A Study on the Challenges and Opportunities of Blockchain Technology Application in Cross-border Payment

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Abstract. Compared with the traditional foreign trade model, cross-border e-commerce businesses using blockchain technology brings a broader development space for foreign trade. With the booming development of cross-border e-commerce in China, issues such as cross-border payment, cross-border logistics, and product quality have also received attention. The smooth development of cross-border business is inseparable from the efficient development of cross-border payment and cross-border logistics. In terms of traditional cross-border payment methods, payment requires the participation of third-party institutions such as international cooperation organizations, takes a long time, and is costly. The use of blockchain technology's decentralization, information immutability, and openness solves exactly these problems, thus making cross-border payments an efficient and convenient development model that reduces costs, is open and transparent, and can trace the origin of products. This paper analyses the challenges and opportunities of blockchain technology in the field of cross-border payments in the light of the characteristics of blockchain technology, and puts forward effective countermeasures and suggestions.

Keywords: blockchain, cross-border payments, cross-border e-commerce

1 Introduction

In 2015, China established the China (Hangzhou) Comprehensive Pilot Zone for Cross-border E-Commerce, the Global Supply Chain Technology Innovation Application Pilot Site, and the Cross-Strait Cold Chain Logistics Cooperation Trial, and completed the national audit since being approved as a pilot project for the Comprehensive Experimental Zone for Cross-border E-Commerce, the scale of China's cross-border e-commerce business has been expanding. The growth rate was 31.1%. Among them, exports amounted to 1.12 trillion yuan, an increase of 40.1%. Cross-border e-commerce has become a new engine to promote the growth of China's foreign trade, how to improve efficiency, ensure information security and other issues are increasingly prominent.

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Blockchain technology is essentially a decentralized database with the characteristics of traceability, openness, and anonymity, which can solve the current problems of cross-border e-commerce.

2 Application of blockchain technology in cross-border payments current status

The blockchain concept was first introduced by Satoshi Nakamoto, the founder of Bitcoin. As the underlying technology of Bitcoin, each data block of the blockchain contains information about a batch of transactions, which is used to verify the validity of its information (forgery-proof) and to generate the next block. In this process, the key is to establish the credit credentials of the blockchain, which is generally done through bookkeeping, using consensus mechanisms to prove the credibility of its various nodes. Scholar Wang He (2020) proposes to transfer traditional third-party trust to a system of trusting the blockchain by establishing a credit hierarchy evaluation model and using mathematical algorithms on a consensus basis to complete it. By dividing the hierarchy of multiple indicators, establishing an indicator system, calculating weights based on hierarchical analysis, constructing a judgment matrix, and calculating efficacy coefficients, user credit level ratings can be calculated. Taking credit rating AA as an example, its calculation method is as follows.

$$d_{U_1} = \left[\sum_{j=1}^{2}(x_{j1} \ . w_j)\right] \ \frac{W_1}{2^{[12]}}$$

$$d_{U_2} = \left[\sum_{j=3}^{4}(x_{j1} \ . w_j)\right] \ W_2 \ /2$$

$$d_{U_3} = \left[\sum_{j=5}^{7}(x_{j1} \ . w_j)\right] \ W_3 \ /3$$

$$d_{U_4} = \left[\sum_{j=8}^{10}(x_{j1} \ . w_j)\right] \ W_4 \ /3$$

Total efficacy factor D=. $\sqrt[4]{d_{U_1} * d_{U_2} * d_{U_3} * d_{U_4}}$. [1]

Bajiru (2016) divides its development process into three stages: the primary stage in the areas of account transfers with non-bank financial institution systems, payments and receipts, remittances, cross-border exchange of currencies online, and transactions in third-party payments; the second stage in the establishment of standardized smart contracts on the network for use in financial asset management; and the highest level is the real transaction system that can be applied in the real world. The current cross-border payment mainly uses the "decentralized" feature of blockchain, as long as there

is a network interface, it can be seen as a completely open book of payment accounting, the buyer and seller transactions are clearly and transparently recorded, and all parties can query under the authority. See Figure 1 for the practical application of blockchain technology in cross-border payments.

