Research on the Integration of Blockchain and Accounting Information Systems Under Budget Reform

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Abstract. Under the reform of budget performance, this research used a literature review to illustrate the crucial theoretical foundation of budget performance management. An inductive approach based on available research has reasoned the knowledge of blockchain technology. The technical principle of the blockchain has been explained; the sharing mechanism and storage of the blockchain technology were being objectively summarised for the consensus mechanism and immutable storage based on gathered information. The integration of blockchain technology and accounting information system was provided based on grounded theory. Finally, a four-layer system framework was designed to integrate blockchain technology and accounting information systems against budget performance. It can offer opinions and references for government departments planning government accounting information systems, and it can also develop constructive systems for software development departments in system planning.

Keywords: Budget performance · Blockchain · Distributed ledger · Smart contracts · Immutable storage · Grounded theory

1 Introduction

The Chinese State Council proposed to establish an "all-round, full-process, full-coverage" budget performance management system (after this, the "Opinions") so that budget performance management transfers from academic research to practical implementation, the introduction of the "Opinions" is a manifestation of China's governance system and governance capabilities to improve further. The comprehensive implementation of budget performance management can improve the efficiency and effectiveness of using monetary funds.

Budget performance management research started outside China, mainly in the United States. In the 1970s, research on government performance management grew

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rapidly, and after 20 years of steady research development, it reached its peak in the 1990s (Burns and Zhiren, 2010). The study of budget performance management is a management study closely related to the study of local economic, political and cultural conditions, and researchers have conducted research from various perspectives. In contrast, according to CNKI academic statistics retrieval results, Chinese scholars have begun paying attention on budget performance since 2003; in 2009, scholars and practitioners began holding more academic seminars and training on-budget performance; in 2018, with the reform of the Opinions, an increasing number of scholars have further increased their attention to this research area.

Why integrate blockchain and accounting information systems? First, there are good opportunities for the development of new technologies. If you ignore and fail to grasp the scenery brought by the development of new technologies, it may be riskier than choosing to lie flat or be conservative. Second, the world economy needs high-quality and rapid growth; insufficient development and failure to pursue faster development will hinder high-quality development. Third, at the current stage, it is more important to solve complex problems across disciplines than problems in a single discipline. Fourth, in 2020, scholars began to pay attention to the research on the application of blockchain technology to accounting information systems, which provided a theoretical reference for the study of this paper. Therefore, the research on combining accounting information systems and blockchain technology cannot be ignored.

Under the reform background of budget performance, due to the prevalence of blockchain technology and accounting information system, much related applied research and exploration have emerged recently, providing theoretical support for integrating blockchain technology and accounting information systems in budget performance.

This paper adopts a literature review method, and it follows the following steps (See Fig. 1 for details): (1) determine the main objectives and scope of research protocol and review the relevance range review (include key words, core theme); (2) review the relevant research articles while verifying the quality of the articles. (3) Take notes, extract relevant important ideas, synthesise, merge and present important ideas; (4) develop overall conclusions and present research knowledge generated in the process.

A grounded theory was originally developed by Glaser and Strauss in the 1960s. The concept of grounded theory is a systematic qualitative method of inquiry that allows the creation of theories based on empirical experience (Glaser and Strauss, 1967). We used a grounded theory approach to integrate blockchain technology and accounting information system. Under the background of budget performance, This paper designs a four-tier system framework for integrating blockchain technology and accounting information systems, providing an opinion reference for government departments in planning government accounting information systems. It can also offer constructive system development goals for software development departments in implementing system planning in the development process.

