Scholar Publishing Group
Academic Journal of Agricultural Sciences
https://doi.org/10.38007/AJAS.2023.040107
ISSN 2789-8415 Vol. 4, Issue 1: 81-96

Edge Computing and Intelligent Blockchain in the Construction of Agricultural Supply Chain System

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Keywords: Block Chain, Supply Chain Finance, ASC Sstem, Innovation Mode

Abstract: As the basis of supply chain finance, agricultural supply chain (ASC) plays an important role in supply chain management. Agricultural industry ecology and supply chain finance industry ecology determine and influence the form of ASC finance development. Supply chain brings the development of the whole agricultural industry chain, and ASC provides rich application scenarios for finance. Blockchain, as a new technology emerged with bitcoin, has had many application scenarios up to now. The purpose of this paper is to optimize the ASC system by combining block chain technology, and to explore the development path of ASC under this technology background. Based on the view of supply chain finance, technology innovation theory, using literature method, case method are studied, such as through the trust model is introduced into the system, the effect of the solution to the system in the coordination between different organization ability, improve the efficiency of the implementation of checkpoint operation, under the precondition of simulation of the ASC will trust values remain above 3.2, thus to block in the chain system computationally intensive tasks of supply chain to provide better environment.

1. Introduction

Blockchain has received a lot of attention since the birth of bitcoin in 2009. Blockchain technology itself and blockchain-related industries have also been developing rapidly. With its characteristics of decentralization, synchronicity of transaction records and irreversibility, blockchain technology provides better development ideas for businesses in the whole industrial chain such as logistics, commodity trading and supply chain finance, and also provides new tools and methods for the integrated development of blockchain and supply chain. Up to now, block chain technology has been applied in logistics, shipping, supply chain information and other aspects. This article combines smart blockchain and edge computing with agriculture, expands the data

source of ASC, and reduces data retention information as much as possible while supporting the continued operation of multiple systems. The database can effectively track the entire agricultural production process, from the initial crops to the inventory for collection and management, each link retains the most detailed and accurate information. Under the effective data management of ASC, the time and cost are saved to the greatest extent. On the whole, the biggest advantage of agricultural blockchain is to eliminate information asymmetry, can effectively and timely promote the effective response ability of the entire agricultural industry chain, promote the development of the entire industry, and increase the value of the entire industry.

Because agricultural products have significant particularity compared with other products, the ASC is different from other fields.Domain supply chain of its own significant characteristics. Variety is a prominent feature of agricultural products, and the differences between different varieties of agricultural products are also very large, at the same time, different from other types of products, agricultural products enter the consumer market in a variety of ways. The basis of ASC is the relevant content of modern agricultural law, including but not limited to its meaning, characteristics and significance. In the entire agricultural product processing process, ASC is the core content, which runs through a series of processes from crop production, processing, and production, and then is equipped with logistics and capital chain supplements to complete the terminal sales of products. Participants in this chain structure model include farmers, agribusiness, wholesalers, retailers, and ultimate end-consumers of agribusiness.

The agriculture of developing countries has undergone tremendous and rapid changes. Some countries are developing faster than others in globalization, and are accelerating the improvement of agricultural production efficiency. The increase in the efficiency of the crop industry has had a great impact on industry, commerce, and employees. The downside of the increase in efficiency is the reduction in local welfare. International organizations interpret it as a brand new global business model. Parvadavardini Soundarrajan explained in detail the various fiscal policies in India and the official and unofficial participants in the agricultural food chain at different levels. He also pointed out that this value chain has promoted the deepening of the local economy. In the agricultural economy, political executors support the use of agricultural chains to provide innovative services and technological solutions at lower switching costs. It is estimated that by 2050, when the global population reaches 9.1 billion, global food demand will also increase by 60%. Sustainable agricultural development is conducive to solving this problem and introducing innovative agricultural technologies. Of course, investment in the agricultural sector is also essential. Vighneswara Swamy conducted an in-depth analysis of the agricultural finance loan methods in India and introduced a variety of AVC loan model study cases. He put forward some practical suggestions on improving agricultural efficiency. Vighneswara Swamy uses a multi-case method to conduct investigations in order to be able to summarize suitable samples and conclusions. Evidence triangulation provides a more rigorous and comprehensive method than a single case study. Secondly, VighneswaraSwamy clearly stated AVC's financing model. [2]. Maitra investigated the assumption that in the previous joint responsibility schemes of microfinance, it was impossible to manage unproductive borrowers and increase the income of borrowers. In a randomly selected village in West Bengal, India, my tiger applied for a commercial agency loan. Therefore, the lender of the local commercial institution selects the borrower of personal debt through the financing of the repayment basis. In other randomly selected villages, my tiger organized a collective loan program (GBL). This project consists of five groups of individuals, who jointly undertake responsible loans. Thanks to pilot loans, the current interest rate of major crops has increased by 27%, and agricultural income has increased by 22%. The impact of GBL loans is not important. Mitra tested the selection of borrowers and the theoretical formulation of incentive models. Farmers selected through experiments are more capable than farmers selected to participate in GBL. This

selection model accounts for at least 30-40% of the observed income difference [3].