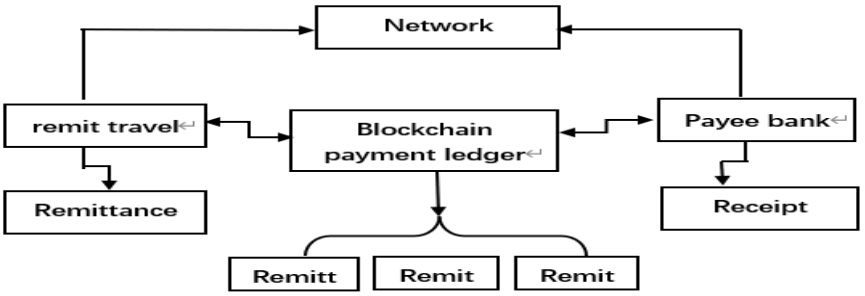

Fig. 1. Blockchain technology application process in cross-border payments

Image source: mobilepayments.com YinTong ZhiLiu

In cross-border payments, blockchain technology bypasses third-party institutions and uses network connectors to connect buyers and sellers directly together, effectively eliminating many intermediate exchange rate conversions and remittance access, making cross-border transaction methods more convenient and faster. The process of the cross-border payment model after applying blockchain technology is as follows: after the buyer submits the order and makes the payment, the blockchain will store and widely disseminate the information to every node (including the seller). After the seller has shipped the goods, the blockchain will also store and widely disseminate the information to every node (including the buyer). [2] The cryptographic features of the blockchain can then encrypt these data and prevent them from being viewed without permission, thus maximizing the security and authenticity of the transaction; the decentralized nature of the blockchain directly connects buyers and sellers, bypassing third-party institutions, avoiding the cumbersome step of currency conversion and greatly improving the efficiency of settlement.

Table 1. Turnover of major cross-border e-commerce platforms and companies in China, 2020

Data source: Hugo Cross Border, Sky Eye Census

Major cross-border platforms and companies	Annual turnover (billion)	Year-on-year growth rate
eBay	673.62	19.00%
Amazon	31065	42.00%
wish	166.18	34.00%
Alibaba	5097.11	35.30%
Hangzhou Contact Interactive Information Technology Company	161.57	2956.00%
Anchor Innovation Technology Co.	93.53	4054.00%
Tianze Information Industry Co.	50.27	29.97%
Zi Bu Chuan Group Limited	18.98	24.70%

From Table 1, we can see that China's cross-border e-commerce is developing rapidly, and the turnover of the Amazon platform in 2020 is USD 310.65 billion, an increase of 42% compared with the previous year. In recent years, Amazon, eBay, and Wish are expanding the scope of investment, and businesses will gradually move from B2B to B2C. Meanwhile, according to the "Blockchain Technology Enterprise Application Summit" report, blockchain technology will also be gradually applied to cross-border e-commerce businesses to achieve the concept of "blockchain + China The concept of "Blockchain + China".

3 Challenges in the application of blockchain technology in cross-border payments

With the rapid growth of cross-border e-commerce in China in recent years, the application of blockchain technology to cross-border payments has also been increasing. However, as blockchain technology applications are still in the development stage, it is a big challenge for cross-border e-commerce enterprises. It is mainly manifested in the following three aspects.