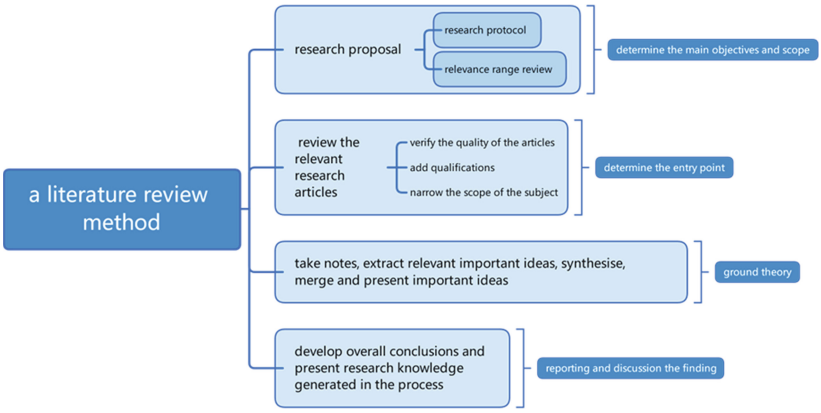

Fig. 1. Process of Literature Review Method

2 Literature Review

Previous scholars developed the mechanism and model perspective. For example, Lu (2006) conducted research on the theory of budget performance evaluation of colleges and universities and put forward suggestions on the design of the budget performance index system of colleges and universities in China, which set a precedent for the study of budget performance management of colleges and universities. Xia (2013) studied the whole budget performance management, proposed to straighten out the relationship between the financial department and the budget unit. He established a unified organisation and hierarchical responsibility management system.

There is also a close link between fiscal and taxation system reform and budget management, Wang (2015) studied the problems existing in the four stages of budget preparation, budget approval, budget implementation, and final account implementation in the budget management reform. Wang (2019) conducted research on the bottlenecks of local governments' promotion of performance budget reform, the overall performance evaluation of departments, the performance indicator evaluation system, and the reform of supporting budget management policies, and mentioned the practical dilemma of local performance budget reform. Zhang and Zhao (2019) made a comparative analysis of the problems existing in the independence of third-party budget performance evaluation in China. Li (2014) studied the budget performance management of administrative institutions from the perspective of internal control and specified the improvement and improvement opinions.

With the continuous development of new technologies in blockchain, Liu et al. (2022) proposed to achieve intelligent management accounting. It is necessary to take the value chain as the entry point, integrate the concept of finance into the business, and fully integrate the management framework of comprehensive budget performance into the system, a technology platform that incorporates blockchain technology and financial sharing network in the system construction. Due to problems such as opaque budget information and distortion of budget information, Du Susheng (2021) proposed that the internal control of enterprises needs to be optimised. Based on this, it is proposed

to be used Blockchain technology optimises the information technology environment and helps implement comprehensive budget management. So, a four-tier comprehensive budget management system is offered, and optimised suggestions are put forward for some processes.

As for the combination of budget performance management and information system, Jiang and Wang (2020) put forward the problem of government accounting information systems under the combination of budget performance management and information system. They put forward the overall implementation requirements and the limitations of the budget performance information system and put forward the best ideas for the government accounting information system.

Previous research has been conducted on management mechanisms and models, a new round of fiscal and taxation reform, performance evaluation, changes in working methods, budget performance management and information results. Recently, a research perspective combining new technologies has emerged. However, there has been no research to combine budget performance, blockchain, and accounting information system frameworks, so the research in this paper fills the gap in the study of combining budget performance, blockchain, and accounting information system frameworks.

3 Methodology

What research methods should be used? Most of the existing techniques are based on Literature review methods. How do accounting information systems and blockchain technology be integrated under the budget performance reform?

It is necessary to clarify the requirements of China's budget performance reform for the accounting information system; it is essential to identify the relationship between the new budget law and the budget performance management system; it is necessary to clarify the specific process of budget performance preparation in China, Implementation principle, sharing mechanism and storage mechanism.

3.1 The Requirements of the New Budget Law on Accounting Information Systems

The 2015 Budget Law (The state council of the people's republic of China, 2014) and the 2020 Budget Implementation Regulations (The state council of the people's republic of China 2020) (hereinafter new policy) cover all aspects of the social budget system. The new policy stands at the level of national laws and makes requirements for the budgets of various units and departments.

