Applications Research of Blockchain Technology in Accounting System

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Abstract: Accounting is the business language of social economy. The in-depth application of blockchain technology in the accounting industry can promote the development of the accounting industry itself, and also further promote the blockchain technology to play a higher role in the whole social economy. This paper studies the necessity and feasibility of the application of blockchain technology in the accounting industry, discusses the working principles of the accounting information system of the seller and the buyer, and constructs the vertical and horizontal application models of blockchain technology in the accounting system. Finally, this paper points out that we can strengthen the promotion of applications of blockchain technology in the accounting system by strengthening policy guidance, improving legislative protection, and cultivating compound talents.

1. Introduction

Accounting is a subject that studies how to recognize income and assets in a certain period. The accounting industry turns economic business into a monetary unit of measurement, and accounting is also an indispensable Department of enterprises, institutions or other economic organizations. The application of blockchain technology in the field of accounting has changed the mode of traditional accounting. Under the background of this information age, the introduction of blockchain technology is in line with the development of the times. What the accounting field needs to ensure is the authenticity of numbers, and blockchain technology ensures the authenticity of "accounts". Blockchain technology has the characteristics of decentralization, distrust, high transparency and tamper proof, which not only greatly reduces the cost of trust, but also ensures the authenticity and reliability of transaction information. With the continuous development of science and technology, blockchain technology is applied in more and more fields, including intellectual property rights, Internet finance, medical care, insurance, internet of things and has achieved subversive development effects. Blockchain technology is suitable for any value related fields, and it also needs the support of blockchain technology in the development of accounting informatization. Relying on the powerful Internet technology, blockchain technology has brought great influence to the accounting field, and has a far-reaching influence on the accounting field. Blockchain technology is both an opportunity and a challenge for the accounting field. The application of blockchain technology in the accounting industry is a trend and frontier of the current accounting development. Studying such application mode and scenario can provide potential direction for the development of accounting and solve some problems existing in the industry.

2. Theory overview of blockchain

2.1. Concept of blockchain

Blockchain is a disintermediated technological revolution. As the underlying supporting technology of network information system, it also transmits value on the basis of real data transmission. Blockchain is to hash the blocks with transaction time information, add time stamp on the block and publish the hash value of the block at the same time, so that the blocks can reach a consensus when confirming the transaction, and the blocks sorted by time are connected with each other to form a complete data chain with continuous growth. Each block in the blockchain can record transaction information, and can contain the hash value of the previous block, which can be traced back to the original founding block. It can query the information of any block, find the error source in time, and keep the information consistent. Decentralization is the core feature of blockchain. Any node of the system is highly autonomous, and no node can control, modify or shield information from the central position. The system information is completely open, any node can connect freely to form a new connection unit, and each node realizes openness, flattening and equality through the point-to-point network. Openness and transparency in addition to encrypting the private information of each user, the transaction data of all other systems are highly open and transparent. All users hold the same set of books and can query any data in the public node. Each user's transaction is stamped with a time stamp, which effectively guarantees the ownership and originality of the information. Because the blockchain has a high degree of openness and transparency. The two sides of the transaction can establish a mutual trust transaction mode without information verification. They only need to implement the terms of the contract automatically through the intelligent contract according to the consensus rules and protocols. The two sides can directly carry out the untrusted transaction anonymously. All nodes can exchange data in the untrusted environment, and any human intervention will not work, which makes the dishonesty behavior significant decrease.

