Research Article

Improving the Application of Blockchain Technology for Financial Security in Supply Chain Integrated Business Intelligence

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For major organizations, establishing financial shared service centers to unify the financial activities of entities in multiple countries and regions for bookkeeping and reporting has become the trend for financial and management optimization. Based on this, this paper selects security company A as a case study, introduces the emerging blockchain technology (BCT) as the core and embeds it into the concept of financial shared center, tries to explore a new model of financial shared service model under BCT from the theoretical perspective, and optimizes the original service model by improving its business process, creating visualized, supervisible, and traceable financial data processing capability, and expanding. This paper first examines the financial shared service model of Company A. This paper starts with the actual situation of Company A’s financial shared service model. Complex procedures, highly centralized information, unreasonable division of labor in corporate processes, and a lack of adequate information communication methods are discovered through process analysis. New requirements for accountants have emerged in the digital age, and the security protection of private keys in asymmetric encryption algorithms in organizations, particularly in large and medium-sized enterprises, must be done well.

1. Introduction

Blockchain (BC), also known as distributed ledger technology, is a distributed database jointly maintained by various nodes of a decentralized network [1]. Each block of data is determined through mining operations by millions of computers [2]. It is stored in a central repository, scattered across a global ledger using advanced cryptography, and when a transaction is made, miners generate a block in about 10 minutes based on the enormous computing power they have at their disposal, which includes all previous transactions [3]. This technology allows any number of key nodes participating in an information system to use a string of cryptographic methods to potentially correlate blocks of data, any one of which contains all the relevant transaction information for a certain effective system time, while generating data to verify the validity of other data information and serve as a link to the next block of data [4]. From the standpoint of auditing, BC can lower credit costs, lower financial risk, lower human error, lower audit costs, and speed up data processing, and is a new form of bookkeeping [5]. BC has gone through three stages of development: BC 1.0, which was a digital currency, BC 2.0, which was smart contracts, and BC 3.0, which was decentralization.

Since the acquisition and sharing of accounting information data are virtual and open, there are many participating subjects, and the risk of security is high in terms of loss and leakage, which greatly increases the company’s concern about the control of information assets and the security of related data and the difficulty of eliminating hidden dangers [6]. Understandably, this is almost impossible to happen in BC, because once the data on the BC are determined, it is very difficult to change, and only if you reach or control more than 50% of the world’s computers can modify the information [7]. BC’s technical architecture is an effective way to achieve innovation in financial data management and mitigate security risks, and provides a new solution and technique for enterprises to solve financial
information management [8, 9]. The deep integration of financial information management with BCT will have a profound impact on the optimization of the internal structure of enterprises, the innovation of corporate governance mechanism, and the research of accounting theory [10]. In addition, BCT will gain an active position and enhance the core competitiveness in the intensifying enterprise information war, and will play an important role in the overall management of enterprises [11]. It will play an important role in improving the complete management level of enterprises [12].

Reliable financial data means that financial information resources have certain integrity and can be used with full trust in the process of entry, transmission, use, and preservation. New requirements are put forward for the transmission quality and confidentiality of financial information [13]. There are firm safeguard mechanisms and constraints on the intentional damage and destruction of financial information [14].

Under the conditions of information technology, financial information generates a considerable amount of data, which differs greatly from the data characteristics formed under the past conditions [15, 16]. The main manifestations are the spatial separation of its accounting data, the relative openness of data, the reliability of data security transmission, the multidimensional readability during the use of data, the convenience of extraction at any time, and the satisfaction of the needs of different information contact subjects, as well as the requirement for the participation of the whole business chain of the enterprise in the entire ecology [17, 18]. At the same time, the new data security risks brought by the changes of new technologies are inevitable, thus requiring enterprises to also establish a secure risk assessment and risk prevention mechanism in a timely manner to ensure the security of accounting big data. With the development of cloud computing, big data, information technology, Internet technology, and big data technology change, prompting enterprises to achieve the development of big data decision management system applications [19]. Many enterprises have essentially completed the construction of the basic work and hardware conditions related to big data information decision making [20].