According to the requirements of the new policy, the main body of budget preparation should not only refer to experience, the current revenue and expenditure budget, the previous year's implementation report, performance appraisal report and cross-annual budget, but also consider external factors such as the country's overall macro policies and development plans. That is to say, the basis of budgeting at all levels has shifted from a pure consideration of internal factors to comprehensive external factors. Simultaneously, there is also a legal basis for preparing cross-annual budgets and performance appraisals.

There have also been new changes in the preparation cycle for the new Budget Law. The new budget law clarifies the medium- long-term financial planning. The new budget law describes that the rolling budget law takes three years as a budget cycle (The state council of the people's republic of China, 2015), which became a new model for preparing budgets by financial budget units. The rolling budget preparation method of the financial budget can improve the efficiency and effect of resource allocation according to the revenue and expenditure of the next three years, combined with the medium-long-term development plan, and through the organic combination of the rolling budget and the annual budget. In new policy subtitle 2 paragraph 3, this budget cycle (Sometimes it also called fiscal policy counter-cyclical adjustment) helps to integrate the annual budget into an organic whole, one cycle a year, one rolling three years, unlike the previous annual budget, which is independent and achieves a cross-annual budget balance (The state council of the people's republic of China, 2020). Under this preparation requirement, budget preparers must view in a higher position and predict future revenue and expenditure. It should estimate the income and spending more accurately, creating an external policy environment to research budget performance information systems.

The preparation of the budget and the budget performance evaluation are unified, and the key to budget performance evaluation is the effect of the input and output of the main budget project. The new policy emphasises the production and the cost of funds in using financial budget funds, emphasises the awareness of savings and proposes spending money on the key items.

Budget preparation and budget performance evaluation should unify, and each budget item's cost and output benefits are the focus of performance appraisal. In using funds, it is necessary to pay attention to the effect of project output and the awareness of management costs. Suppose the company want to achieve a reasonable distribution of funds within various departments and projects. In that case, it is necessary to evaluate the performance of the budget and take the results of the budget performance evaluation as an essential basis for the preparation of budget performance in the next year. Simultaneously, at the policy level, the results of budget performance evaluation are stipulated as an essential basis for the preparation of budget performance in the next cycle.

3.2 New Budget Law and Budget Performance Management System

Budget management is the process of enterprise management and budget execution, which include top-level management support, strategic planning and the bottom level of specific business implementation, covering all levels and business units of the enterprise. Budget management refines through strategic planning to a particular implementation plan. From the perspective of the specific implementation of informatisation (Du, 2021), its data package contains structured, semi-structured and unstructured data to ensure the realisation of the company's strategic goals and specific business objectives and further control the operational and financial risks of the enterprise.

Budget management is an optimal allocation process of enterprises' human, material, and financial resources. According to the strategic planning of enterprises, the enterprise should identify key businesses and projects of enterprises, and further tilt resources to crucial work, key businesses and critical projects. With the development of various new technologies and applications, management evaluation tools and systems are becoming

more and increasingly perfect, providing fertile soil to take root in Budget performance management. Under the influence of new technologies such as blockchain technology, big data, and smart finance, new technologies have produced more application cases and scenarios in the financial field. The latest technologies can be leveraged for electronic invoices, mobile payments, digital signatures (Zutshi et al., 2021), and electronic archives in budget performance management. Every application of new technology is a change, and the road to future reform is heavy and long-term.

After revising the new budget law policy in 2020, the dynamic cycle process of budget performance management is more dependent on implementing the budget performance information system. Based on the information research on budget performance management, we can focus on the enterprise's strategy, constantly revise the specific business objectives, ensure the rationality and implementation ability of the enterprise's strategic goals, and continuously improve with the development of the enterprise.

In the accounting information system of budget performance management, when the system is found that there is a gap between the actual results and the budget target, it can be quickly warned and start the corresponding measures and remediation plans. According to the previous operations and data, it can make more scientific business objectives, the key and risk points can be identified and early warned. The management can implement preventive measures to avoid risks and strengthen internal control.

