

# Practice and Reflection on the Application of Blockchain Technology in the Guangdong-Hong Kong-Macao Greater Bay Area

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**Abstract:** Blockchain technology has now entered the 3.0 era with solutions of "Blockchain Plus Industry". As a technological innovation and industry-leading region, the Guangdong-Hong Kong-Macao Greater Bay area has inherent advantages in the development of blockchain technology. How blockchain can lead the development of industry ecology in the future is a question worthy of our in-depth discussion. By analyzing the policy support and basic status of the Guangdong-Hong Kong-Macao Greater Bay Area, this paper sorted out the structure of the four-level characteristic development mode of blockchain technology, summarized the impossible triangle of technology, incompatibility issues, standard construction, supervision and other issues, and put forward relevant suggestions for the development of the blockchain in the Guangdong-Hong Kong-Macao Greater Bay area.

## 1 Introduction

In the 18th collective study of the Political Bureau of the CPC Central Committee, General Secretary Xi Jinping emphasized that the integrated application of blockchain technology played an important role in new technological innovation and industrial change, which means that the development of blockchain technology has become a national strategy. In the development plan of the Guangdong-Hong Kong-Macao Greater Bay Area, blockchain technology, as an important breakthrough in the independent innovation of core technologies, is the driving force for the economic development and scientific and technological progress of the Greater Bay Area.

## 2 Blockchain application scenarios

Blockchain has the characteristics of distributed, shared and immutable, which can enhance trust and improve cooperation efficiency in multi-party cooperation. These advantages make blockchain highly concerned in industrial application scenarios. Many scholars analyze the application scenarios of blockchain mainly from the following aspects.

Shenzhen Special Zone News (2020)<sup>[1]</sup> proposed to promote the construction of the intellectual property interconnection chain of universities in the Guangdong-Hong Kong-Macao Greater Bay Area through the construction of public-owned chain combined with alliance chain, realize the application of blockchain in intellectual property, and solve the problems of long time and low efficiency in the confirmation of intellectual

property rights, high cost and difficulty in rights protection, and low utilization rate in the authorization. The application scenario proposed in this paper is to use the central CA, root CA and sub-CA for identity authentication, use the alliance chain for authorization, and store the ownership in the public chain. After the alliance chain authentication and authorization, the AI intelligent patent value evaluation system issues SMART coins to the patent owner to confirm the patent value and ownership. SMART currency is endowed with patent value and cannot be artificially hyped. It is a right affirmation tool with stability and security.

Wang Y. (2020)<sup>[2]</sup> pointed out that China Construction Bank has applied blockchain technology in domestic letter of credit, fortification, international factoring and other fields, which can improve timeliness, reduce operational risks and ensure the security of financial information.

Ye Y.Q, Wei M. (2020)<sup>[3]</sup> analyzed and pointed out that the Fintech industry incubation center of Guangdong financial high-tech zone of blockchain, including smart retail, supply chain finance, supply chain management, and blockchain security monitoring.

Yang X.M., Li X., Wu H.Q. and Zhao K.Y. (2017)<sup>[4]</sup> proposed that the characteristics of blockchain could improve the deficiencies in the regional collaborative innovation mechanism of the Guangdong-Hong Kong-Macao Greater Bay area, and solve the problems of system, trust and information flow in the development process.

From the government's policy level, industry level, education level of scientific research about big bay, Hong Kong and Macao to blockchain development.

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Zhong W. (2019)<sup>[5]</sup> present situation that the current large bay area standard system has not yet formed. The core technology needs to be overcome, relevant laws and regulations is not perfect, imperfect market mature, block chain lack of talent, etc. The research proposes that the development of blockchain in the Guangdong-Hong Kong-Macao Greater Bay area, its related industrial policies, planning and layout, research and development direction and application scenarios should be based on scientific research and demonstration.

