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The Necessity of Digital Technology in the Supply Chain Finance Network Based on Digital Integration

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Abstract

Modern enterprise information consultancy and management firms are evolving with a fresh paradigm. This model emphasizes primary businesses and oversees the capital, data, and logistical operations of small to medium-sized entities. It aims to transform unpredictable risks into manageable supply chain enterprise risks, ensuring the most minimal financial service risks. Additionally, supply chain finance offers a broad spectrum of financial solutions for businesses throughout the supply chain. As technology advances, this has given rise to a novel supply chain financial ecosystem. This network can effectively execute supply chain finance operations. Notably, supply chain finance is inherently a credit-based financing system. Conventional techniques fall short in addressing the trust issues within the financial network of supply chain finance. This study introduces a digital methodology for financial network scrutiny. Initially, computer systems are employed to probe the trustworthiness challenges of the financial network, segmenting indices based on the network's demands to mitigate interfering elements. Subsequently, these systems evaluate the financial trust impacts on the supply chain, establish a financial network blueprint, and undertake a holistic examination of the financial network outcomes. Simulations in MATLAB indicate that, when assessed under specific criteria, the digital technology's financial network trust in supply chain finance surpasses traditional approaches in network reliability.

Keywords: Computer Technology, Digital Technologies, Supply Chain Finance, Supply Chain Financial Network

1. Introduction

1.1 *The Digitalization Of Supply Chain Financial Networks Under the New Model*

With the rapid development of technology and the advancement of digital transformation, supply chain financial networks are also undergoing a profound transformation [1]. The new model, represented by new technologies such as the internet, big data, and artificial intelligence, is gradually changing the traditional operation mode of supply chain finance, making it more transparent, efficient and flexible [2]. The digitalization of supply chain financial networks under the new model is no longer an option, but a necessary transformation [3].

The capital chain is the primary concern of both enterprises and investors. Enterprise Information Consulting Management Co., Ltd. is an enterprise born under a new model. It uses big data to obtain known information, such as enterprise invoicing, enterprise tax payment, and enterprise capital flow, which helps enterprises select the most suitable financing channel for enterprises and solve problems such as shortage of capital chain [4]. The capital chain can understand the true business situation of a company by analyzing its financial reports and credit data. The capital chain focuses on the management of capital flow, information flow, and logistics of SMEs. The capital chain can find hidden dangers in the business process of enterprises in a timely manner, and avoid the capital chain break of SMEs due to poor management. Financial network trust is one of the important contents of supply chain finance, which is of great significance to supply chain finance. However, in the process of financial networks, the financial network scheme has the problem of poor reliability, which has an impact on supply chain finance. Some scholars believe that the application of digital technology to the financial analysis of the supply chain can effectively analyze the financial network scheme and provide corresponding support for the financial network [5].

1.2 *Digital Advantages of Supply Chain Financial Networks Under the New Model*

Digitalization has a necessary impact on all fields of society, and financial chain can provide necessary conditions for digitalization. However, under the new mode, how to use the digital development mode to develop, promote the development of supply chain, improve its operational efficiency and transparency, and reduce the corresponding operational risks is the main research problem at present.

1. Improve operational efficiency

The digitalization of supply chain finance networks can greatly improve operational efficiency. Compared with the traditional operation mode, experience is simpler in the operation process, such as completing orders, processing, and logistics tracking services, and realizing online payment. In the service process, the input quantity has realized the rapid processing of system orders, the digitalization of safety stock management, the effective control of corresponding data and the avoidance of excessive squeezing. Through the supply chain processing, reducing the financial processing links, a lot of time and manpower, and completing various trading activities, greatly improve the efficiency of operation and management.

2. Enhance transparency

The digitalization of supply chain finance networks can enhance transparency throughout the supply chain. Digital management of supply chain can realize cloud sharing of information and complete real-time tracking of information, including order, inventory, logistics, payment and settlement, etc. [7], so as to keep all parties running effectively. In addition, digitalization can also transform supply chain operation data into easy-to-understand graphs and charts through data analysis and visualization tools, helping participants better understand supply chain operations. Through real-time data transmission and sharing, supply chain participants can understand the operation of the entire supply chain, improving transparency and accuracy in decision-making [8].