2.2. Core technologies of blockchain

In general, blockchain is a new distributed infrastructure, which mainly combines four core technologies, namely distributed ledger, consensus mechanism, modern encryption technology and smart contract. Distributed ledger is the most basic core technology of blockchain. In the decentralized distributed network, each node has the same permissions, and no node can record accounts alone. All data can be viewed, shared and copied between blocks. Anyone can become a node on the ledger with the permission of the blockchain system network. With secure distributed storage for verification, tampered information can be detected immediately. In the blockchain, there is no centre to command and coordinate, and each node has distributed accounting. Therefore, to ensure the consistency of transaction data of all nodes, we must be able to obtain the recognition and consensus of the whole network, and jointly consciously maintain the data. Each block stores all the records on the network by encryption. Although the transaction information is public, the identity information of the recorder in each block is highly encrypted. As an advanced means of modern cryptography. The smart contract is generated by computer code. It is a special digital protocol, which contains all the information of related transactions. The corresponding programming script is formed according to the specific transaction mode. All the trigger conditions can be compiled with code. The rules and terms are embedded in the blockchain, which can automatically perform the operations that meet the conditions, greatly improve the response efficiency of the system. The transaction process is irreversible and can be tracked in the whole process.

2.3. Infrastructure of blockchain

The basic blockchain system includes three levels: data layer, network layer and consensus layer. The expanded blockchain system architecture is improved to seven levels: infrastructure, basic components, ledger, consensus, intelligent contract, interface and application, and two parts: operation and maintenance and system management. The infrastructure layer provides the operating environment and hardware facilities for the normal operation of the blockchain system; the basic component layer

provides the communication mechanism, database and password library for the blockchain system network; the ledger layer is responsible for the information storage of the blockchain system, encapsulating the underlying data blocks and the related data encryption and timestamp and other basic algorithm technologies; the consensus layer mainly encapsulates the blockchain network nodes Inter point consensus mechanism and consensus algorithm; the intelligent contract layer compiles and deploys the business logic in the blockchain system, and completes the conditional triggering and automatic execution of the established rules through the code to minimize manual intervention; the interface layer completes the encapsulation of functional modules to provide a simple call mode for the application layer; the application layer encapsulates various application scenarios and cases of the blockchain, and the call mode is simple With the interface of smart contract layer, it can provide users with various services and applications, and realize technology landing. The system management layer includes authority management and node management; the operation and maintenance layer are responsible for the daily operation and maintenance of the blockchain system.

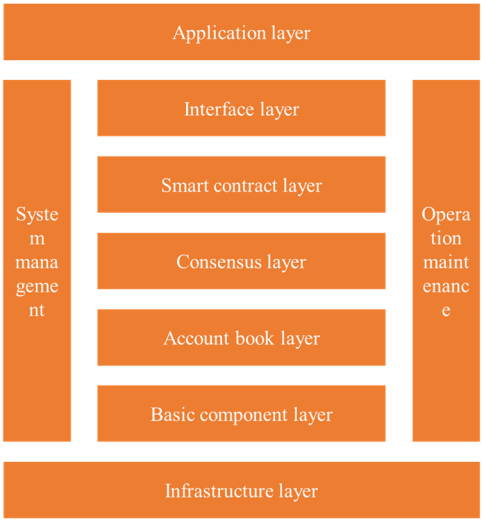

Figure 1. System architecture diagram of blockchain

3. Necessity and feasibility of applications of blockchain technology in accounting system

3.1. Necessity

The traditional way to prepare financial report is that due to the content of accounting information and the heavy workload of financial personnel, financial reports cannot be issued in time. Due to the low quality of accounting information, the lack of professional ability of accountants, the indifferent concept of rule of law, the lack of principle, driven by personal interests, concealing the real financial data and other factors, it is easy to produce the situation that the financial report is not objective and untrue. The amount of accounting information is large, the content is wide and the time is long. Only by summarizing the accounting documents and the data on the accounting books, can the financial report be prepared to comprehensively analyse the financial status and operating results of the accounting subject. The financial report is relatively lagging behind and has not strong timeliness. Blockchain technology makes post analysis of financial report into pre and in-process dynamic analysis. The preparation of financial reports according to the law and regulations, reflecting the financial status of the accounting subject and the production and operation activities, is the main content of financial work. The financial statements in time order include daily, weekly, monthly, quarterly, semi-annual and year-end financial reports. It is divided into preparation units, including company report and summary report. Each organization can record financial information in real time by using blockchain technology, and the system can generate financial report according to demand in time. It can reflect the financial status dynamically and truly in advance and predict the financial status and operation activities in advance. The complete financial data