3.3 The Specific Preparation Method of the Budget of Two Up and Two Down, Three Up and Three Down

According to the spatial logic programme, Budget Performance Management Workflow is divided into top-down, bottom-up and top-down combination methods (commonly known as two up, two down, three up, and three down). The preparation method of "two up and two down" is directly related to the budget performance system framework, and the different preparation modes are set up in advance, and the system selection framework is described in detail in the fourth part of this article. The specific preparation method of the budget of two up and two down, three up and three down is as follows:

1. The first UP stage: According to different cycles and their annual and medium-term budget revenue and expenditure targets, each functional department prepares the capital revenue and expenditure budget of the unit, references relevant budget performance evaluation results, prepares the revenue and expenditure budget and the three-year special budget task requirements for the next year with the prescribed format. The budget performance department summarises each functional department's annual revenue and expenditure budgets.
2. The first DOWN stage: The budget performance is adjusted according to the board of directors' budget control number, and then the budget control adjustment is issued to the relevant centralised functional departments.
3. The second UP stage: The relevant centralised functional department submits the adjustment budget control number to the budget performance department, and the budget performance department summarises and prepares the department budget, submits it to the unit budget performance meeting for consideration and submits it to the board of directors for approval.

4. The second DOWN stage: the board of directors revises and approves, and the budget performance department is responsible for issuing budget indicators to each functional department.

3.4 Principles of Blockchain Technology

3.4.1 Introduction to Blockchain Technology

Blockchain technology is new computer science and technology with new applications in many fields and has brought changes to society. Blockchain allows the internet to implement a distributed network state, allowing consensus to be shared between connected networks (Zhang et al., 2020). The consensus gives the concept of a network of trust between nodes in a blockchain. Additionally, blockchain is linked to distributed ledger technology.

Blockchain begins with a node's transaction request, packaged into a block by encryption, decryption algorithms, and sharing mechanisms, and then broadcasts the block to other nodes. Nodes are confirmed and validated in the blockchain network. When the block is successfully verified, the block will be attached to the end of the blockchain of chain structure; the block cannot be deleted and be tampered. Transaction requests can be stored at the end of the blockchain, and the transaction can be completed (Zarrin et al., 2021).

3.4.2 The Sharing Mechanism and Storage Mechanism of the Blockchain

Blockchain integrates smart contract technology to achieve a deal between nodes. The deal commits digital logic, and the deal is subject to the immutability of blockchain data, which must be executed and cannot be revoked when the conditions are mt.

When a node requests to be packaged into blocks (See Fig. 2 for details), the data is stored using distributed ledger technology. Distributed ledger technology makes the corruption of any node will not endanger the security of data. Even if a node is compromised, this malicious node may lead to bad transactions or improper storage. The sharing mechanism of other nodes in the network can also automatically replenish new blocks

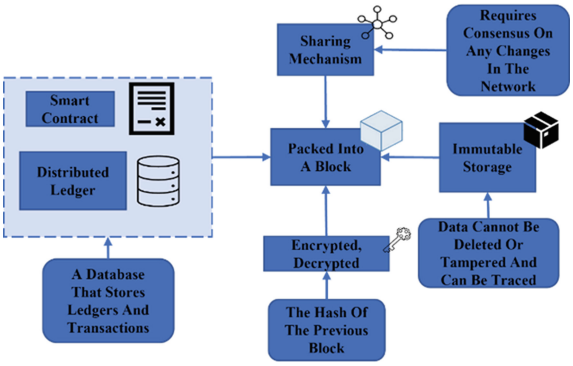

Fig. 2. Blockchain Technology Processing Process, Pictured According Zarrin et al. (2021)

at the end of the blockchain, ensuring the integrity of the data. In the blockchain private chain, the information on the nodes of the private network is packaged, the packaged blocks are put into the public network, and they are transmitted out like a broadcast in the public network, and all the nodes are sent outward, which is spread outward like a broadcast, which improves the efficiency of the blockchain private chain (Zarrin et al., 2021).