3. Reduce operational risk

The digitalization of supply chain finance networks can reduce operational risk. On the one hand, digital management can improve the overall transparency of the supply chain, improve the participation of relevant personnel, better manage operations and reduce operational risks. In addition, digital management can reduce the manual intervention rate, reduce the error rate of intervention,

improve the objectivity of supply chain management, and further reduce the corresponding risks. Therefore, digital management can complete the data analysis of supply chain, enhance the transparency of management and reduce the risk of management. Digital technologies can monitor and predict potential risks in the supply chain, helping participants take action in advance to reduce operational risks [9].

4. Improve the response speed of customer needs

The digitalization of supply chain finance networks can improve the responsiveness of customer needs. In the past transmission mode, consumers in the supply chain needed to fill in the form information and process it manually, which is not only complicated, but also slow in corresponding time. However, the digital supply chain can simplify the operating environment, complete online information filling, electronic orders and electronic systems, and customers can place orders quickly, and also track the corresponding logistics information and processing progress. In the process of digital processing, customers can complete the corresponding work only by online monitoring without waiting. Therefore, supply chain digitalization can improve customer satisfaction, increase sales volume in the supply chain and improve management efficiency[10]. Improve customer demand response speed: Digital technology can quickly respond to customer needs, improve customer satisfaction, and improve the competitiveness of enterprises.

5. Enhance the competitiveness of enterprises

The digitalization of supply chain finance networks can enhance the competitiveness of enterprises. Under the environment of digital development, in order to improve their own development level and adapt to the development and changes of the market, enterprises constantly change their management methods, especially the transformation of digital technology. Digital technology can improve the development efficiency of enterprises, optimize existing results and improve their competitiveness. In addition, digitalization can also help enterprises better collaborate and integrate with upstream and downstream enterprises, optimize the operation status and efficiency of the entire supply chain, and gain greater advantages in the fierce market competition. Through digital transformation, enterprises can improve efficiency, reduce costs, optimize resource allocation, and gain greater advantages in the fierce market competition [11].

1.3 The Challenges of the Digitalization of Supply Chain Financial Networks Under the New Model

Data integration and standardization: Digital transformation is needed to solve the problem of data integration and standardization to ensure data accuracy and consistency. **The difficulty of technical implementation:** The implementation of the digitalization of the supply chain financial network under the new model requires technical support, especially for some complex large-scale enterprises, the technical implementation is difficult.

Develop a digital strategy: Enterprises should clarify the goals and paths of digital transformation and integrate digital technology into all aspects of the supply chain financial network. **Build a digital platform:** Through the construction of a digital platform, data integration, sharing and exchange are realized, and the synergy effect of supply chain financial networks is improved. Enterprises should pay attention to the supervision of supply chain, dig deep into the information between different links, and improve the safety level of supply chain operation. The main trend of digital supply chain transformation, and digital security is a problem that needs to be paid attention to in the transformation, and different measures should be taken. **Changing traditional business models:** Digital transformation requires changes to traditional business models and processes, which may encounter some resistance. In the process of digitalization, it is necessary to comply with relevant regulatory requirements, such as the privacy of customer and enterprise information. Under the new model, digitalization is the development trend of supply chain, and it is also the basis of reducing cost, transparency, and operational risk of supply chain. However, there are many challenges to implementing digital transformation, which requires enterprises to develop a clear digital strategy, upgrade technology, change traditional business models, and focus on data integration and standardization, as well as cybersecurity. By effectively responding to challenges, the digitalization of supply chain financial networks under the new model will bring enterprises stronger competitiveness and better development prospects.

1.4 The Significance of the Digitalization of Supply Chain Financial Networks Under The New Model

1. Increase transparency and efficiency in your supply chain

The digital development of supply chain requires a lot of manpower, material resources and costs, and it is necessary to realize the wireless transmission and sharing of data with the help of technologies such as big data, cloud computing and blockchain. Supply chain digitization can not only improve the accuracy and transparency of information, but also improve the operational efficiency of information. Digitalization can improve the data transmission between various environments in the supply chain and complete the monitoring of various links, such as inventory, production, sales and so on.

