

Research on the Innovative Application of Digital Supply Chain Finance in Private Science and Technology Enterprises in China

(Full Paper)

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ABSTRACT

Based on the comprehensive impact of digital technologies on supply chain finance in different application scenarios, we analyze operation procedures optimization and critical control points of four innovation modes about digital supply chain finance in private science and technology enterprises, which are digital supply chain finance model based on prepayment, digital supply chain finance model based on inventory pledge, digital supply chain finance model of based on accounts receivable and digital supply chain finance model of based on intellectual property pledge in this paper. At present, there are some problems in digital supply chain finance, such as weak risk control, inadequate technology application and imperfect legal system. In order to promote the efficient implementation of digital supply chain finance to private science and technology enterprises, the leading institutions of supply chain finance should attach importance to the governance strategies such as controlling the source of risk to avoid risk, accelerating the ecological innovation of digital technology enabling, and improving the legal system to regulate development.

Keywords: Digital technology, supply chain finance, private science and technology enterprises.

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INTRODUCTION

With the innovation and reform of digital technologies such as Internet, big data, cloud computing, artificial intelligence, etc., platform organizations based on new technologies continue to show the trend of integration and development with traditional industries, giving birth to new formats of digital economy (Zhang, 2019). The scale of digital economy was 31.3 trillion yuan, contributing 67.9% to GDP growth in China in 2018. The development of digital economy has accelerated the pace of transformation of new and old driving forces of private science and technology enterprises in China. In the first three quarters of 2019, the added value of high-tech manufacturing industry increased by 8.7% year-on-year, 3.1% faster than that of industries above designated size in China. China ranks 14th in the global innovation index. Private enterprises account for 83% of the high-tech enterprises in China. Private science and technology enterprises have become the main force and powerful economy supporting scientific and technological innovation in China. They have played an important role in improving China's source innovation and basic research ability. However, the inherent characteristics of light assets and high risk of private science and technology enterprises lead to serious financial exclusion (Xu & Wang, 2018). Although the balance of science and technology loans reached 328.3 billion yuan in China in 2018, it is far from meeting the financial needs of innovation investment of private science and technology enterprises. The problems of imperfect financial support mechanism, lack of capital investment subjects, insufficient policy coordination and imperfect intermediary service restrict the speed of innovation and development of private science and technology enterprises (Dou, Li, & Wu, 2014). At this stage, whether from the perspective of meeting the needs of innovation driven strategy, or from the perspective of building a modern industrial system of collaborative development of science and technology innovation and finance, it is of great significance to develop a new financing mode suitable for the development characteristics of private science and technology enterprises and provide high-quality financial support for their independent innovation.

Supply chain finance started at the beginning of this century in China. It has experienced the stage of supply chain finance 1.0 led by commercial banks and the stage of supply chain finance 2.0 led by industrial enterprises. With the intervention of Internet technology, it has developed to the stage of supply chain finance 3.0, contributing to easing the financial constraints of SMEs, including private science and technology enterprises. New digital economic model calls for new forms of financial services. Fintech is the product of the deep integration of finance and technology, and an important engine to drive the upgrading of modern financial industry. Driven by digital economy and financial technology, supply chain finance 4.0 (hereinafter referred to as "digital supply chain finance") based on digital technology has brought new opportunities for the financing needs of private science and technology enterprises. With the application of the new generation of digital technology, supply chain finance is not only the combination of industrial chain and finance, but also the deep integration of "digital technology + industrial ecology + modern finance". It will not only improve the availability, convenience and security of financial services for private science and technology enterprises, but also promote the precise services of supply chain finance for the high-quality development of private science and technology enterprises. Based on the analysis of the endowment

characteristics of digital supply chain finance, we discuss the operation process and critical point design of supply chain financial innovation mode in private science and technology enterprises from the perspective of digital technology penetration. Finally, we put forward corresponding governance strategies for the constraints that may exist in the actual application at this stage.