3.1 Immature underlying technology and high-risk potential

The core driver for the development of the blockchain industry is the iteration of the underlying blockchain technology. The performance of the underlying blockchain technology has been one of the biggest impediments to the application of blockchain technology on the ground. Domestic alliance chain development places a high priority on the need for the usability of blockchain commercial applications. Since 2018, the demand for blockchain enterprise-level development has been increasing, and several Baas (Blockchain as a Service) platforms with domestic independent intellectual property rights have emerged, and currently, the more representative domestic BaaS platforms include Ant Chain Baas Platform, Fun Chain Feiluo BaaS Platform, Complex America BaaS Platform, FISCO BCOS, etc. The alliance chain has a strict identity license management and permission management mechanism, and the developers of the alliance chain are concerned about ensuring the privacy of enterprises. In terms of data sharing, the traditional proxy re-encryption has some flaws. Proxy re-encryption nodes may fail, be down, a network connection is not available, proxy nodes do not convert or incorrectly convert, etc., resulting in the failure of decryption by authorized persons.

In the application of enterprise blockchain in China, according to the "2019 China Blockchain Enterprise Top 100 List", the most listed enterprises belong to Beijing, accounting for 40%; Shenzhen Hangzhou is next, Guangzhou, Chongqing, Nanjing, and other enterprises are also on the list. Compared to most regions in China, its blockchain enterprises are still in the early stage of development and have yet to emerge. Therefore, there is still a lot of room for innovation and breakthroughs in the blockchain field for cross-border payments in China.

3.2 High technical threshold and lack of professional talents

Blockchain technology is, after all, an internet technology with a high threshold, and the underlying technology platform may require thousands of professionals to work together to build it. The requirements for talents should not only be familiar with the transaction rules and transaction characteristics of major platforms, but also have a certain foundation in foreign languages, and preferably understand foreign markets, consumer preferences, etc. The recruitment and training of talent is a key focus for the development of cross-border e-commerce in China.

Skills in demand by cross-border e-commerce companies	Percentage of
Knowledge of cross-border e-commerce operations	78.85%
Foreign language communication skills	75.96%
Data analysis skills	60.58%
International trade expertise	58.65%
Logistics basics	52.88%

Fig. 2. Skills in demand by cross-border e-commerce companies

Data source: "Comparative Survey Analysis of the Supply and Demand of Talent for Cross-border E-Commerce Enterprises

In 2020, the Ministry of Education announced that cross-border e-commerce became one of the 51 new majors to train new forms of foreign trade talents for China. However, blockchain technology is interdisciplinary, and it is difficult for ordinary university institutes to train them according to the professional model, which is a big challenge. At present, only 32 universities in China offer blockchain courses, including well-known institutions such as Tsinghua University, Peking University, and Central University of Finance and Economics. In addition, in terms of the current development of the blockchain field, there is a large talent gap. Data from the "2020 New Infrastructure Talent Report" released by the Lajia Big Data Institute shows that The demand for talents in the blockchain industry has increased by sixty-seven percent, which is the highest among the six new infrastructure-related industries, and mainly exists with first-tier cities such as Beijing, Shanghai, and Hangzhou, where the demand for talents is relatively large. See Table 2.

3.3 Industry standards have not yet been harmonized and the regulatory system is lacking

The application of blockchain in cross-border payments is still at the stage of exploring breakthroughs, and the introduction of China's regulatory policy on the blockchain is not yet perfect. Globally, only some countries explicitly support the application of the project. For example, the UK successfully conducted a trial of distributed computing ledgers between central banks in 2017 through the use of simulated blockchain technology by the central bank, and the test results showed that the time for cross-border

payments between central banks of various member countries could be simplified from 2-4 days to a few seconds while reducing the dependence on third-party counterparties. However, most developed countries have not shown support for research and application in the area of blockchain and have only set up trials to develop and apply it in isolated locations. The lack of a system has resulted in the lack of uniform standards for blockchain systems. Compared to the traditional payment system, which is mature and well established, the application of blockchain technology is a big challenge and an important reason for limiting the development of cross-border e-commerce in China. Moreover, cross-border e-commerce business involves multiple countries, with different regulatory policies and different needs of transaction participants between countries, which may lead to unnecessary legal disputes.