is conducive to play a role in financial supervision. Blockchain technology is to establish a shared database, each block forms a complete data chain. In the process of financial data recording, each record is linked from beginning to end, forming a chain, and there are many organizations in the data chain. Financial data is not interfered by human beings or influenced by personal factors. Data is successfully entered in one block, and personnel will be audited on multiple blocks. Data changes involve many departments. It can be said that it can lead the whole body to effectively ensure the authenticity of financial information and ensure the quality of financial supervision.

3.2. Feasibility

Blockchain technology has powerful shared database and scientific encryption algorithm, which ensures the authenticity and reliability of accounting information. It is completely feasible to build an accounting supervision system based on blockchain technology. Enterprises can use the principle of blockchain technology to research and develop accounting management workflow, working methods and operation methods suitable for the characteristics of their own units, divide various departments of enterprises into several blocks, formulate block functions according to their responsibilities, realize block tasks, ensure the security of block data, connect and restrict each other, establish distributed ledger, decentralize and record economic activities dynamic data, using the function of blockchain sharing database, dynamically manage accounting information, build accounting management and supervision blockchain, and make accounting management work serve production and operation activities. Through the study of the theory and principle of blockchain, we can know its operation mechanism and workflow, and the data records are determined on demand. We can also use accounting information as data records to form a blockchain in the field of accounting. In view of the advantages and characteristics of the above-mentioned blockchain technology, its application in the accounting information system can completely avoid the fraud risk existing in the current accounting information system, and greatly improve the authenticity and reliability of financial information. Through the construction of two-tier blockchain technology in the original transaction link and accounting information processing link, the transaction information is solidified from the source and process, so that the accounting information cannot be changed and tampered with, so as to solve the above related problems. Therefore, it is completely feasible to establish a credible accounting information system based on blockchain technology by studying the accounting information processing model.

4. Principles of applications of blockchain technology in accounting system

4.1. Working principle of accounting system of seller

First of all, in the internet of things system applying blockchain, each enterprise needs to use the enterprise organization code as the unique identification. If it is a natural person, it needs to use the ID card as the unique identification, and each identification will exist as an independent unit. Secondly, each company will have a pair of public key and private key in the system. When each transaction occurs, the system will send the signature file of the transaction content, buyer, amount and product information to the buyer. After the transaction is completed, the buyer will broadcast the signature file of the seller and the buyer's information in the whole network with the private key signature. After receiving the information, each client will first decrypt it with its own public key to obtain the signature file of the seller, and then use the private key signature. The buyer's public key is decrypted to check whether the information in the seller's signature file is consistent with that in the buyer's file. If it passes the test, the data record will be included in a block, which will be stored in the seller's blockchain. The brief workflow is shown in the figure.

