



Prospects for the Application of Blockchain Technology in the Governance of Illegal Employment in Yunnan Border Areas

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Abstract. The issue of illegal employment in Yunnan's border areas not only disrupts normal immigration control but also poses a significant threat to social stability and security. The covert nature of illegal employment among foreigners demands substantial manpower, resources, and financial investment for effective investigation and enforcement. Moreover, challenges such as fragmented communication and weak interdepartmental collaboration further exacerbate governance inefficiencies. Blockchain technology, with its inherent features of decentralization, transparency, and immutability, offers a novel approach by enabling cross-platform information generation, transmission, modification, and supervision. This innovation introduces new ideas and technical solutions to address the long-standing issue of ineffective information sharing among departments in the governance of illegal employment.

Keywords: Yunnan border area; illegal employment; blockchain technology

1 Introduction

Since China's reform and opening up, Yunnan's border regions have undergone rapid economic development, establishing themselves as a gateway to Southeast Asia and the world. However, geopolitical complexities and an increasing demand for labor have exacerbated the issue of illegal employment in these areas. Currently, managing illegal foreign employment in China involves the collaboration of multiple departments, including labor, taxation, and public security authorities. However, differences in responsibilities and jurisdiction, along with inadequate interdepartmental information sharing, have resulted in inefficiencies in identifying and addressing cases of illegal employment. Blockchain technology presents a promising solution to these challenges by facilitating secure, cross-platform information sharing, modification, and supervision. By breaking down departmental silos, this technology enhances collaboration and improves the overall efficiency of regulatory efforts.

2 Current Situation of Illegal Employment in Border Areas of Yunnan

Since the launch of the summer public security crackdown and rectification campaign by the national public security organs in 2023, the governance of "three non-compliant" foreigners (illegal entry, illegal residence, and illegal employment) has continued to advance, and a total of 14,222 "three non-compliant" foreigners have been investigated and dealt with, providing important guarantees for maintaining border security and the stability of entry and exit order. According to the analysis of the seizure situation, illegal employees in the border areas of Yunnan are mainly engaged in low-end labor industries such as catering, housekeeping, and massage. From the perspective of the working area, these personnel are mainly distributed in border areas such as Dehong, Baoshan, Lincang and Xishuangbanna, covering cities and rural areas. From the perspective of gender structure, women used to be the main ones, mainly involved in the service industry, but the proportion of men has gradually increased in recent years. Illegal employees generally have a low level of education, most of them lack professional skills, and can only engage in simple physical labor. In addition, illegal employment has gradually shifted from border areas to more economically developed areas such as the southeast coast[5]. According to data from Yunnan Province's assistance to public security organs in other provinces and cities in repatriating "three non-compliant" personnel from neighboring countries, most illegal employees enter the mainland through the Yunnan border. Their large presence not only occupies local employment resources, but also disrupts the economic order, while posing a potential threat to public safety and health security.[6]

3 Overview and Application Prospects of Blockchain Technology

3.1 Overview of Blockchain

Blockchain originated from "Bitcoin" and was first proposed by Satoshi Nakamoto in 2008. It is a decentralized distributed ledger that provides chain storage, cannot be tampered with, is secure and reliable. It records transactions and information through a growing data block chain to ensure data security and transparency.[1]

First, decentralization: there is no centralized control node in the blockchain system, and all data records are distributed on various nodes. Any tampering behavior of any node will be discovered by other nodes, thus ensuring data security.

Second, transparency: The transaction records in the blockchain are open and transparent to all participating entities, and anyone can view the historical records, which increases the transparency of the data management system and enables data sharing.

Third, immutability: Once the information is recorded on the blockchain, it is almost impossible to be tampered with. If the data needs to be modified, the consent of all participants is required, which ensures the reliability and authenticity of the data.

Fourth, the nature of smart contracts: The blockchain platform supports smart contracts, which can automatically execute contract terms under preset conditions, reducing human intervention and disputes.

3.2 The Application and Prospects of Blockchain Technology

With the rapid development of modern information technology, how to promote the modernization of the national governance system and governance capacity has become an important issue. Blockchain technology is regarded as a tool for national governance and has achieved incremental benefits in providing public services, increasing the security and efficiency of services. [2] Under the background of blockchain technology in the intelligent digital era, we should accurately grasp the essence of blockchain and promote the integration of blockchain technology and police work on the basis of development trends, so as to improve the efficiency of police work.

