Explore the Application and Challenges of Blockchain Technology in the Field of Higher Education in China

Xiaorong Chen[1,*]

[1] *PSB Academy (coventry degree), Singapore 039594*
**Corresponding author. Email: 7628es8i@psba.edu.sg*

ABSTRACT
With the continuous opening of China's blockchain industry, blockchain technology is strongly sought after by all walks of life in China, and it has played an important role in fields that rely heavily on data accuracies, such as finance, auditing, and the Internet of Things. With the development of the modernization of the education governance system and governance capabilities, blockchain technology has a greater application potential in the education field, which will help improve teaching efficiency and education quality, but it is still at a low level. This article refers to related documents analyze and elaborate on the application status and challenges of blockchain technology in the field of higher education in China.

Keywords: *Blockchain technology; higher education; modernization of education; innovation and development*

1. INTRODUCTION

Blockchain technology is an emerging technology that emerged after the Internet of Things, big data, artificial intelligence, etc., and has attracted more and more attention from governments, organizations, and most companies in various countries. Since 2016, many developed countries, such as the United States, Japan, and the United Kingdom have successively upgraded blockchain technology to the national strategic level. At the same time, at the end of 2016, China issued the "Thirteenth Five-Year" National Informatization Plan [1], clarifying that "strengthening the advanced layout of strategic frontier technologies" includes blockchain technology; in August 2017, the State Council issued a document to promote the development of regional pilot applications of new technologies such as blockchain and artificial intelligence [2]. In 2018, China will continue to promote the construction of national standards for blockchain technology and participate in the development of international standards [3]. The successive introduction of various policies all shows that China attaches great importance to blockchain technology.

In October 2016, the Ministry of Industry and Information Technology's "China's Blockchain Technology and Application Development White Paper" pointed out: "The transparency of the blockchain system and the non-tamperable characteristics of the data are fully applicable to student credit management, college employment, academic, qualification certification, and industry. Educational cooperation and other aspects are of great value to the healthy development of education and employment." Today, as the modernization of education continues to develop, blockchain technology, as a strategic frontier technology, has very important significance for Chinese higher education, and more and more people began to pay attention to the exploration and application of this technology in the field of education. By introducing the definition, core technology and characteristics of blockchain technology, this article summarizes the current research and application status of this technology in the field of higher education, and puts forward the challenges and countermeasures that blockchain technology faces in the process of innovation research based on the corresponding status.

2. THE CONCEPT AND CHARACTERISTICS OF BLOCKCHAIN

2.1. The concept of blockchain

The concept of blockchain technology was first proposed by Satoshi Nakamoto in the article "Bitcoin: A Peer-to-Peer Electronic Cash System" [4] in November

2008. Blockchain technology is accompanied by the emergence of Bitcoin. Bitcoin is a virtual cryptocurrency with blockchain as the underlying technology. The core of blockchain technology is a data structure that combines blocks in a chain. It does not require a central organization to organize or manage, but uses the Internet to record information in a distributed manner to achieve the purpose of storing information. The information recorded by the block chain is composed of two parts: the block header and the block body. The block header is connected to the next block through the main chain, and the block body is responsible for storing and analyzing the information. With its unique operating principle, the blockchain has changed the traditional recording method that needs to be managed and controlled by a central organization. This new method enables every transaction information to be disclosed to all accounts, ensuring the reliability and authenticity of transaction information. In May 2017, China released the first blockchain standard "Blockchain Reference Architecture" [5], in which the definition of blockchain was given: "Blockchain is a kind of in the peer-to-peer network environment Next, through transparent and credible rules, build an unforgeable, unchangeable and traceable block-chain data structure to realize and manage a transaction processing model."

2.2. Characteristics of blockchain technology

As a brand-new trust mechanism, the blockchain adopts two methods of distributed information release and common identification, so that the only reliable database can be centrally maintained. With the correlation between cryptography and data blocks, each electronic transaction information will be recorded in a separate data block, so as to ensure the reliability and authenticity of each transaction information, and generate the next record block in time. In general, the realization of blockchain technology relies on the following four characteristics.