CHARACTERISTICS OF DIGITAL SUPPLY CHAIN FINANCE

Digital supply chain finance is the product of traditional supply chain finance embracing digital technology. As shown in figure 1, due to the application of big data, cloud computing, Internet of Things, blockchain and other technologies, digital supply chain finance presents a complex network structure, and the participants in the platform are infinitely expanded. The operation structure of upstream and downstream node enterprises in supply chain is no longer limited to the traditional chain organization, forming an energy coupling cluster network organization. The supporters of supply chain financial activities, such as government, financial institutions and logistics, also reflect the crisscross interest-related relationship, and expand more service channels through platform space. In the complex network system, the platform of supply chain finance plays the role of a neural hub and grasps the coordination of business flow, capital flow, logistics and information flow (hereinafter referred to as "four flows") in supply chain operation. It is familiar with the operation key points of supply chain system, and timely provides various supporting services including finance for the fund deficient enterprises in the platform. Therefore, the enterprises focus on the development of core competitiveness, which is conducive to the improvement of the competitive advantage of supply chain.

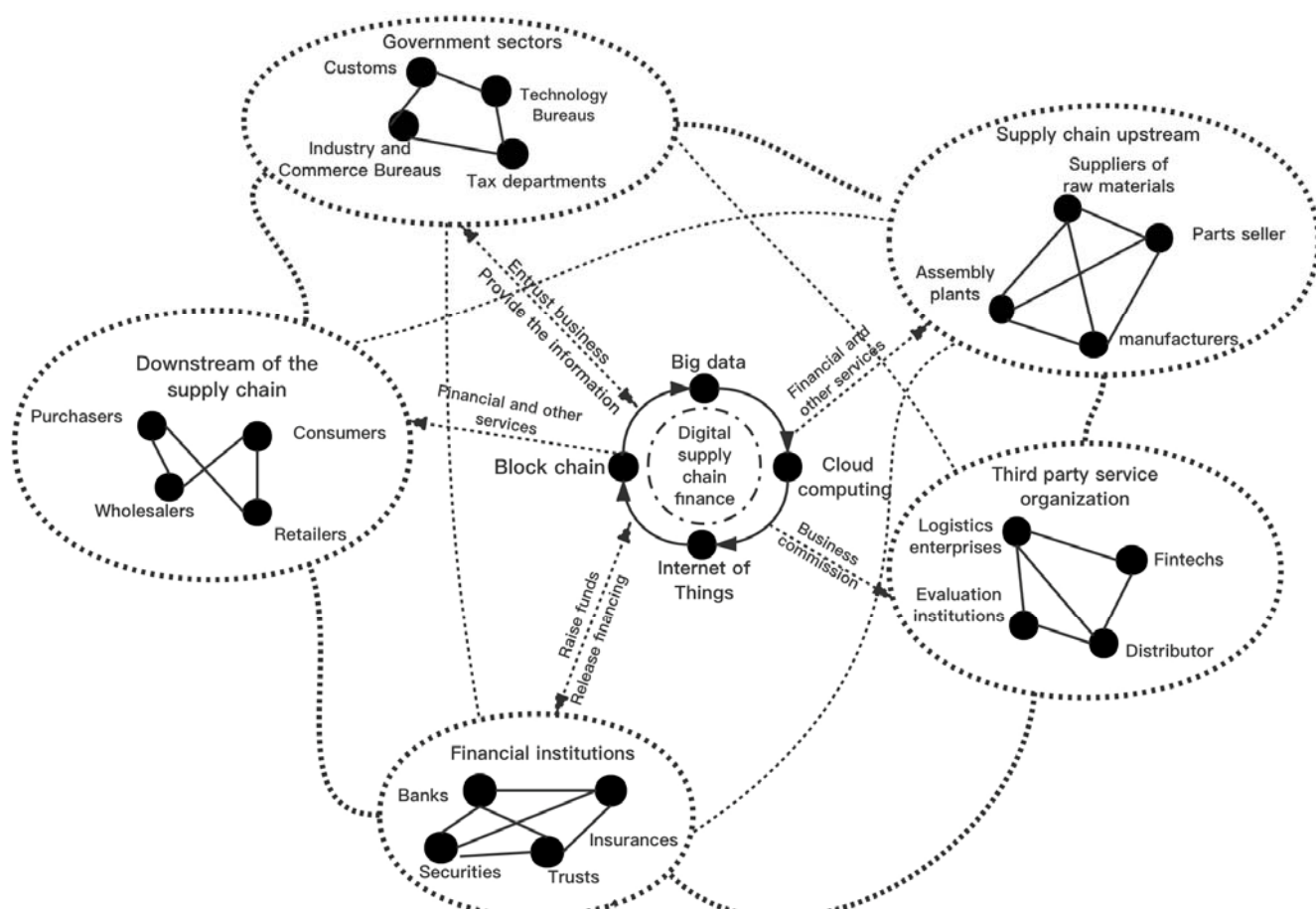


Figure 1: Complex network structure of digital supply chain finance

Driven by the convergence of digital technologies, supply chain finance has entered the era of innovation, transformation and upgrading. Compared with traditional supply chain finance, due to the innovation integration of digital technologies, digital supply chain finance presents the endowment characteristics of precision financing services, radiation credit enhancement and smart risk control, which can break through the bottleneck of high-quality development of traditional supply chain finance services for private science and technology enterprises in terms of service cost, operation efficiency, risk management and control, time and space span, etc. Thus, digital supply chain finance may provide diversified and personalized financial services for more and more private science and technology enterprises in supply chain finance ecosystem.

Precision Management Service

Traditional supply chain finance, which is dominated by labor and paper media, is difficult to realize transaction procedure control based on track management. It cannot accurately control the "four flows" matching degree, which limits the advantages of supply chain finance. The application of digital technology in the field of finance has given birth to a new business form of