At present, cross-departmental, cross-institutional and cross-field data sharing has long been affected by institutional constraints. Administrative departments have management authority over data generators, but due to the dispersion of power, data information islands have been formed. In addition, the regulatory review mechanism is too single in terms of data filtering, resulting in insufficient credibility of complex data. How to eliminate these interference factors and achieve more authentic and reliable data sharing has become an urgent problem to be solved. The application value of blockchain technology in national governance is particularly prominent, especially in the field of data storage and sharing.[3] By integrating technologies such as distributed ledgers, peer-to-peer transmission and sharing mechanisms, blockchain has the advantages of decentralization, immutability and traceability, which can effectively reduce disputes caused by insufficient transparency and credibility in government decision-making. By incorporating data into the national governance system using blockchain technology, we can build a consortium chain platform to achieve multi-party collaboration and a controllable governance model.[4] Various fields and institutions act as distributed nodes to jointly record data and ensure its authenticity, further promoting the intelligent and information-based development of national governance.

4 Foreign Employment Management System Based on Blockchain

The traditional management model shares less data with other departments, which seriously hinders the efficient management work. The distributed system of blockchain can make all relevant departments the subjects of information management. On the basis of ensuring the security of information data, they can jointly enter, update and share data to achieve strict control over the illegal employment of foreigners.

4.1 Design of Foreign Employment Management System Model Based on Blockchain

The system uses blockchain technology as a carrier to build a foreign employment information management system with "embassies (consulates) abroad, border inspection departments, and local public security" as the core.(see Fig. 1)

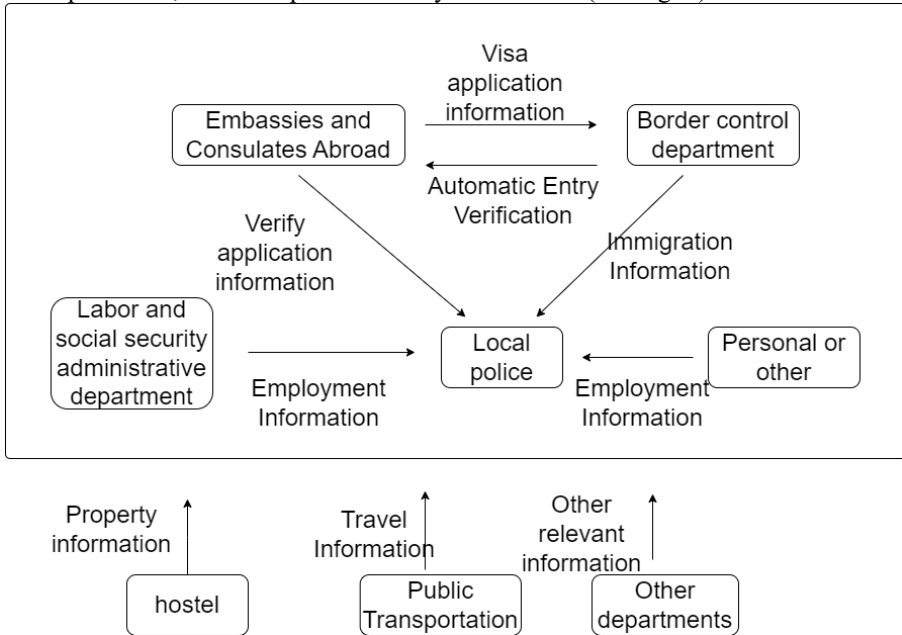


Fig. 1. Diagram of the data sharing model of the foreigner employment management system

4.2 The Architecture of Foreign Employment Management System Based on Blockchain

According to the basic architecture of blockchain and the basic needs of foreign employment information management, the following is a design of the system architecture of the foreign employment information management system based on blockchain, which has six layers, namely application layer, contract layer, incentive layer, consensus layer, network layer, and data layer. (see Fig. 2)