4 Opportunities for blockchain technology applications in cross-border payments

Whether it is "mobile payments", which have exploded in popularity in the last few years, or "digital currencies" in the last two years, people are increasingly aware of the importance of payment methods. Even though blockchain technology is still in the research and development stage, its features of blockchain technology have given cross-border payments more convenient and real transactions. Based on the characteristics of blockchain, it is believed that it will bring unlimited possibilities for cross-border payments in China.

4.1 Direct transactions between buyers and sellers to achieve lower costs

At present, cross-border payments in China still mostly use third-party payments, with Ali and Amazon as the mainstream platforms. Traditional cross-border payments generally have to go through international interbank cooperation organizations as intermediaries to achieve transaction funds recorded, tracked, reconciled and cleared between different systems. Paying banks, intermediaries, and receiving banks all pay corresponding fees, and the arrival date usually takes 2-3 working days. As shown in Fig.3, according to a McKinsey report on global spending in 2016, the average cost to commercial banks of a single cross-border payment through correspondent banking was between $25 and $35. In 2015, global cross-border payment revenues reached $300 billion, and while cross-border payment transactions accounted for less than 20% of national spending, the resulting trade costs accounted for nearly 40% of national trade costs. The value of cross-border payment transactions is less than 20% of national spending, but the resulting trade costs account for nearly 40% of national trade costs.[3]

Banks	Handling fee	Telegraphic charges	Wire transfer-time
Bank of China	0.10% of remittance amount, $50-260 per transaction	150 RMB /pen	2-3 working days
China Construction Bank	0.10% of the remittance amount, $20-300 per transaction	80 RMB/pen	3-5 working days
Industrial and Commercial Bank of China	0.10% of remittance amount, $50-260 per transaction	150 RMB /pen	2-3 working days
Agricultural Bank of China	0.10% of the remittance amount, $20-200 per transaction	80 RMB/pen	3-5 working days
Bank of Communications in China	0.10% of the remittance amount, $50-150 per transaction	150 RMB /pen	3-5 working days
China Merchants Bank	0.10% of the remittance amount,100-1000RMB per transaction	150 RMB /pen	2-5 working days

Fig. 3. Charges for wire transfers from ordinary individual bank customers to overseas

Data source: The Future of Global Financial Infrastructure

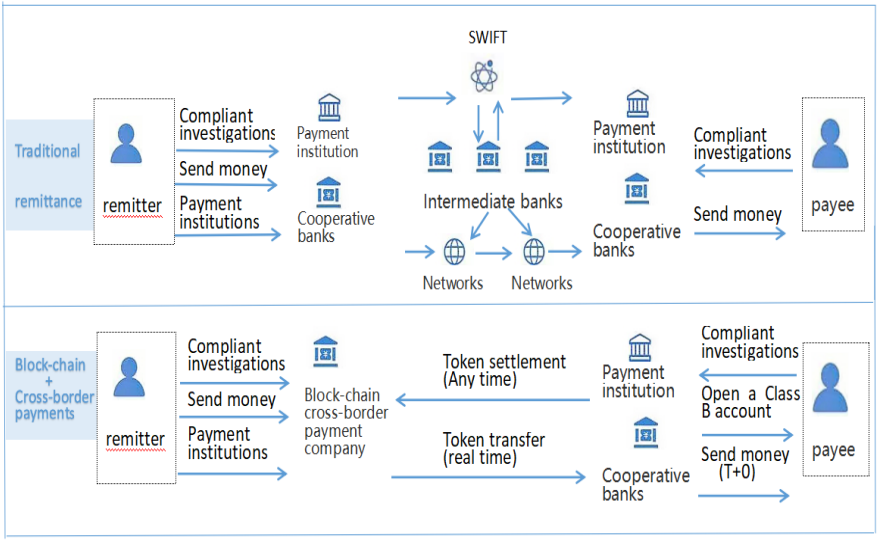

Fig. 4. Flow chart comparison of traditional remittance model and blockchain + cross-border payments