By applying block chain technology to ASC, this paper constructs a supply chain management system that fully considers the unique characteristics of ASC by utilizing its resource integration function and the existing information resources in ASC. This paper discusses the existing problems in ASC from multiple perspectives and demonstrates the feasibility of using block chain technology to construct ASC management system. In order to ensure the stability of the system, a dynamic trust model is adopted to dynamically track the changes of entity behavior. Moreover, a complete set of performance indicators are adopted to evaluate the performance of the supply chain to ensure the stability of the whole supply chain system. At the same time, the incremental checkpoint technology is used to improve the agricultural management system in solving the complex computing model, so as to make full use of resources and improve the system performance.

2. Proposed Method

2.1. ASC

(1) Supply chain

Many business entities include suppliers, manufacturers, distributors, and retailers in order to achieve the following objectives:

1) Obtaining raw materials.

2) Deep processing of raw materials to obtain the final product.

3) Distribution of products to retailers.

And collaboration, this process defines it as the supply chain. Traditionally, forward logistics and backward information flow are used to describe the characteristics of a supply chain. For years, researchers have looked at the different parts of a supply chain. However, with the scale of the market economy not expanding, the number of participants, and the granularity of division of labor becoming more and more refined, researchers have recently begun to integrate the performance, design and analysis of supply chains. From a realistic perspective, the concept of supply chain originates from a series of changes in the production environment, including the growth of manufacturing, the shortage of raw materials, the reduction of normal service life of products and the globalization of market economy. Now, researchers are inclined to expand the scope of the supply chain to include the reverse goods cycle, which refers to the recycling, remanufacturing and reuse of products. In the research of the production field, the concept of supply chain is largely derived from the two-stage and multi-level inventory model. What is more noteworthy is that significant progress has been made in the research of the two-level inventory system. The supply chain process is shown in Figure 1 [4].

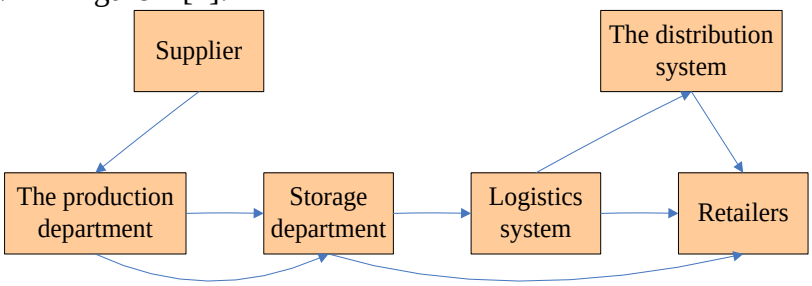

Figure 1. Supply chain flow

As mentioned above, a supply chain is an integrated generation process in which raw materials are converted into final products and then consumed by consumers. On the whole, a supply chain

can be thought of as having two basic, integral processes: the planned production and inventory management processes, the product sales and the logistics processes. These processes represent a basic framework that covers all the detailed activities that occur in the process of transforming raw materials into final products. The above planned production and inventory management processes cover all activities involved in the manufacturing and storage of products. In more detail, the planned production process describes the design and management of the entire product manufacturing process including the scheduling and acquisition of raw materials, the design and scheduling of production processes, and the handling and control of materials. Inventory management describes the design and management process of product storage scheme. The distribution and logistics processes determine how products flow from warehouse to retailer. In this way, the product may go directly to the retailer, or first to an intermediate distributor and then to the retailer. These processes include inventory management, product shipping, and final product distribution. All these processes described above do not exist alone as a single individual, but interact with the supply chain as a whole. The design and management of these process details determine the overall performance of the supply chain [5].

(2) Characteristics of ASC

Because agricultural products have significant particularity compared with other products, ASC has its own significant characteristics that distinguish it from other supply chains. Variety is a significant feature of agricultural products, and the difference between different varieties of agricultural products is also very large, at the same time, different from other types of products, agricultural products enter the consumer market in a variety of ways.For example, some agricultural products that can be consumed directly without further processing, such as vegetables, poultry and eggs, can enter the market directly without any intermediate process. Of course, at the same time, these products can also go through a deeper processing to enter the consumer market. This is a significant difference between agricultural products and other products. In addition, there are other products that must go through deep processing to reach the consumer market, such as wheat and cotton. In general, the supply, production, processing, distribution and retail of means of production constitute the ASC. The relationship between these links is shown in Figure 2.