digital Finance (He, 2019). The application of the Internet of Things and artificial intelligence can realize the full-process trajectory management of production, trade, and warehousing of technology-based enterprises, generate an intelligent monitoring network covering the entire chain and can feed back big data in real time, which can not only solve cargo control and warehouse receipt repetition Inventory supervision issues such as pledge and simultaneous supervision can also provide information support for financial institutions to accurately predict the funding needs of technology-based financing enterprises in all aspects. On the blockchain supply chain finance platform, each private science and technology enterprise can record transaction information in real time, and systematically complete the right confirmation of receivables or prepayments and the value management of all kinds of collaterals. Financial institutions provide and adjust credit lines for private science and technology enterprises through intelligent technical means. Private science and technology enterprises repay in time through intelligent contract. The whole process embodies "efficiency + saving + accuracy". With the improvement of digital technology, supply chain finance can better build a high-level data sharing center with the help of big data information depiction, visualization of Internet of Things technology, transparency of blockchain technology and other functions, and realizes the integrated management and monitoring of the whole chain information. This makes it possible to accurately position financing customers, accurately analyze customer financing needs and accurately provide customer financing solutions.

Network Credit Transmission

With the concept of "extension production" of all factors of supply chain industry, the interconnection of credit value has become the core issue of supply chain finance services (Shao, 2017). In the traditional supply chain finance services, the credit of the focus enterprises usually only covers the private science and technology suppliers or distributors of direct trade, which is difficult to be transferred to the upstream and downstream enterprises indirectly related. This kind of single-layer credit transmission can only solve one layer of financing problem, and limit the inclusive effect of supply chain finance, and restrict its effect of serving the innovation and development of private science and technology industry. In the digital supply chain finance, the new technology based on the Internet of Things and blockchain solves the problem of multi-level credit penetration, which makes the original strip credit transmission evolve into the network type credit transmission, and radiates the good credit of the focus enterprise to private science and technology enterprises that have direct or indirect transactions in the whole platform. These enterprises rely on the credit energy given by the focus enterprises to obtain financial resources to meet their capital needs in supply, production and sales. It is worth noting that the focus enterprise is the credit source of the whole supply chain finance ecosystem in the network credit transmission. Therefore, it is very important to set the access conditions of the focus enterprise. Besides, the digital technology is used to split the receivable creditor's rights and interests generated by credit sale, prepaid confirmation rights and interests based on the real trade information so that they can circulate among the platform enterprises, which is conducive to improving the efficiency and quality of credit transmission in the network platform.