This paper starts with the definite condition of Company A’s financial shared service model. The financial shared service model is a technique to standardize numerous operations and consolidate them in a brand new department devoted to cost reduction and efficiency improvements that can provide value to the organization. Because of the rapid advancement of BCT, immature technology will be gradually perfected in the future. In order to improve financial processing and administration capabilities, Organization A, as a financial organization, must set up a perfect financial shared service model based on BC.

This paper arrangements are as follows:

Section 2 discusses the related work of blockchain network. Section 3 examines an optimization of financial shared service center architecture and the private chain builds a new internal organization. Section 4 studies an application of financial shared service model with BCT. Section 5 concludes the article.

2. Related Work

The functions of peer-to-peer transactions, automatic settlement, and updated ledger of BC network are specifically analyzed, and the author argues that the payment of corporate funds through the BC network will cross the third-party intermediaries and thus achieve the purpose of reducing the cost, which can reduce the easy process and financial cost in an extremely simplified way. The consensus mechanism, which generates a distributed ledger by processing data through digital encryption, is at the heart of BCT, according to the study, and its steps are decentralized and deapproved procedures. The accounting ecology will be changed by BC’s own audit, the BC information entry process is quite dry to the accounting of easy, review, confirmation, bookkeeping, and other acts of automatic verification, by all parties involved and confirmed, can ensure the integrity of the accounts, thus reducing the financial fraud and reflecting the accuracy and authenticity of financial data. By comparing the traditional audit with the audit under BC mode, the large amount of audit data and the time occupied by the audit will cause the delay and inaccuracy of the audit, while the BCT can improve the audit efficiency and implement the supervision. The combination of IoT and BC can build a distributed application system that can solve the problem of centralization of power and can achieve further increase of wealth by building a shared economic circle.

The financial shared service model is a way to standardize various processes and centralize them in a brand new department that specializes in providing cost reduction and efficiency improvements, which can bring value to the company. With the establishment of a shared service center, the company can protect its internal information and improve information security. Outsourced financial operations can compromise corporate secrets and weaken internal controls. Financial shared service centers can improve the value of enterprises, which is welcomed by many enterprises and can strengthen the strength of enterprises. However, we need to be aware of the risks in the process of continuous process transformation so that the financial sharing center can further improve the process and realize the value-added of the enterprise. The financial sharing service model can gather the advantages of enterprise finance and form a centralized force, which can form an advantage in enterprise competition and achieve the purpose of cost reduction.

The distributed ledger principle of BCT, with its functions of transparency, sharing, and non-tampering, can be perfectly integrated into the accounting bookkeeping and auditing process, according to domestic and international research, while BC, as a new computer technology, can provide the best data storage and information sharing capabilities. With the in-depth development and application of this technology, BCT is promoting the reform of accounting industry, which will change the accounting measurement model from the basic principle, and can simplify the
accounting process, reduce the financial operation cost, control the financial risk, and reshape the accounting and auditing thinking. The application in accounting already means the beginning of the improvement of the financial shared service model. After a lot of research and analysis and existing applications, scholars at home and abroad regard BC as the next hot spot for technology development and the next new technology that alters productivity, as well as the Internet technology that has the greatest impact on the accounting industry.

3. Optimization of Financial Shared Service Center Architecture Based on BCT

In this section, they examine that the private chain builds a new internal organization and the data BC and business BC of the financial shared service center. Under BCT, the financial shared service center has already established a semicentralized structure.

3.1. Private Chain Builds a New Internal Organization to Form a New Financial Shared Service. Company A has constructed a new internal organization model through the private chain of BCT, as shown in Figure 1. The data BC and business BC of the financial shared service center under BCT supplement the original single unified accounting business processing module and form three independent chain structures that operate uniquely and can support each other respectively. The data BC and business BC can provide data, optimize processing capability, business verification, and business support for data processing and business support. By setting permissions in the data and business BC and providing the private key of this part only to the staff of the organization inside the private chain, a lot of data will be set as the data information developed only for the private chain. In the BC model, the financial shared service center becomes a semicentralized organization, and because the private chain opens only a few limited nodes and can have limited control over the nodes, the private chain can significantly improve the speed of transactions. The private chain can also build an internal closed system to retain confidential data and avoid hostile assaults, thereby better securing Company A’s trade secrets, due to the limited number of nodes.

