consistent with the connotation of the digital economy. In addition, the electronic currency Bitcoin uniquely owned by blockchain technology can achieve good cooperation among countries and industries, effectively solve many problems that hinder the integrated development of industries and global integration, such as law and exchange rate, conquer the barrier of information sharing among industries and fully realize the health and transparent development of industries. Smart contract means that, in the current legal system, contract codes are written into the underlying layer of a blockchain system and can not be modified, to ensure that trade will happen whatever the cause is, and effectively prevent any dispute arising from credit issues.

Change of the Digital Economy Mode by Blockchain Technology and Status of the Application of Blockchain Technology in the Digital Economy

Change of the digital economy mode by blockchain technology

The change in the digital economy caused by constantly developed blockchain technology is increasingly prominent. The processing of internet information by blockchain has revolutionarily changed the development of the digital economy, achieved sustainable development of the digital economy, created advantages that the traditional economic development mode does not have, and promoted the transformation of the internet from information-based to value-based. Based on the development of the digital economy, the technology of blockchain is used to achieve development and innovation, revolutionarily changing the business mode of the digital economy.

Innovation of existing economy mode by blockchain technology

Initially, by connecting strangers on a platform, the digital economy conducted the integration of resources and information, to ef-

fectively allocate idle resources, reduce the cost of trade and time, and achieve mutual benefit and win-win results among consumers. However, the traditional digital economy has defects in respect of information processing and collection, namely a lack of exchange and communication among platforms and isolation between trades of each platform. In such cases, multiple platforms have not only scattered consumers but also hindered the effective allocation of idle resources. To obtain more information resources, participants in the digital economy have to register as users on various platforms. But they cannot freely cross between platforms, making credit accumulation unstable and increasing trade costs between entities. The incompleteness and asymmetry of information hinder the development of the digital economy. The development of blockchain technology effectively prevents these issues.

Technical base for the innovation of the digital economy by blockchain

The digital economy is derived from a series of physical sharing platforms, such as Uber and Airbnb, and achieves the sharing of idle capacity by linking up different users. However, the digital economy is a centralized system formed in 2010, which achieves information and resource sharing by commercial organizations or platforms founded by the government. With the development of the internet, the technology of communication and cryptology also keeps advancing. The application of blockchain in the digital economy also keeps developing. With the decentralized mode of information creation, the digital economy has achieved broader expansion. The technology of blockchain promotes the development of the digital economy in two aspects. First, under the internet conditions, the blockchain innovates the application of the internet and achieves fundamental change for the internet in respect of information technology. Second, the trust conditions that the digital economy relies on are also quantized through blockchain technology. To sum up, the technology of blockchain provides the digital economy with a natural development platform.

The core and key of blockchain technology is decentralization, which just matches the wide sharing behaviors of the digital economy. The application of blockchain-based distributed ledger improves and develops the digital economy that mainly relies on the internet and credit mechanism, facilitating the allocation and effective utilization of resources, reducing trade costs constantly, and conquering problems that cannot be solved by systems and laws.

Problems and Developmental Countermeasures of the Application of Blockchain in The Digital Economy Mode

Challenges in the application of blockchain in the digital economy

Although the application of blockchain in Bitcoin is well known, such technology has not been generalized in the digital economy, because there are many prominent problems during the application of blockchain in the digital economy even if such technology has so many advantages.

The development of blockchain is restricted by an existing state institution

On one hand, in virtue of its feature of decentralization, blockchain evades the regulation of the state, impacting the economy of such a state. For example, its application in Bitcoin embodies strong autonomy, which can ignore the currency-issuing mechanism of central banks, affecting the mode of currency circulation and harming the stable and efficient development of the economy. On the other hand, relevant authorities have not formed mature regulative technology for the application of blockchain. As a kind of revolutionary technology in respect of information creation, blockchain has not acquired effective regulation. So, the broad application of blockchain will lead to huge instability and risk.

The integration of blockchain technology into the digital economy requires great cost.

Although the development of the Chinese digital economy is rapid, it is still not mature. And blockchain technology is still not developed. In the current situation, the technology of blockchain faces a lot of problems. The integration of blockchain into the digital economy will increase the operating cost of financial institutions. The relevant risk and instability are prominent. Therefore, banks have not taken into consideration the application of blockchain.

