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Blockchain+big data: Smart contract design for decentralized financial sharing platform

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Abstract: This article takes Company A as an example to focus on the optimization path of a decentralized financial sharing platform that integrates blockchain technology and big data. By analyzing the hierarchical architecture and core technologies of blockchain and combining them with the capabilities of big data in data integration, analysis, and risk prediction, the author proposes a smart contract design scheme for a financial sharing platform based on "blockchain + big data." The author studied and designed a solution including architecture reconstruction, security optimization, and process automation to address the centralized data security risks, information asymmetry, business process redundancy, and talent shortage issues of Company A's existing platform. Empirical results indicate that this solution effectively addresses the pain points of data silos, high trust costs, and inefficient processes in traditional financial sharing platforms, providing a balanced, secure, and intelligent technological path for the digital transformation of large enterprise finance. The blockchain technology itself has unique advantages: decentralization, trustlessness, and a unique distributed ledger form. These advantages can be used to optimize the architecture of financial sharing platforms, promote and apply them, thereby improving financial work efficiency and expanding enterprise economic benefits.

Keywords: *Blockchain, Big data, Decentralization, Financial sharing platform, Smart contract.*

1. Introduction

Since the 21st century, China's economy and technology have shown a vigorous and steady trend of development. At the same time, various challenges faced by Chinese enterprises have emerged one after another, mainly reflected in the expansion of business scale, the increase of cross-border business, the explosion and fragmentation of information, the inefficiency of enterprise organizational structure, and the complexity and variability of market environment. Many large enterprises have gradually realized that the simple and crude traditional financial management model can no longer effectively fit the current market environment, economic environment, and development environment. Therefore, how to innovate financial management and break through management difficulties has become the key for enterprises to leap to a new level of economic development [1].

After continuous exploration in practice, many enterprises in China have established financial shared centers in the early 21st century. In 2014, the "Guiding Opinions of the Ministry of Finance on Comprehensively Promoting the Construction of Management Accounting System" also clearly stated that large enterprises and enterprise groups should be encouraged to fully utilize specialized division of labor and information technology advantages, and establish financial shared service centers. In this context, the financial sharing model, with its characteristics of "standardized and streamlined business processing, clear division of labor, and specialization" combined with information technology and

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systems, effectively helps enterprises achieve cost reduction, quality improvement, and efficiency enhancement, becoming the choice for many domestic enterprises to move towards a new starting point.

In 2022, ZTE New Cloud Services Co., Ltd., together with ACCA and Xiamen National Accounting College, released the "2022 China Shared Services Field Research Report", summarizing the nine key elements for building a world-class financial shared service center. It can also be seen from the report that in recent years, financial sharing centers have shown a rapid development trend in China. Overall, financial sharing serves as an intermediate link in enterprise financial management, undertaking the function of connecting the past and the future. It provides core data information for managers to support management decisions, and provides accounting information required for business finance integration for financial accounting. However, after more than 20 years of development, the shortcomings of financial shared services have gradually been exposed: threats to data security, rising business processing costs, low employee motivation in financial shared centers, and high turnover rates. There is still a long way to go before achieving the goal of integrating business and finance, which is to guide business activities with financial information and support financial activities with business information. Therefore, the optimization and construction of financial sharing platforms will be the top priority for future enterprise financial management.

In recent years, with the vigorous development of emerging technologies such as big data, cloud computing, RPA, and blockchain, China has fully embarked on the digital transformation of its economy and society, and has also promoted the digital transformation of accounting work. Among them, blockchain technology, with its unique characteristics of distributed accounting, transparency, immutability, and full traceability, can open up new paths to solve the problems of data security threats and rising costs in traditional financial shared service centers. General Secretary Xi Jinping proposed that we should accelerate the development of blockchain technology and industrial innovation, and actively promote the integration of blockchain and economic and social development. It can be seen that vigorously developing blockchain technology has become a trend. In addition, in recent years, the international and domestic economic development situation is unpredictable. Force majeure factors such as the Sino US trade conflict and the COVID-19 have brought a new round of impacts and challenges to the development of enterprises. Enterprises should take stock of the situation and constantly update and explore the financial sharing model suitable for their own enterprises [2].

2. Relevant Overview

2.1. Overview of Blockchain Technology

2.1.1. Blockchain technology and related concepts

In recent years, blockchain technology has attracted widespread attention worldwide and has become a research hotspot in the fields of computer technology and finance. In terms of the fundamental definition of blockchain technology, Mainelli and Smith [1] first described blockchain as the technology that supports Bitcoin and viewed it as an open, decentralized transaction ledger. Tapscott and Tapscott [2] believes that the true value of blockchain technology lies in its decentralized nature. To capture this core feature, they suggest characterizing the application level of blockchain technology by measuring the degree of decentralization, the number of participants in the network, and transaction speed. Regarding the characteristics and applications of blockchain technology, Iansiti and Lakhani [3] pointed out that blockchain is not just a distributed ledger, but has enormous potential in ensuring transaction security and transparency.

2.1.2. Blockchain Technology Architecture

The blockchain technology architecture divides blockchain technology into different levels based on its inherent functions and logical structure for functional analysis and design. It is usually divided into data layer, network layer, consensus layer, contract layer, and application layer, as shown in Figure 1.

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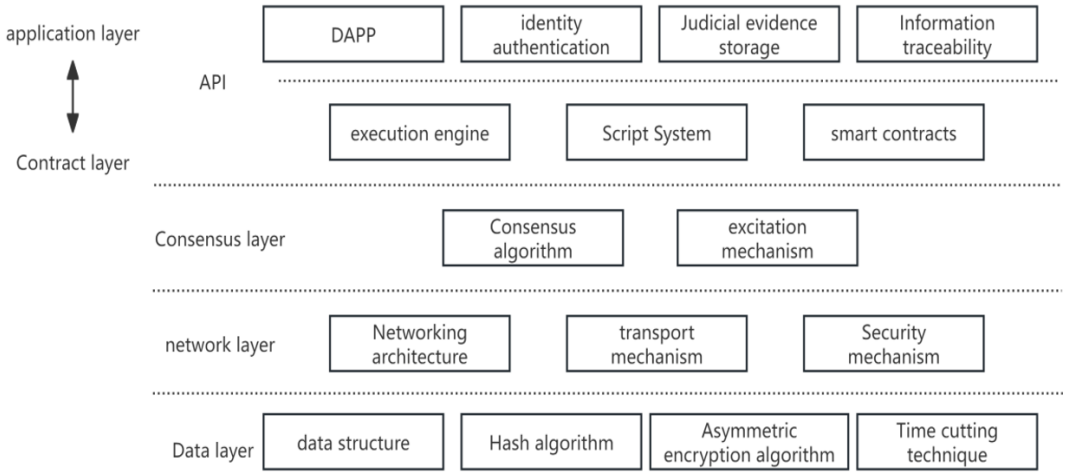

Figure 1.
Architecture of Blockchain Technology System.

The data layer is responsible for generating, storing, and managing the raw data structure of the blockchain, forming ordered blocks based on data structures such as MerkleTree, and forming an immutable chain. The network layer is responsible for the mutual communication and data synchronization between nodes, including networking architecture, transmission mechanisms, security mechanisms, etc. The consensus layer ensures the consistency of node data, encapsulates various consensus algorithms, and provides incentive mechanisms to drive node consensus behavior. The contract layer provides a programmable environment that supports writing and executing smart contracts on the blockchain, including execution engines, scripting systems, and smart contracts. The application layer is directly aimed at end users and service providers. Developers build various applications based on different application requirements through the API interface of the underlying blockchain or other development tools, including decentralized applications (DApps), identity authentication programs, etc. The various layers of the blockchain technology architecture are jointly operated by multiple types of technology combinations, and different blockchain systems generate various combination variants based on the selection of individual technologies according to their needs. Consensus mechanisms, cryptography, and smart contracts are the key technologies of blockchain [4].