The information on the node is packaged into blocks and is highly autonomous—the user login into Google (www.google.com) through computers or mobile phones. From the perspective of user perception, once the connection is set, the user does not know which block in the blockchain he is visiting.

4 Findings: Blockchain Integrated with Accounting Information Systems

4.1 Integration of Blockchain Technology and Accounting Information Systems

Through the configuration of nodes, they are connected to different types of blockchain systems. Data dissemination has been controlled. Cross-chain technology has also achieved specific results to exchange and transmit data in two or more blockchain networks. Blockchain technology permeates all aspects of the economy and society with this new feature (Zhao, 2018). These applications include public and commercial fields such as identity authentication, electronic voting, notarisam authentication, logistics tracking, accounting information systems, etc. Blockchain technology has proven an excellent way to reshape business processes as auditors automate audit procedures (Upadhyay, 2020). According its trust mechanism, it can also facilitate data sharing in accounting information systems and avoid data security risks.

The integration of blockchain and the accounting information system has the performance of immutability, full traceability, and full node sharing. It has a high degree of data security and autonomy. It can eliminate human-caused data delays, damage, errors and even fraud. These characteristics can effectively make up for the potential limitations of existing accounting information systems and promote the upgrading and improvement of accounting information systems.

4.2 The Application of Integration of Blockchain Technology and Accounting Information Systems

In the “dual system” where event accounting and responsibility accounting coexist, relevant enterprises and institutions, financial institutions, various financial entities, auditing institutions can be used as a single physical node in the accounting information system. And according to their business and economic attributes, it is divided into their corresponding level of chain data structure.

Therefore, the management of the accounting information system can be carried out following the requirements of “all-round, full-process, full-coverage” comprehensive budget performance management.

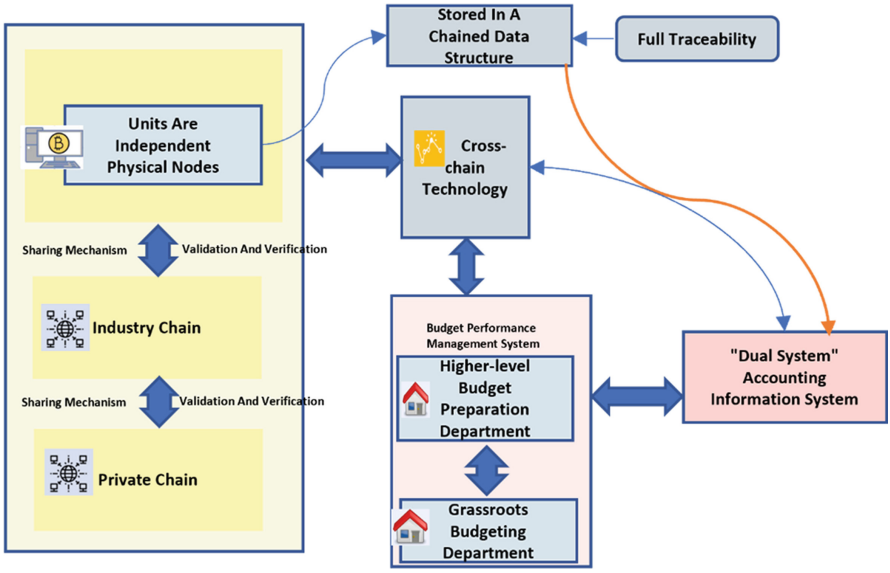

Fig. 3. Integration of blockchain and accounting information system

4.3 A Four-Tier System Framework for the Integration of Blockchain and Accounting Information Systems in the Context of Budget Performance

Following the top-level concept of an "all-round, full-process, full coverage" budget performance management system, the budget performance information system is placed at the management level. The top-down four-layer system framework of budget performance is designed with the flow of information, capital, and control flow (For details, see the four-layer framework system of budget performance in Fig. 4). The information system frameworks of the traditional control layer and the accounting layer have significant differences. The four-layer framework can achieve two-way interoperability with blockchain-enabled multi-agent systems and variable storage, sharing mechanisms, and encryption. The smart contract is located at the application port, directly linked to the four-layer framework system, and the multi-agent system supporting the blockchain is mutually interoperable.

