

The Application of Blockchain Technology in Management Accounting

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Abstract

As an emerging information technology, blockchain technology is quietly subverting the existing business model. Based on a series of technologies such as distributed storage, open ledger, encryption algorithm and so on, the two core technology characteristics of blockchain, namely "decentralization" and "ntamability", have solved the bottleneck of management accounting development in information collection and processing. This paper will start with the core technology of blockchain and discuss the application of block chain characteristics in management accounting. Through analysis, it is found that the block chain technology will effectively stimulate the application of management accounting in practice, and fully support the strategic decision of enterprises. However, the application and development of blockchain technology in management accounting at the present stage have some limitations in the aspects of legal constraints, relatively immature technology and confidentiality.

Keywords

Blockchain technology; management accounting; application research.

1. Introduction

With the development of global economy, the increase of Transaction demand diversification and transaction complexity make global enterprises put forward higher requirements for management accounting to provide decision support and value creation function. With the support of AI, Internet of Things, cloud computing, blockchain and other technologies, more and more means are available for management accounting. But at present, the development of management accounting is still largely restricted by the information bottleneck. The emergence of blockchain technology makes it possible to break through the information bottleneck faced by management accounting. Due to the characteristics of block chain technology, the real, fair and safe trading environment is guaranteed, the openness of distributed open networks will also lead to a new and more transparent business environment, the information network achieved by point-to-point transmission will carry more abundant information resources. Although business operators do not want their low-level operation and financial data to be touched by external information users or even regulatory authorities, based on the open trading chain, the value brought by enterprise information transparency and authenticity will be improved, which will trigger the emergence of a new business environment.

In this paper, the block chain technology will impact on the application of the management accounting are studied, the purpose is to realize the optimization of management accounting, give full play to the management accounting in the forecast, decision-making, planning, control, responsibility to assess the effect of five functions, the decision and management for the enterprise to provide more accurate and comprehensive information, make the enterprise decision-making more reasonable, scientific, operational stronger and stronger.

2. Literature Review

Satoshi Nakamoto published a paper titled "Bitcoin: A Peer-to-peer Electronic Cash System" on the Bitcoin forum on November 1, 2008 [1]. As one of the underlying technologies of Bitcoin, blockchain emerged. Blockchain has attracted great attention from academic circles due to its unique decentralized trust mechanism, untamability, complete transaction history and other advantages, and is expected to become the leading actor driving the development of the post-Internet era. Tapscott et al. believe that blockchain is a digital distributed ledger that cannot be forged or tampered with. It can not only be used to record financial transactions, but also create value in many fields [2]. Swan points out several limitations facing blockchain technologies in the future, including concurrency, security, resource consumption, latency, and bandwidth [3]. Wang Shuo found that in the exploration of combining blockchain technology with the financial field, in addition to the practical application of some virtual currencies such as Bitcoin, other related technologies are still mainly exploratory attempts in the financial field, and the new financial system will bring a strong impact on the existing regulatory model [4]. Yang Xia and Dong Jieren used blockchain technology to optimize the financial activities of an enterprise, and put forward the idea of promoting the intelligent financial transformation of an enterprise by means of decentralization, distrust and distributed mechanism, but they were still in the stage of theoretical exploration [5]. Zhang Liucheng and Yu Linlin put forward the idea of an irreversible distributed financial system by taking advantage of the decentralization and untamability of blockchain technology. However, they also put forward that without a large number of trusted nodes, the security of financial information will never be completely solved by blockchain technology [6].

In the 1920s, European and American countries represented by the United States had developed all the management accounting practices used in the industry today. Unfortunately, management accounting has not formed a perfect modern information and accounting system, nor can it be fully integrated with other software, so that the potential of the system has not been fully utilized [7]. In the long process of exploration, the application of data mining is still limited to the field of financial indicators, such as mainly including cost management, asset management, budget management, revenue management, etc [8]. Kong Choumin, Li Lijun and others believe that in the future, under the blockchain economic environment of mutual trust, sharing and national autonomy, information collection, integration and analysis will be more efficient, which is conducive to ensuring the management accounting system and promoting the innovation of management accounting methods and tools [9]. Although strategic management accounting has a perfect theoretical assumption and development prospect, in practice, due to the poor availability of external information, the research on strategic management accounting cannot build a mature theoretical system without the support of practical cases [10].

Throughout the above literature, the research on the application of blockchain technology accounting and other fields has just started, and its combination with management accounting has not yet achieved research results, and the application of blockchain technology in practical scenarios is still in the discussion stage. Nevertheless, the characteristics of blockchain technology are bound to have a disruptive impact on the accounting discipline that has developed for five centuries.