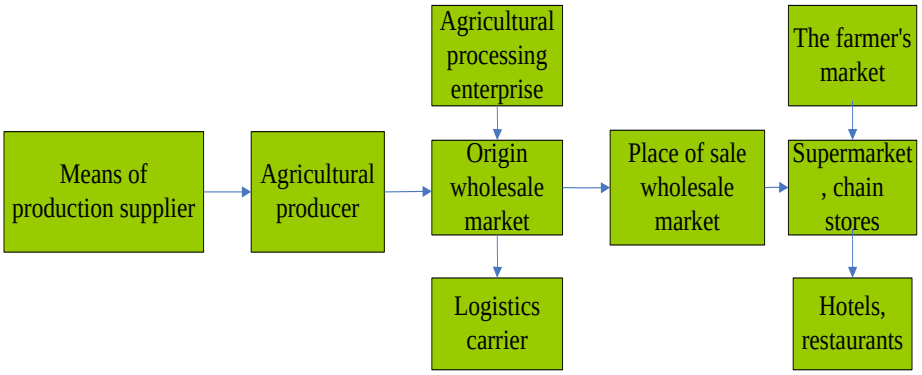

Figure 2. ASC model

As can be seen from Figure 2, agricultural products can be transferred from the production field to the consumer market in various ways. Therefore, according to the production and circulation process of agricultural products in the actual process, the framework of agricultural products supply chain can be summarized as follows:

1) From suppliers of means of production to producers of agricultural products to wholesale markets of producing areas to retail terminals and then to final consumers of agricultural products.

2) From average producer to agricultural product manufacturer, agricultural product processor,

wholesale market, terminal, and final consumer of agricultural product.

3) From the supplier of the means of production to the producer of agricultural products, retail stores, and final consumers of agricultural products.

Therefore, by combining the above discussion and the characteristics of agricultural products, it is different from the supply chain of the general agricultural supply chain, and the supply chain of the supply chain can be more accurately defined. This is a complicated concept, in a sense. The characteristics and development of modern agricultural law based on analysis and research are the core of agricultural products processing. Through information management, supply and funds cover agricultural supply, agricultural production and the process of final products becoming a series of final products. Through the circulation network, the product will eventually flow to the final consumer.Participants in this chain structure model include farmers, agro-processing enterprises, wholesalers, retailers and the final end-consumers of agro-products, among which, the main relationship of agricultural value chain is shown in Figure 3 [6-7].

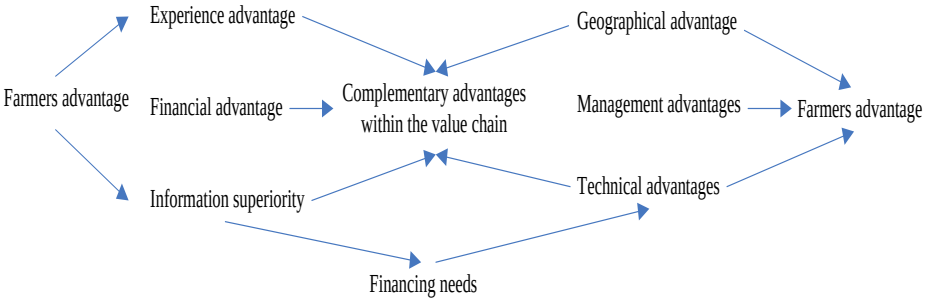

Figure 3. Agricultural value chain subject relationship

(3) Workflow technology

There are quite a few enterprises and organizations in the supply chain management system in the agricultural field. The role of supply chain management is to coordinate and cooperate among these various entities to complete a specific business process. Because a business process often involves many enterprises and organizations, it is necessary to strictly coordinate the specific activities within the process in a process-oriented way. This process management method is workflow technology [8-9].

Workflow technology is produced by the application of information technology in modern enterprise office. With the expansion of enterprise scale and the increasing complexity of business processes, the traditional process management has been unable to meet the requirements of modern enterprises for efficient office. Therefore, the use of information technology to replace the original process management, to achieve paperless office, can greatly improve the office efficiency of enterprises. At present, workflow technology has been widely used in telecommunications, banking and other industries.

Currently, the widely accepted definition of workflow is that workflow is a business process that relies on information technology for automated processing. The core of workflow is used to describe the operation of specific business processes. Workflow describes the specific parameters of various activities contained in the business process with specific data structure, records the logical relationship between these activities, and drives the operation of these activities in a process-based way. Workflow technology is an application design method with large abstract granularity. The whole abstraction is a workflow involving multiple specific business activities [10].