Intelligent Risk Control

In supply chain finance system, we can obtain the transaction data verified by supply chain alliance enterprises with the help of Internet, cloud computing and big data technology. We can realize the real-time supervision of logistics dynamics, inventory value and goods warehouse receipt through Internet of Things, artificial intelligence and other technical means. The accelerated integration of blockchain encryption with cloud computing, Internet of Things, artificial intelligence and other technologies can prevent "duplicate or false warehouse receipts" and "self-insurance and self-financing" (Song & Chen, 2016) and other problems of loan fraud or fund arbitrage. Obviously, the use of digital technology has greatly enhanced the control ability of the leading institutions of supply chain finance to all kinds of transactions at the platform structure level. The operation of supply chain finance involves prepayment, inventory, receivables, all kinds of intellectual property rights and other asset elements as well as guarantee, mortgage, asset evaluation and other service elements of private science and technology enterprises. These elements not only relate to the risk source of supply chain finance, but also affect the key control points of risk management. Driven by the real business of the supply chain, the digital intelligent contract generated according to the transactions of each participant in the industry chain, cluster chain and service chain can not only prevent the moral hazard and speculation of the participants, but also realize the comprehensive evaluation of the asset mortgage or debt structure among the alliance enterprises in the platform. The intelligent design of closed self-compensation mechanism can better prevent the risk of capital investment and return. In the mature stage of digital technology application, intelligent risk control can better prevent all kinds of risks arising from the structure layer and element layer of supply chain finance and improve the overall risk prevention and control ability of the platform.

INNOVATIVE APPLICATION OF DIGITAL SUPPLY CHAIN FINANCE IN PRIVATE SCIENCE AND TECHNOLOGY ENTERPRISES

Due to the application of digital technology, supply chain finance has undergone great changes in the functional design of real estate or intellectual property pledge value estimation, credit evaluation of participants and risk control of capital recovery. Therefore, based on the endowment characteristics of digital supply chain finance, we will discuss the innovative design of the operation process optimization and key point layout of private science and technology enterprises applying supply chain finance mode in different scenarios in this section.

Digital Supply Chain Finance Model Based on Prepayment

This financing mode mainly takes place in the purchasing process of private science and technology enterprises. It emphasizes that private science and technology enterprises sign a commitment buyback contract with upstream suppliers, and use the established warehouse confirmed by logistics enterprises designated by the platform to apply for loans from financial institutions and take the future sales revenue of private science and technology enterprises as the source of repayment. The specific business process is shown in Figure 2.

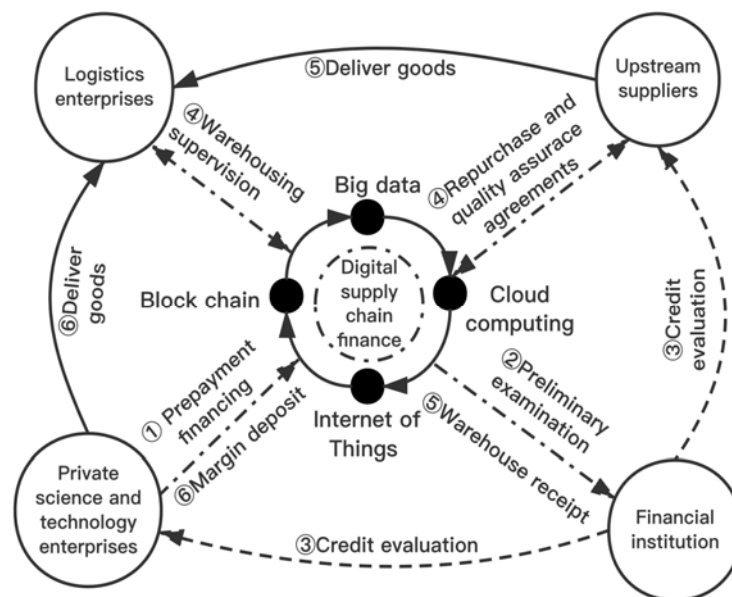


Figure 2: Technological process of digital supply chain finance model based on prepayment