2.1.2.1. Consensus Mechanism

Consensus mechanism refers to the set of rules, protocols, incentive measures, etc. that enable consistency among nodes in a distributed system. Compared to traditional distributed systems, the core goal of blockchain is to maintain the consistency of stored data on a weak trust basis. Therefore, it introduces more economic game algorithms to make attackers' attack costs far greater than their benefits, thereby achieving technological confidence without the need for third-party authentication. The consensus mechanism of blockchain systems usually includes the following aspects: - How to determine the ownership of recorded information rights (accounting rights) under decentralization; Secondly, how to ensure that nodes with accounting rights fulfill their obligations and prevent malicious nodes from damaging the system (Byzantine problem); The third is the rules for block generation, selection, and confirmation. Common consensus algorithms in blockchain include POW, POS, DPOS, PBFT, etc [5].

2.1.2.2. Cryptography Technology

Cryptography technology upgrades blockchain systems from distributed systems to immutable, verifiable, and valuable databases, serving as the underlying support for credit labeling of data. Blockchain is often confused with distributed ledgers. Initially, blockchain was mainly used for virtual

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currency transactions, and the concept of ledger is more in line with its scenario. But blockchain is only a branch of distributed ledger technology. Distributed ledger technology refers to the use of specific protocols to enable each node to synchronously store a complete copy of the ledger. Blockchain technology combines distributed technology and cryptographic technology to shape specific data structures and account models, in order to achieve tamper proof technical characteristics on a decentralized basis. There are three main types of encryption algorithms used in blockchain technology:

One is the hash algorithm, which converts data into a fixed number of bytes of hash value, and the generated hash value does not reveal the content of the original data and has uniqueness, achieving irreversible mapping from plaintext to ciphertext. Taking the data structure of the Bitcoin system as an example, a block consists of a block header and a block body. The block header is linked to the previous block through a hash pointer, meaning that the generated hash value of each block includes the hash value of the preceding block, ensuring that each block is immutable; The block body stores specific data in a Merkle Tree structure, that is, by grouping each data and taking hash values, and finally performing hierarchical operations to form a root hash, which is stored in the block header to ensure the immutability of individual data. The block header not only contains the preceding block hash and root hash, but also includes timestamps, version numbers, and so on [6].

The second is asymmetric encryption algorithm, which randomly generates key pairs. If one key is used to encrypt, another key is required to decrypt. The publicly available key is the public key, while the privately held key is the private key. The public key cannot derive the private key. The blockchain account model is based on asymmetric encryption, where the account address is generated by calculating the public key. Users can use the private key to sign transactions or data, and other nodes can use the account address to verify their identity.

The third is high-order algorithms based on application requirements, mainly implemented by combining block based data privacy, access control, and other requirements with encryption algorithms, such as attribute based encryption, homomorphic encryption, etc.

2.1.2.3. Smart Contract

A smart contract is code that automatically executes specific instructions under preset conditions, essentially by endowing objects with numerical characteristics, that is, by programming and deploying objects on the blockchain. The operating mechanism of the four smart contracts is as follows: convert the rules, agreements, algorithms, models, etc. negotiated by all parties into standardized contract code, and after verification, upload the contract to the chain in the form of transactions. When an event that meets the preset rules triggers a contract, each node verifies and executes the contract in the virtual environment, and uploads the execution result to the chain, synchronously changing the state, value, etc. of data objects in the blockchain network.

2.2. Overview of Big Data

The research on big data technology in foreign countries started relatively early, and different scholars have different research focuses. Firstly, some scholars focus on exploring the fundamental theories of big data technology. British scholar Schoenberg provided a basic explanation of the concept, characteristics, functions, and values of big data in his book " [4]. Secondly, some scholars focus on the research of the impact of big data technology. The development and application of big data technology have had both positive and negative impacts on human society. On the positive side, scholars such as Marcel, et al. [7] believe that the application of big data technology can enable people to live a safer, smarter, and more efficient life [5]. On the negative side, Albert Barabbas argues in "Explosion: New Thinking for the Future in the Age of Big Data" (2012) that big data technology can accurately predict people's thinking states and behavior patterns, and various databases that record human behavior will bring unprecedented risks to humanity [6]. Scholars such as Baur, et al. [8] believe that big data technology is not perfect and must have some flaws and busy spots [8]. Thirdly, some scholars focus on the ethical and justice issues of big data technology. In their book "Ethics of Big Data," Davis and

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Patterson systematically discuss ethical issues in big data from four perspectives: identity, privacy, belonging, and reputation Davis and Patterson [9]. Zwitter [10] believes that the predictive function of big data technology poses a threat to the development of human free will Zwitter [10]. Pilkington [11] believes that big data technology has exacerbated social inequality Pilkington [11]. Pardo [12] believes that ethical issues, data privacy, and informed consent should be taken into account when using student data [13].

3. Overview of the Financial Sharing Platform of a Enterprise Co., Ltd.

3.1. A Company Introduction

A Enterprise Co., Ltd. was established in August 1999, occupying a huge market share in the Chinese dairy market and providing diversified dairy products to Chinese residents. As of 2021, A Enterprise has established more than 50 processing points and 38 production bases, respectively. There are a wide variety of dairy products, with over a hundred items. According to the 2020 financial report released by Company A, its revenue reached over 76 billion yuan last year, with a year-on-year increase of 10.6% in business revenue. On the day of the financial report release, its stock price rose by 3.94%. It is believed that in 2020, when the industry development and market economy were generally impacted by the epidemic, the achievement of A company's performance in this job is closely related to its implementation of intelligent strategies [9].

Over the past decade, Company A has grown from a product manufacturing enterprise with limited market coverage and annual sales of 40 million yuan to a production line with over 400 small and medium-sized enterprises, covering all major cities including Hong Kong and Macau, with sales exceeding 10 billion yuan, in line with international standards. The expansion of enterprise scale inevitably requires a transformation of organizational structure and an upgrade of management mode. In the rapidly developing social environment, if Company A wants to keep up with the pace of the times, it needs to adjust and optimize its financial risk management plan reasonably based on its own development status. At the same time, it also needs to make reasonable adjustments to its future development strategy in China. The SAP system created not only handles financial accounting uniformly, but also achieves full online deployment. Company A has also begun to optimize its original financial functional framework and created a financial information sharing service platform in accordance with the requirements of the times.

3.2. A Enterprise FSSC Financial Shared Service Platform Status

At present, Company A mainly adopts the following model to operate the financial shared service platform: seamlessly integrating CE network reimbursement system, OPENTEX imaging system, OA system, human resources PS system, EAS fund payment system, SAP financial system, budget management system, and business travel platform to promote standardization of business processes, and achieving efficiency improvement through the skirt effect of batch integration processing, providing professional information sharing services for internal and external units of the group [10].

3.2.1. A Development History of FSSC Financial Sharing Platform for Enterprises

Before 2012, Company A mainly used traditional methods to carry out financial risk management work, which involved setting up corresponding finance departments in each subsidiary. The finance department was responsible for calculating the company's daily accounting costs and timely transmitting financial data analysis reports to the headquarters. In the above model, some basic financial work of Company A, such as daily auditing and bookkeeping, requires financial personnel to be responsible. With the continuous expansion of the company's scale, if Company A still adopts the original financial management model in the fierce market competition environment, the management drawbacks of low efficiency and high cost will become increasingly prominent. Moreover, the above problems will also have significant constraints on the quality of employee training and financial management sales and effectiveness, such as the management's difficulty in understanding grassroots

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information data, and the company's profits showing a downward trend. Obviously, if Company A does not improve and optimize its financial management model in a timely manner in the rapidly developing social environment, it will have a significant impact on its industry competitiveness and future development. In this context, Company A has started to reform its financial management model by creating a financial shared service platform in order to address the shortcomings of traditional financial management models in a timely manner. A company officially launched its CRM system and SAP-ERP system in 2013. After implementing and applying the above systems, it integrated and optimized its internal business units, and also recreated business processes to achieve stable and efficient transmission of internal information. After obtaining a stable system, A Enterprise Group created a financial information platform based on the ERP database. Using this platform, A Enterprise also achieved real-time statistical management of financial statement data information and organically integrated front-end finance and business [11].