### 3 The development status of blockchain in the Guangdong-Hong Kong-Macao Greater Bay area

Blockchain application scenarios in the Guangdong-Hong Kong-Macao Greater Bay area have covered all aspects of the industry application layer, including government administration, standard construction, education and scientific research, industry level, intellectual property rights, industry supervision, real estate developer lottery room selection application and so on. The application of the industrial map of blockchain in the Guangdong-Hong Kong-Macao Greater Bay area is in a leading position nationwide and has its own unique advantages in the world. Due to the different positioning of cities within the Bay area, the development of blockchain varies from city to city. Blockchain projects are concentrated in Hong Kong, Shenzhen and Guangzhou, and activities are concentrated in Macao. The development pattern of blockchain is coordinated and matched with the development outline of the Guangdong-Hong Kong-Macao Greater Bay area. As the core engine of regional development, Hong Kong, Macao, Guangzhou and Shenzhen concentrate on their scientific and technological innovation ability, complement each other's advantages, promote industrial upgrading by point and area, and promote the development of surrounding areas with technology.

With the establishment of the Guangdong-Hong Kong-Macao Greater Bay area blockchain alliance in Guangzhou in 2018, the number of registered blockchain enterprises has grown rapidly. As shown in Figure 1, by the end of 2019, there are a total of 20,602 registered blockchain enterprises in Guangdong Province, among which 6,820 are newly increased in 2019<sup>[6]</sup>, which is enough to reflect that the blockchain technology will usher in a more rational and scientific development under the support of supporting policies and institutions.

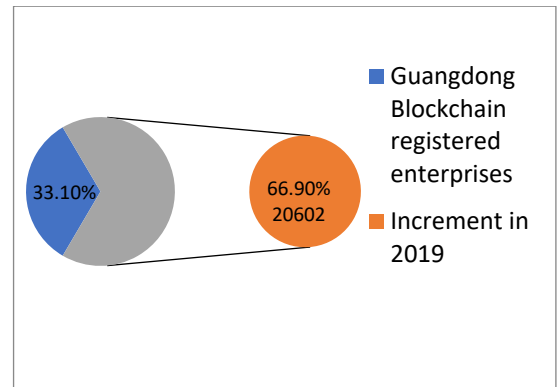


Figure 1. Inventory and increment of blockchain registered enterprises in Guangdong Province in 2019

Data source: collated according to interchain pulse statistics

#### 3.1 Policy support

Since the launch of blockchain planning in the Guangdong-Hong Kong-Macao Greater Bay Area in 2016, the state has formulated multiple policies to support the development of the Greater Bay Area, support the development of blockchain technology in the region, and strengthen the supervision of digital currency transactions. Thanks to the support of numerous policies, favorable conditions have been created for the development of blockchain in the Guangdong-Hong Kong-Macao Greater Bay area.

November 2016, Shenzhen Municipal Financial Office released the 13th Five-Year Plan for the Development of Shenzhen Financial Industry, which mentioned that it supports financial institutions to strengthen the research and exploration of emerging technologies such as blockchain and digital currency. In December 2016, the People's Government of Guangzhou issued the notice of Guangzhou City Accelerates the Development of IAB Industry 5-year Plan (2018-2022)<sup>[7]</sup>, which mentioned blockchain technology as a key field. In February 2018, the Securities and Futures Commission of Hong Kong issued the Securities and Futures Commission Warns Investors against Cryptocurrency Risks, which showed that digital currencies involving ICOs would be considered as securities and would be subject to supervision. In December 2019, Shenzhen Pilot Demonstration Zone Construction Action Plan (2019-2025) was officially issued<sup>[8]</sup>. Shenzhen Futian District will speed up the construction of the country's first digital currency building; In May 2020, the People's Bank of China, the Banking and Insurance Regulatory Commission, the Securities Regulatory Commission and the SAFE jointly issued the Opinions on Financial Support for the Construction of the Guangdong-Hong Kong-Macao Greater Bay area, proposing to support research on the promotion of innovative technologies such as blockchain, big data and artificial intelligence in risk prevention and financial supervision.