2.2. Block Chain Technology

(1) Concept

Data storage blocks are scattered together, and there are peer-to-peer transmissions, consensus mechanisms, encryption algorithms, and some innovative application models for computer technology in the network era.This is China's "white paper on the block chain technology and application development" in the formal definition of the block chain. [11].One. This is one of the most representative digital system systems, and is the most representative digital system support. Blockchain technology includes 6 technologies, including encryption algorithms, smart manufacturers, network protocols, consensus mechanisms, confidentiality,and data storage. From the following four perspectives to understand the concept of block chain, contribute to a better understanding of the block chain technology.

From a purely mathematical point of view, blockchain is an advanced development product of computer examples, and its essence is a decentralized, maintained, and decentralized public database [12]. From a technical point of view, the blockchain is a huge database with public decentralization. From a commerce point of view, it is a network does not require the agency will be able to complete the transaction and the actual transaction value realization. Confirm from the perspective of traditional credit card transactions to replace traditional credit card transactions[13].

(2) Characteristics

1)Decentralization

Compared with the central institution, in the process of data storage and verification, accounting The block chain plays the overall role of outlets in the collaborative maintenance, undermine or exchange of the central processing engine. The central processing engine not only maintains and transmits. Fee setup to manage the organization.

2)The system is programmable

Blockchain produces smart configurations, digital currency or other applications through system programming script codes. Script programs are becoming more and more agile.

3)Data can not be tampered with, safe and reliable

Blockchain data cannot be altered or forged. You can apply the principle of asymmetric encryption and create powerful computer functions based on the consistency of the algorithm (for example, to prove the workload of a node in a distributed system). In this way, on the one hand, external attacks can be prevented, and on the other hand, data security can be ensured. [14].

(3) Characteristics of different stages

1) Technology origin stage

The key technologies of block chain development so far are several core technologies applied in the initial stage of technology, including point-to-point network, encryption algorithm and database technology. Compared with the Internet network structure relying on the central server, the peer-to-peer network gives each computer, namely the node, equal network power to share network resources and data information within a certain range. To ensure the use of network data security, usually use encryption, through public and private keys encryption, data storage decryption process, and data transport. The public key is generally used by the sender of the information and the receiver of the information USES the private key[15-16].

2) The bitcoin phase

Bitcoin is the most successful application scenario of blockchain technology, but bitcoin is not exactly equivalent to blockchain, which is the underlying technology for building bitcoin applications. According to the imf's digital currency report, blockchain technology has great potential to drive changes in the financial ecosystem. China's central bank has also taken a big step in the development of digital currency, aiming at issuing the central bank's digital currency. The

specific operation is being explored and promoted. The bitcoin stage and the characteristics of modern blockchain technology are shown in Table 1.

Table 1. Comparison between blockchain technology and bitcoin system

	Block chain	The currency
Nature	The underlying architecture of value delivery	Cryptographic-based digital currency
Consensus algorithm	Multiple algorithms can be constructed	Proof of workload (POW)
Transaction processing times (seconds)	Ten thousand times or more	Seven seconds or less
Link form	Public chain, private chain, alliance chain	The chain of public

3) Smart contract phase

Through each block, you can see the latest bookkeeping of each node, and you can also query each historical record, which can be traced back as far as the creation block, forming a complete trading chain. In short, smart contracts are digital commitment agreements. After the block chain technology was invented, the intelligent contract developed into a computer program based on distributed Shared ledger. The embedded contract can be applied to the traditional financial field and social public management field. The specific features are the distributed storage record and verification of data, which cannot be tampered with or forged. In addition, it also has the functions of automatic operation and value transfer [17-18].

(4) Block chain algorithm

PoW is English Proof Work abbreviations. PoW has the following requirements for the Node B transmission block format.

$$H(B) \le \text{target} \tag{1}$$

Where H is a specific partition algorithm, and the target is a fixed number. That is, the partition value of the entire block is less than the specified number of targets [19].

If the maximum value of fragmentation is HASHmax, the probability of finding a valid block in each operation is [20].

$$\frac{\text{target}}{\text{HASH}_{\max}} \tag{2}$$

As this guy shown above, the smaller the target, the less likely to find an effective block in each experiment.

