Blockchain Technology Enables Fixed Assets Investment Statistics

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Abstract. Blockchain technology is a kind of decentralized transaction and data management technology, which has been extended to many economic and social fields, such as digital finance, Internet of things, intelligent manufacturing, supply chain management, digital asset trading and other economic and social fields, but the application of statistical work is still less. The current investment statistics business of Power Grid Companies involves multi-department collaboration and multi-level interactions. There are uneven data maintenance and low data quality among various business departments. The statistics majors and the basic data providing departments and the statistical data reporting units are both at the upper and lower levels. There are varying degrees of "mutual trust issues". According to the characteristics of blockchain Smart Contract, consensus mechanism and linked storage structure, multi-party sharing of data on the chain and higher credibility, this paper explores how to integrate the technical characteristics of blockchain with the investment statistics business, and change the business model of investment statistics.

1. Challenges and opportunities facing investment statistics

1.1. Challenges facing investment statistics business
In recent years, the company's investment statistics management work relies on big data analysis and has carried out a large number of statistical innovation applications, laying a certain foundation for the promotion of automatic statistics of online power grids. However, due to the fact that the investment statistics business involves multi-department collaboration and multi-level interaction, the data maintenance requirements of various business departments are uneven, and the investment completion data is affected by assessment interference, there are "mutual trust problems" in varying degrees between the statistical specialty and the basic data providing departments, and between the superiors and subordinates of the statistical data reporting unit, and further improving the quality of statistical work is facing huge challenges.

1.2. Opportunities facing investment statistics business
With the birth of blockchain technology, it brings new opportunities for the further promotion of investment statistics business - blockchain technology is a "sharp weapon" to solve the problem of trust. With blockchain as the technical support, it will bring profound changes to the investment statistics business, substantially reverse the passive situation of investment statistics business, and support the
sustainable development of the company and power grid.

2. The concept and characteristics of blockchain

2.1. The concept of blockchain
Blockchain technology originated from the foundational paper "Bitcoin: A Peer-to-Peer Electronic Cash System" published in 2008 by a technical geek under the pseudonym Satoshi Nakamoto. In a narrow sense, a blockchain is a decentralized Internet open ledger that combines data blocks in a chain into a specific data structure in chronological order, and guarantees that the data cannot be tampered with and cannot be forged through Cryptography. Broadly speaking, the blockchain uses a chained data block structure to verify and store data, uses a distributed consensus mechanism and mathematical algorithms to collectively generate and update data, uses Cryptography to ensure the security of data transmission and use, and uses automated scripts a new decentralized infrastructure and distributed computing paradigm in which codes (Smart Contract) are used to program and manipulate data[1].

Blockchain is an innovative application mode of computer technology such as consensus algorithm, asymmetric encryption algorithm, distributed storage technology, P2P network technology and other computer technologies in the Internet era. The blockchain data is maintained by all nodes, and each participating maintenance node can copy and obtain a copy of a complete record, which can realize distributed establishment in a weak trust environment without a central authority a set of trust mechanism ensures that the data in the system is transparent, traceable and hard to be illegally tampered with.

2.2. Characteristics of blockchain
Blockchain is a kind of Distributed Database that combines data blocks in time sequence and ensures that they can't be tampered with or forged by Cryptography. Its characteristics can be summarized as "1", "2" and "3". The "1" sentence can be summarized as follows: trusted Distributed Database; "2" core property: distributed and unforgeable; "3" key mechanisms: Cryptography Principle, data storage structure, consensus mechanism.

2.2.1. Principles of Cryptography
One of the principles of Cryptography: hash algorithm. Hash algorithm is a general term for a class of encryption algorithms. Input any length of string, hash algorithm can produce fixed size output. Collision power of hash function: the hash specifically and uniquely identifies a block. The privacy of the hash function: the specific content of the block cannot be deduced from the hash value.

The second principle of Cryptography: asymmetric encryption. Asymmetric encryption refers to encryption algorithms that use different keys for encryption and decryption, also known as public and private key encryption. In the blockchain network, each node has a unique pair of private key and public key. When using this key pair, if one key is used to encrypt a piece of data, it must be decrypted with the other key.