### **3.2 Four-level characteristic development mode of blockchain with industry**

According to the unique geographical advantages of the Guangdong-Hong Kong-Macao Greater Bay area, it is planned to develop in four key directions: blockchain with industrial manufacturing upgrading, blockchain with digital justice and digital government, blockchain with big data circulation and cross-border data financing, and blockchain with industrial think tank and talent base. With the implementation of more and more blockchain projects, the blockchain industry enters the scene of technology landing, and the application effect of blockchain development extends from the financial field to the real economy becomes more and more significant.

#### **3.2.1 Hardware and software infrastructure**

The Guangdong-Hong Kong-Macao Greater Bay area has dual advantages in software and hardware. A large bay area of Guangdong has the largest distribution center - Shenzhen global electronic market, as well as a leading manufacturing in Dongguan, international finance, shipping and trade center and international aviation hub of Hong Kong, has a perfect infrastructure construction and traffic configuration, more famous airport and fine port, the transportation is convenient, is a large bay area of Guangdong infrastructure construction has provided the important safeguard. A large bay area of Guangdong is also created the world's first article millions of TPS thunderbolt chain, a large bay area of Guangdong mill enterprise deployed 1.5 million nodes play, such as guest cloud block chain and improvement of the hardware and software infrastructure development complement each other, infrastructure promoted the innovation of chain block, block chain applications to promote the process of the construction of infrastructure. Financial service is the first application field of block chain technology in China, and the construction of financial infrastructure is relatively perfect. On this basis, the technology expansion, general applications and industrial applications of the Greater Bay area are more expansible and adaptable.

#### **3.2.2 Technical extension layer**

The technology extension layer includes technological iterations of blockchain technology itself attributes, such as consensus mechanism, smart contract, distributed ledger, etc., as well as cross-disciplinary applications combined with modern technologies, such as big data, artificial intelligence, Internet of Things, etc. The Guangdong-Hong Kong-Macao Greater Bay area has the largest concentration of BaaS/SaaS technology extension layer service enterprises in the world, including Huawei Cloud Platform and Tencent Cloud Platform. As a new technology of the infrastructure of digital economy, its characteristics of decentralization and difficulty in tampering make it capable of reconstructing models in many fields and have great potential to create a new ecology. Regardless of the development trend of blockchain itself or the trend of integration with other

technologies, the cross-innovation of blockchain and new generation technologies such as artificial intelligence, cloud computing, big data and the Internet of Things has laid a foundation for the future distributed business system.

#### **3.2.3 General application layer**

The geographical and institutional advantages of the Guangdong-Hong Kong-Macao Greater Bay area enable the general application of blockchain technology to be realized in Hong Kong and Macao, such as distributed exchanges, TokenFund, STO, gambling, e-sports, etc. The Guangdong-Hong Kong-Macao Greater Bay area shows diversity and extension in terms of blockchain ecological services, such as capital institutions such as Coin Capital and Huobi Capital; Incubators Guangzhou Yimi Incubator, Guangzhou Blockchain International Innovation Center Capital Machine, and successively produced rating agencies, training institutions, industry associations and other organizations serving the blockchain industry.

#### **3.2.4 Industry application layer**

Blockchain in the Guangdong-Hong Kong-Macao Greater Bay Area has an extremely rich range of applications. The technology has infiltrated into government management, education and scientific research, finance, logistics and other industrial fields, intellectual property, industry supervision and so on. In the aspect of government affairs management, in August 2018, Shenzhen Municipal Tax Bureau, Tencent and Kingdee cooperated to release the first research results of the application of blockchain withinvoice ecosystem in China and set up the application scenario of the whole invoice process management of WeChat payment -- invoicing -- reimbursement. In industry regulation, blockchain plays a crucial role in the financial industry. Blockchain, as a regulatory technology, can improve the accuracy and efficiency of internal compliance procedures of financial institutions, accelerate the construction of cooperative regulatory models, and acquire a certain degree of risk assessment ability.