Image source: know.com

Comparing the flow chart of the traditional remittance model with that of blockchain + cross-border payment in Fig.4, it can be visually seen that the use of blockchain eliminates the intermediary bank link, allowing buyers and sellers to conduct transactions directly, with buyers being able to settle at any time and blockchain cross-border payment companies being able to transfer token (tokens) in real-time. Blockchain saves the

data of each node and can guarantee the information when the buyer makes a collection, thus eliminating the intermediary and eliminating the need to charge intermediary fees, which greatly reduces expenses in terms of cost and makes it easier and faster to conduct transactions.

4.2 Transaction information made public and traceable

The most prominent feature of blockchain technology is its ‘decentralization', along with its distributed bookkeeping technology and its unique encryption methods. Through this technology, all products are tagged with unique attribute data and their data can be efficiently accessed, including traceability back to the source and identification of quality and authenticity. This provides an effective means of information security for goods while ensuring that information cannot be altered. [4] The current means of querying product information are barcode identification technology and QR code identification technology, but they are difficult to apply in the cross-border e-commerce business, and the information immutability of blockchain technology solves this challenge. When either buyer or seller makes a transaction, the transaction is the subject of the recording chain and is stored in the blockchain in the form of nodes, which can then be traced back to the relevant product information. This provides a higher level of security and authenticity for cross-border payments, and also brings unlimited possibilities for cross-border payments in Dongguan.

4.3 Relevant information can be disclosed to the participants to make the process open

Traditional payment methods require intermediaries to remit money, and each institution has a different remittance system. Cross-border business involves multiple countries, and it is difficult to check the transaction records of funds quickly and accurately if you want to do so. Most of China's cross-border enterprises are currently on the rise and need to work with bigger platforms, and the transparency of the transaction process is a big help to their development. The blockchain system is open, except for the private information of the parties to the transaction being encrypted, the transaction data of the blockchain can be viewed by anyone, and the participants of all parties can view the transaction information through the public blockchain data and related applications, and the information of the transaction process cannot be tampered with, even if the blockchain nodes are tampered with, the original data and information are not lost. Therefore, the information of the whole system is highly transparent. [5] In addition, in the blockchain cross-border payment model, there is no need to convert national currencies into each other, only the digital currency negotiated between the buyer and seller is needed to complete the payment, and there is no need to store additional other currencies, which is conducive to improving the liquidity of funds.

5 Countermeasure suggestions for the application of blockchain technology in cross-border payment

5.1 Encourage research and development to break through blockchain technology and improve payment security

Blockchain technology at this stage is stuck in the concept stage, there are a few products that can be applied. Compared to mature Internet technology, there are no breakthrough applications for blockchain technology yet, and it is difficult to break through the technical threshold. And blockchain early development technology does not produce benefits in the short term, many cross-border e-commerce enterprises are considered superfluous. The application of new technology is sure to impact the traditional model, and more and more banks and third-party institutions are beginning to realize the convenience and security of blockchain technology, all exploring and breaking through the application of blockchain technology in cross-border e-commerce. The traditional proxy re-encryption mentioned above has shortcomings, which can be solved by the Shamiri threshold key sharing scheme (see Fig.5). n members are assumed in the Shamir threshold key sharing party, and the algorithm splits the key into n key slices, and the original key can only be reconstructed by collecting $\geqslant$ k slices, k being the threshold value (k< n). For example, the cross-border e-commerce payment owner splits the transformation key into 20 key slices using the Shamir threshold key sharing scheme and sends them to each of the 20 proxy re-encryption nodes. The licensee needs to request a key conversion from at least 15 nodes before reconstructing the conversion key using the Shamiri threshold key sharing scheme.[6]