2. Reduce costs and improve efficiency

The digitalization of supply chain financial networks can reduce costs and improve efficiency in the supply chain through digital technology. The first problem is to reduce the cost of supply chain digitalization, reduce the degree of manual intervention, complete the objective transformation of numbers, and reduce the error rate of digital development. At the same time, numerical development can complete the sharing and remote transmission of supply chain data, and reduce the error rate of manual operation. Second, digital technology can improve the efficiency of loan approval. Traditional loan approval requires manual review and evaluation, which is not only inefficient but also prone to errors. Digital technology can automate the approval of loan applications through technologies such as big data analysis and machine learning, improving the efficiency of approval. Finally, digital technology can reduce inventory costs. By understanding the inventory situation in real time, enterprises can achieve accurate control of inventory, avoid inventory backlog and out-of-stock, and reduce inventory costs.

3. Enhance risk management and control

The digitalization of supply chain finance networks can enhance risk management and control capabilities through digital technology. First, digital technology can improve the transparency of information, allowing financial institutions to have a more accurate picture of the situation in the supply chain and better assess risks and benefits. Second, digital technology can realize risk early warning and automatic response functions. When an abnormal situation is found, the digital system can automatically respond issue early warning signals, and take timely measures to avoid losses. Finally, digital technology can realize intelligent risk control management. Through technologies such as big data analysis and machine learning, each business can be accurately evaluated and audited to reduce the probability of risk occurrence.

4. Promote industrial upgrading and innovative development

The digitalization of supply chain financial networks can promote industrial upgrading and innovative development through digital technology. First of all, digital technology can realize industrial intelligence. Through intelligent technology, it can realize the automation and intelligent management of production, logistics, sales, and other links, and improve the efficiency and competitiveness of the industry. Second, digital technology can drive industrial innovation. Through digital technology, traditional industries can be combined with the Internet, big data, artificial intelligence, and other technologies.

In short, the digitalization of the supply chain financial network under the new model is very necessary, because it can significantly improve the work efficiency and core competitiveness of enterprises, and can also coordinate and improve the overall operation effect of enterprises, so as to achieve more comprehensive, accurate and rapid management and decision-making, and help enterprises to be invincible in the fierce market competition. The prospect of future development trend Under the new model, the future development prospect of digitalization of the supply chain financial network is very broad. With the continuous expansion of digital technology, it can not only improve the operational efficiency of supply chain, but also enhance the intelligence in the management process, realize the in-depth excavation of supply chain and promote the digital development of operation management. In addition, the digital development of supply chain provides corresponding support for the intelligent development of AI and the overall management of supply chain in the later

period, completes the digitalization of management and the intelligence of development, and greatly improves the operational efficiency of supply chain. In a word, the digitalization of the supply chain financial network under the new model will become one of the important forces to promote industrial development. On this basis, this paper proposes digital technology to optimize the financial network scheme and verify the effectiveness of the model.

This paper uses computer technology analysis and model calculations to demonstrate that Enterprise Information Consulting Management Co., Ltd. serves as a link between capital and enterprises, and the financial network constructed accurately controls the operational capabilities and funding chain of the enterprise, thereby establishing trust between both parties in the financial network.

2. Related Concepts

2.1 Mathematical Description of Digital Technology

Digital technology is the use of digitalization to optimize the financial network scheme and, according to the indicators in the financial network y_i , find the unqualified value in the supply chain finance is z_i , and the financial network. The scheme is $tol(y_i \cdot h_{ij})$ integrated to finally judge the feasibility of supply chain finance, and the calculation is shown in Equation (1):

$$tol(y_i \cdot h_{ij}) = y_{ij} \geq \max(h_{ij}) \leftrightarrow \sum_{i=1}^n h_i Y_i \quad (1)$$

Among them, the judgment of outliers is shown in Equation (2):

$$\max(h_{ij}) = (h_{ij}^2 + 9) \succ mean\left(\frac{1}{n} \cdot \frac{h - \mu}{\sigma} \sigma_h \sum h_{ij}\right) \quad (2)$$

Digital technology combines the advantages of digitalization and uses supply chain finance for quantification, which can improve the trust of financial networks.