3. The Characteristics of Blockchain Technology and Its Application in Management Accounting

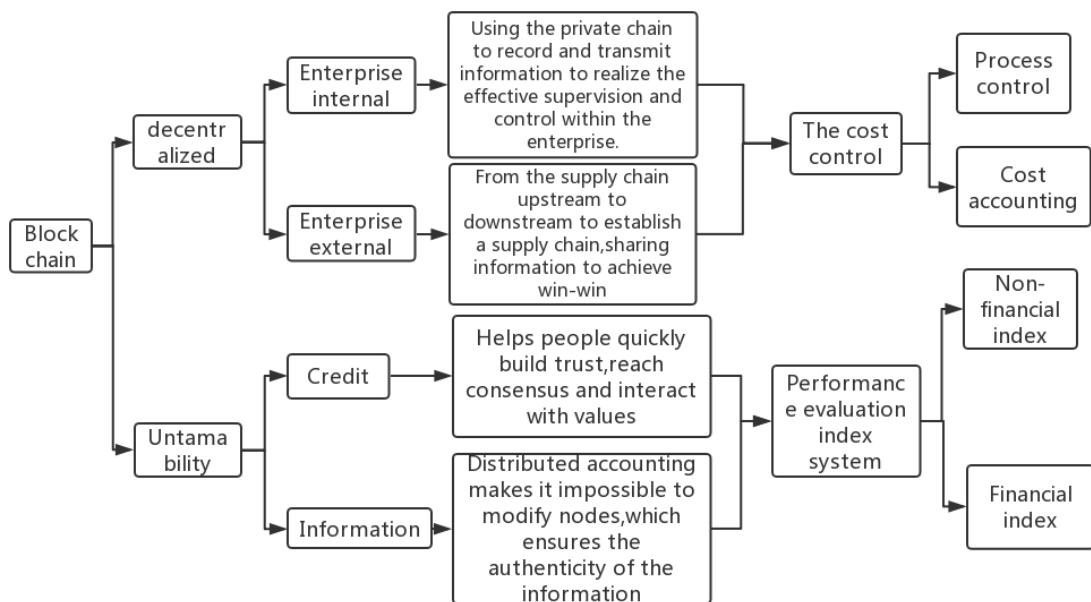


Fig 1. Two features of block chain technology are respectively applied in management accounting

3.1. Application of "Decentralization" in Management Accounting

Distributed storage is the most important feature of blockchain technology. It changes the traditional distributed storage mode, in which data is stored in multiple parts according to corresponding rules and managed by central nodes, and adopts decentralized management. The main performance is: the transaction is composed of the joint participation of different nodes; All nodes record and store complete transaction information. Let each node manage the data and participate in the record, review and update of the ledger, so as to achieve the purpose of maintaining the entire block network for each node; The absence of centralized equipment and mechanisms in the recording and storage process; The transaction data realizes the point to point transmission, then forms the network relation. The characteristics of "decentralization" enable information to be transmitted in a timely manner, so that enterprises can obtain abundant transaction information and quickly grasp the market changes and their own business conditions.

At present, public chain, alliance chain and private chain are three specific applications of block chain technology in enterprise operation, among which alliance chain is most suitable for enterprise transformation. League chain than male chain completely decentralized performance weak centralized, though unable to realize anonymity and cannot fully guarantee the privacy of parties, but the league chain has better flexibility and autonomy, and transaction confirmation between alliance or in-house personnel only, does not involve peripheral low trust of information users, consensus can significantly reduce the cost.

Under the characteristics of "decentralization", enterprise strategic management accounting can achieve the following improvements.

First of all, outside the enterprise, the enterprise should establish a network relationship map with itself as the core. Referring to Porter's Five Forces model, the relationship and transaction records of competitors, potential competitors, substitutes, suppliers and purchasers with enterprises and other relevant information are plotted in the same block chain map. Enterprises provide information support for strategic management through comprehensive

and in-depth analysis of the interactions and complex relationships with various trading parties on the block chain. Enterprises and consumers, suppliers, other companies in the same industry and other related industry partners to jointly establish alliance chain, sharing information, to achieve a win-win situation.

Secondly, inside the enterprise, the enterprise should establish the network relation map of each organization activity with strategy as the core. According to the Analysis of Porter's value chain, the activities of enterprises are divided into main activities, including raw material supply, production and processing, storage and transportation of finished products, marketing, after-sales service and support activities, namely procurement management, technology development and human resource management. Enterprises can use private chain to record and transmit information. Since the private chain is only open to enterprises, users cannot realize anonymity in the process of using it. In this way, enterprises can effectively supervise and control the execution of various activities. Enterprises can improve the flexibility and applicability of blockchain by autonomously defining the consensus mechanism of blockchain, the permissions and capabilities of nodes and other rules.