After completing the pilot of CRM system and SAP-ERP system in 2014, Company A began to promote its application scope and basically achieved comprehensive use after 2015. The successful operation of Company A's characteristic information system also means creating favorable conditions for the implementation of subsequent financial sharing models.

In 2015, Company A officially began construction of the "A Enterprise Group Financial Shared Management Model (FSSC) Fund Sharing Platform" project.

In 2016, the first phase of the project construction was completed, providing support for A company to build a new financial model, achieve the transformation and upgrading of the company's financial institution, and establish the BI platform foundation and business intelligence analysis system.

3.2.2. A Overall Design of FSSC Financial Sharing Platform for Enterprises

The financial sharing platform of Company A positions the shared services of various departments based on business and processes, in order to develop key positions and organizational frameworks for the internal financial sharing service platform. From the figure, it can be seen that each department is mainly responsible for its corresponding responsibilities. For example, the general ledger accounting and reporting department is responsible for statistical accounting, and every business from milk source procurement to mass production involves the entire group; Cost control accounting, transfer various business cost items to the financial sharing platform for processing, and settle them on a monthly basis; Report preparation, shared platform reports no longer require manual filling to reduce error rates. The work of expense reimbursement, reserve funds, and personal loans needs to be handled by the expense reimbursement department, which manages the daily business reimbursement of employees on a large scale to improve reimbursement efficiency; Provide credit risk management to reduce the possibility of 'hidden operations'. Procurement and Accounts Payable Department, detailed to each procurement expense, including all payable items such as advance payments, accounts payable accounting, and invoice verification. Sales accounts receivable department, responsible for accounting for various types of accounts receivable; Mastering monthly and annual revenue lays a solid foundation for analyzing profitability, and is also responsible for calculating input tax and internal transfer sales. In addition, an Operations Safety Management Department and a Service Support Department have been established, among which the Operations Safety Management Department is mainly responsible for various safety management within the group, including milk source quality supervision, system operation safety and maintenance, and main database maintenance. The Service Support Department is the after-sales department of the shared service platform, mainly responsible for innovative performance evaluation, management of education and training, archives, customer service, etc [13].

The following figure shows the overall design of FSSC for A Enterprise Group:

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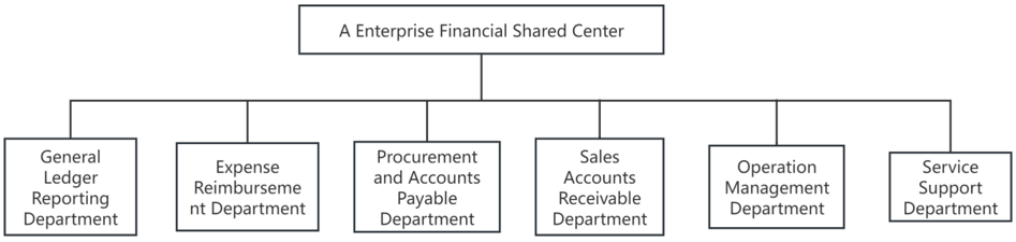

Figure 2.
Overall Design of FSSC for Company A.

The businesses of Company A that are not included in the financial shared service platform mainly include financial data analysis, daily budget and tax docking. The main reasons why the financial sharing platform is not included in the above business are as follows: firstly, some businesses are management accounting work, and in the sharing platform, the authority will be decentralized, which is not conducive to daily management; Secondly, the market conditions and customer demands of each subsidiary under the group are different, and the daily budget should be formulated by the subsidiary itself, which cannot achieve the unity of the entire group; Thirdly, due to the market positioning of Company A in the dairy industry, the product types in some remote areas may deviate from those of other subsidiaries, so the daily budget should not be included in the sharing. Each branch should tailor its daily budget to meet its own market needs; Fourthly, it is difficult to handle relocation within the management scope of different regions, and the work content with different personalized needs cannot be standardized and unified [14].

3.2.3. A Construction of FSSC Information Platform for Enterprises

In Company A, the SAP system is the core of the financial shared service platform. Based on this, the entire financial shared platform can be constructed. Next, the mainline can be created by comprehensively utilizing the impact transmission system, approval management system, and other systems. In terms of interface construction, it is necessary to achieve a comprehensive approach. Only on this basis can the shared operation platform be formed, which integrates eight major modules such as information transmission module, main data module, and human resources module.

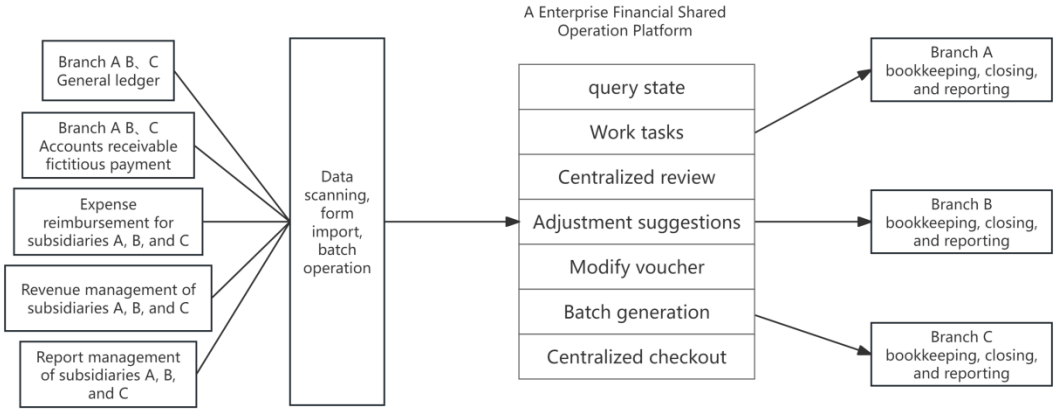

Figure 3.
A Enterprise Financial Sharing Platform Operation Platform.

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3.2.4.A Basic Architecture of FSSC Financial Sharing Platform for Enterprises

The financial sharing platform of Enterprise A, which has introduced the SAP system, was constructed based on the degree of system connectivity. In the first stage, Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM) modules were first added, greatly improving the standardization of the business processes of the shared service platform of Enterprise A. This made the group data more transparent and visual, laying the foundation for the Plan and Implementation (BI) module and Equipment Management module (PM) to be implemented in the second stage. In the next stage, the fund management module, budget management module, and human resource management module can be added within the original module scope to facilitate real-time interaction of data information between various business modules [15].