Blockchain is not mature at a technical level

Although many solutions have been proposed for problems of blockchain, such as Lightning Network, Chinese blockchain technology is still not mature. On one hand, the technology of blockchain is still in the early stage of development, and even developed countries have not improved their blockchain technology. On the other hand, China invests less in the research of blockchain than developed countries. The utilization of blockchain by China is also less than that of developed countries, causing inadequate experience. Besides, the threshold for blockchain is relatively high, which is not practical for entities in small markets.

Developmental Countermeasures for Accelerating the Integration of Blockchain and the Digital Economy based on Big Data Technology

Promote the rapid fusion of big data and blockchain at a technical level

With the ongoing development of the digital economy, the integration between blockchain and big data technology is an inevitable trend. On one hand, the technology of blockchain can conquer the bottleneck of big data technology, to serve the digital economy better. On the other hand, the gradually maturing big data technology also needs an application entity to embody its value. The complete integration of big data and blockchain, two independent internet technologies, will require the solving of technical problems, as well as a fusion of them by the government and enterprises through the market. As the technology of big data has developed for a period, it can be seen as a relatively mature internet technology. Therefore, in actual operation, it is relatively easier to integrate blockchain (as a new technology) into big data technology with big data technology

as a carrier. First, it is relatively easier to integrate blockchain (as a new technology) into big data technology with big data technology as a carrier in actual operation. Blockchain technology can be used as a data collection technique for big data technology platforms to eliminate data-isolated islands. With current computer technology, as long as a set of programs and interfaces meeting the requirement of blockchain technology is developed for big data platforms, the fusion between blockchain technology and big data platforms can be achieved directly and served and the integration of blockchain technology and big data technology can be achieved directly. Second, data stored in the blockchain system can be freely traded as assets in big data platforms, to integrate these two technologies. For example, a data credit system can be established. When an enterprise uploads data into the blockchain system, some credit can be assigned by the system based on the value of such data. When an enterprise requires to query data, some credit will be deducted. By deeming data as assets, the integration between blockchain technology and big data technology will be achieved in the form of trading.

Government promotes the integration of blockchain and big data technology

Blockchain is a kind of mature internet technology. In nature, it is a distributed database technique and an underlying technique of computers. As indicated in a research report issued by McKinsey in 2016, the technology of blockchain is a revolutionary technology after the steam engine, electric power, and internet technology. The advantage of blockchain is that its information recording and reading require verification each time. Since an actual trade process requires many times of information recording and reading, trading in the blockchain system requires much verification to achieve the final purpose of the trading. In virtue of its feature of being trust-free and open, blockchain can optimize the social structure and improve public policy. The trust-free and openness of blockchain technology make possible decentralized autonomy of the society, namely social participants have the same right and duty in a standard system of circulation. Data information is stored in a single block in the blockchain system, forming a cycled chain from single blocks by encrypted signature verification. In a blockchain system, each single block node has complete information about the system and all information is traceable. Therefore, the government shall issue laws and regulations on big data and blockchain, to enhance the regulation of data information. Besides, the government shall also provide technical and financial support for industrial transformation and pay attention to the combination of industries, universities, and research in the digital development of industries. It shall formulate uniform standards for the digital development of industries and encourage universities or research institutes to cooperate with industries in digital transformation. Government shall put up the digital development of industries as a national strategy and push ahead with digital reform in various industries.

Enterprises promote the integration of big data and blockchain technology

Blockchain technology is a distributed storage technology in nature and an underlying computer technology. With current com-

puter technology, if a set of programs and interfaces meeting the requirement of blockchain technology is developed for big data platforms, the fusion between blockchain technology and big data platforms can be achieved directly and served and the integration of blockchain technology and big data technology can be achieved directly. Enterprises shall establish and improve uniform standards for the digital development of industries step by step, make use of the validation of data by blockchain, and use blockchain data as the data source of big data platforms, to protect the security of data. Blockchain alliance platforms shall be established separately to add enterprises (as nodes) in an industry into the blockchain system, to provide the foundation for the development of blockchain and big data technology. Meanwhile, the combination of industries, universities, and research in the digital development of industries shall be paid attention to. Universities or research institutes shall be encouraged to cooperate with industries in digital transformation. Only economic entities with authority can access data, to form a benign development cycle of difficulty encountering, difficulty solving, and difficulty discovering. Additionally, enterprises can cooperate with universities to foster internet versatile talents for blockchain or big data technology or recruit talents with internet skills through education and training institutions as a reserve of talent.