2.2.1. Decentralization

The essence of blockchain is a decentralized database, and decentralization is one of its most important characteristics. Simply put, a blockchain is a network structure organized by multiple nodes, and these nodes are formed point-to-point. Unlike traditional methods, blockchain technology makes full use of the memory function of each node to ensure the authenticity and reliability of transaction information, and can effectively transmit and maintain information. All kinds of information are stored in many nodes with mutual backup functions. Therefore, even if one of the nodes has a problem, it will not affect other nodes, ensuring the accuracy of other information.

2.2.2. Consensus

Thanks to the characteristics of decentralization, the blockchain has formed countless network nodes through point-to-point, some of which will jointly identify and confirm transaction information to ensure that the recorded information is more authentic and reliable. In addition, the transaction information will function correctly only if the information in more than 50% of the nodes matches each other. This rule guarantees the accuracy of all transaction information. This is the consensus of blockchain technology.

2.2.3. Traceability

The storage of blockchain data is time stamped, which adds a time dimension to the data and is highly traceable. The interconnected nodes in the blockchain use cryptography to ensure the accuracy of the information stored in the nodes. In addition, the information in each node can be checked and verified at any time in a traceable manner, which further enhances the accuracy of the information between each node.

2.2.4. High degree of trust

The information recorded on each node of the blockchain is highly transparent and open, and each node opens its stored information to each other, any node can access the data at any time, and the entire system information is highly transparent. In addition, the blockchain has the characteristics of non-tamperability, and uses asymmetric cryptography principles to sign transactions so that transactions cannot be forged. At the same time, hash algorithms and digital signatures are used to ensure that transaction data cannot be easily tampered with. The more nodes participating in the system, the higher the security of the distributed database.

3. CURRENT STATUS OF RELEVANT APPLICATIONS OF BLOCKCHAIN IN THE FIELD OF HIGHER EDUCATION

The industry fields that blockchain can involve are very broad. Based on the rich technical characteristics of blockchain technology, it can be applied to many aspects in the education field.

3.1. Improve the degree certification and student status management system

According to the non-tampering characteristics of blockchain technology, it has inherent advantages to record the identity information of teachers and students, and student status files in the education field. Since then, the information on the strength of teachers, academic qualifications and degrees cannot be falsified or tampered with to ensure the authenticity of qualification

certificates, academic certificates and diplomas. In higher education, the degree certification and student status management of colleges and universities are very important and indispensable. In the traditional student status and degree management system, all student information is uniformly stored in an independent central server. Once the server encounters a failure or damage, these data will be lost, and the authenticity of the damaged data There is no guarantee. In order to prevent this situation from happening, blockchain technology can be applied to the management of student status and degree, and the corresponding smart contract can be written for data tampering and leakage that may occur in the process of student status and degree management, and then decentralized A standardized management model to regulate the behavior of each node to ensure data security. In addition, blockchain technology can be used to develop a new model of degree certification, which makes the process of degree certification easier and reduces the cost of degree certification.

3.2. Improve the protection plan of intellectual property rights

Thanks to the high trust and traceability of blockchain technology, blockchain technology is very suitable for the protection of intellectual property rights. The first thing the blockchain solves is the confirmation of the rights of digital works. From the perspective of the core technology of the blockchain, when the digital copyright is registered, the application of the hash algorithm can obtain the unique hash number corresponding to the digital work, that is, the "ID card" of the digital work, combined with asymmetric encryption Technology to realize the uniquely definite correspondence between digital works and authors.

Because of the high traceability of the blockchain, all actions of digital works after confirmation of rights will be recorded in the system one by one, such as the circulation and transaction of digital works. This realizes the traceability of digital works, provides powerful technical guarantees and conclusive evidence for the judicial collection that may be required in the follow-up, thereby enabling fast targeted tracking and inquiries, facilitating the identification of the source of illegal infringements, and safeguarding the original creator and publisher. Rights and interests, reducing the cost of rights protection.