Strategic BC, on the other hand, can form a strategic financial shared service center by processing the data on the data BC and business BC, providing Company A with information related to investment risk prediction, decision prediction, and operation management warning. It can provide management with future decision-making recommendations and data analysis, improve the company’s operation, maximize the function of the financial shared service center from accounting to management, and optimize the financial management model. The construction on the private chain can combine the financial shared service model from intelligent accounting to strategic management, which can ensure the authenticity, security, and efficiency of business processing, and also empower the financial shared service center with scientific management capabilities and strategic decision-making capabilities.

3.2. Extent of Financial Shared Service Model. Company A’s traditional financial sharing center is only limited to the internal part of the company, ignoring the impact of the external environment on the company. With BCT, a company’s connection with its strategic partners may go farther, not just in terms of assisting Company A’s operations and improving its performance but also in terms of seizing opportunities in a rapidly changing external environment. Company A is able to broaden the reach of financial sharing services thanks to the alliance chain’s function, include the stakeholder companies in the financial sharing, provide some public and private keys to the companies in the alliance chain, and connect the BC of external companies with the BC of the company, from which it can acquire favorable data for reasonable improvement and additional arrangement of specific business, as shown in Figure 2.

In the financial shared service center built with the alliance chain, the company’s customers and suppliers and other stakeholders can participate in the company’s business processes and provide advice and further business activities as participants in Company A’s business activities and business management, and connect all business links in a complete way. Simultaneously, we can optimize the original transaction process based on Company A’s business data, as well as organize and develop business activities based on the original transaction process. Setting up a dual mode of private chain and alliance chain can increase the value of an enterprise alliance because Company A has its own commercial secrets. Several nodes are added to the BC network, and each alliance company is set up as each node, and the business shared with suppliers and customers is organized out and broadcasted to each node to form an alliance chain with suppliers and customers to share business information and advance the overall business level, and smart contracts are set up to unify the business payment processes of group companies, supply chain companies, and customer companies to improve the automatic fund. Settlement capacity and capital turnover capacity are also improved. Relying on the alliance chain, a win-win model can be set up to link the
whole supply chain companies to each other and share information and benefits [21, 22].

3.3. Optimization of Financial Shared Service Module Based on BCT

The information chain formed by BC has traceability and is chained in chronological order, allowing reverse traceability of blocks, as shown in Figure 3. At the same time, only information that reaches consensus can be chained, which also provides high-quality audit evidence for auditing. The financial shared service center has already formed a semicentralized structure under BCT. Accounting information will be verified by multiple nodes during the data uploading stage, and no single node will be able to carry out hidden transactions, which means that audit risks will be reduced at the source in terms of audit evidence, audit efficiency will be improved, and the level of internal control will be achieved as it should be. At the same time, the data on BC are recorded chronologically and broadcasted to the whole network, which can ensure the timeliness of information, reduce the tampering behavior of business time in the original system, and reduce the audit burden in the audit link. In terms of internal auditing, it is not only possible to conduct internal auditing through its own financial personnel but also to issue some common keys on the alliance chain to other parties such as business partners, upstream and downstream enterprises, and creditors so that stakeholders can cross-authenticate and not only provide relevant information to stakeholders but also expand the auditing function from auditors to the government, business partners, and other people to conduct business monitoring together.

Company A should evaluate the overall situation of each business unit at each quarterly stage and analyze the cost of each business unit and its contribution to the revenue of the whole company. The core algorithm of BCT, hash function, will be used in the process of profit calculation and search. The hash function forms a string of letters and numbers of a specific length, which is randomly recorded in a linear table, similar to encryption. At the same time, the data for the preparation of the concert report come from the entire block chain and can be verified for integrity and presence through the Merkle tree data structure, which can group the data codes of each block body and continue to calculate new hash values, layer by layer recursively, till finally one hash value remains to form the Merkle root, as shown in Figure 4 [9, 23].