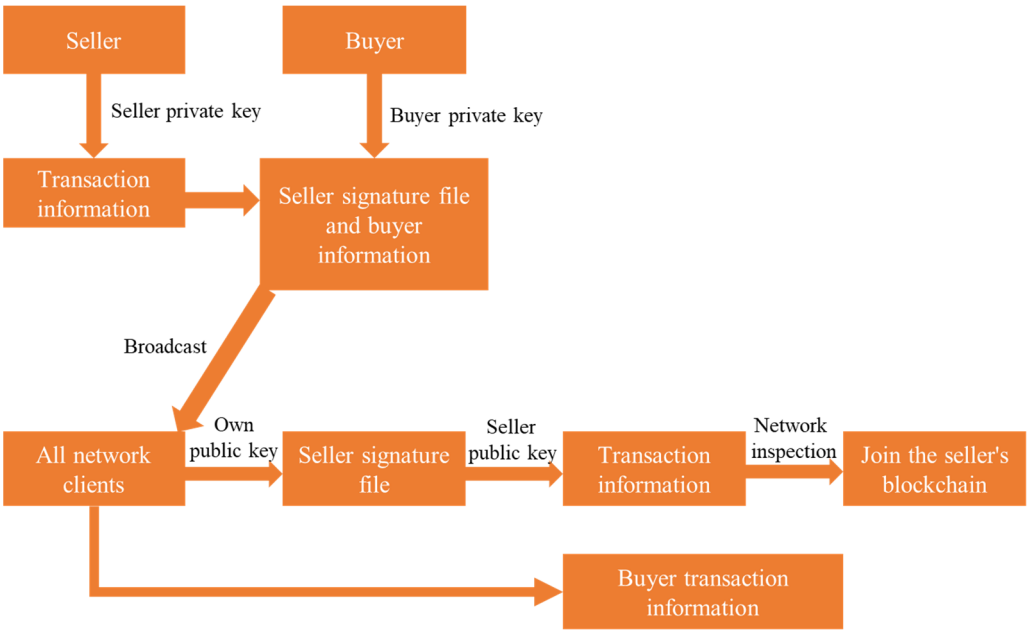

Figure 2. Workflow of accounting information system of seller based on blockchain technology

4.2. Working principle of accounting system of buyer

First of all, for the buyer, the enterprise organization code and ID card are still the only identification in the internet of thins system applying the blockchain, and each identification will exist as an independent unit. Secondly, when each transaction occurs, the system will send the signature file of the transaction content, buyer, amount and product information to the seller. After the transaction is completed, the seller will broadcast the buyer's signature file and the seller's information in the whole network with private key signature. After receiving the information, each customer will decrypt it with its own public key to obtain the buyer's signature file. Then, we decrypt the buyer's public key to check whether the information in the buyer's signature file is consistent with that in the seller's file. If it passes the test, the data record will be included in a block, which will be stored in the buyer's blockchain. The brief workflow is shown in Figure 3.

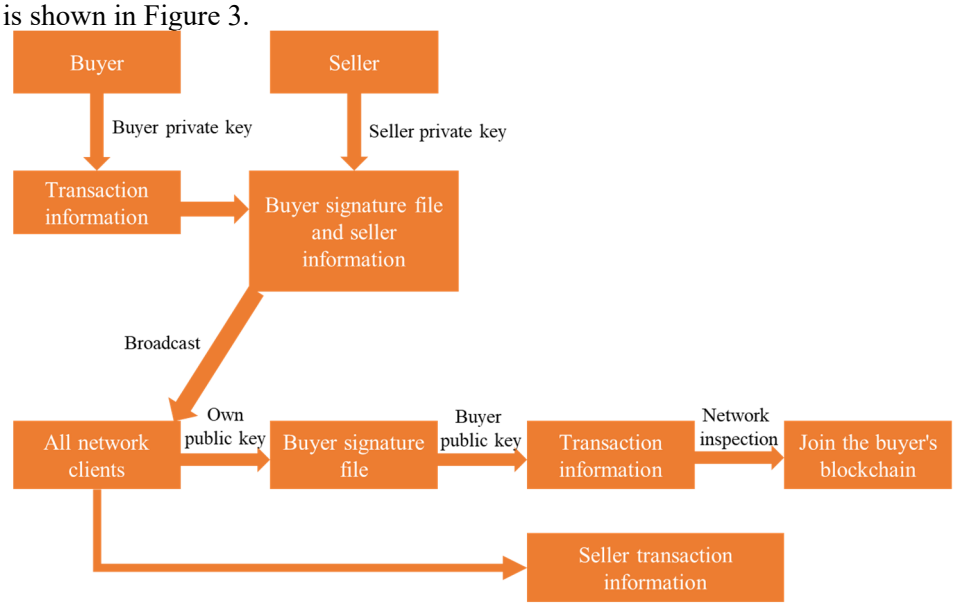

Figure 3. Workflow of accounting information system of buyer based on blockchain technology