Hypothesis I. The financial network requirements are h_i , the financial network scheme is set_i , the satisfaction of the financial network scheme is y_i , and the financial network scheme judgment function is $M(h_i \approx 0)$ as shown in Equation (3):

$$M(v_i) = \sum h_i \cap \xi \rightarrow \oint y \Rightarrow \sum_{i=1}^n h_i^2 \cdot \frac{1}{n} \quad (3)$$

2.2 Choice of Financial Network Trust Scheme

Hypothesis II. The supply chain finance function is $e(h_i)$, and the weight coefficient is w_i , then the financial network requires unqualified supply chain finance as shown in Equation (4):

$$e(h_i) = z_i \cdot \prod M(v_i) - w_i \Rightarrow \sum_{i=1}^n h_i \quad (4)$$

Based on assumptions I and II, the comprehensive function of supply chain finance can be obtained, and the result is shown in Equation (5):

$$e(h_i) + M(v_i) \leq \max(h_{ij}) \quad (5)$$

In order to improve the effectiveness of trust in financial networks, all data needs to be standardized and the result is shown in Equation (6):

$$\overline{e(h_i) + M(v_i)} \leftrightarrow mean\left(\frac{1}{n} \cdot \frac{h - \mu}{\sigma} \sigma_h \sum h_{ij}\right) \quad (6)$$

2.3 Analysis of Financial Network Programmes

Before digital technology, it is necessary to conduct a multi-dimensional analysis of the financial

network scheme, map the financial network requirements to the supply chain financial library, and eliminate the unqualified financial network scheme is $No(h_i)$, According to Equation (6), the anomaly evaluation scheme can be proposed, and the results are shown in Equation (7):

$$No(h_i) \leftrightarrow \int \overline{e(h_i) + M(v_i)} \quad (7)$$

Among them, $\int \overline{e(h_i) + M(v_i)} > 1$ it is stated that the scheme needs to be proposed, otherwise the scheme is passed. The summary function for all scenarios is $Zh[No(h_i)]$, and the result is shown in Equation (8):

$$Zh[No(h_i)] = \sum No(h_i) \quad (8)$$

Supply chain finance conducts comprehensive analysis and sets thresholds and indicator weights of financial network schemes to ensure the accuracy of digital technology. Supply chain finance is a systematic test of financial network solutions, which needs to be analyzed. If the supply chain finance is in a non-normal distribution $unno(h_i)$, its financial network scheme will be affected, reducing the accuracy of the overall financial network, and the calculation result is $accur(h_i)$, shown in Equation (9):

$$accur(h_i) = \frac{\int \overline{e(h_i) + M(v_i)}}{\sum No(h_i)} \times 100\% \quad (9)$$

The survey of financial network schemes shows that the financial network trust scheme presents a multi-dimensional distribution, which is in line with objective facts. Supply chain finance has no directionality, indicating that the financial network trust scheme has strong randomness, so it is regarded as a highly analytical study. If the random function of supply chain finance is $randon(\cdot)$, then the calculation of Equation (9) can be expressed as Equation (10):

$$accur(h_i) = rand\left[\frac{\int \overline{e(h_i) + M(v_i)}}{\sum No(h_i)}\right] \times 100\% \quad (10)$$

Above all, supply chain finance adheres to standard criteria. Primarily, through digitalization, it refines the supply chain finance by eliminating redundant and non-pertinent plans, adding missing ones, and ensuring a robust dynamic interrelation throughout the entire financial network strategy.