3.2. Application of the "Untamability" Feature in Management Accounting

"Untamability" is a feature of blockchain technology based on distributed bookkeeping, which increases people's trust in information, and since all participating nodes have the same information advantage, users on the blockchain have the right to read the transaction information on the node. Therefore, the asymmetry of information is greatly reduced, making transactions fairer and encouraging more users to participate in the construction of blockchain. With the increase of users, the transaction volume also increases and the data volume naturally increases, which increases the difficulty of information modification and forms a positive cycle. On the one hand, it helps enterprises to collect authentic and reliable information to support strategic management decisions; on the other hand, the trust established between enterprises trading on the chain also makes the underlying data among enterprises gradually transparent, making it more convenient for enterprises to collect information supporting strategic management decisions.

The blockchain's function is to design a "consensus mechanism" across time and organizations that makes it easy to determine values and then interact -- value reconfiguration. For enterprises with multiple organizations and departments, the management needs of each organization and department are not consistent. The headquarters must set goals and policies for various functional businesses and decide on resource allocation. As a result, the performance assessment of organizations by headquarters will be particularly complex. Coordination between organizations and departments is also an unavoidable problem in practical work. For example, if manufacturing personnel and marketing personnel do not work closely together, the opportunity to improve the product to adapt to market changes may be lost.

"Consensus mechanism" can help people quickly build trust and reach consensus on value. Therefore, the internal mechanism of "consensus mechanism" can be further studied to solve the problem of cross-organizational performance evaluation in management accounting system. Only under the orderly mechanism of "consensus", a series of management accounting performance evaluation work can go smoothly, according to the theory of input and output, on the basis of strategic objectives, set up a "unified" scientific evaluation indicators, including quantitative financial indicators and non-financial indicators, to assess the key success factors of enterprise management, etc.

4. Application of Block Chain Technology at All Levels in Management Accounting

Table 1. The application of five levels of block chain technology in management accounting

	The layer	Included technology	Application in management accounting
The first layer	THe data layer	Including data block, chain structure, asymmetric encryption and so on	The collection of management accounting information, such as the collection of financial data, business data, operational data and other basic data in production and operation
The second layer	The network layer	Including P2P network, communication mechanism, verification mechanism	Standardize management accounting information, using block chain language to describe the layer above and the information collected
The third layer	The consensus layer	Including POS, POW, DPOS	Manage the network communication of accounting information, conduct network communication of the data defined at the previous level, and conduct authentication at each node
The fourth layer	The smart contract layer	Including scripting code, intelligent contracts, and algorithmic mechanisms	Data storage and management. Cloud processing platforms such as distributed accounting are used to store and manage the large amount of data generated in the upper level
The fifth layer	The application layer	Including programmable finance, programmable currency and so on	Generate terminal reports. Use big data analysis and application technology, according to different needs to provide the corresponding terminal report

4.1. The Data Layer

Data layer is mainly for the business enterprise inside and outside a lot of structured, semi-structured, and unstructured data, financial information, business information use timestamp, hash function, asymmetric encryption, merkel tree and chain structure, data block chain key technologies define it as the block chain language, the enterprise all kinds of information to standardize, make the enterprise all kinds of information through the block chain structure performance, through the block chain technology enterprises can make full use of unstructured data and semi-structured data, the data in the chain of blocks to register and broadcasting, distributed stored in the block chain, It has greatly improved the efficiency of information transmission and communication between departments as well as the efficiency of data processing, realized the mode of information sharing and demand on demand, and also promoted the further integration of financial information and business information.

4.2. The Network Layer

A big feature of blockchain is decentralization. There is no central network node or server in blockchain network. Any two nodes participating in the blockchain network can conduct transactions directly, and there is no limit on the time it can join or exit the transaction. Any two nodes in the blockchain network have the same status and can access the information transmitted in the network at any time and equally. The information from the previous level is broadcast on the whole network using P2P network. Through the broadcast on the whole

network, each node on the block chain verifies the transmitted information to ensure the authenticity and reliability of the transmitted information.

4.3. The Consensus Layer

Blockchain is characterized by distributed accounting, and reaching consensus in distributed system is a key problem. The emergence of blockchain provides a good solution to this problem, which improves the efficiency of reaching consensus in highly decentralized distributed system through workload proof method. Since a lot of information has been distributed by some nodes in accounting (such as customer information, supplier information, competitor information, etc.), the subsequent information collection is not needed, but directly verified. The verified information will form a new block and enter into the next layer for classification and storage.