On the one hand, every transaction can be recorded only after all nodes have been tested, which can prove the authenticity and reliability of the new transaction information. On the other hand, once the data record is added to the blockchain, each node will continue once as the basis and extend, and the transaction time will leave a timestamp to make the transaction data unique. Therefore, each transaction data can be accurately located and traced in the blockchain. In addition, any data records are added to the blockchain on the basis of the past data records. Therefore, based on the past real transaction records, all blocks in the chain are connected by timestamps and associated with each other. If you want to forge new data records, you must create a new blockchain. However, as the chain becomes longer and longer, the difficulty and cost of making a new chain is huge, so that the possibility is almost zero. Therefore, it is impossible to falsify and tamper with the past transaction information. Through the research on the working principle of blockchain technology, we prove that it can build a credibility system that is difficult to break and tamper with.

5. Models of applications of blockchain technology in accounting system

5.1. Longitudinal model

Vertically, the accounting information system based on blockchain technology can be divided into three layers: the bottom layer is the technology layer, that is, the blockchain Internet of things network, which is based on the interconnection of the Internet of things environment, constitutes a decentralized distributed ledger, and also includes a consensus mechanism; the middle layer is the application layer, that is, the combination of business types and blockchain, which jointly constructs the production and procurement The top layer is the operation layer, that is, the generation and entry of original voucher and the generation of bookkeeping voucher. An overview of the model is shown in the figure.

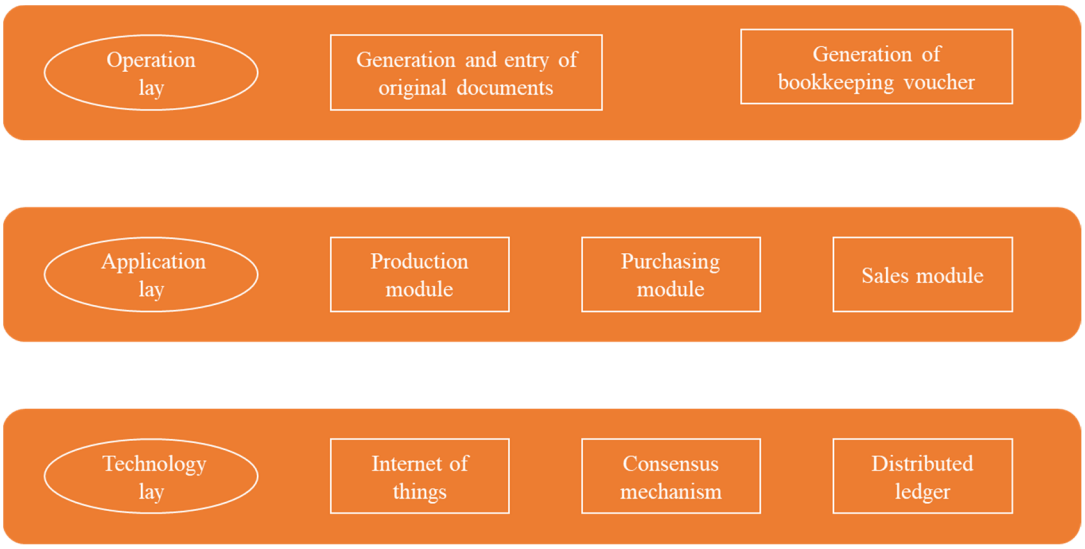

Figure 4. Longitudinal model of accounting information system based on blockchain technology