In 2016, each Bitcoin block must adjust the target value according to the following formula.

$$\text{target}_{new} = \frac{t_{2016}}{2weeks} * \text{target} \tag{3}$$

Where t_{2016}Display time needed for generating 2,016 blocks. The shorter the time, the smaller the ultimate goal. The difficulty of generating values of the block can also be obtained by the following equation.

$$difficulty = \frac{\text{target1}}{current_{\text{target}}} \tag{4}$$

In order to find a legal block on PoW, a lot of calculation, power and time are required[21-22]. To speed up the creation of blocks, PoS will also check the share of digital coins held by nodes. In order to achieve PoS, there are a variety of methods that can be used to adjust the mining difficulty using the remaining accounts.

$$H(B,t) \le balance * \text{target} \tag{5}$$

Set R within the range of the current connector, and set S to provide the current smart token F to the coefficient (ie, CW, as the value of the current smart token, smart token=SP, [23]:

$$Connector = FSP, P = \frac{R}{SF} \tag{6}$$

Purchase dS smart token, the user must pay the cost of PdS. This is the same as changing the remaining connectors. In other words, dR = PdS [24]. In addition, since R = FSP, we can obtain the derivative.

$$dR = d(FSP) = Fd(SP) = F(Sdp + Pds) \tag{7}$$

Therefore, the above two equations can be combined to obtain:

$$Pds(1-F) = FSdP \tag{8}$$

$$P = \left(\frac{S}{S_o}\right)^a P_0 \tag{9}$$

Because CW or F1 can provide 100% liquidity, prices will vary greatly and remain at a certain level. If CW is greater than 0 and less than 1, it is the above-mentioned normal supply and demand price curve. The user will pay the following number of tags.

$$E = \int_{S_n}^{S_n+T} PdS = \int_{S_n}^{S_n+T} P_0(S/S_o)dS \tag{10}$$

$$E = R_0\left(\sqrt[F]{1+\frac{T}{S_0}} - 1\right) \tag{11}$$

Finally, the exchange formula is as follows[25]:

$$E = -R\left(1-\left(1+\frac{T_1}{C_1+T_1}\right)^F\right) \tag{12}$$

2.3. Edge Computing

As a hot technology, edge computing has been widely used in the business field. Among them, Internet companies hope to extend their existing cloud service capabilities to edge networks with the help of their own relevant advantages in the service industry. Microsoft released "Azure IoT Edge" and other edge products, and enhanced streaming data analysis capabilities for Azure cloud services; Amazon released "AWS Greengrass" edge software to seamlessly extend AWS cloud

services to devices.

Communication companies hope to use edge computing technology to further tap the value of network connection equipment, and improve their technological status in the consumer Internet of Things and Industrial Internet by strengthening the relevant performance of the access side network. As the initiator of the concept of fog computing, Cisco has planned the overall framework of edge computing from its own major aspects, including the release of edge-side dedicated network hardware devices for smart manufacturing or IoT scenarios, and the use of software-defined technologies to create IOx applications The framework reorganizes edge capabilities, launches the "Fog director" product to systematically manage edge computing application services, and relies on the DevNet developer community to provide APIs, SDKs, etc. to cultivate the industrial ecology. As the lead unit of the Edge Computing Industry Consortium (ECC), Huawei has released lightweight computing systems and converged gateway devices, promoted real-time Ethernet TSN technology for manufacturing application scenarios, and gradually formed an overall edge computing solution.

3. Experiments

3.1. Experimental Background

Financial institutions according to the characteristics of the agricultural industrial structure is the economic subject on the industrial chain as a whole binding, using industrial quality economic subject of credit and guarantees to improve the credit level of a weak economy, with the appropriate design of loan agreement and other financial services, to transform a single subject of uncontrollable risk for the whole industry chain of controllable risk, in order to meet the financing needs of each link in the industry of a systematic financing arrangements. Agricultural industry ecology determines the structure of ASC and the form of ASC finance development.

Taking block chain technology as an example, it is of great significance to use block chain technology to solve various problems and pain points of real economy industry. There are many participants in ASC finance, including commercial Banks, commercial factoring companies, upstream and downstream suppliers, underwriters and core enterprises, and various agricultural production and operation entities. At present, due to the large number of participants, which increases the financing cycle and financing cost. In addition, all kinds of certificates in the supply chain often need manual verification, which increases the audit risk of credit investigation agencies. Through the decentralization of block chain technology, the trust and consensus mechanism and the characteristics that cannot be easily tampered with, all the trading behaviors in the supply chain are put into the block chain, so that the supply chain finance can get away from the complicated manual audit, and the third-party credit investigation agencies do not need to spend time to verify the authenticity of the certificates, which greatly improves the financing efficiency.

3.2. Experimental Design

(1) The relationship between agricultural enterprises and suppliers is one of prosperity and interlose-loss. Better service suppliers will enhance the strength of agricultural enterprises' supply chain and thus improve their competitiveness. The intervention of capital flow can penetrate all levels of suppliers, and the effective analysis of data can give early warning to the production process. Enjoy the pricing power of financing, can meet the financing needs of suppliers and obtain financial benefits naturally; Optimize the financial statements of agricultural enterprises and reduce the rigid liabilities of notes payable. The supply chain participants and influencing factors are shown in Table 2.