4.4. The Smart Contract

Smart contracts are digital protocols that use algorithms and programs to write contract terms onto the blockchain and execute them automatically according to the rules. Smart contracts store the terms of the contract, the triggering conditions and the specific actions to be taken after the contract is triggered. The smart contract automatically monitors the conditions of the relevant parties in real time. If the relevant parties have reached the conditions, the computer of the parties that have reached the conditions will automatically trigger the contract execution program. Through the first three levels, the management accounting data in the enterprise experienced data collection, block chain processing and full network authentication. The authenticity and reliability of these information have been greatly guaranteed. However, due to the large number of enterprise departments, complex business and diversified information sources, block chain will classify the data through cluster analysis, decision tree analysis, time series analysis, etc., providing a prerequisite for the application of management accounting in various fields.

4.5. The Application Layer

Blockchain will be further developed for enterprise-level blockchain applications in the future. Through the efforts of all industries, blockchain technology is gradually being applied to the development of all industries away from Bitcoin and Ethereum, so as to improve the production efficiency of enterprises and promote industrial transformation and upgrading. In management accounting, the block chain technology can be flexibly according to the needs of users, combined the technology of intelligent contracts to generate different areas of the management accounting report, if the managers need to understand the budget information, you can generate the budget management and accounting reports, including revenue budget report, cost budget and cost budget, etc., which greatly improved the management accounting information correlation, and improve the function of management accounting information decision support and value creation.

5. Limitations of Block Chain Technology in Management Accounting

5.1. In Terms of the Legal

The development of blockchain technology is restricted by national laws. The distributed storage emphasized by blockchain weakens the national regulation of transactions and impacts the existing regulatory system. At present, countries in the world have different attitudes towards blockchain technology and research progress, but there is one thing in common: the field of laws and regulations governing blockchain technology is still in a blank stage, and countries lack uniform industry norms and standards, which increases the risk of the application of blockchain technology. In management accounting system, because the data are stored in different places, this has higher requirements on the management and confidentiality

of the data. The information obtained to support strategic management decisions based on blockchain technology also needs legal support. In the absence of legal support, the decision-making information obtained, including competitors, markets, customers and suppliers, can be judged as commercial information disclosure.

5.2. In Terms of Information Security

Although consensus mechanism is an important support of block chain security, but it's still there is the possibility of a breakthrough, once the whole chain is force were breakthrough, not only causes enterprise's transaction information is tampered with, can also lead to information leakage, the most early, especially in the application block chain system vulnerable, lead to the black market of information, caused the leakage of trade secrets, false information transmission and the market order disorder, greatly affect the quality of management accounting is used to support decision-making information.

5.3. In Terms of Blockchain Infrastructure

This is an important factor limiting the current development of blockchain. The infrastructure of blockchain itself is not perfect, complex applications are difficult to carry out, cross-chain technology is not mature enough, and the current infrastructure architecture of blockchain is not enough to support large-scale commercial applications. Depending on the current information technology equipment, there is a certain inefficiency, uncontrollability and unpredictability in the process of information collection, transmission and processing. Businesses use block chain related accounting information needed for the strategic management of technology acquisition decision, not only need to configure the expensive transport, storage and information processing software and hardware equipment, also need to undertake the information collection inefficiencies, uncontrollable and unpredictable costs brought about by the time, and to support management decision-making information gathered by the cost is too high, will reduce the application value of information. For example, Estonia's health records are still in a chained database (that is, not stored on the blockchain), but the blockchain is used to identify, connect and monitor these health records and determine who can access or change them. This compromise means that the current performance level of blockchain may not match that of traditional databases.

Few start-ups today have the credibility and technology stability to meet the scale of government or industry deployment. Mainstream technology companies will actively position themselves as BaaS companies similar to cloud storage model, providing these emerging enterprises with "blockchain as a service", so as to bridge the gap between the technology of emerging enterprises and the actual business needs of customers.

5.4. In Terms of Privacy Asset Issues

Since the blockchain is a public distributed transaction ledger, the data on the chain is public, which makes many scenarios requiring privacy impossible to be applied on the blockchain. In the era of big data, data is assets, information is the commodity, many institutions are keen to expand through various channels of data mining, prediction and comprehensive monitoring, a lot of accounts and transaction information is a key asset for businesses and business secrets, block chain system completely transparent decentralized virtually violation of enterprise business privacy. At present, some privacy solutions have been proposed in the market, but they all need to be significantly modified in the underlying design of blockchain, so it is difficult to apply them to the existing blockchain. Further research is still needed in this regard.

Furthermore, the open ledger data is not conducive to the benign competition of the industry, making the industry tend to be homogeneous, and more detrimental to the development of the overall market.

6. Summary

The rapid development of block chain has brought a change to management accounting, making it more convenient to collect, store, process and report management accounting information. Therefore, management accounting can better play its functions of decision support and value creation on the original basis. At the same time, it should also follow the trend of The Times, seize the advantages of new technologies, integrate big data, cloud computing, block chain and other new technologies with management accounting, promote the improvement of management accounting system and promote enterprise value creation activities.

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