Enlightenment of Blockchain Technology for the Chinese the Digital Economy in the Future

Chinese blockchain technology is still developing, but its application prospect tells us that grasping this developmental opportunity will create a good future for the Chinese digital economy. When the digital economy has become an inevitable trend in the development of the Chinese economy, the development of the digital economy driven by blockchain is extremely urgent. China shall invest plenty of funds and human resources in the research of blockchain technology and strive to grasp core technology, which will promote the sustainable development of the Chinese economy.

Chinese blockchain alliance shall be established with great effort

In the trend of economic globalization, blockchain alliance has been a mainstream trend. Such alliances can not only achieve technical sharing but also form blockchain organizations, to promote the development of blockchain technology among different alliances. The sharing mode of financial institutions is the main pattern of blockchain alliances. Currently, R 3 launched by R3CEV is the largest blockchain alliance in the world. The blockchain technology advocated by R 3 will be rapidly applied in international financial payment and clearing. This alliance has absorbed 43 banks across the world. R3 alliance aims to establish common standards. Technical giants like Microsoft, IBM, and Amazon provide technical support for this alliance. Multi-cooperation will reduce the cost of collaboration.

Research of blockchain technology and establishment of infrastructure platform shall be promoted

The keyword for the research of blockchain technology is to solve the problems in the application of blockchain technology, in-

cluding industrial regulations, risk control, and business scenario. The establishment of infrastructure platforms for blockchain shall also be paid much attention to. Research shall be conducted in respect of the regulation policies of blockchain. The government shall invest a great deal of research funding in respect of the establishment of research platforms for blockchains. The academic circle shall conduct in-depth research on the theoretic basis of blockchain technology and find out those industries to that blockchain technology may be applied, as well as potential problems during such application, to lay a solid foundation for the actual application of blockchain. Especially, different algorithms in various fields shall be combined, to guarantee the feasibility, safety, and applicability of the technology. The industrial circle shall actively attempt to establish blockchains, apply blockchain technology in various industries, and detect a technical defect in practical application, to improve the possibility of application in practical fields.

Talent cultivation for blockchain technology

The cultivation of talents determines the depth and width of the development of blockchain technology in the future as blockchain can be applied in other industries requiring decentralization, the application of blockchain in different demands different professional talents. For example, the application of blockchain in the financial field requires the combination of professional financial talents with education in blockchain technology, to meet the requirement of practical application. Currently, the research on blockchain technology demands professional teams, which requires not only funds but also advanced theories. Therefore, the cultivation of talents for blockchain cannot be achieved by private organizations. Government shall organize, and institutions shall provide funds for, talent cultivation and research on blockchain technology. The talent deficiency will not be conquered unless the State pays much attention to talent cultivation and the demand for versatile talents (Table 1).

Conclusion

Based on the analysis in this paper, the digital economy has become an inevitable trend in the development of the Chinese economy. However, there still are some problems in the development of the digital economy, which requires us to find proper solutions. The use of blockchain technology is one of the approaches to the development of the digital economy. Besides, because of its features of decentralization, the ability, and the form of point-to-point information processing, blockchain technology has become a key approach to solving the information asymmetry caused by the centralization of digital economy platforms. The development of the internet is the precondition for the application of blockchain technology. Currently, the internet is transforming from information-based to value-based, promoting internet reform and governance based on consensus, sharing, and co-governance. The development of blockchain also enhances the value credit system online and offline, quantizes the credit degree, crystallizes the establishment of a credit mechanism, and strives to build a credit system and mechanism for social communication and product & service trading. As a whole, blockchain technology is an inevitable path in the development of the digital economy and social life.

All circles think highly of the value and prospect of blockchain technology. However, as a brand-new technology, blockchain also accompanies potential risks. Public authorities and the legal system of the government shall learn about and embrace this new technology and conduct proper adjustments in management philosophy. Besides, the technology of blockchain itself shall meet the requirements of the government's regulation and shall not develop itself freely. As long as both can mutually embrace and integrate, this technology can promote efficiency, control risk, and push ahead social development.

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Conflict of Interest

No conflict of interest.

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