Table 2. Supply chain process table of participants

Globus container	The client
Order service	Supplier A's information system
Order service	Supplier B's information system
The inventory service	Supplier C's information system
Notification service	Supplier C's information system
And distribution services	Supplier D's information system

The specific plan is:

(2) Establishment of alliance chain -- block chain subject to prior node control and management during the consensus stage can be read by all people, and the root hash and API (application programming interface) can be exposed to the public. API is the data that can allow the outside world to conduct restricted search and query the block chain status.

(3) Digitize and digitize the accounts payable of agricultural enterprises, that is, the accounts receivable and creditor's rights of suppliers, and issue them into electronic payment vouchers, which shall be finally honored and paid by agricultural enterprises. At the same time, a factoring company wholly owned or controlled by agricultural enterprises shall be established to accept such vouchers for financing.

(3) Agricultural enterprises use electronic payment vouchers to replace the traditional bank notes and establish a new payment system. After the suppliers sign the electronic vouchers, they can transfer the debit and return financing and any amount of term to the secondary suppliers within the amount and term of the vouchers.

(4) The trust level classification method is applied. As shown in Table 3, after the approval is completed in the system, the factoring company will transfer the funds to the reserved account of the supplier through direct bank-enterprise connection or e-bank remittance to complete the whole process within 15 minutes.

Table 3. Trust level classification method under supply chain system

Trust level	Trust value	Description
A	0-0.2	very low
B	0.2-0.4	low
C	0.4-0.6	ordinary
D	0.6-0.8	high
E	0.8-1.0	very high
F	>1.0	extremely high

4. Discussion

4.1. ASC System Analysis Based on Block Chain Technology

For different entities, agricultural enterprises can use different trust evaluation threshold values to make trust judgments. For example, if agricultural enterprise A sets its trust threshold value to 0.6, and if the calculated trust evaluation value to enterprise B is greater than 0.6, then A will consider B's service capability to be credible and will use the services provided by B. At the end of the

interaction, you add a piece of data to your interaction history database to record the interaction. On the contrary, if the confidence of the entity obtained by calculating the value from A to B is less than 0.6, if λ is, then the unreliable service provided by A is tried to provide by the same service node in other grids. The impact of various forgetting factors is shown in Figure 4, and the barriers to change in different value chains are shown in Figure 5.

Using formula (3), the direct trust evaluation of pair can be obtained by calculating the past trust evaluation value of A and B. Different values of λ will lead to different trust evaluations. For some enterprises that prefer and trust the latest trust evaluation, λ can take a smaller value, such as λ=0.1. In contrast, for some entities that do not believe that time differences play a role in trust evaluation, lambda can be taken as a larger value for agribusiness such as agribusiness λ=0.8.

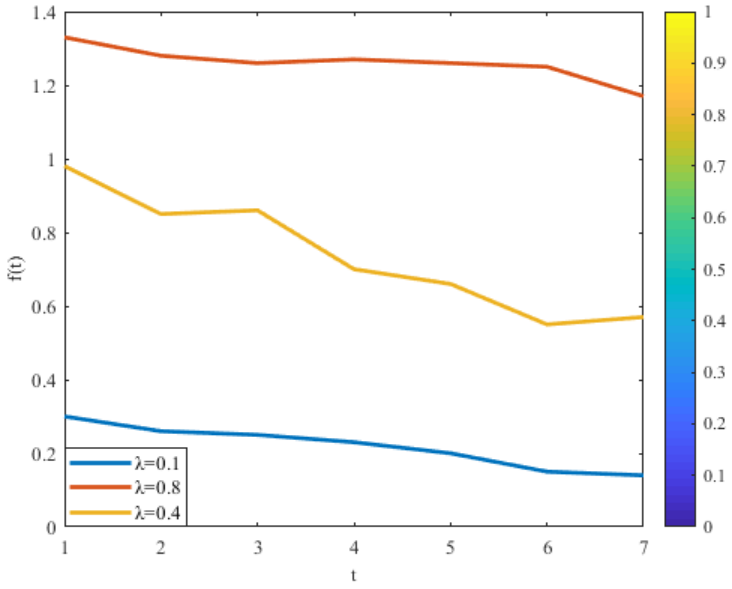

Figure 4. Effect comparison of forgetting factor when taking different values of λ