- ① Private science and technology enterprises sign purchase and sale agreements with upstream suppliers, and apply for prepayment financing online accordingly;
- ② The platform captures the production and transaction scenarios of private science and technology enterprises and upstream suppliers through big data technology. It also extracts, integrates and analyzes transaction data and generates credit evaluation reports and delivers them to financial institutions with the help of cloud computing;
- ③ Financial institutions carry out multi-dimensional evaluation based on the offline credit situation of private science and technology enterprises;
- ④ The platform signs repurchase and quality assurance agreements with upstream suppliers and warehousing supervision agreements with logistics enterprises;
- ⑤ The platform informs the upstream supplier to deliver goods to the designated logistics enterprise warehouse. The logistics enterprise collects the goods information through the Internet of Things technology, generates the electronic warehouse receipt and shares it with the financial institutions in real time;
- ⑥ Private science and technology enterprises shall submit the deposit for taking goods. Financial institutions shall issue instructions to the logistics enterprises online to release the corresponding amount of goods taking right to the private science and technology enterprises.

According to the above process, committed buyback of upstream suppliers, supply of warehouse receipt pledge for logistics enterprises and repayment of private science and technology enterprises with future sales revenue are the key control points for the operation of digital supply chain finance model based on prepayment. In order to clarify the credit situation of upstream suppliers' commitment to buy back, we can trace the real trade activities between the main bodies of supply chain from the huge database, establish the coupling relationship, outline the panoramic image of upstream suppliers and conduct a comprehensive analysis by using the deep mining function of big data. Due to the application of electronic label technology in the Internet of Things, online and offline goods data docking, 24-hour intelligent warehouse management and remote positioning can be realized to ensure the security of pledged goods. Meanwhile, the comprehensive application of big data and cloud computing technology realizes the monitoring of the fluctuation of the commodity price of the pledge and provides convenience for financial institutions to adjust the credit line and interest rate. The intelligent contract is designed in strict self-compensation logic system to ensure that the sales revenue of private science and technology enterprises is used for repayment with the support of digital technology. This closed capital return program design of supply chain can prevent the risk of capital recovery.

Digital Supply Chain Finance Model Based on Inventory Pledge

This financing mode usually takes place in the production link of private science and technology enterprises with inventory pledge. It requires the use of Internet of Things, cloud computing and other technologies to carry out dynamic monitoring and value evaluation on the chattel pledge of private science and technology enterprises. Private science and technology enterprises

apply for loans from financial institutions with inventory as the pledge and take the capital inflow of future inventory sales as the source of repayment. The specific business process is shown in Figure 3.

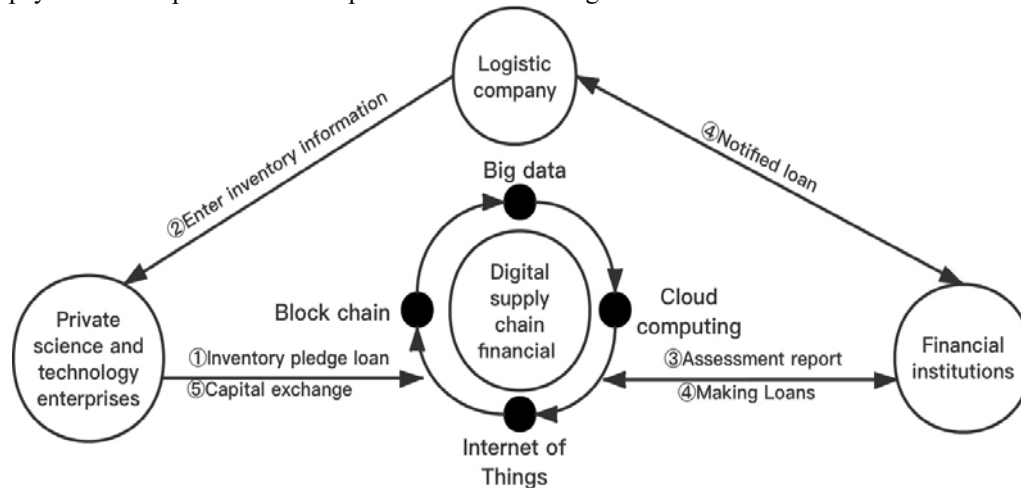


Figure 3: Technological process of digital supply chain finance model based on inventory pledge