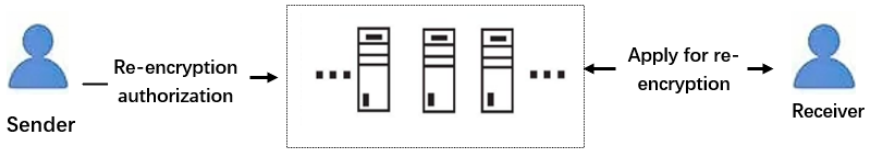

Fig. 5. Shamiri Threshold Key Sharing Scheme

More business, thus being able to better capture the characteristics of blockchain. Fig.6 shows the number of national and ministry blockchain-related policies from 2015-2020, indicating that China is developing the blockchain sector in a later trend, with various policies in place, and there is great potential for developing blockchain technology in China. At the same time, the regulatory policy of blockchain will be improved and perfected, which is also a significant opportunity for China to develop blockchain. In addition, China can also adopt an experimental approach before promoting it, Encourage and give support to individual cross-border e-commerce enterprises to implement the full application of blockchain technology for transactions in the cross-border e-com

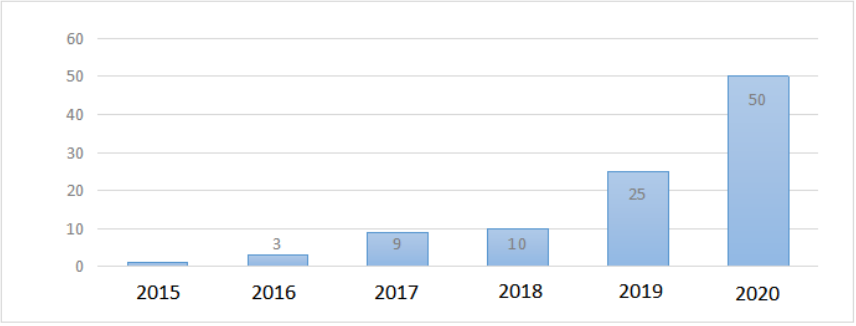

Fig. 6. Number of national and ministerial blockchain-related policies, 2015-2020

Data source: 01 Blockchain, Zero2IP

5.2 Integration with traditional payment methods Enabling faster innovation

Although blockchain technology brings the advantage of making cross-border e-commerce payments more convenient and faster, it is impossible for China to completely abandon traditional payment methods at this stage, so it is also a good way to combine them with traditional methods for innovation. In July 2019, its product, Alipay HK, has been licensed by the central bank. In addition to payment functions, it also uses blockchain technology to support cross-border remittances, and the usage rate has exceeded 50% in Hong Kong..... [7] Take the city of Dongguan as an example. Although Dongguan City is late in developing blockchain, it tends to take the lead later, thanks to the fact that the city provides a wide application space for blockchain technology applications. The development of blockchain requires a large investment of time and a higher level of synergy, and it is only after the application network and big data network are formed that the scale effect of the data will be transformed into economic benefits. Therefore, China can integrate the strengths of various science and innovation platforms to jointly invest in blockchain research to achieve a breakthrough in blockchain technology.

5.3 Blockchain technology as the basis for building a cross-border e-commerce platform

Blockchain offers advantages for cross-border payments, and one promising direction is to create a cross-border e-commerce platform with blockchain as the underlying layer. OpenBazaar (Babbitt), for example, is a decentralized marketplace for trading goods using Bitcoin, with no fees and no fear of censorship. There are no high fees to pay through OpenBazaar and no fear of personal information being collected by the platform and leaked or resold for other uses. [7] Blockchain technology is not intended to replace traditional payment methods, but rather to serve as the underlying technology to better serve the cross-border e-commerce industry, improve platform-wide security

and authenticity, and open up new markets. It is suggested that China can create its platform based on blockchain technology, establish blockchain technology companies and realize the building of a cross-border e-commerce industry alliance chain, which not only improves payment efficiency but also ensures the security and authenticity of transactions.

