

Research on the Construction of “Four-in-One” Mode of Supply Chain Finance Based on the Internet of Things Technology

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Abstract: This paper designs a new type of inventory pledge financing mode based on the unique functions of the Internet of Things technology and the business process of inventory pledge financing mode. The “four-in-one” mode of supply chain finance based on the Internet of Things technology enables efficient and transparent transfer among participants, further reducing credit risk and market risk, and at the same time, other operational risks like external fraud can be reduced as well by real-time intelligent tracking of pledges.

1. Introduction

The original intention of banks to carry out supply chain finance business is on the one hand for the needs of market expansion, and on the other hand, the need to deal with financing problems for small and medium-sized enterprises (SMEs). [1] Supply chain finance focuses on the real trading background among enterprises in the supply chain to effectively control the logistics, capital flow and information flow by combining the self-compensated trade structure design with the core enterprise’s credit strength as the guarantee, through which the uncontrollable risks of individual enterprises’ credit business are transformed into overall controllable risks, which has better alleviated the difficulty of financing for SMEs.[2] Supply chain finance business also has some shortcomings in the process of practice. For example, there are other forms of information asymmetry, mode lag, and high operational risk among banks, which stimulates the demand for financing mode optimization and risk control.

2. Overview of the Internet of Things

2.1 Working Principle of the Internet of Things

The Internet of Things (IoT) is a network technology that uses intelligent sensing technology to connect items to the Internet for information exchange and communication to achieve intelligent identification tracking and supervision under a contractual agreement. The working principle of the IoT is shown in Figure 1:

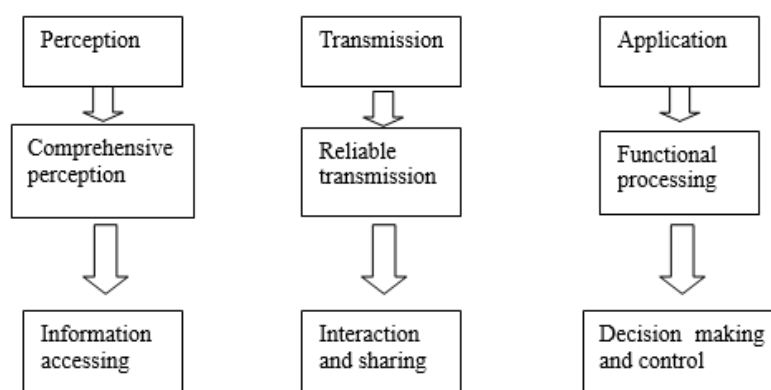


Figure 1 Working Principle of the Internet of Things

2.2 Key Technologies of the Internet of Things

2.2.1 Radio Frequency Identification Technology (RFID)

Radio frequency identification technology is a non-contact automatic identification system that automatically recognizes a target object through radio frequency wireless signals and realizes acquiring relevant data.[3] The system mainly includes electronic tags, readers and computer networks. The electronic tag consists of a chip and an antenna. The target object is mainly identified by being attached to the object. The electronic tag has a unique electronic code for storing the relevant information of the target object.[4] For example, an electronic tag is embedded in the pledge in the inventory pledge financing mode, and information related to the pledge is stored. The reader reads the information in the electronic tag through the radio frequency wireless signal. It first needs to send a specific inquiry signal.[5] When the electronic tag reaches this signal range, it will sense the signal and give a response signal with the information stored in the electronic tag. After receiving the response information signal, the reader will transmit it to the host in the computer network after the corresponding processing, and the host completes the functions of data processing, transmission and communication.

2.2.2 Global Positioning System (GPS)

The Global Positioning System is a combination of satellite and communication technology applications. GPS can quickly and accurately acquire the three-dimensional position, velocity and time information of the target object without weather and time constraints, and has the characteristics of high precision, high efficiency and automation. GPS is an indispensable part of the IoT system. In the inventory pledge financing mode, effective control of the pledge liquidity is one of the urgent problems to be solved. RFID can effectively solve the real-time tracking of pledges in a small area, but once the pledge is transported over long distance, RFID alone can't solve the problem. However, combining RFID with GPS can solve the problem well. A transport vehicle equipped with a GPS receiver can be accurately located by satellite positioning.