- ① Private science and technology enterprises apply for inventory pledge loans online to supply chain finance platform by virtue of their own inventory;
- ② Through the Internet of things electronic label technology, the platform can input the inventory information of private science and technology enterprises into the system with the help of standardized interface;
- ③ Use big data, Internet of Things and other digital technologies to obtain inventory value evaluation information in real time and issue assessment certificate, which shall be submitted to financial institutions by the platform;
- ④ Financial institutions evaluate the off-line credit status of private science and technology enterprises in multiple dimensions and make credit decision;
- ⑤ The platform signs a pledge contract with the private science and technology enterprises and requires them to transfer the inventory to the designated local logistics enterprises;
- ⑥ Logistics enterprises shall check and accept the inventory, and continuously supervise the inventory status to provide real-time data for the loan of financial institutions;
- ⑦ Goods revenue of private science and technology enterprises is automatically and fully transferred to financial institutions by payment and settlement center of the platform. If the loan is repaid, the pledge contract will be invalid;

The above process shows that inventory value evaluation, inventory pledge and future sales revenue repayment are the key control points of digital supply chain finance model based on inventory pledge. This mode requires the platform to establish a huge Internet of Things system. Using information receivers such as QR code reading equipment, infrared sensor and radio frequency identification device, we can accurately detect temperature, concentration, volume, density, quality and other information of inventory in the storage, and convert information of offline goods into online data so as to realize the seamless connection between online and offline. Therefore, we can solve the problem that it is difficult and expensive to evaluate the value of chattel pledge of private science and technology enterprises, which mainly includes a large number of high-tech inventories such as electronic components, new materials, pharmaceutical reagents, etc. We can realize the mobile alarm and real-time monitoring of inventory location transfer, goods missing and damage by video monitoring and radio frequency technology. With the help of supply chain finance platform, logistics enterprises and financial institutions realize real-time sharing of pledge information. Financial institutions can access the current information of the pledged property at any time and release the pledge with one key. In this way, it can improve the financing efficiency of inventory pledge of private science and technology enterprises and better adapt to their financing characteristics. Finally, the closed self-compensation system ensures that the sales revenue of inventory flows back to financial institutions.

Digital Supply Chain Finance Model of Based on Accounts Receivable

This financing mode usually takes place in the sales link of enterprises. Private science and technology enterprises located in upstream suppliers apply for loans with receivables as pledge and take future payment of customers as repayment source. The specific business process is shown in Figure 4.