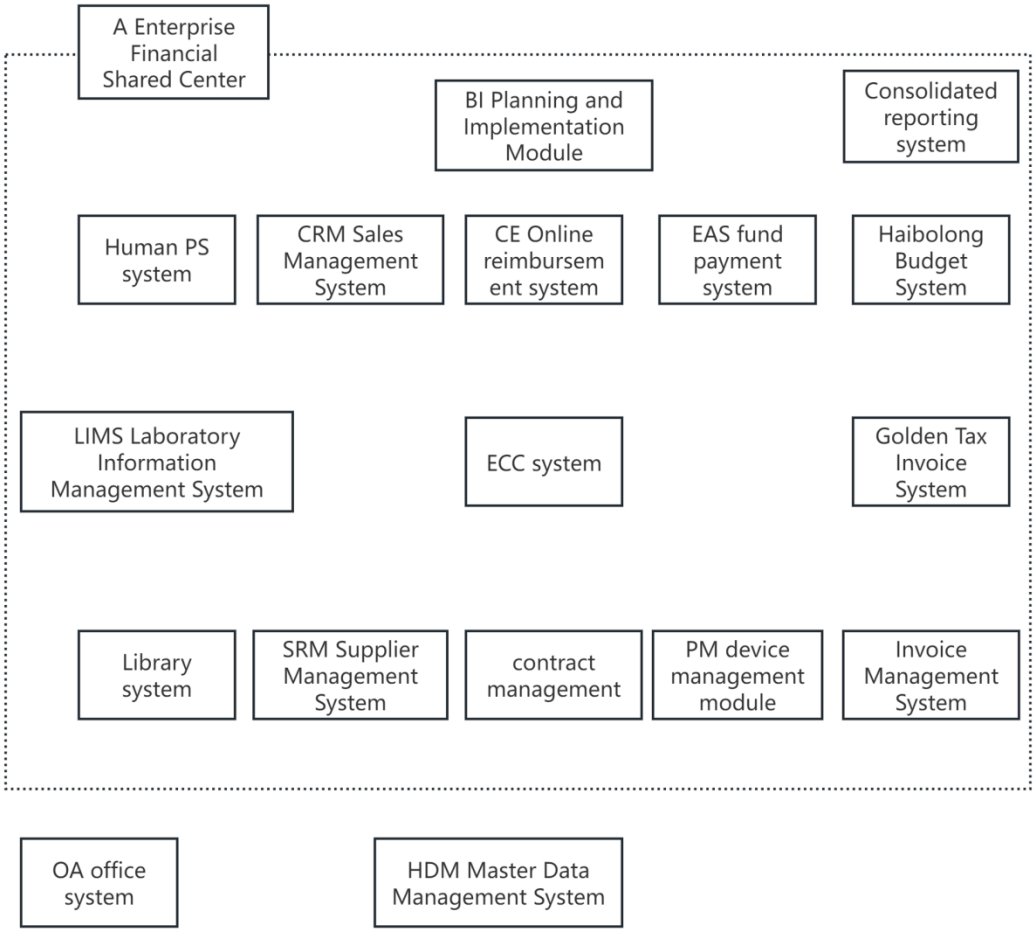

Figure 4.
A Basic Architecture of Enterprise Financial Sharing Platform.

A company mainly utilized the SAP-ECC system to create a financial shared service platform, and introduced many systems such as contract management system and fund payment system into the platform based on actual needs, laying a good foundation for practical application in the future. At present, the architecture of A company's financial sharing platform is already very complete in theory, but there are still many unresolved issues in its development and promotion process. The traditional financial model has been operating in China for several years and has become a fixed mindset for

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financial personnel. However, its acceptance is not high, and the company has many management levels, unclear allocation of rights and responsibilities, and unresolved issues such as financial data fraud. In view of this, the financial sharing platform of Company A is facing severe challenges and urgently needs to be optimized and improved [16].

In the financial sharing platform of Company A, the EAS fund payment and receipt system is mainly responsible for integrating payment and receipt information and sharing information with the CE network reimbursement system; After integration, the CE network reimbursement system transmits expense and payment information to the ECC system. The CRM sales management system is responsible for integrating marketing expense information, while the LIMS laboratory information management system is responsible for integrating product inspection information. The resulting data is ultimately transmitted to the ECC system. The inventory system, contract management, invoice management system, PM equipment management module, and SRM supplier management system are responsible for integrating product warehousing information, contract information, invoice verification information, daily maintenance information, and supplier procurement information, respectively. After integration, the information between each system is transmitted to the ECC system of Company A for data sharing.

4. Problems with the Financial Shared Service Model of Company A

4.1. Centralized Storage of Data Information Poses Security Risks

4.1.1. Financial Shared Center

The financial models mainly based on financial shared centers generally suffer from information security issues. In this mode, the financial data of various business units of Company A will be stored in a unified system for analysis and reporting. However, this also brings risks to data security and confidentiality. A company's financial shared center involves a large amount of sensitive data, such as financial statements, customer information, contract agreements, etc. If these data are hacked or leaked by internal personnel, it may cause economic losses, damage to reputation, or legal liability to the company. And A company's financial system lacks reliable backup and recovery mechanisms. If data is lost due to disasters, failures, or human deletion, it may lead to business interruption, data inconsistency, or inability to trace. At present, the personnel management of China's financial shared service centers has not yet formed a complete system, and most financial shared service centers lack personnel incentive and restraint mechanisms, resulting in personnel instability. In addition, the finance department of the group headquarters has high control over the operation of the financial shared service center, holding a large amount of financial resources and decision-making power, which increases the risk of abuse of power.

4.1.2. Business Process Aspects

From the perspective of business processes, for example, in customer management, current customer relationship management systems often involve a large amount of sensitive data, such as customer names, contact information, consumption records, preference analysis, etc. If this information is leaked and exploited by criminals or competitors, it will have a negative impact on the company's brand image and customer loyalty. In the marketing process, if there is poor advertising effectiveness, negative customer feedback, or network attacks, and data security cannot be guaranteed, marketers often face more challenges and difficulties, which will affect marketing strategies and performance [16].

4.2. Asymmetric Information

4.2.1. In terms of Spatial Distance

In recent years, due to the rapid expansion of Company A, its branches and subsidiaries have been established in various parts of China, and the long spatial distance has become a key factor in information asymmetry. When communicating with the shared center, branch and subsidiary companies may increase communication costs, and for enterprises, it may also cause them to miss out on certain

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policy benefits. For example, due to the involvement of A company's branch and subsidiary companies in multiple industries and fields, there may still be information asymmetry in business coordination with the shared center, which undoubtedly reduces the efficiency of collaboration and may lead to business errors, delays, duplication, and even contract violations. Especially in contract management, there is a high possibility of omissions, conflicts, and contradictions in contract terms. For example, the contract of a subsidiary of Company A could have enjoyed certain preferential conditions, but due to the financial sharing center located in Shandong Province, the legal department of Shandong Province and the local legal department were unable to communicate effectively, thus missing the opportunity for preferential treatment. In addition, there is a possibility of violating regulations, for example, if the location of a subsidiary or branch has issued relevant financial policies, but due to poor communication of financial information with the group, the enterprise may violate legal and regulatory restrictions [17].

4.2.2. Business Process Aspects

From the perspective of business processes, due to the lack of an effective information sharing platform, Company A is unable to do a good job in supplier credit evaluation and grasp whether the supplier's credit risk is controllable, which has a significant impact on the company's procurement costs and quality. For example, in the payment process, Company A's procurement management of raw materials is relatively loose, with opaque information on raw material procurement and settlement, incomplete records of the raw material procurement process, lack of data management in raw material procurement, acceptance, warehousing, payment and other links, which cannot guarantee the quality and quantity of raw materials, and suppliers cannot guarantee whether the source of raw materials is compliant and whether there are any abnormal situations in the procurement process.

4.2.3. Practical Application Aspects

Due to the origin of the concept of financial sharing in foreign countries, compared to the application of financial sharing by foreign enterprises, China started relatively late and has a certain gap in technology application and information technology development. Nowadays, financial sharing in China is only applied in the basic aspects of accounting, and there are certain difficulties in further exploration. However, Company A's application of financial sharing is limited to the surface of financial basic work, without tracing the root of product information. In the ever-changing market situation, enterprise management needs to go deep into the front-end of product manufacturing. For Company A, attention should be paid to the management of raw materials and the current implementation of financial sharing management mode [18].

4.3. Incomplete Business Processes

4.3.1. Management Aspect

The management of Company A has neglected the management of its financial sharing platform, resulting in low business execution. Due to the lack of a reference financial sharing operation system and unified standards in China, Company A has not examined itself from the perspective of financial sharing system and philosophy. The financial sharing model implemented is far from the ideal effect of financial sharing philosophy.

4.3.2. Employee Aspect

On the one hand, in the financial sharing model, the financial personnel of the sharing center shoulder most of the financial functions of the group, which undoubtedly increases the workload of the financial sharing center personnel, makes personnel turnover more frequent, and the integration of business and finance often occurs. Moreover, personnel turnover is frequent, and new employees cannot adapt to their new positions as soon as possible, resulting in low efficiency in work.

On the other hand, after the establishment of the financial sharing center of Company A, the financial functional departments of various branches were reduced, and the financial work was taken

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over by the group. Only a small number of basic financial staff were retained in each branch. Although the financial costs of each branch were reduced, these financial personnel engaged in basic financial work could not truly participate in the company's strategic planning and could not maintain enthusiasm for their work. In the financial sharing mode, the personnel of the financial sharing center have to bear a huge workload. A large amount of repetitive work will consume the energy of the staff, and the limited management positions will exacerbate the negative emotions of the staff [19].