2.2.3 Data Analysis and Processing Technology

In the architecture hierarchy of the Internet of Things, the types and quantities of information transmitted from the sensing layer to the application layer are gradually increased, and the amount of data that needs to be processed and analyzed is multiplied. How to effectively mine, organize and apply such massive information is a difficult problem that the Internet of Things needs to solve. Data analysis and processing functions are a key to the effective application of the Internet of Things, and the emergence of cloud computing has realized this possibility. Cloud computing is a kind of distributed computing technology, which can process thousands or even billions of information in a few seconds, which provides a shortcut for processing the massive information collected in the Internet of Things system. Cloud computing emphasizes the aggregation, optimization and dynamic processing of information, which greatly improves the operational efficiency while reducing the cost of information processing.

3. Construction of Inventory Pledge Financing Mode Based on IoT

3.1 Construction Principles of the Mode

The construction principles of the inventory pledge financing mode based on the Internet of Things technology are as follows:

3.1.1 The Principle of Practicability

The principle of practicability means that the inventory pledge financing mode based on the IoT designed in this paper can make up for the defects of the original inventory pledge mode. It can effectively avoid fraud risks such as false pledges and multiple pledges in the course of business development, as well as the risk of price fluctuations caused by market demand, and on this basis, realize information sharing before, in, and after stages of the entire supply chain financial business.

3.1.2 The Principle of Suitability

The principle of suitability refers to the degree of integration of the inventory pledge financing mode based on the IoT and the participants of the business. Where there is a market, there is a game, so in the design of the new mode, we must regard all participants as a whole and take into account the interests of all participants of the entire supply chain finance, in order to achieve Nash Equilibrium.

3.1.3 The Principle of Scalability

The principle of scalability refers to the ease with which the inventory pledge financing mode based on IoT technology can be interfaced with future technologies. Because the technology is constantly updated, the inventory pledge financing mode built on the basis of the existing technology will also change with the upgrading of future technologies. Therefore, it is necessary to design with a developmental vision to predict the development direction of the future technology of the IoT to achieve an easy connection between the existing mode and the future technology.

3.1.4 The Principle of Reusability

The principle of reusability means that the inventory pledge financing mode based on the Internet of Things technology designed in this paper can be well matched to the financing mode of prepayments and accounts receivable after making corresponding changes. For example, through the function of information sharing, the credit risk of accounts receivable is further reduced, and the influence of the “bullwhip effect” is reduced by the data analysis and processing function, which can effectively control the inventory.

3.2 Design of Inventory Pledge Financing Mode Based on the Internet of Things

In the inventory pledge financing mode based on Internet of Things technology, the real-time tracking of pledges improves the supervision and operation ability of logistics enterprises. Real-time and accurate warehousing information is effectively transmitted among the participating entities, which increases the transparency of the financing business. Real-time data sharing enhances the bank’s regulatory capabilities and reduces the risk of funds. The “four-in-one” in the new mode is shown in Figure 2:

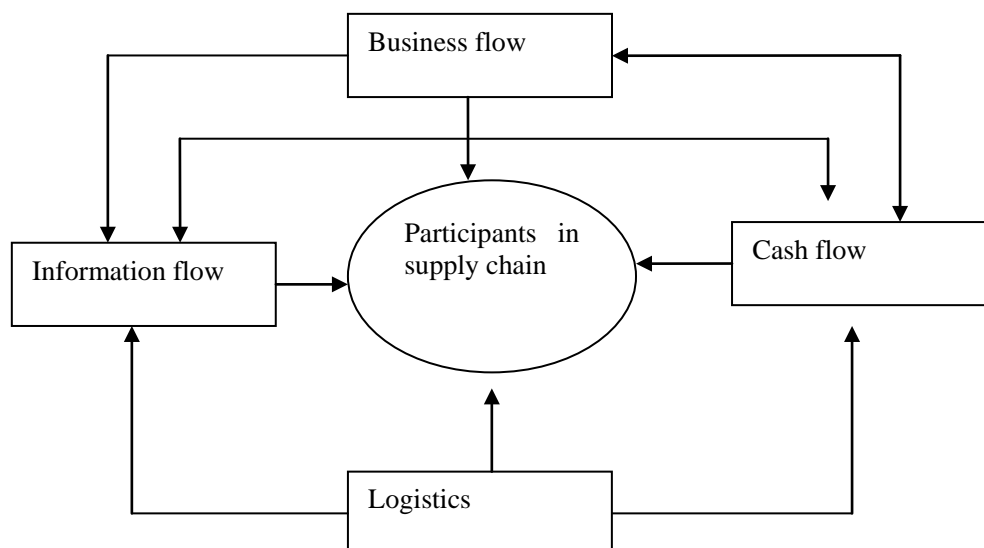


Figure 2 The “Four-in-One” in the New Mode

In the inventory pledge financing mode based on the Internet of Things technology, for the third-party logistics enterprises, the IoT information system based on the inventory pledge financing mode not only realizes the warehousing and storage of the pledge and the internal intelligent management, but also realizes the rapid sensing of the changing market environment.

Firstly, the IoT system based on the inventory pledge financing mode can successfully achieve

the collection of various types of data during the business development process. In this system, data is collected mainly from the following aspects: First, relevant information or self-owned information collected by the financial institutions, core enterprises, third-party logistics companies and other parties through the field investigation before the inventory pledge financing business is carried out, such as the relevant background of the supply chain, the strength of the core enterprise, the debt and operation information of the SMEs; and then sharing the data information between the participants through the application layer to achieve information symmetry. The second is to collect the relevant information of the pledge through the application of electronic tags, video surveillance, GPS and other sensing technologies embedded in the pledge. This is the information that the inventory pledge financing mode needs to focus on. The third is the data entered by the practitioners based on the paper materials such as business applications. This part may be incorrectly entered due to operational errors, so it needs to be verified before it can be completed.

Then, for the participants in the supply chain finance, they can realize the real-time sharing of various information in the business development process by linking the remote interface of the system. Banks and other financial institutions can use the system to conduct loan business approval, issue warehousing dispatch orders, and real-time monitoring of pledge status to issue relevant orders to third-party logistics enterprises. Financing SMEs can use the system to make pledges out of the warehouse application, check the application progress and the storage status of the goods, etc.

Finally, in the process of business lending and post-lending, the logistics practitioners need to enter relevant information such as the quantity of pledge, the ownership of the goods, and the market price into the Internet of Things system, so as to introduce the value of the pledge and process the value and data. The minimum limit in the layer database is compared to determine if the service is eligible. If the standard is met, the bank and other financial institutions will be informed, and the bank will make loans to the financing small and medium-sized enterprises according to the actual situation. During the time when the pledge is pledged, the data processing layer in the system will track the price of the pledge market and synthesize all aspects of the value of the pledge. If there is a potential risk, the employee should communicate with the financial institution in a timely manner and make corresponding countermeasures based on the actual situation, such as increasing pledge, increasing margin or disposing of pledge. If there is no potential risk, the business will start normally.

4. Conclusion

Through the introduction and analysis of the Internet of Things principle and related technologies, it can be found that the Internet of Things technology has the functions of real-time tracking, data analysis processing and information sharing. The combination of these functions can effectively compensate for the defects in the supply chain financing mode. Therefore, this paper takes the supply chain financial inventory pledge financing mode as an example, combined with the application of Internet of Things technology to design a “four-in-one” inventory pledge financing mode to achieve the optimization of the mode.

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