3. Optimization Strategies for Supply Chain Finance

Through digital methods, a stochastic optimization approach is applied to supply chain finance, fine-tuning the parameters associated with financial network trust issues to enhance supply chain finance optimization. Digital methodologies categorize supply chain finance into various financial network tiers, choosing diverse solutions at random. During the iterative phase, the financial network strategies of these different tiers are refined and scrutinized. Once the optimization review concludes, the financial network tiers of the varied solutions are juxtaposed to identify the most optimal supply chain finance.

4. Methodology and Results

4.1 Introduction to Financial Networks

To streamline the financial network, this study focuses on supply chain finance in intricate scenarios. It examines 12 routes with a testing duration of 12 hours. The detailed financial network structure of the supply chain finance plan is presented in Table 1.

Table 1. Financial Network Requirements

Scope Of Application	Grade	Reliability	Financial Network Trust
Prepayment Financing	Normal	80.98	81.27

	Higher	82.39	79.25
Accounts Receivable Financing	Normal	81.55	78.32
	Higher	79.55	79.37
Spot Pledge Financing	Normal	79.44	81.10
	Higher	80.48	79.58

The financial network process in Table 1 is shown in Figure 1.

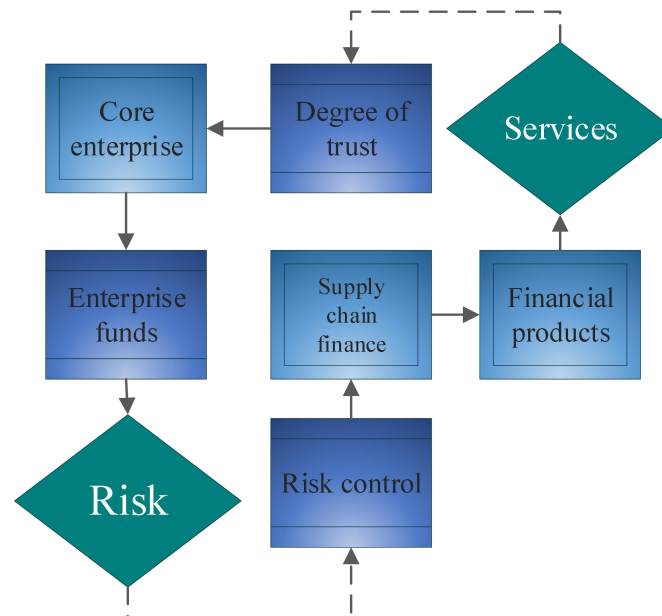


Figure 1. The Analytical Process of Supply Chain Finance

When juxtaposed with traditional approaches, the financial network strategy of digital technology aligns more closely with real-world financial network needs. Evaluating the logic and dependability of supply chain finance, digital methods outperform conventional ones. The variations in financial network strategies depicted in Figure 1 indicate higher trustworthiness and reliability in digital solutions. As a result, the speed of financial network resolution, the trustworthiness of the financial network plan, and the overall stability of digital technology are enhanced.

4.2 Supply Chain Finance

The financial network strategy for supply chain finance encompasses unstructured data, semi-structured data, and structured data. Following the initial selection via digital technology, a preliminary financial network plan for supply chain finance is derived, along with an evaluation of the feasibility of such financial network strategies. To more precisely assess the trustworthiness of the supply chain financial network, one should choose supply chain finance and financial network plans across varied financial network tiers, as illustrated in Table 2.

Table 2. The Overall Picture of the Financial Network Trust Scheme

Category	Trust	Analysis Rate
Prepayment Financing	83.30	82.60
Accounts Receivable Financing	80.60	83.91
Spot Pledge Financing	82.10	83.39
Mean	85.27	83.12
χ^6	84.39	81.90
P=1.598		

4.3 Financial Network Trust and Stability of Financial Networks

In order to verify the accuracy of digital technology, the financial network scheme is compared with the common method, which is shown in Figure 2.