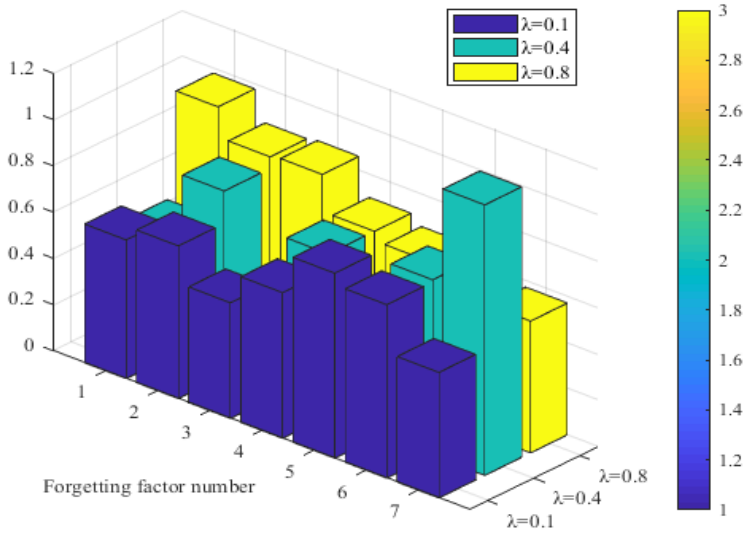

Figure 5. The change of the trust threshold when λ takes different values

Now suppose there are four parties involved in the supply chain, they are product supplier A, product supplier B, product wholesaler and the company engaged in logistics business. They exchange information with each other through the supply chain system. The logistics company can query the order information of supplier A and supplier B through the supply chain system, so that the logistics company can work out A more reasonable transportation plan. The inventory information of the wholesaler can be inquired by supplier A and supplier B through the grid service of the supply chain system, and supplier A and supplier B can use this information to adjust their production schedule. At the same time, supplier A, supplier B and product wholesalers can query the transportation plan of the logistics company and the detailed logistics information in the transportation process through the grid service of the supply chain system, so that supplier A, supplier B and product wholesalers can master the specific details in the logistics process in detail.

Encapsulation process completed in turn above will own resources into the grid service, create the grid service description document and deploy grid service container, on the basis of this process, the last part is the use of grid service create the user interface, to the supply chain system users with a convenient for management, maintenance and use of the system using an interface. This interface mainly provides the following functions to manage the authentication of users to prevent unauthorized users from using the system, to manage users' rights to ensure that users can only use the service functions within their own rights, and to record the specific operations of users.

The specific process of users using the services provided by this system is that users operate through the user interface provided by the supply chain system. This involves authentication of the user's identity, verification of the user's privileges, and recording of the details of the user's actions. After the authentication of the system, the user can use the service required by the user through the service interface provided by the supply chain system. When the user selects a service, the service management module in the supply chain system will create a grid instance of the corresponding service according to the user's request, and return the handle of the grid service instance successfully created to the user, then the user can use the service. When the user uses the service to complete the task, the service management module service will notify the end of use through the interface provided to the user by the system. At this point, the service management module in the grid supply chain system will destroy the grid service and release the grid resources occupied by the service.

4.2. Research on ASC System Innovation Based on Block Chain Technology

In the supply chain system, some complicated numerical models often appear. Therefore, it is necessary to use the distributed processing power of the grid to distribute these complex computing models into the grid for calculation. At this point, you need to use the checkpoint mechanism to deal with the dynamic and unstable rows of the grid environment. Checkpoint technology is an important means to realize fault tolerance of distributed/parallel systems, and it is also the basis for process migration, job switching and system simulation. The optimization system is based on simulated data, and the change of trust value of enterprise A can be seen in Figure 6. Checkpoint technology is used to write the program state information to the persistent storage device when the program is running normally. When the program crashes due to an exception and needs to be restarted, the program can be restored from the recently saved checkpoint file to the state the program was running when the program saved the checkpoint, so that the previous progress can be continued, thus reducing the loss caused by the program crash. In this supply chain system, Conder's checkpoint mechanism is used to solve the complex numerical calculation model. Meanwhile, the checkpoint mechanism is optimized with the incremental checkpoint mechanism, which makes Conder more efficient in performing checkpoint operation and makes full use of

system resources.

When a user submits a job, they submit their job to a cluster system managed by Conder through a proxy. Conder's proxy module then matches this job to the host needed by the job's computing environment, and assigns the job to a matching host to run on. When the matching host is no longer available, the Conder system's checkpoint module first saves the checkpoint for the job and then looks for the next matching host for the job. When the job continues on another host, due to the checkpoint mechanism, the job is restarted from the saved checkpoint image, thus saving the previous progress. The matrix operation file size comparison is shown in Figure 7.