In the top-down four-tier budget performance information system, the starting level of data flow (arrows) starts at the decision-making level. By setting long-term goals for the organisation, determine what the business will do and what it will not do in the future, and select the company's direction in the next 5 to 10 years. When collecting data, it is necessary to integrate the macroeconomic environment database into it, and take into account market operation data, customer relationship management system, competitor information, future market share growth forecasts, etc., to form a budget performance information system for the enterprise and business decision support system.

In the top-down four-tier framework system, the second layer is the management, which covers the budget performance information system and the business decision support system. Among the data sources of the second layer, the critical data is transmitted

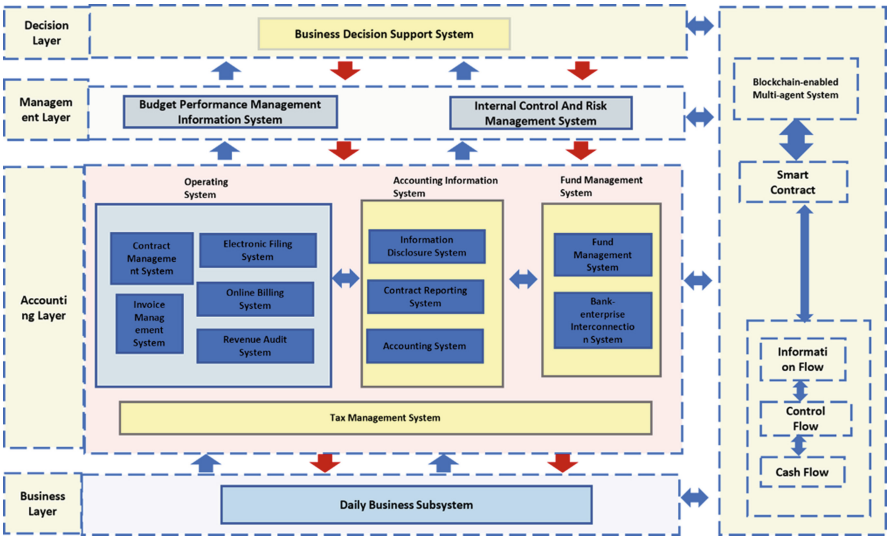

Fig. 4. The top-down four-tier budget performance information system

based on the decision data information of the first layer. This critical data becomes the key point of control in the budget performance management control (OECD, 2019), in which the main business strategy, work focus, and key objectives of the control in the annual business plan during the business period are also the key points in the process control.

A budget performance management system is a critical middle-level system connecting strategic management and execution, which can realise the optimal allocation of resources, concentrate high-quality resources arranged in essential positions, realise the effective use of resources, and realise the closed-loop of management (Reimann et al., 2019). Budget performance management is the perfect combination of business operation activities and financial budget. Whether using a "top-down" or "bottom-up" preparation method, it is necessary to go through repeated communication and coordination, adjustment and modification. The small cycle of "several up and down" may be formatted in the data flow process.

Budget performance management is closely related to implementing the budget, monitoring, evaluating, and budget adjustment. It is necessary to continuously summarise experience in the use and implementation of funds, step by step, and improve the budget management level of funds.

5 Discussion

According to the whole process of information flow, the four-layer system framework from the bottom up is designed in combination with the "value method" and the "matter method" (Jiang and Wang, 2020), which has obvious advantages over the traditional

simple budget management system that only covers budget preparation, implementation and evaluation. The system reflects the "trinity" of pre-performance assessment, performance monitoring during the event, and post-performance evaluation.