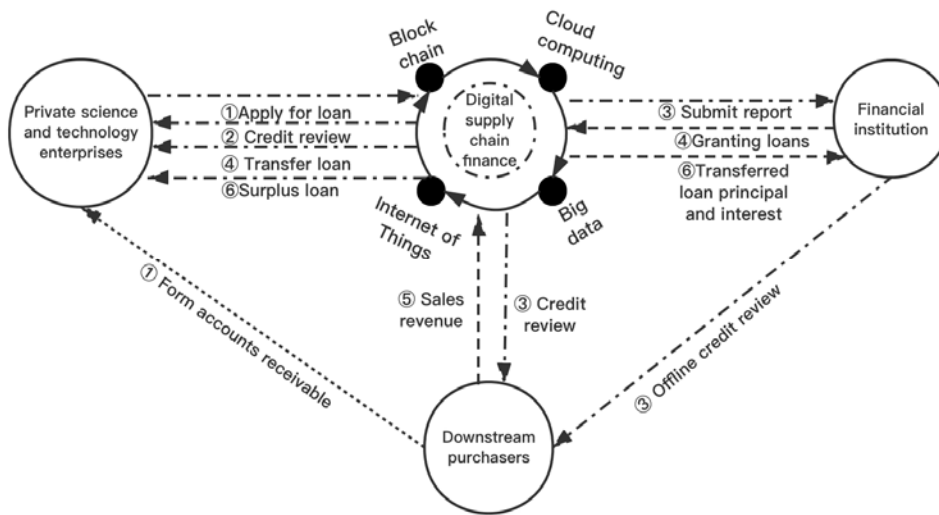


Figure 4: Technological process of digital supply chain finance model of based on accounts receivable

- ① Private science and technology enterprises sign sales contracts with downstream purchasers, and apply for loans online with receivables as pledge;
- ② The platform uses blockchain and Internet of Things technology to comprehensively review and evaluate the operation, repayment ability and credit level of upstream and downstream enterprises, and submit the information report to financial institutions;
- ③ Financial institutions carry out multi-dimensional comprehensive evaluation in combination with online evaluation reports and offline credit records of upstream and downstream enterprises;
- ④ Financial institutions provide credit to private science and technology enterprises, and payment and settlement center of the platform will transfer the funds to private science and technology enterprises;
- ⑤ Downstream enterprises in supply chain will transfer the sales revenue as the repayment source to the payment and settlement center of the platform, the platform will repay the principal and interest to the financial institutions. The balance will be transferred to the private science and technology enterprises;
- ⑥ If the financial institution obtains the principal and interest of this financing, the pledge contract of accounts receivable will automatically become invalid.

In the above process, the authenticity of accounts receivable, the quality of accounts receivable and the future payment of customers are the key control points of digital supply chain finance model of based on accounts receivable. Due to the application of blockchain technology, the chain block structure based on time stamp can realize the traceability of each transaction process, prevent upstream and downstream enterprises from defrauding loans by false sales activities. All relevant subjects in the platform participate in bookkeeping and generate a distributed ledger for collective maintenance, which can ensure the authenticity of receivables and claims. In addition, the platform uses big data to establish credit archives for enterprises and continuously updates the contents of the archives in real time. The platform realizes the comprehensive audit of the quality of claims in combination with cloud computing and uses intelligent contract to complete online automatic approval and payment. Finally, a strict self-compensation system ensures that future payment of customers will be returned to financial institutions in time.

Digital Supply Chain Finance Model of Based On Intellectual Property Pledge

This financing mode is suitable for the transaction scenario of intellectual property transfer between private science and technology enterprises and their partners. It requires that digital technology be used to build information sharing modules related to intangible assets. Private science and technology enterprises use the future income right of intellectual property of the transferee enterprise as pledge to loan to financial institutions, and the intellectual property transfer fee payable by the transferee enterprise as repayment source. The specific business process is shown in Figure 5.