## **4 Blockchain boosts the development prospects of the Guangdong-Hong Kong-Macao Greater Bay Area**

In the development outline of the Guangdong-Hong Kong-Macao Greater Bay area, it is necessary to give full play to the regional advantages of the Bay area, explore the characteristics of local economic development, and activate new potential energy of innovation and entrepreneurship. The implementation of the plan needs to rely on the innovation and application of technology. The value transfer of blockchain technology and the trust mechanism can meet the landing of the planning. Its applications are mainly summarized in the following aspects:

#### **4.1 Blockchain with social governance: intelligent services reshape the governance system of a diversified society**

The "9+2" institutional characteristics of the Guangdong-Hong Kong-Macao Bay area and the regional combination with their respective advantages have added more uncontrollable factors to the increasingly diversified social governance. Hong Kong and Macao society demands more personality, more dispersed, the history of Guangzhou culture deep, deep philosophy and traditional redundancy procedure is more, Shenzhen strong innovation consciousness, the concept of Shenzhen girl identity is strong, but crash culture is popular, Dongguan is a manufacturing hub, the characteristics of line for public health, Common problems, such as pollution, are difficult. Huizhou grows under the spillover effect of Shenzhen. The back garden style of social development has too much external influence and insufficient internal force.

Self and consensus are contradictory and unified. Blockchain technology can solve this problem of social governance. Blockchain technology, as a decentralized, distributed ledger of smart contracts, can create individual sections for each individual, which can intelligently record and track individual behaviors in real time. The links formed by each node can restrict each other, and a two-way incentive mode is formed based on Proof of Work (PoW) or Proof of Stake (PoS) to promote the consensus of the group. For example, in the initiative of low-carbon travel, the application of blockchain will record the daily travel behavior of each individual. Each record can only be automatically generated in the node according to the use of application scenarios. After the node is generated, it will be broadcast to all nodes, which cannot be tampered with and cannot be reversed. Given the corresponding material incentives for each method, each record generated will be able to accumulate digital currency or points, which can be used for consumption or issued with a certificate of entitlement. This virtuous circle mechanism will reshape the governance system of intelligent service society.

#### **4.2 Blockchain with fintech: a self-consistent decentralized trust mechanism to build a financial innovation platform**

Technological innovation is the core strength of the Guangdong-Hong Kong-Macao Greater Bay area, and also the potential of the Greater Bay area to compete with the other three bay areas in the world. Financial value as the transfer of industry has been in the application of the restriction of the trust factor to innovation practice, set up in the center of the block chain as value passed after the bridge of financial technology is endowed with the trust of the label decentralization, can high efficiency, low transaction costs to realize financial revenue and expenditure, payment and settlement, capital allocation, cross-border settlement of international trade and other business.

The core technology of blockchain technology applied in financial technology is P2P (Point to Point) peer-to-

peer payment method. According to the forecast of McKinsey & Company, P2P technology in B2B cross-border business settlement application can reduce the cost of each transaction by a total of \$11, of which 75% is the intermediary bank network cost and 25% is the compliance investigation and exchange cost. In addition to reducing transaction costs, the application of blockchain technology will provide financial industry into science and technology strength, establish effective communication between stakeholder body mechanism, coordinate with all concerned groups, with tamper-resistant, decentralized characteristics such as books and set up the stranger mutual checks and balances between the self-consistent trust mechanism, establish the platform of financial innovation.

#### **4.3 Blockchain with smart manufacturing: smart contracts give new impetus to the real economy**

One of the goals of the application of blockchain in the real economy is the intelligent manufacturing that can be customized to meet the increasing personalized needs. The manufacturing in the Guangdong-Hong Kong-Macao Bay area has always led the world. As the world factory in China, made in China looks at Dongguan, the Pearl River Delta area has a long history of resource advantages in the manufacturing field. Under the new normal manufacturing from the unity of the traditional factory production to change due to the need to become flexible production model, from the supply market dominance to demand led production mode transformation of supply and demand, from the supermarket stores marketing mode to public domain, the live and shop club deals such as flowers, blossoming operation way to reform the innovation, Not only in the public domain traffic to focus on, but also in the private domain traffic to explore the potential. The programmable feature of smart contract can meet the needs of various intelligence in the new real economy era.