3.3. Ensure the integrity of scientific research

In the education and management of colleges and universities, ensuring the integrity of scientific research is a very important part. The use of blockchain technology can provide the most innovative solutions for the protection of scientific research integrity. The blockchain technology can be used to ensure academic standards, and the data of various academic misconduct detection systems in the world can be shared and stored on the blockchain. Record scientific research work. Tang Yinhui [6] and others used blockchain technology to build an academic anomie prevention and control system, and proposed that through the data sharing of domestic and foreign academic misconduct detection systems, scientific research work should be recorded on the blockchain to provide a new defense against academic anomie. Control means. Zhou Jie [7] and others applied blockchain technology to the management of scientific research results to protect scientific research copyright while preventing plagiarism and falsification of data, which effectively improved the integrity awareness of scientific research staff.

3.4. Efficient use of educational resources

The co-construction and sharing of educational resources is an important force to promote development and innovation. A large number of foreign studies [8] [9] have confirmed that the allocation of funds has a positive role in promoting technology transfer activities in universities. Due to the difference in the geographical environment, the distribution of educational resources in certain areas is severely uneven, which limits the efficiency of the use of educational resources. In this regard, the traditional solution is to transform educational resources in various regions into digital resources and share them in various regions on the Internet. However, the efficiency of this sharing solution is low and the accuracy of information is relatively low. Blockchain technology can change this traditional sharing method. Every teacher can upload materials and data into his or her own block using decentralized point-to-point storage technology, allowing all information to be shared. In addition, thanks to the consensus of the blockchain, the accuracy of these data and materials have also been verified. In this way, the efficiency of sharing and utilization of educational resources has been improved.

4. THE APPLICATION OF BLOCKCHAIN TECHNOLOGY TO THE DEVELOPMENT PATH OF HIGHER EDUCATION

In recent years, there have been some new developments in the applications of blockchain technology in the field of education. Its application in information management, learner abilities, and digital educational resource results have become a research hotspot and practical tool in some countries, but in practice, the existing challenges are still worthy of attention, and its application in the field of higher education must have more innovative development paths.

4.1. Strengthen legal protection

The application of blockchain technology to the modern development of higher education must comply with relevant laws and regulations and obey supervision. Explore the establishment of a security guarantee system that adapts to the blockchain technology mechanism, guide and promote blockchain developers and platform operators to strengthen industry self-discipline and implement security responsibilities. It is necessary to implement the rule of law in the management of the blockchain to promote the safe and orderly development of the blockchain. Government departments can use technological means such as blockchain to innovate regulatory methods, improve regulatory efficiency, reduce regulatory costs, and improve management and service capabilities. Establishing and improving the blockchain regulatory system is the prerequisite and basis for improving the effectiveness of supervision. It is necessary to strengthen the safety research of blockchain technology, supervise the illegal hype behavior of blockchain technology, and strive to improve the safety and reliability of blockchain technology as a whole level. As an important part of digital technology, blockchain is of great significance to the construction of digitalization and modernization of education governance. However, the lack of relevant technical standards hinders the implementation of blockchain technology in education governance. In order to better enable blockchain to serve higher education efficiently, it is necessary to promote the standardization of blockchain education and higher education applications, and promote the formulation of laws and regulations on the application of blockchain technology to higher education.

4.2. Focus on talent training

As we all know, the development of any innovative business is inseparable from the support of technical talents. An important factor in the modernization of higher education by blockchain technology is the cultivation of technical talents. The technical level of professionals determines the effectiveness and influence of educational governance. To make full use of the blockchain to reshape education governance, it is necessary to build a sound talent training system, establish a multi-level talent training platform, and train high-level technical talents. Strengthen the research of blockchain core technology, improve the infrastructure of blockchain education and governance, strengthen the in-depth cooperation between universities and blockchain technology companies, invite technology company researchers to teach in universities, integrate the most cutting-edge blockchain technology into the classroom, and enhance students Technical literacy is conducive to the improvement of the quality of blockchain talent training. In order to guide blockchain technology to achieve better progress and development, it is necessary to pay close attention to the development of blockchain technology at home and abroad, support and cultivate the blockchain software and hardware development ecosystem, build a blockchain research and innovation platform, and establish a blockchain The chain research center promotes the innovative integration of blockchain and new-generation technologies such as artificial intelligence, big data, cloud computing and the Internet of Things, and relies on blockchain technology to improve the modernization efficiency of higher education.