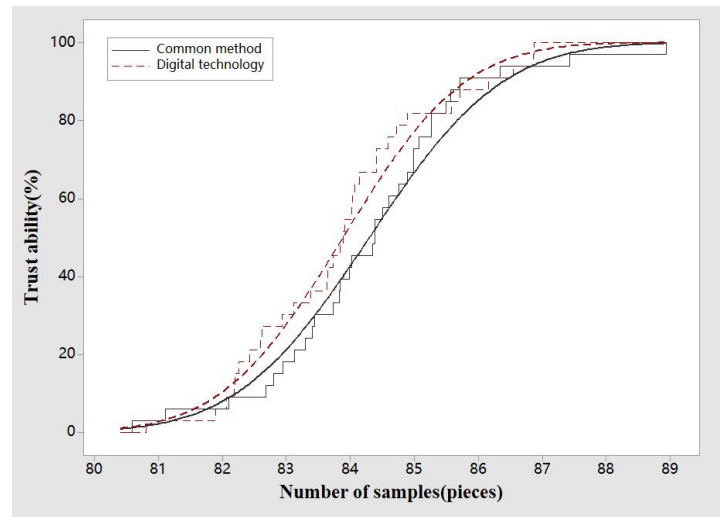


Figure 2. Financial Network Trust with Different Algorithms

From Figure 2, it's evident that the trust level of the financial network in digital technology surpasses that of traditional approaches, yet it has a reduced margin of error. This suggests that the financial network derived from digital technology is notably consistent, in contrast to the fluctuating nature of financial networks from conventional methods. The mean financial network strategy of the aforementioned three algorithms is detailed in Table 3.

Table 3. Comparison of the Accuracy of Financial Networks by Different Methods

Algorithm	Financial Network Trust	Magnitude of Change	Error
Digital Technology	93.12	93.49	91.11
Normal Method	91.75	90.65	89.98
P	86.34	82.27	90.42

From Table 3, it's apparent that traditional techniques fall short of ensuring trust within the financial network of supply chain finance. The supply chain finance has seen significant shifts, resulting in a high margin of error. In contrast, digital technologies consistently demonstrate a higher degree of trust in financial networks. Notably, the trust level for digital technology in financial networks exceeds 91%, with minimal variations in accuracy. To further underscore the advantages of digital technology, a comprehensive analysis is conducted using various methodologies, as depicted in Figure 3.

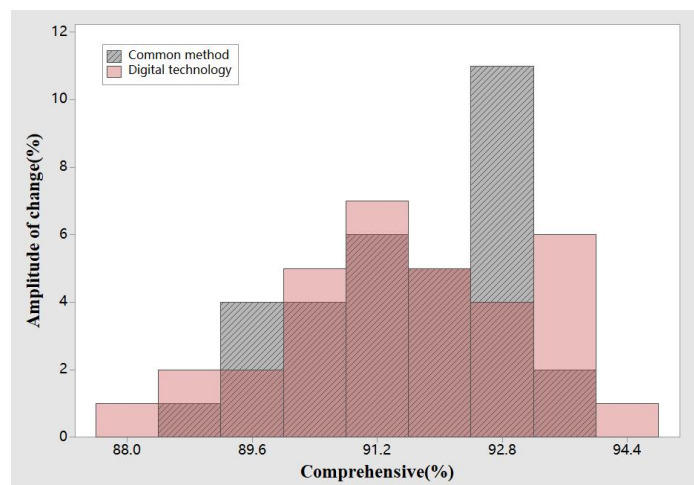


Figure 3. Financial Network Trust for Digital Technology Financial Networks

From Figure 3, it's evident that the trustworthiness of the financial network in digital technology markedly surpasses that of traditional techniques. This can be attributed to digital technology's

enhancement of the supply chain's financial adjustment coefficient and the establishment of a threshold for financial network trust issues, thereby filtering out non-compliant financial network strategies.

5. Conclusion

Addressing the challenge of inadequate trust in supply chain financial networks, this study introduces digital technology, enhancing supply chain finance through digital integration. Concurrently, there's an in-depth examination of financial network trust, leading to the formulation of a set of trust-related issues in the financial network. Findings indicate that digital technology can bolster supply chain finance, ensuring stability across generic financial networks for such finance. Yet, during the digital technology application, an overemphasis on financial network analysis has led to suboptimal choices in financial network metrics.

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