5.2. Horizontal model

Horizontally, corresponding to different operation modes of accounting information system, this model needs to apply blockchain in one or two links. These two links correspond to the operation layer of the above vertical model. The first layer of blockchain is in the generation and entry of original vouchers, and the second layer of blockchain is in the generation of bookkeeping vouchers. These two links solidify the transaction information from the source and process. The schematic diagram is shown in the figure. From the operation mode of accounting information system, the first layer of blockchain technology is the basis of accounting information security and reliability. Whether in the artificial

intelligence mode or in the man-machine cooperation mode, it is the key to ensure the credibility of accounting information. The second layer of blockchain technology is the mechanism to solidify the accounting information processing process. In the man-machine cooperation mode, the second layer of blockchain technology can make every step in the accounting process leave traces, accounting information cannot be changed, tampered with, make it verifiable, traceable, and greatly ensure the authenticity and reliability of accounting information. Of course, because the processing of AI model is completely automatic by the system, the process itself can be traced back. Therefore, in this case, we do not need to build the second layer of blockchain

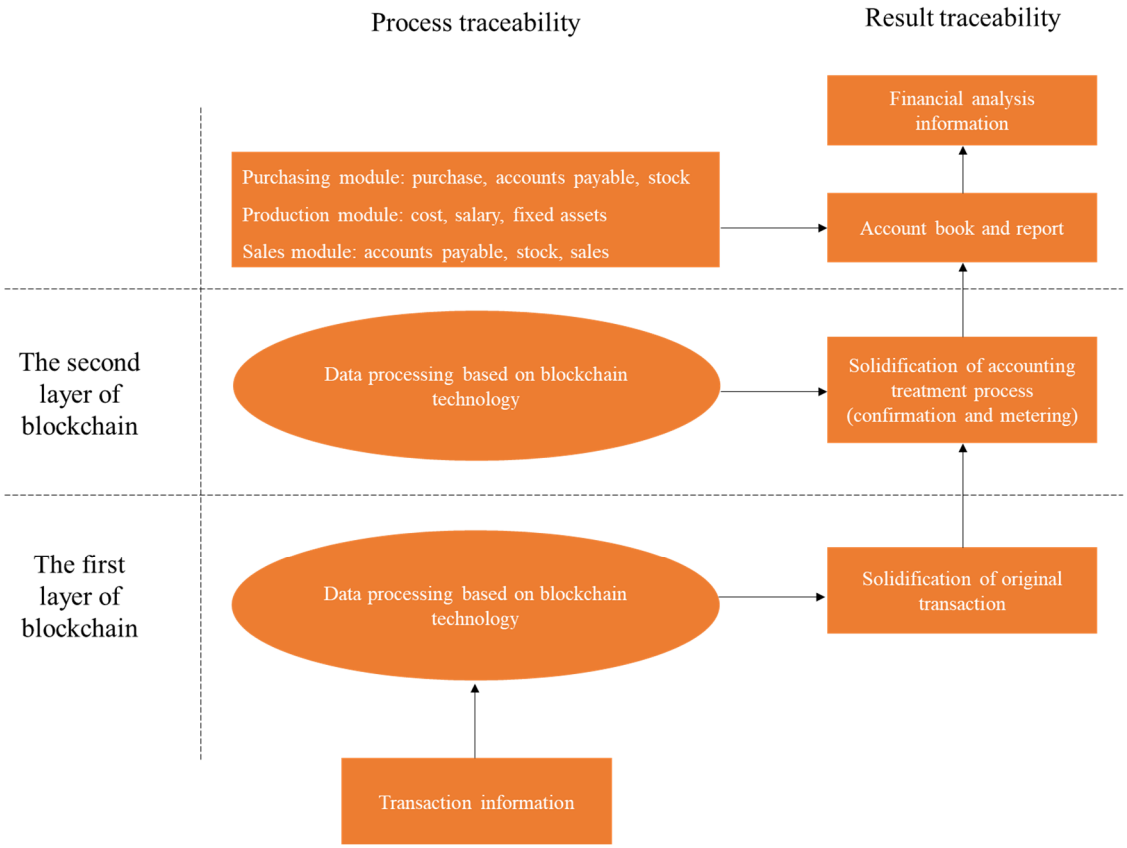

Figure 5. Horizontal model of accounting information system based on blockchain technology