The budget performance management system is interoperable with the third-party tax system and can also be interoperable with the third-party audit system (not shown in the Fig. 3 as an extensible system). The audit system can realise the budget preparation audit, the audit of the target, the audit of budget execution, the audit of final accounts and performance, and the tracking and analysis of the improvement of audit accountability. Budget performance management adopts an information platform, and the budget performance process flows upwards, divided into top-down and bottom-up. In the process flow, it sometimes needs to be adjusted repeatedly many times. In the initial top-level design, it is necessary to integrate the management method of the matter law, and the "value law" and the "matter law" can independently send and receive data according to the needs of the matter.

The data of the budget performance management system is automatically distributed according to the time series. And it is refined for each quarter and each month. According to the completion of the previous period, the budget for the next period is made, and the effective budget rolling is realised to provide a basis for scientific decision-making and prediction. In the distribution of budget data time series, the different results are decomposed layer by layer into the responsible persons of each department, and the reasons for the differences are found, management measures are implemented.

The specific recommendations are as follows:

5.1 The Chained Data Structure Can Be Traced Throughout the Process, Helping to Implementation and Implementation in Comprehensive Budget Performance Management

In the compilation method, the traditional budget preparation is either a "bottom-up" type in which the relevant personnel of the grass-roots unit prepare the budget plan of the unit and summarise it by the superior unit, or the "top-down" type is organised by the superior unit, and then decomposed and issued to the grass-roots units. Due to the phenomenon of "data was islanded in distinct silos" (Iemma et al., 2014), both compilation methods face the situation of out-of-sync information, excessive manual intervention, and the separation of planning and reality in the implementation process. Although the traditional system includes "top-down" and "bottom-up" and can solve the above problems, it significantly increases the budgeting process's time and labour costs. Simultaneously, the reference of historical data often faces the problem of timeliness. In today's rapid development of the socio-economic operating environment, the historical data of grass-roots units is difficult to reflect on their current actual situation promptly, and it is easy to deviate from the budget plan.

If blockchain technology is adopted to integrate with accounting information systems, there are many advantages to using chained data structure data storage (Liu and Lee, 2021). First, the fused system has a clear advantage in the authenticity of its data. As independent physical nodes, units or organisations at all levels upload their operational data or financial statements to the information system, and they are stored in the chain

data structure, and no one can delete or tamper with them. Any data update or maintenance operation will be recorded in the data structure as an operation record, and the system can trace the whole process from the underlying technical level. In this way, on the one hand, the loss or damage of data caused by human error is eliminated, and on the other hand, the possibility of fraud is eliminated from the root cause. Second, the fused system can be both shared and independent. The physical nodes on each consortium chain can write and read data to facilitate data sharing in the region or industry, but they cannot obtain data from other consortium chains. Some departments directly related to budgeting, such as budget preparation or review departments, can serve as key nodes and apply cross-chain technology, enabling them to read data from multiple consortium chains. Third, the fused system can transfer cross-chain. The grass-roots budgeting department can more timely and accurately obtain accurate data that reflect the supply and demand of funds of relevant departments and write the data to it through cross-chain nodes. In the alliance chain to which the higher-level budgeting department belongs, it realises the efficient circulation of data between various departments and helps to open up the "dual system" of coexistence of event accounting and responsible accounting, and then promote comprehensive budget performance management. As a cross-chain node, each region's budgeting and auditing departments are responsible for sharing budget data with the higher-level budgeting and auditing departments in their jurisdictions. In short, while ensuring the legitimacy, security and timeliness of data, the integrated system adopts a combination of "top-down" and "bottom-up" budgeting methods and information system architecture, conducive to comprehensive budget management.

5.2 The Sharing Mechanism of the Public Chain, Private Chain and Alliance Chain Helps the Matching of Budget Performance Management Funds and Ensures the Effective Use of Funds

Managing the flow of funds in the budget implementation process is the core of the entire budget management. Existing "dual systems" mechanisms are an excellent way to monitor money flow within an organisation. Since the financial data of each unit and department within the organisation is within the management scope of the financial accounting information system, each input or exit item will have its clear source and destination.