4.3.3. Specific business aspects

There are also many problems in the reimbursement business process, such as the audit process of department heads and finance departments not being merged, but being carried out separately, which leads to two issues. Firstly, there is a need for department heads and finance departments to verify reimbursement forms and original vouchers, which not only increases workload but also increases the likelihood of errors. The second is that it increases the time and cost of reimbursement, and the communication and exchange between department heads and finance departments will consume more time and require more human resources. In addition, if there are any problems with the content and quantity of reimbursement documents, such as not meeting the company's expense standards and budget, or not being consistent with the original vouchers, if these problems are found, the documents must be returned and rechecked, which will undoubtedly delay time and increase costs, and reduce work efficiency [20].

4.4. Lack of Professional Talents

After the establishment of the financial shared center by Company A, the platform began to handle the basic financial accounting work of each subsidiary. The responsibilities of the financial staff of each subsidiary were redistributed, which exceeded their previous business scope. In the past, they were only responsible for basic construction work and did not have deep professional skills. Moreover, it was difficult to significantly improve their own level in a short period of time. Therefore, facing the change in responsibilities, it may be difficult for them to quickly assume their positions. During the financial work of Company A, although the relevant personnel have relatively rich financial experience, they are older and do not have a significant advantage in learning the concept and implementation of the financial sharing center.

5. Design Countermeasures for Enterprise Financial Sharing Platform Based on Blockchain Technology and Big Data Technology

5.1. Refactoring the Financial Shared Center and Introducing Blockchain Technology

The financial shared center of Company A consists of three layers of architecture: strategy, business, and shared center. Based on these three layers of architecture, blockchain technology is introduced and integrated with each other, as shown in Figure 5. Firstly, building a strategic blockchain to serve the strategic sharing center; Secondly, building a business blockchain to serve the business and financial sharing center; Finally, create an information blockchain service for the sharing center [21].

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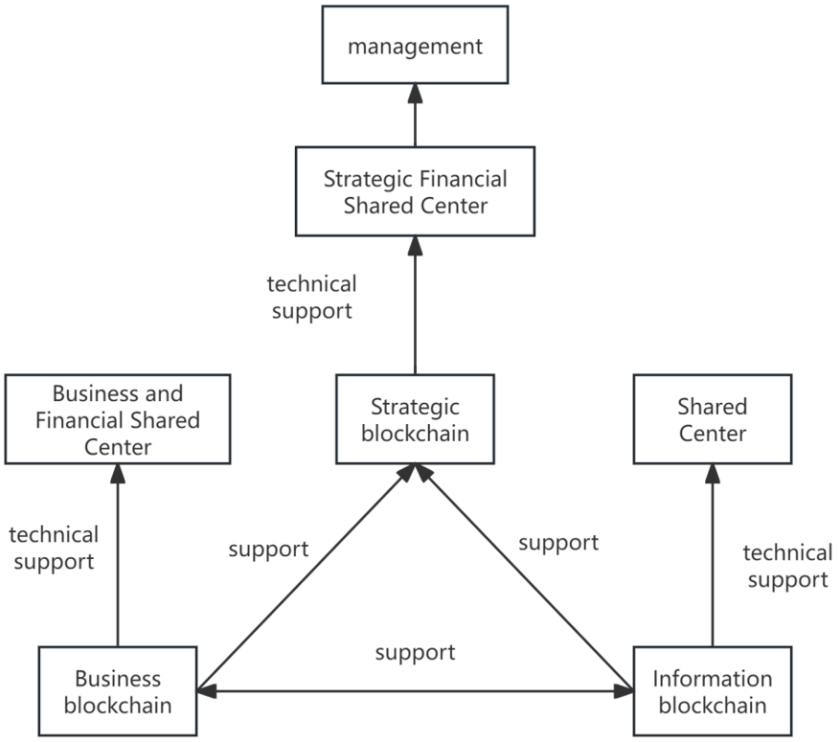

Figure 5.
A New Financial Shared Center Framework Model for Enterprise A.

Strategic blockchain: Strategic blockchain serves the Strategic Finance Shared Center, providing technical support including but not limited to enterprise fundraising planning, investment strategy, income distribution, risk management, financial structure optimization, etc., so that the personnel of the Strategic Finance Center can provide detailed and intuitive financial models for group managers, facilitating group decision-makers to make optimal decisions on the future development of the group.

Strategic Financial Shared Center: The basic structure of the Strategic Financial Shared Center remains unchanged, and its service targets are still the group management. After the completion of the blockchain platform, the Strategic Financial Shared Center is responsible for integrating, summarizing, and analyzing various information provided by the strategic blockchain platform, providing effective information for the group's strategic development, and providing optimal decisions for improving the group's operational efficiency.

Business blockchain: Based on the financial accounting standards of Company A, business blockchain provides comprehensive technical support for the company from budget, cost, profit, tax and other aspects. With the help of smart contracts, business blockchain can automatically perform tasks such as cost control, profit analysis, tax planning, cash flow statistics, etc. according to the corresponding logic set by the enterprise. This not only greatly reduces the large and complex work of financial personnel, but also provides objective and effective information for the enterprise. The entire process provides an effective model for the integration of business and finance, ensuring smooth communication between the business department and the finance department.

Information blockchain: Consensus mechanism is the technical support for the construction of information blockchain. As an important component of blockchain technology, it relies on the independence and competitiveness between nodes to make each node consciously abide by preset rules, ensuring the reliability and unity of information data. By utilizing consensus mechanisms in enterprises, various nodes within the group can reach a consensus on financial standards. The system will

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automatically record transactions such as purchases, sales, and reimbursements, eliminating the need for manual input into the system by relevant personnel. This eliminates repetitive work for financial personnel, reduces their pressure, and improves work efficiency.

By transforming the infrastructure of blockchain, the underlying structure of "financial sharing+blockchain" can be obtained. This structure is the key to ensuring the reasonable use of blockchain technology in A company's financial sharing platform, and also the key to optimizing blockchain financial sharing services. Only by building a complete underlying architecture can the actual implementation of blockchain financial sharing services be guaranteed. The specific architecture is shown in Table 1.

Table 1.
Infrastructure Table of Blockchain Financial Sharing Model.

Infrastructure	**Core Technology**
Data layer	Data blocks, asymmetric encryption
network layer	Shared central server, P2P network
Consensus layer	Pos consensus algorithm
Incentive layer	Contractual and Legal Constraints
Contract layer	smart contracts
application layer	Personal client, accounting system, fund system

Here, the six layer application functions of blockchain are:

Data layer: At the data layer, blockchain technology provides a reliable and tamper proof storage mechanism for financial transactions and records. The data layer needs to ensure that all financial transactions of Company A, such as invoices, payment vouchers, audit records, etc., are accurately entered into the blockchain. This typically involves standardizing the format and structure of data to be applicable to blockchain platforms while ensuring data privacy and security.

Network layer: The network layer is responsible for establishing and maintaining blockchain nodes. When applied to a financial shared center, it may involve establishing a private or consortium blockchain network, which is jointly maintained by the financial center and its partners. It is necessary to ensure the stability and efficiency of the network, while maintaining member management and permission allocation of the network.

Consensus layer: The consensus layer is the core of the blockchain network, ensuring that all transactions and data are verified and agreed upon in the network. In the environment of the financial shared center, the consensus mechanism Proof of Stake (PoS) is chosen to ensure a fast, efficient, and low-cost transaction confirmation process that meets the needs of financial operations

Incentive layer: Participants in the blockchain network need appropriate incentives to maintain network operation and participate in the consensus process. In private or consortium blockchains, incentive layers may differ from token incentives in public blockchain networks and rely more on contracts and legal constraints.

Contract layer: In the financial shared center, smart contracts can automate many financial processes and operations, such as automatic invoice processing, credit management, payment execution, etc. The contract layer needs to develop and deploy these smart contracts, and ensure that their logic complies with financial rules and regulatory requirements.