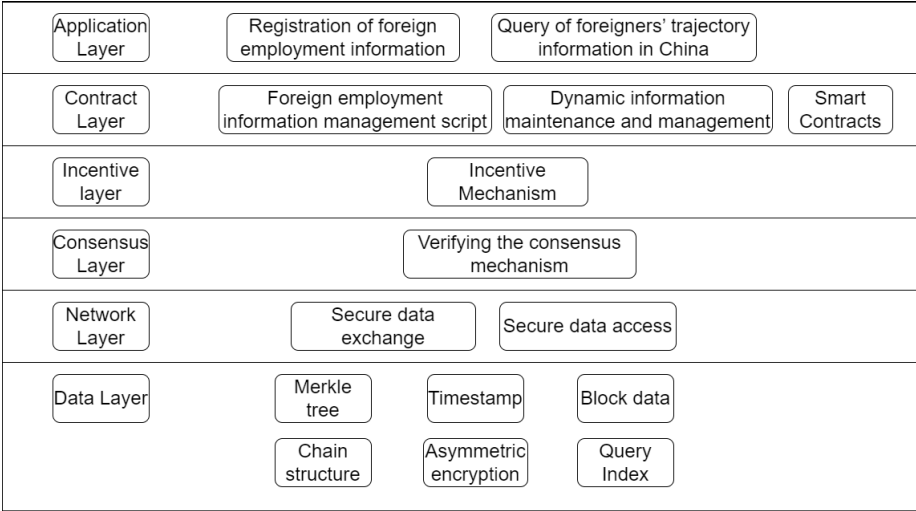


Fig. 2. Blockchain technology architecture diagram for foreigner employment data management

4.3 The Implementation Process of Foreign Employment Management Based on Blockchain

First, it is clear that the main entities on the chain are the public security, exit-entry border inspection departments and embassies (consulates) in Yunnan border areas as the main nodes, as well as the labor and social security administrative departments and other nodes. Second, confirm the data and information related to foreigners in various departments. The embassies (consulates) abroad upload the visa information of foreigners; the exit-entry management department uploads the entry information of foreigners (including the entry and exit of foreign border residents with border documents), the reasons and plans for coming to China, etc.; the labor and social security administrative department uploads the employment information of foreigners, and other nodes upload the information of foreigners' activities in China. Third, according to the actual needs of each subject, the scope of information utilization is set. The management node and the main node use the block information to analyze the employment of foreigners and verify whether there is illegal employment or other risks; Fourth, each information management subject uploads the information in real time according to the actual situation of foreigners, and after the consensus of the nodes in the whole network is reached, the relevant information is recorded in the blockchain, and maintained by the whole network to ensure the traceability and authenticity of the data. Fifth, the local public security, exit-entry border inspection departments, and embassies (consulates) abroad take the lead, and the smart contract is generated after certification by other nodes, and the information specifications, information usage rights, etc. are entered to record the legally employed foreigners.

5 Advantages of Blockchain Technology in the Governance of Illegal Employment

5.1 Ensure Data Sharing Between Departments and Eliminate Information Barriers

A major governance problem of illegal employment is that data cannot be shared, resulting in information islands in various departments and the inability to work together to govern illegal employment. Blockchain technology has significant advantages in data sharing. Through decentralized distributed ledgers, it ensures that all participants can access and verify data in real time, eliminating information islands. Blockchain technology uses a distributed ledger mechanism to distribute ledger data to multiple nodes in the network and update the ledger status in real time to ensure data synchronization and consistency.

5.2 Ensure Information is Authentic and Reliable and Improve Management Efficiency

The blockchain reduces the risk of trust. All participants can understand the operating rules of the system, check the authenticity of the ledger content, and ensure that the stored content will not be tampered with. In the process of verifying the information of foreigners in China, it can effectively compare and identify false information, and further investigate whether they are illegal employees, thereby improving work efficiency. The identity information of workers can be stored on the blockchain to prevent forgery and identity fraud. Employers can verify the identity and background information of job seekers through the blockchain to ensure that they are hired by legal workers. This identity authentication mechanism not only helps to reduce illegal employment, but also improves the recruitment efficiency of employers. In addition, smart contracts on the blockchain can also be called self-executing contracts, which eliminate the risk of human interference. Once a contract is formed, it cannot be tampered with. With the blessing of decentralization, the contract is backed up on the entire network to ensure security. When each department requests to operate on the data, the node can query the smart contract to ensure authenticity, thereby improving the work efficiency of each department.