2.2.2. Data storage structure
Merkle Tree: Merkle Tree is actually a data structure. This tree-like data structure is very efficient in quickly summarizing and checking the integrity of large-scale data. As long as any node in the tree is tampered with, the root node hash will not match, so the purpose of verification can be achieved.

2.2.3. Consensus mechanism
The consensus mechanism is a mechanism for blockchain nodes to reach a consensus on block information throughout the network. It can ensure that the latest block is accurately added to the blockchain, and that the blockchain information stored by the node is consistent without bifurcation and can even withstand malicious attacks.
3. Analysis of matching degree between blockchain technology and investment statistics

3.1. Business pain point 1: manual data verification, report data submission is random, and data quality is poor.

At present, investment statisticians and construction, finance, equipment and other business departments sign and confirm the data submitted offline, which has high cross department communication cost, increased the workload of investment statisticians, and the data quality through manual verification is poor, which affects the efficiency and accuracy of investment statistics report submission. For example, the actual investment of a 110kV power transmission and transformation project was completed only in September 2015, March 2016, July 2016 and December 2016, and the investment data was submitted randomly, divorced from the actual situation, and the data quality was poor[2].

Analysis on the matching degree of blockchain technology: using Smart Contract to transform algorithms and rules into automatically executed contracts, the system automatically judges the quality of basic data, moves the discovery and rectification of abnormal data forward, realizes automatic verification and automatic calculation on the investment statistics data chain, and improves data quality. The basic data is digitally signed on the chain to reduce the cost of cross department communication and management[5].

Figure 2. Blockchain technology realizes automatic verification and automatic calculation on the investment statistics data chain
3.2. Business pain point 2: unclear ownership of data responsibility.
The current investment statistical statements are generated based on the account data. From the basic data to the final report, many circulation links, such as data submission, verification, calculation, submission, audit and release, need to be operated by many people. There is a risk that the report data is tampered with, and it is difficult to quickly investigate and easily lead to unclear data responsibility.

Analysis on the matching degree of blockchain technology: the consensus mechanism[4] and linked storage structure of the blockchain can record the identity information of the person who changes each data, ensure the integrity and traceability of the data, solve the problem of low cost of tampering with traditional centralized databases, and clarify the data responsible[3].

Figure 3. Blockchain technology guarantees data integrity and traceability

3.3. Business pain point 3: the number of law enforcement inspections such as external audit and Statistics Bureau has increased, and it is difficult for statisticians to quickly collect effective supporting materials.
In the past two years, law enforcement inspections such as external audits and the Bureau of Statistics have increased, making it difficult to provide materials. At present, the National Bureau of statistics requires that the investment amount should be filled in according to the specification of the certificate. If the project investment amount is filled in according to the progress of the project image, the progress sheet signed by the construction unit, the supervision unit and the construction unit shall be used as the filling certificate. The statistical data and the filling certificate shall be submitted simultaneously on the online direct reporting platform of the Bureau of statistics every month, and the spot check shall be carried out for the projects with an investment of more than 20 million yuan in the current month. According to the company's current construction and management requirements for power grid infrastructure projects, there is no monthly tripartite signing schedule. It is necessary to increase the offline management process, and the time to organize the documents according to the project is tight and the workload is heavy.

Analysis on the matching degree of blockchain Technology: the data on the chain can be shared by many parties and has higher credibility, which can be used as the supporting material for audit and the law enforcement of the Bureau of statistics, and can be used for reliable and accurate audit tracking.
4. Conclusion

In general, when blockchain is applied to investment statistics, new changes will take place in the power grid investment statistics business, which will not only make significant changes in business models such as the statistical subject (who makes statistics) and statistical methods (how to make statistics), but also greatly improve the quality, safety and transparency of investment statistics, which can solve the problems of manual data checking, statistical analysis, and so on. The problems such as poor data quality, unclear data responsibility, and difficulty for statisticians to quickly collect effective supporting materials should be improved to enhance the "mutual trust" between the statistical specialty and the basic data providing departments, and between the upper and lower levels of statistical data reporting units, and profoundly change the investment statistics concept and statistical paradigm.

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