#### **4.4 Blockchain with education: a new model of online education, innovative education, builds a talent pool**

The 2020 novel coronavirus attack on the global epidemic has led to a historical revolution in online education. Blockchain provides technical support for the change of online education mode, and also creates new educational demand for blockchain technical talents. It is predicted that by 2023, 10% of the world's GDP will be stored in blockchain or its technology. The application of blockchain to promote the development of online and offline education lies in credit management, learning certification and the development of online teaching platform. In addition to the application of blockchain in the field of education, it also creates an educational and training demand for blockchain talents. Blockchain talent cultivation is closely related to education. Among the world's four major bay areas, San Francisco Bay Area and New York Bay Area have taken the lead in opening blockchain-related courses, followed by Tokyo Bay Area

in Japan and Guangdong-Hong Kong-Macao Greater Bay area. According to the QS World 100, 15 schools in the New York Bay area are currently among the world's top 100.

Under the favorable policies, the Guangdong-Hong Kong-Macao Greater Bay area, relying on its superior geographical location, has a good economic foundation and a good hardware foundation. Now the blockchain with industry ecology has been basically formed, which has brought strong support for the subsequent development of blockchain. The current research question of blockchain is no longer about whether it can be applied to a specific industry, but how to apply blockchain to the industry. As a benchmark region for high-speed development in China, the Guangdong-Hong Kong-Macao Greater Bay area should not only focus on close exchanges among cities within the region, promote resource sharing and mutual help among all parties, but also apply technological innovation to a wider range of industries and regions to promote the spillover effect of blockchain technology. In the case of multiple factors tending to favorable development, based on policies, research strength and rich application scenarios, the landing and improvement of the blockchain with industry will bring a better and faster development trend than that of other Bay area.

## 5 Conclusions and Suggestion

As blockchain technology becomes more and more mature, the combination of application scenarios will become more and more close. This paper attempts to put forward solutions and construction suggestions from the following three aspects:

### 5.1 Strengthen legislative regulatory, accelerate standardization construction, and promote the scientific and orderly development of blockchain with industry

In the rapid development of blockchain application scenarios, it is necessary to accelerate the legislative process of blockchain with industry, improve legal construction, improve regulatory means, establish regulatory responsibilities of various institutions, and establish a sound regulatory governance system. In regulation, we can try traditional with innovative methods, such as establishing negative list with consensus mechanism and economic incentive mechanism. Setting up a negative list refers to setting up a negative list of industry codes of conduct, and companies that do not comply with the agreement will be blacklisted.

### 5.2 Pay attention to top-level design, build a sharing platform, and formulate the overall development plan of blockchain with industry

The development of blockchain technology has been elevated to national strategy. Under the favorable conditions of this major decision, the top-level design and planning of blockchain development should be done well,

and the development roadmap and time node table of blockchain with industry should be formulated. In the development of a large bay area of Guangdong blockchain, we can build a data sharing platform, promote the mechanism innovation, system integration. On the other hand, we can reduce the information asymmetry of inefficient communication, promoting Hong Kong and Macao large bay area with the international communication between interconnected, enhancing information transparency and trust. All can provide blockchain with industry build non-barrier development platform.

### 5.3 Give full play to the first-mover advantage of the Guangdong-Hong Kong-Macao Bay area, stimulate the ability of technological innovation, and reserve talents of blockchain with industry

The Guangdong-Hong Kong-Macao Greater Bay area is blessed with unique geographical advantages, and the pilot demonstration zone in Shenzhen provides infinite possibilities for the innovative economy of the Bay area. The open, trusting and fair environment provided by blockchain technology is conducive to reaching institutional consensus within the Guangdong-Hong Kong-Macao Greater Bay area, realizing coordinated regional development, and leading the rapid development of blockchain with industry. The Guangdong-Hong Kong-Macao Greater Bay Area should make good use of this opportunity to strengthen infrastructure construction, enhance inter-city exchanges within the Greater Bay area, train local professionals through universities, enterprises and associations, introduce international outstanding talents, and establish a talent pool for the development of blockchain with industry.

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[2]Blockchain with Cross-border E-commerce: Application and Future of New Technology Enabling E-commerce, a university-level scientific research project of Xinhua College of Sun Yat-Sen University (2019KYYB09)

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