Application layer: End users will interact with the blockchain system at the application layer, which includes customer service, billing management, payment systems, etc. in the financial shared center. Develop a user-friendly interface at the application layer to ensure that financial staff and customers of Company A can easily access blockchain services, and ensure transparency and ease of understanding in the process.

The architecture of "blockchain financial sharing" has greatly improved the internal information exchange capability of Company A, enhanced the efficiency and quality of financial management, reduced financial costs and risks, and utilized the data analysis and business intelligence functions

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provided by blockchain technology to gain insights into market dynamics and business opportunities, enhancing financial innovation and value creation capabilities. As shown in Figure 6.

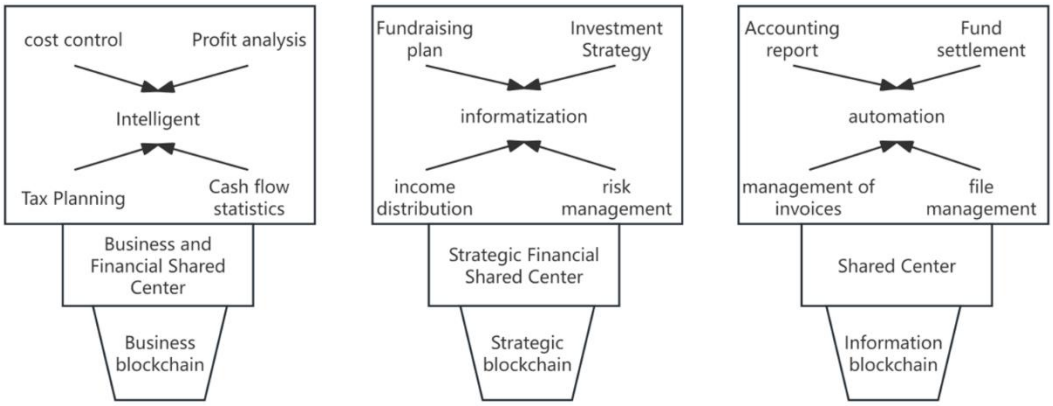

Figure 6.
Optimization of Financial Sharing Function by Blockchain.

5.2. Establishing a blockchain risk management module to address data information security issues

A company can try to establish a blockchain risk management module to address the security issues of data information on the financial sharing platform. As shown in Figure 7, each branch and employee within the group needs to have their own identifier to prove their identity on the financial sharing platform. Each branch and customer on the platform is treated as a separate node. As long as you log in to the distributed node through the private key, you can verify the information in order to reach consensus. The timestamp on the blockchain records business process information, which can be automatically uploaded to the financial sharing center. Key holders have the right to access past transaction information at any time. The design principle of the blockchain risk management module is as follows: every transaction behavior of each branch within the group will be recorded on the blockchain chain and accompanied by a timestamp when it occurs. The chain of timestamps will continue to extend with the increase of transaction behavior. Due to the fact that transactions recorded on timestamps are arranged in chronological order, any employee who wants to modify data information that has already occurred will change the entire chain. In this way, it increases the difficulty for employees to tamper with and forge data information, which helps to improve the risk control level of the financial sharing platform.

Establishing a risk control module to optimize the financial sharing platform requires the use of asymmetric encryption technology and is based on a "dual chain" architecture consisting of private chains and consortium chains. When transaction activities occur, each store acts as a seller and promptly uploads transaction information to the private chain through private key encryption. At the same time, customers act as buyers and upload transaction information to the consortium chain through public key encryption. After verification and agreement, this transaction information will be saved on the blockchain chain. The owner of the private or public key has the authority to view relevant data information at the end of the transaction, while other personnel cannot access transaction information, which is equivalent to building a security wall both internally and externally within the group. From this, it can be seen that establishing a blockchain risk management module can compensate for the data information security deficiencies of financial sharing platforms, increase information transparency, ensure the authenticity, security, and reliability of data information, and make it more valuable for reference.

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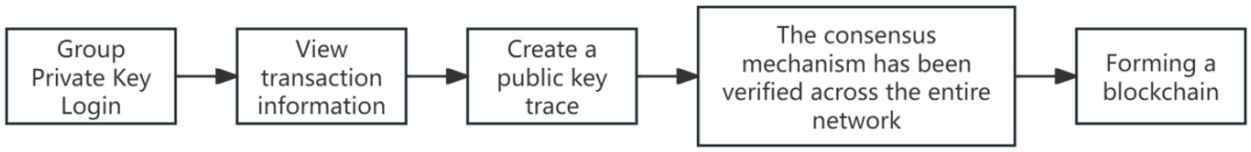

Figure 7.
A Enterprise Blockchain Risk Management Module.

5.3. Using Blockchain Smart Contracts to Solve Problems in the Expense Reimbursement Process

The use of blockchain technology's smart contract features can provide ideas for optimizing the expense reimbursement process. The logic diagram of the smart contract for expense reimbursement process is shown below. A company can set up an intelligent approval process in the expense reimbursement process, which first requires the use of big data technology for basic checks. The basic inspection includes reviewing the original documents and auditing their compliance. Among them, reviewing the original documents not only requires checking whether the code on the invoice is authentic, but also checking whether the amount on the voucher is true and whether the occurrence time matches. If the original documents provided by the reimbursement personnel do not match the results of the big data check, the original reimbursement documents need to be returned to the reimbursement personnel. The compliance of audit documents refers to the logical review of the transportation mode, departure and arrival dates, and accommodation days selected by the reimbursement personnel, to verify whether there is any phenomenon of reimbursement personnel forging reimbursement information. Secondly, comparative analysis should be conducted, including comparison of similar businesses and detection of abnormal reimbursement. Comparison of similar businesses refers to comparing reimbursement with other similar businesses in the database to verify whether the reimbursement is reasonable. If it is found that the reimbursement behavior is obviously unreasonable after comparison, it needs to be returned to the reimbursement personnel with reasons explained. If the amount is only high, it can be re audited by financial personnel. In addition, the intelligent approval process can automatically identify some abnormal reimbursement behaviors, such as duplicate reimbursements, by utilizing big data. Finally, it is necessary to review whether the reimbursement meets the budget. The group needs to conduct budget management in advance and set corresponding expense reimbursement standards based on employees' positions and levels. Automatically calculate whether the reimbursement expenses match the budget management based on the calculation formula already set in the budget management module. If they match, the intelligent approval process is completed. In the entire intelligent approval process, for general daily reimbursement business, intelligent approval can achieve automatic review. For some reimbursement behaviors with high amounts or risks, they need to be automatically reviewed and marked in the smart contract before being submitted to employees for further review. Intelligent approval simplifies the reimbursement process, accelerates reimbursement speed, and improves approval efficiency.