5.3 Data is Open and Transparent, Making it Easier for the Public to Supervise

All data on the blockchain is open and transparent, and any participant can view and verify the data in the ledger. At the same time, the chain structure of the blockchain allows the source and transfer process of the data to be tracked and verified, improving the credibility and auditability of the data. Due to the openness and transparency of blockchain technology, all community members can participate in the supervision process, forming a process of national supervision, reporting and reporting illegal foreign employment.

6 Future Prospects of Blockchain Technology in Illegal Employment Governance

Blockchain technology has broad application prospects in the governance of illegal employment in border areas of Yunnan. By improving capabilities in identity authentication and information transparency, blockchain technology can significantly improve the efficiency and effectiveness of illegal employment governance. In the future, as blockchain technology continues to develop and mature, its application in illegal employment governance will become more extensive and in-depth. The government and enterprises need to strengthen cooperation, jointly promote the application of blockchain technology in labor management, and continuously improve relevant laws and policies to provide a solid institutional guarantee for the application of blockchain technology. Through the coordinated advancement of technology, law and management, blockchain technology will play an increasingly important role in the governance of illegal employment, promote the legalization and standardization of the labor market, and bring far-reaching social and economic benefits.

6.1 Strengthen Data Sharing and International Cooperation

Blockchain technology, with its decentralized and tamper-proof characteristics, can greatly improve the data sharing and transparency of illegal employment governance. By establishing a unified blockchain platform, key data such as entry and exit data, employment information, and enterprise employment records in border areas can be recorded and shared in real time to ensure the accuracy and real-time nature of the data, while ensuring data sharing among departments. In the future, it is even possible to establish a cross-border blockchain platform with neighboring countries to share key information such as entry and exit information and employment data in real time and jointly combat border violations.

6.2 Improve Verification Efficiency and Accuracy

In the governance of illegal employment, verifying the authenticity of identity and employment information is key. Blockchain technology can ensure the authenticity of each record and allow border management departments to quickly verify information. For example, through the blockchain platform, border management departments can quickly verify the identity, entry time, work location and other information of foreign personnel, so as to effectively identify whether they are illegally employed. Based on blockchain-based smart contract technology, an automated supervision system can be built. Smart contracts can set specific rules and conditions. Once these conditions are met, the system will automatically perform corresponding actions, such as issuing alarms, restricting account access, etc. This helps border management departments to detect and prevent illegal employment in a timely manner.

6.3 Improving Governance Effectiveness and Credibility

The introduction of blockchain technology can improve the efficiency and credibility of illegal employment governance in Yunnan's border areas. By recording and sharing data in real time, border management departments can more accurately grasp the situation of illegal employment and formulate more precise governance strategies. At the same time, the transparency and immutability of blockchain technology can ensure the authenticity and credibility of data and enhance the public's trust in governance work.

6.4 Combining Artificial Intelligence and Big Data Technology

In order to comply with the requirements of the immigration management work conference to "accelerate the implementation of the information and intelligent strategy of immigration management", on the basis of blockchain technology, artificial intelligence and big data technology are combined to further improve the governance effect, firmly grasp the opportunity, use the power of information technology, and innovate new methods and new ideas for immigration management. Through the analysis and mining of a large amount of data, the laws and trends of illegal employment behavior can be discovered, providing more powerful support for governance work.

7 Conclusion

Blockchain technology, with its unique technical advantages, provides new ideas and means for the governance of illegal employment in Yunnan's border areas. Through the application of identity authentication, smart contracts, record management and cross-border cooperation, blockchain technology is expected to greatly improve governance efficiency, protect the legitimate rights and interests of workers, and promote the stable development of social economy in border areas. However, to achieve the comprehensive application of blockchain technology in illegal employment governance, some challenges need to be overcome. For example, the cost and complexity of technology implementation, data privacy protection, and supporting laws and policies all need to be fully considered and resolved. Only when technology, law, and management are promoted in a coordinated manner can blockchain technology realize its maximum potential in illegal employment governance.

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