From the operation mode of accounting information system, the first layer of blockchain technology is the basis of accounting information security and reliability. Whether in the artificial intelligence mode or in the man-machine cooperation mode, it is the key to ensure the credibility of accounting information. The second layer of blockchain technology is the mechanism to solidify the accounting information processing process. In the man-machine cooperation mode, the second layer of blockchain technology can make every step in the accounting process leave traces, accounting information cannot be changed, tampered with, make it verifiable, traceable, and greatly ensure the authenticity and reliability of accounting information. Of course, since the processing of AI mode is completely automatic by the system, the process itself can be traced back, so in this case, there is no need to build the second layer of blockchain. With the development of enterprises becoming more and more diversified, different enterprises will customize special accounting processing system according to their own personalized needs. In the case of the application of two-tier blockchain technology, not only the basic accounting work such as filling in bookkeeping vouchers can be solidified, but also the personalized choice of accounting processing mode in the process of purchasing, production and sales can be fixed. On this basis, the subsequent accounting treatment and financial analysis process will be more secure and

credible. Therefore, the application of blockchain technology can greatly ensure the authenticity and reliability of accounting information, and make the results traceable and verifiable.

6. Promotion strategies of applications of blockchain technology in accounting system

6.1. Strengthen policy guidance

The national top-level design can promote all ministries and commissions to conduct business exchanges on blockchain technology, cooperate to formulate some national macro policies, and help and guide the further development of blockchain technology. At present, the digital currency which is being implemented in China is the underlying driving force to promote the blockchain accounting technology ecology in the future. At the same time, in order to realize the application of blockchain technology in the whole industry, including the accounting industry, the government departments and the market need to constantly think about strong incentive mechanism and perfect technical guarantee. Relevant departments and enterprises should also reasonably balance the cost, benefit and risk of blockchain landing application, and use both policy and market to complete the initial market entry and promotion of the technology.

6.2. Improve legislative guarantee

Law is the most important factor for the good and stable operation of social economy. In order to make the blockchain deeply applied in the accounting industry, it is necessary to guarantee the supporting relatively fair and balanced legal system. In order to better protect and balance the interests of all parties involved in the application mode promotion of blockchain technology in the accounting industry, we should constantly consider and predict the potential problems in advance from the perspectives of technology, business, accounting and so on to finally ensure the in-depth application of blockchain technology in the accounting industry. At the same time, the relevant government departments and staff also need to constantly learn new technology and legal knowledge, so as to better supervise the application of blockchain in the accounting industry, prevent loopholes from being exploited and cause serious social and economic losses.

6.3. Cultivate compound talents

Blockchain technology, as a kind of technology originated from computer network algorithm, is almost a new thing for the majority of accountants. In the future, in order to make the application of blockchain technology in the accounting industry more in-depth, we need to cultivate a group of compound talents with logic algorithm knowledge and accounting theory literacy, and speed up the combination of production, learning and research in related aspects. Only in this way can we really use this technology to accurately cut in and solve all kinds of pain points existing in the accounting industry. In the future accounting industry, the majority of accounting researchers and accounting practitioners need to constantly think about the integration of complex accounting business and blockchain technology, and deepen the content of theory and technology learning. The state should advocate the cooperation between government, enterprises and universities, promote the pilot, put the theory into practice, and help the blockchain accounting technology ecosystem to solve the loopholes that cannot be made up in the application process. Only in this way can the data structure and algorithm logic of the technology be more suitable for the development of accounting industry.

7. Conclusions

Since the accounting computerization and internet accounting, blockchain technology may become a new technological ecological change in the accounting industry. The combination of blockchain technology and internet of things technology can strengthen the management of physical assets in accounting business and provide technical guarantee for the consistency between accounts and reality. This paper expounds the necessity, feasibility and basic principles of the application of blockchain technology in the accounting system, constructs the horizontal and vertical models of the credibility

guarantee mechanism of the accounting information system based on blockchain technology from the horizontal and vertical directions, and draws the conclusion that the accounting information system based on blockchain technology can provide credibility guarantee.

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