4.3. Increasing financial investment

The application of blockchain technology in the field of higher education directly determines the development quality and competitiveness of higher education in the future. Therefore, the government should introduce corresponding incentive policies and increase financial support. The competent departments of governments at all levels should also learn from the more mature advanced practices of blockchain technology applications in developed countries and regions. French Minister of Economy and Finance Bruno Le Maire's answer on blockchain and cryptocurrency related issues: The first task of the French government is to promote the development of the blockchain ecosystem, which has the potential to modernize French enterprises and the economy An important technology to make a contribution [9]. In the next five years, France will invest 4.5 billion euros in breakthrough innovative technologies, including blockchain technology. We should take into account the actual conditions and application levels of various fields in China, and timely introduce corresponding blockchain technology support policies, especially in the field of higher education, we should actively introduce incentive policies to encourage school-enterprise cooperation, and promote the research and application of key technologies.

4.4. Increase publicity

The application of blockchain in higher education is still in its infancy. The current level of blockchain technology is still not enough to match the modern development of higher education. This exposes a shortcoming of the blockchain, mainly due to public awareness. Insufficient degree and acceptance. In order to better promote the blockchain, establish everyone’s awareness of blockchain technology, apply the blockchain to higher education efficiently, and form a benign integration relationship with higher education, blockchain technology companies should cooperate with universities and actively Guide the society and the public to popularize blockchain science, rationally face the objective value of blockchain, and fully understand the importance of trust structure, information transmission and value transmission. This is to promote the

development and application of blockchain technology in higher education. The key link.

5. CONCLUSION

It can be seen that the application of blockchain in the field of higher education has a good development prospect. The rational use of the characteristics of the traceability and difficulty to tamper with the data of the blockchain and the combination of it with various open educational resources will help to reduce higher education. Barriers to improving the enthusiasm of learners and the quality of education. However, from the current situation, the application of blockchain technology in the field of higher education lacks a well-formed system, and there is no complete case teaching and academic articles for reference. The technical level, the system level, and the shortage of talents need to be continuously applied in practical applications. To be perfected, it will take some time for the mature application in the field of higher education to be supported by the R&D team and the national policy level. The bright prospects are worthy of our investment more energy to research, so as to promote the internationalization and modernization of blockchain technology in the field of higher education.

REFERENCES

[1]Notice of the State Council on Issuing the National Informatization Plan of the "Thirteenth Five-Year Plan"

[2]Guiding Opinions of the State Council on Further Expanding and Upgrading Information Consumption and Continuously Unleashing the Potential of Domestic Demand

[3]The Ministry of Industry and Information Technology released the main points of the standardization work of informatization and software service industry in 2018

[4]Nakamoto, S. (2008). Bitcoin: A Peer-to-Peer Electronic Cash System〔EB/OL〕.〔2019-08-10〕.https://nakamotoinstitute.org/bitcoin/.

[5]The first China Blockchain Development Contest Results Conference 2017.05.16

[6]Tang Yinhui, Fang Guangzheng. Prevention and Control of Academic Anomie and Innovative Application of Blockchain Technology [J]. Publishing and Distribution Research, 2019, (05): 40-43+59.

[7]Zhou Jie, Liu Haitao. Exploration of the application of blockchain technology in the construction of scientific research integrity in colleges and universities [J]. Journal of Agricultural Library and Information, 2020, 32 (08): 34-39.

[8]LANDRY R, AMARA N, OUIMET M. Determinants of Knowledge Transfer: Evidence from Canadian University Researchers in Natural Sciences and Engineering[J]. Journal of Technology Transfer, 2007, 32(6).

[9]MARKMAN P, GIANIODIS P T, PHAN P H, ET AL. Entrepreneurship from the Ivory Tower: Do Incentive Systems Matter? [J]. Journal of Technology Transfer, 2004, 29 (3-4).