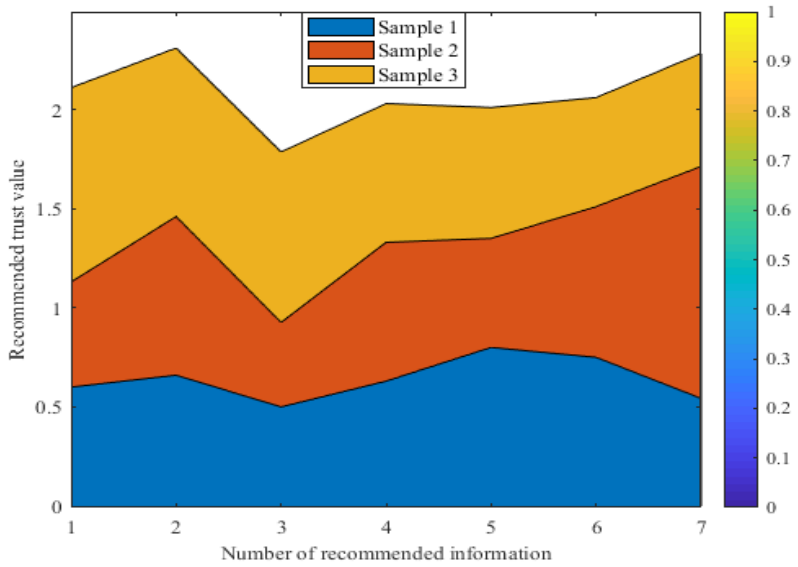

Figure 6. Changes in recommendation trust values for different samples

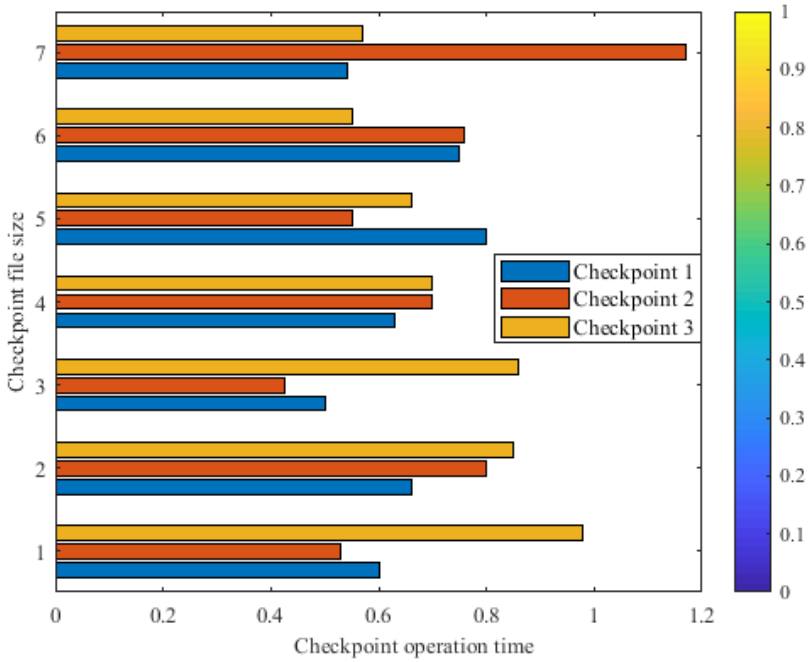

Figure 7. Comparison of checkpoint file sizes

5. Conclusion

Under the increasingly fierce competition in the industry supply chain field, supply chain financial service providers are seeking to reform and improve their core competitiveness in the supply chain finance field. There is continuous fierce competition, rapid capital turnover and rich cash flow, as well as industry, Various attempts have been made in electrical equipment such as telecommunications, computers, automobiles, and the chemical industry, but the development is relatively mature. Compared with the maturity of supply chain financing in these areas, ASC finance is still fertile land. Introduce the workflow technology in the field of ASC management system, standardize the supply chain management system defined by each process, and strictly define the activities of the process. In this way, by routing the various activities of the entire system, users can fully control their business.

Based on the background of the ASC management system of blockchain technology, this article explains the development of blockchain technology, the research of hotspots in the blockchain field, the main concepts in the supply chain field, and the current main issues. This article will combine ASC's existing technology and infrastructure to build a system and infrastructure. Finally, it analyzes demand analysis, feasibility analysis, the main technologies used in the system, the trust model used in the system, the supply chain performance index used in the system, and the incremental checkpoint technology used in the incremental system.

This paper applies the grid technology in the computer field to the ASC field, makes full use of the resource integration work of the grid technology, and uses the existing information resources in the ASC field to construct a supply chain management system. This article fully considers the inherent characteristics of ASC, explains the problems of ASC from various angles, and expresses the possibility of using grid technology to build ASC management system. In order to ensure the stability of the system, a dynamic trust model is adopted. Track entities dynamically. In addition, a complete set of performance indicators is used to evaluate the performance of the supply chain to ensure the overall stability of the supply chain system. At the same time, key technologies are used. In order to solve the complex calculation model Conder management system. Maximize the use of resources and improve system performance.

Funding

This article is not supported by any foundation.

Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

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