4. Application of Financial Shared Service Model with BCT

BC, as an emerging big data tool, can bring benefits to companies from the aspect of financial sharing center and improve their financial management. However, from the technical aspect, it is true that there are still certain problems, the most prominent of which is the security of public and private keys, and asymmetric keys can be used for authentication and signature (and encryption if needed). Diverse keys should be used for different reasons, according to cryptographic security design principles, to avoid utilizing the same key for multiple purposes and causing data leakage. As Figure 5 shows the consequence of encryption on...
different finances, typically enterprise systems are designed so that a user who loses his authentication key can improve it by answering some security questions. Losing a private key to Bitcoin or the BC, on the other hand, means losing access to the BC indefinitely. Therefore, if the private key is stolen, it will lead to the leakage of confidential information and cause serious financial loses. Therefore, it is important to improve the security of public and private keys to protect them from loss and theft.

Under BCT, finance personnel will be separated into numerous directions for transformation; a part of finance personnel will act as risk management talents, using the features of smart contract of BC to set up technology for each business, to supervise all aspects of transactions in real time, and to monitor whether there is misperception in the setting of transaction authority and whether business processing routine and standard type are violated; a part of finance personnel will move to the direction of cost control. As shown in Figure 6, it can be known that another part of financial personnel will develop in the direction of capital forecast, and as a capital-intensive enterprise, the flow of capital of Company A needs to be paid heavy attention. Figure 6 shows the contact with the banking industry but can assess the next stage in the landing strategy via the corporate BC.

For the company to plan and forecast the movement of funds, the finance staff should keep up with the times, learn computer knowledge, and integrate the power of technology into the knowledge framework that is the eternal truth. As shown in Figure 7, compared with the previous accounting computerization, the procedure of generating, organizing, and using accounting-related information, each method...
Learning Curves (Naive Bayes)

Scalability of the model

Performance of the model

Learning Curves (SVM, RBF kernel, $\gamma = 0.001$)

Scalability of the model

Performance of the model

Figure 6: BC protection performance.
related to the participation in the security of accounting data adds a greater probability of uncertainty and is a risk enhancement. Under the condition of informationization, all information is disseminated through the relevant Internet network, and in each transmission link, due to the openness and openness of data participation, the number of people involved and close to the data is higher; thus, the probability of data loss, leakage, attack, and tampering is further increased [24, 25].

Data controllability is dependent on a particular level of spatial and scale controllability. In the relatively high degree of openness of the Internet virtual environment instantaneous, such as Figure 8 showing the protection consequence of diverse programs, the existence of data does not rely on paper media or individual storage methods kept in the internal financial institutions, but open distribution in numerous types of cloud and network, the company’s control over the storage medium is weak. Therefore, the security conditions and technical capabilities of the company’s financial data are a new challenge for financial personnel and institutions, and it is difficult to have a more effective action plan to solve the problem once the company’s financial data are leaked and damaged by information. Finance personnel are required to keep their knowledge updated and keep up with the times to master certain relevant technologies and capabilities.

5. Conclusion

The increasing development of BCT that makes immature technology will be slowly perfected in the future. Organization A, as a financial company, must set up a flawless financial shared service model based on BC in order to boost financial processing and management capabilities. At present, the relevant legal system is still not perfect. As a result, the security conditions and technical capabilities of a company’s financial data present a new challenge for financial personnel and institutions, and it is difficult to devise a more effective action plan to address the issue once the company’s financial data has been leaked and damaged by information. To ensure the smooth application of BCT and bring better improvement to the financial sharing center in the real sense, maintain the authenticity and validity of financial information from the root, and give greater play to the advantages of BCT and Fintech, it is necessary to start from the company and first establish the application system belonging to the company itself to realize self-management and self-monitoring in order to ensure the smooth application of BCT and bring better improvement to the financial sharing center in the real sense.

Data Availability

The datasets used during the current study are available from the corresponding author on reasonable request.

Conflicts of Interest

The authors declare no conflicts of interest.

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