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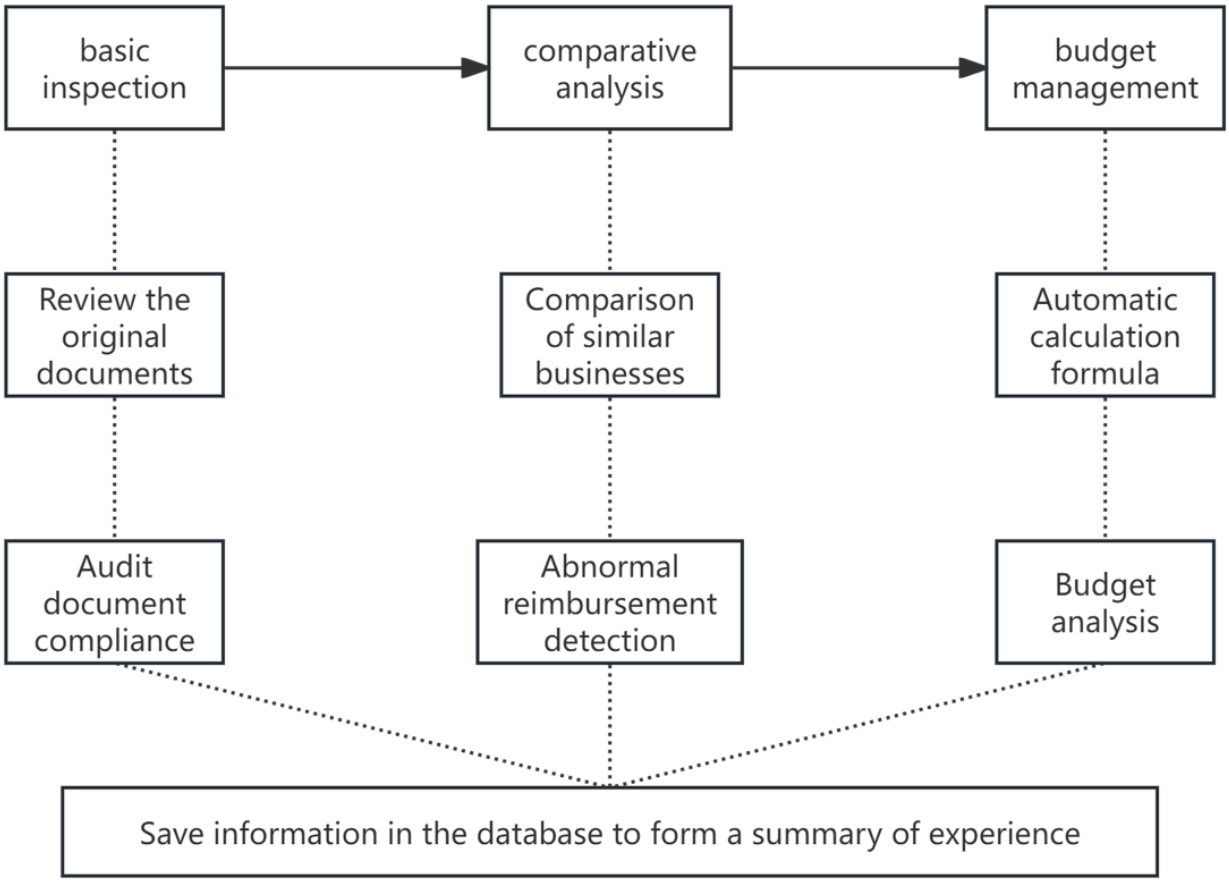

Figure 8.
Logic diagram of expense reimbursement smart contract.

The optimization plan for expense reimbursement process is shown in the figure: firstly, employees with reimbursement needs submit expense reimbursement applications, and the original documents are scanned by the image scanning system and sent to the finance departments in various regions. Then, the finance departments in various regions use intelligent contracts to conduct preliminary review of the original documents. At this point, everyone on the private chain can view reimbursement information and supervise each other to ensure that the reimbursement process complies with regulations. After the preliminary review meets the requirements, the finance departments of various regions will upload the original bills to the financial sharing center and use intelligent contract to conduct another review. If there are no issues after two reviews, the fee can be confirmed. The bank enterprise system automatically transfers expenses to employees, while the financial robot automatically records accounts and uploads scanned copies to the archive management center for storage, ultimately completing the entire expense reimbursement process.

After the improvement of blockchain technology, the reimbursement process is open and transparent, and the expense reimbursement process will become more simplified. The increase in automation will greatly improve the efficiency of approval, and only two automatic approvals are needed to complete the reimbursement process, breaking down the barriers of layers of approval. At the same time, the establishment of the budget management module helps the group to adjust and optimize any unreasonable business areas in a timely manner, thereby further improving the efficiency and quality of the group's financial accounting.

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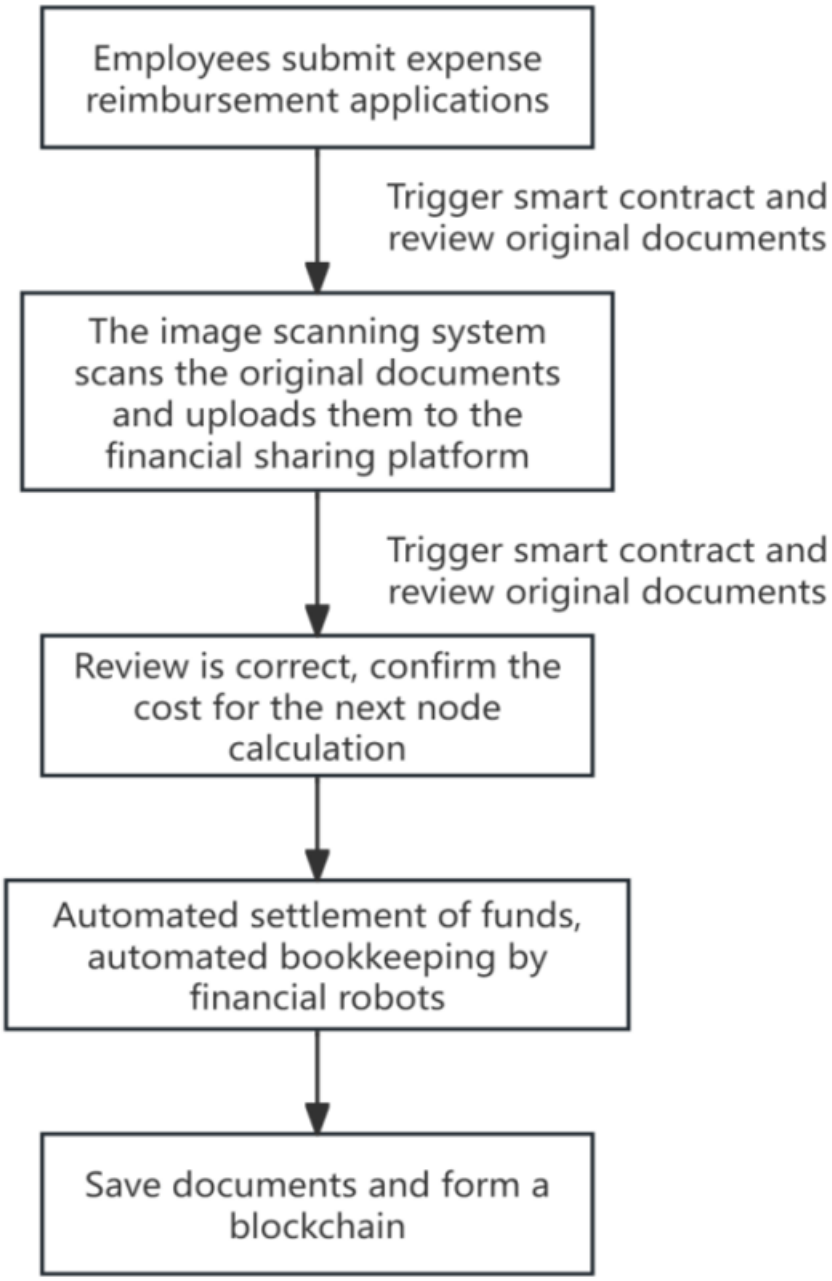

Figure 9.
Optimized Expense Reimbursement Process.

5.4. Using blockchain smart contracts to solve problems in the sales and payment process

A company has a wide range of sales and payment business, and can introduce blockchain technology to optimize its sales and payment business. In the "dual chain" structure of blockchain, each branch corresponds to a node on the private chain, and each customer corresponds to a node on the consortium chain, although the seller and customer can automatically trust each other. However, in order to be on the safe side, the first step is to evaluate the customer's creditworthiness through smart contracts. Based on big data technology, the customer's historical business dealings with the company can be analyzed in advance. If there have been no business dealings with this customer in the past, the

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customer's business dealings with other companies can be analyzed to infer the possibility of the customer fulfilling their obligations normally during the transaction process. If the credit evaluation meets the standard, the enterprise can reach a transaction with the customer, and the system automatically conducts intelligent sales approval; If there is a risk that the customer cannot fulfill the contract normally, it needs to be transferred to the financial sharing center, and professional responsible personnel will determine whether the transaction can be reached.