5.4 Increase investment in network security and create a secure network environment

Blockchain technology is a technology built on a network, and securing cyberspace means securing the blockchain space. While blockchain can encrypt transaction data to prevent information from being tampered with and stolen, it is ultimately based on the security of the network environment. According to the investigation, on 20 March 2018, the Slow Fog security team observed an automated coin theft attack in which the attacker took advantage of an Ethereum node forensic flaw to maliciously invoke the theft of tokens for a period of up to two years, with the value of the single stolen and yet-to-be transferred Ethereum reaching up to $20 million in current value, along with 164 types of tokens, the total value of which is difficult to estimate. Therefore, it is recommended that China's relevant technical departments should increase their investment in research and development to ensure network information security, and design a safe and secure cryptographic system, which can improve the security of digital currency processing technology and blockchain wallets to avoid theft of transaction information. At the same time, regulations related to network security should be formulated and improved to build a reliable and efficient working environment for blockchain technology.

5.5 Develop long-term education mechanisms to nurture professional talents

Blockchain is a new thing and involves a comprehensive field with multiple disciplines. From a worldwide perspective, there is a shortage of blockchain talents in all countries. The training of blockchain talents is a long-term process and the difficulty of entering the industry is higher than that of the Internet industry. Although many universities in China have opened professional courses on international trade and cross-border e-commerce, they can still train professional talents in many aspects and channels. For Example, the opening of cross-border e-commerce professional training pilot, the Internet and blockchain technology professional training institutions, etc.; the incubator of enterprises to give subsidies for equipment and office. At the same time, the training can be targeted not only at young students in school but also at potential entrepreneurial groups in the community who are capable of doing so.

5.6 Increasing the regulation of platform companies

There is no uniform standard for the global use of blockchain technology, the standardized system lags behind the development of the technology itself, and the existing note

policy does not apply to digital currencies. Moreover, blockchain in cross-border payments is completed directly using distributed bookkeeping and peer-to-peer transactions. Its multi-party participation process is anonymous, the calculation between nodes follows a certain algorithm, and its data interaction is trustless, which means that to a certain extent, it increases the difficulty of supervision. It is suggested that China can introduce relevant regulatory laws and regulations to clarify the scope of blockchain technology service provision and use, and stipulate its legal responsibilities in terms of risk prevention and security management to avoid transaction data being used and stolen by attackers. In addition, relevant regulatory authorities should be established to comprehensively monitor and regulate blockchain technology.

6 Conclusion

Under the environment of rapid development of the Internet, the cross-border e-commerce market is expanding. The development of blockchain applications in cross-border payment lays the foundation for the transformation of China's foreign trade, and at the same time plays an important role in China's economic development and import and export trade. The powerful functions of blockchain can well solve the problems of payment time, cost, efficiency, and authenticity in cross-border payment, and has great potential for development.

Fund Project

Guangdong University of Science and Technology, "Quality Project" Teaching Achievement Cultivation Project in 2020 (No. CQ2020079), "Research on the Construction of Innovation and Entrepreneurship System of Cross-border E-Commerce Talents Cultivated by the School, Industry and Enterprise"; 2021 Guangdong Province General University Characteristic Innovation Project (Humanities and Social Sciences Project): "Exploration of Big Data in Cultivating Cross-border E-Commerce Industry Chain - Taking the Cross-border E-Commerce Platform in the Greater Bay Area as an Example" (No. 2021WTSCX103); Guangdong Institute of Science and Technology 2021 University-level Research Project: "Research on Cultivating Cross-border E-Commerce Industry Chain in Dongguan City Based on Big Data Technology" (No. GKY 2021KYYBW-13); Guangdong Institute of Science and Technology (GIST) 2021 School-level Research Project "Research on the Status of Digital Talents Based on Dongguan City Digital Empowerment Plan" (No. GKY-2021KYYBW-25); Guangdong Institute of Science and Technology (GIST) 2021 Project "Research on the Integration and Development of Dongguan Digital Economy and Real Economy" (No. GKY-2021KYYBW-30).

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