The smart contract mechanism based on blockchain technology (Ge, 2021), applied in budget performance management, can make the flow of funds perform according to the process. Because its data is unmodifiable, the contract must be triggered once the conditions are met. In recent years public, private, and consortium chains (Hei et al., 2022) have been introduced and blockchains can better solve the problem of data being too transparent and difficult to control the scope of dissemination in traditional blockchain networks (Konashevych and Khovayko, 2020). To ensure that operational or financial data is shared within the region or industry, it can be isolated from data from other regions or industries to protect its privacy (Li et al., 2020) Consortium chain technology can be used to control the horizontal and vertical dimensions of shared data in the accounting information system.

5.3 Decentralisation Facilitates the Management of Overall Budget Performance and Improves the Efficiency of Funds

Evaluating the effectiveness of budget funds is another important task of the budget performance management system. The traditional evaluation process is mainly based on "post-evaluation", supplemented by manual investigation, evidence collection, seminars, etc., to evaluate budget performance's actual input and output effect. However, in reality, the evaluation of budget funds often requires a lot of human and material resources, and it isn't easy to reflect on the actual situation of the use of funds. On the one hand, because the ultimate beneficiary units of budget funds are often numerous, it isn't easy to be included in the supervision of government organisations' financial and accounting systems. On the other hand, it is difficult for projects with a long period to evaluate their effectiveness in an evaluation cycle effectively.

Compared with ordinary financial payment or transaction systems, accounting information systems based on budget performance have higher data sharing, timeliness and traceability. Blockchain technology decentralises the management of data (Chen et al., 2020) so that the financial data of each organisation in the budget management system is shared on their respective alliance chains, and its competent authorities can inquire about the allocation and payment of each fund, evaluate the effect and efficiency of the use of funds, and improve the efficiency of the use of funds. Take advantage of the fact that end users can connect to the network through multiple gateways, any of which can be used to initiate payments, improve the overall success rate of payments and address channel imbalances to maintain the long-term sustainability of the payment channel network and enhance the efficiency of funds (Liao and Shao, 2021).

6 Conclusion

Under the background of budget performance, this paper describes the relevant theoretical basis of budget performance management by using the method of literature review, describes the requirements of the new budget law on the accounting information system, systematically analyses the new budget law and the budget performance management system, and introduces the budget preparation methods of two up, two down, three up and three down in combination with the framework of the information system.

Through a brief introduction to the principles of blockchain technology, the technical principles of blockchain are interpreted by inductive reasoning of knowledge according to general research. The sharing mechanism and storage mechanism of blockchain technology is objectively summarised according to the experience and common-sense judgment of the collected data.

According to the grounded theory, the application integration of blockchain technology and accounting information system is proposed. The chain data structure can realise the whole process of traceability. It can help implement and practice comprehensive budget performance management and propose a sharing mechanism that applies to public, private, and alliance chains. It can help match funds for budget performance management and ensure the effectiveness of funds; proposed that decentralisation can help full budget performance management and improve the efficiency of funds.

Finally, a four-tier system framework for integrating blockchain technology and accounting information system under the background of budget performance is designed, which can achieve two-way interoperability with the multi-agent system supporting blockchain and realise two-way interoperability in variable storage, sharing mechanism, encryption and encryption. The smart contract is located at the application port, directly linked to the four-layer framework system, and the multi-agent system supporting the blockchain is mutually interoperable.

It provides an opinion reference for government departments to plan the government accounting information system and provides constructive system development goals for software development departments in system planning. However, Blockchain technology covers a wide range. The research breadth is slightly insufficient. The framework designed in the applied research in this paper represents universality. It limits the guiding significance of applied research to specific practices. The specific conclusions and suggestions only consider budget reform. The actual application should design all possible specific application scenarios to achieve both advanced and smooth implementation. In future research, we should pay more attention to specific case studies and propose more targeted and applicable integration schemes based on specific particular to improve efficiency.

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