Figure 10 shows the optimized sales and payment process of Company A. When a transaction occurs, the branch uploads the transaction information to the financial sharing platform through a private chain, and the customer uploads the transaction information to the financial sharing platform through an alliance chain, thus forming a peer-to-peer distributed transaction. After the approval of the smart sales, the financial sharing platform will automatically generate a sales contract by using the smart contract template and the pre agreed quotation and details. After both parties confirm that there are no errors, the sales contract order will be uploaded to the blockchain. In addition, a specialized collection program can be designed to regularly collect outstanding accounts to ensure that they can be collected as soon as possible. After the customer makes the payment, the financial robot will perform automatic bookkeeping. At the same time, the financial personnel of the accounts receivable team of the financial sharing platform are responsible for timely uploading the relevant bill information to the archive management center for classification and storage, completing the entire sales collection process.

By utilizing blockchain technology to optimize the sales and payment process of Company A, it is possible to reduce the risks and hazards caused by customer defaults or delayed payments within the group. In addition, in this process, each transaction is accompanied by a timestamp, which can effectively prevent the phenomenon of business data being tampered with, avoid data fraud in the cash flow and logistics links of goods, achieve automatic supervision, and ensure the authenticity and reliability of data information. The automated execution of sales contracts will benefit the improvement of the group's sales collection efficiency and further achieve effective allocation of funds.

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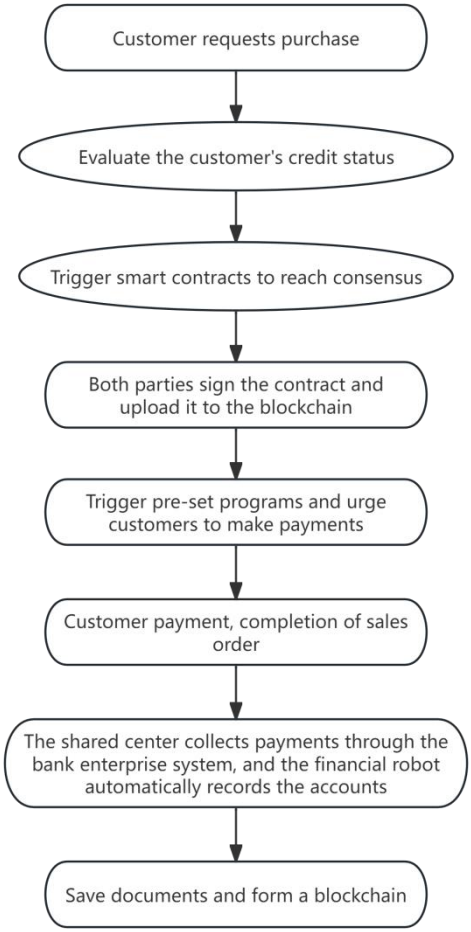

Figure 10.
Optimized Sales Collection Process.

6. Conclusions

This article selects Company A as the research object, introduces the theories of process reengineering and shared services, and analyzes the problems in data storage, information exchange, and business processes of its financial shared center. Based on the causes of these issues, a new financial sharing platform and business process have been developed using blockchain technology, which has improved the shortcomings of the past. This article mainly analyzes the feasibility of blockchain technology in sharing platform research from the perspective of technological development.

Transparency:

The author confirms that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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DOI: 10.55214/25768484.v9i4.6430

References

[1] M. Mainelli and M. Smith, "Sharing ledgers for sharing economies: An exploration of mutual distributed ledgers (aka blockchain technology)," *Journal of Financial Perspectives*, vol. 3, no. 3, pp. 38–69, 2015.

[2] D. Tapscott and A. Tapscott, *Blockchain revolution: How the technology behind bitcoin is changing money, business, and the world*. New York: Penguin Random House, 2016.

[3] M. Iansiti and K. R. Lakhani, "The truth about blockchain," *Harvard Business Review*, vol. 95, no. 1, pp. 118-127, 2017.

[4] M.-S. Viktor and C. Kenneth, *The big data era: A revolution in life, work, and thinking. Translated by Sheng Yangyan and Zhou Tao*. Zhejiang: Zhejiang People's Publishing House, 2013.

[5] P. Leitner, M. Ebner, and M. Ebner, *Learning analytics challenges to overcome in higher education institutions*. Cham, Switzerland: Springer, 2019.

[6] L. B. Albert, *Explosion: New thinking for predicting the future in the big data Era. Translated by Ma Hui*. Beijing: China Renmin University Press, 2012, pp. 123-133.

[7] G. Marcel *et al.*, "A unified accretion-ejection paradigm for black hole X-ray binaries-V. Low-frequency quasi-periodic oscillations," *Astronomy & Astrophysics*, vol. 640, p. A18, 2020. https://doi.org/10.1051/0004-6361/202038268

[8] N. Baur, P. Graeff, L. Braunisch, and M. Schweia, "The quality of big data. Development, problems, and possibilities of use of process-generated data in the digital age," *Historical Social Research/Historische Sozialforschung*, vol. 45, no. 3, pp. 209-243, 2020. https://doi.org/10.12759/hsr.45.2020.3.29-43

[9] K. Davis and D. Patterson, *Ethics of big data*. United States: O'Reilly Media, 2012.

[10] A. Zwitter, "Big data ethics," *Big Data & Society*, pp. 1-6, 2014. https://doi.org/10.1177/2053951714535901

[11] E. Pilkington, "Digital dystopia: How algorithms punish the poor. The Guardian," Retrieved: https://www.theguardian.com/world/2019/apr/25/digital-dystopia-how-algorithms-punish-the-poor, 2019.

[12] A. Pardo, "Ethical issues, data privacy, and informed consent in the use of student data," *Journal of Educational Data Mining*, vol. 11, no. 3, pp. 45-67, 2019. https://doi.org/10.1234/jedm.2019.112

[13] A. A. ElSayed, M. Caeiro-Rodríguez, F. A. MikicFonte, and M. Llamas-Nistal, "Research in learning analytics and educational data mining to measure self-regulated learning: A systematic review," in *World Conference on Mobile and Contextual Learning*, 2019, pp. 46-53.

[14] J. Zhang, "Design of a smart contract for medical records based on blockchain," *Highlights in Science, Engineering and Technology*, 2023. https://doi.org/10.54097/hset.v32i.4932

[15] E. Chen *et al.*, "Building random, fair, and verifiable games on blockchain. Raffle smart contract designs on Sui Network," *arXiv preprint arXiv:2310.12305*, 2023. https://doi.org/10.48550/arXiv.2310.12305

[16] K. Bálint, "Blockchain and smart contract creation for efficient and secure data storage of consumer habits and logistics data," *Procedia Computer Science*, vol. 253, pp. 49-58, 2025. https://doi.org/10.1016/j.procs.2025.01.068

[17] W. Jiang *et al.*, "DSCAPS: A decentralized smart contract auditing platform based on sidechain," *Information Sciences*, vol. 677, p. 120861, 2024. https://doi.org/10.1016/j.ins.2024.120861

[18] L. Zhang, "Data-sharing system with attribute-based encryption in blockchain and privacy computing," *Symmetry*, vol. 16, 2024. https://doi.org/10.3390/sym16111550

[19] B. Zhao, "Towards a secure blockchain ecosystem: Current vulnerabilities and future directions in smart contract security," in *ITM Web of Conferences*, 2025, vol. 73: EDP Sciences, p. 03014.

[20] Y. Du, C. Lin, T. Liu, X. Li, W. Wei, and S. Gao, "OR-SPESC: Design of an advanced smart contract language for data ownership," in *Asia-Pacific Web (APWeb) and Web-Age Information Management (WAIM) Joint International Conference on Web and Big Data*, 2023: Springer, pp. 77-88.

[21] M. S. Prashanth, V. U. Maheswari, R. Aluvalu, and M. P. Kantipudi, "SocialChain: A Decentralized Social Media Platform on the Blockchain," in *International Conference on Pervasive Knowledge and Collective Intelligence on Web and Social Media*, 2023: Springer, pp. 203-219.

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