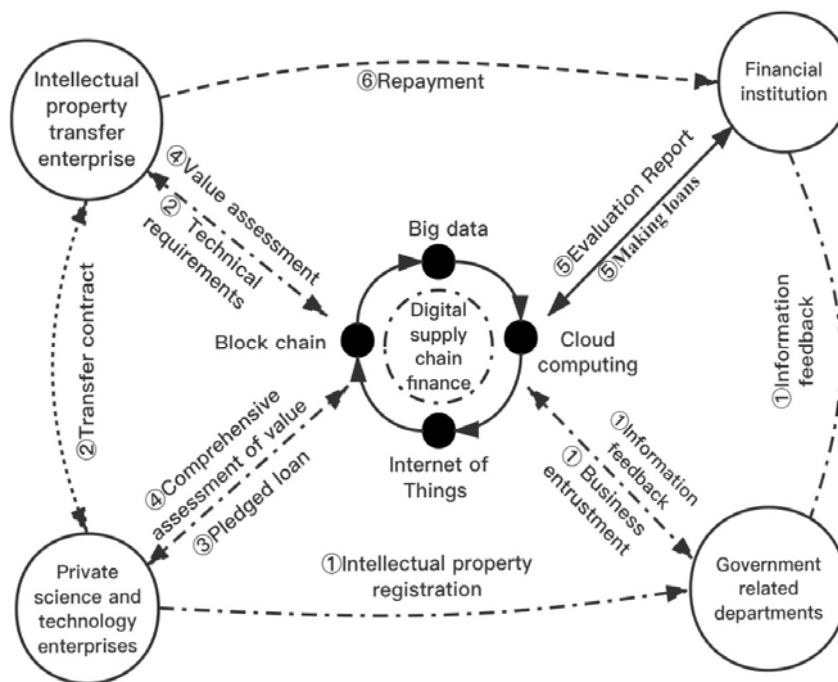


Figure 5: Technological process of digital supply chain finance model of based on intellectual property pledge

- ① Private science and technology enterprises register their intellectual property rights with relevant government departments, and The platform uses standardized interface to introduce intellectual property information held by relevant government departments (such as science and Technology Bureau, intellectual property trading center, etc.) through standardized interfaces.
- ② The platform uses digital technology to build the information sharing module of intangible assets, realizes the docking between private science and technology enterprises. Intellectual property transfer agreement signed by both parties.
- ③ Private science and technology enterprises submit the application for intellectual property pledge loan online.
- ④ The platform uses digital technology to screen and judge information. It evaluates the application value, future earnings and operation status, development potential and technology prospect of intellectual property rights of private science and technology enterprises. The platform also analyzes the operation and profit status before and after the application of intellectual property rights by the transferee enterprises;
- ⑤ Financial institutions make loan decisions based on the evaluation results submitted by the platform and the agreements signed by both parties of technology supply and demand, combined with the offline credit status of private science and technology enterprises and the business performance and credit status of the transferee enterprises;
- ⑥ The transferee enterprise organizes production by using intangible assets such as patents and trademarks, and pays the transfer fee to the platform as the loan repayment source of the financing enterprise according to the agreement.

Integrated with the above processes, intellectual property information sharing and value evaluation, intellectual property income pledge and intellectual property transfer fee repayment are the key control points for the operation of digital supply chain finance model of based on intellectual property pledge. By using Internet, big data and other technologies to establish intellectual property sharing module, we can overcome the information asymmetry between private science and technology enterprises and intangible assets transferee enterprises, which can realize the sharing of advantageous resources within the supply chain. With the help of big data, cloud computing and artificial intelligence, the feasibility, market value and future development prospect of intellectual property can be comprehensively analyzed and evaluated, which can quickly make a reasonable judgment on the value of intellectual property. The pledge loan based on the income right of intellectual property is a supply chain finance innovation in line with the knowledge intensive characteristics of private science and technology enterprises. The income right of intellectual property is the core pledge of supply chain finance, which belongs to the guarantee category of right pledge. The new profit created by the transferee after using intellectual property is an important source for private science and technology enterprises to collect the transfer fee of intellectual property. Therefore, the platform needs to combine the application of digital technology and check whether the income right of intellectual property is guaranteed. Thus, the platform grasps the operation status of the transferee before and after using the intangible assets and uses the intangible assets evaluation method to accurately estimate the value of the income right of the intellectual property transfer and provides the decision basis for the financial institutions to provide the credit line. Finally, the repayment of intellectual property transfer fee also reflects the characteristics of capital return of supply chain finance self-compensation.

GOVERNANCE STRATEGY OF DIGITAL SUPPLY CHAIN FINANCE APPLIED IN PRIVATE SCIENCE AND TECHNOLOGY ENTERPRISES

The characteristics of digital supply chain finance can promote the above-mentioned different supply chain finance models to provide high-quality services to private science and technology enterprises. However, as the development of digital supply

chain finance in China is still in its infancy, there are some constraints in the practice of providing financing services for private science and technology enterprises, which restrict the effect of financial services. First of all, the operation risks of supply chain finance include external environment risks, supply chain network risks and supply chain enterprise risks (Jüttner, Peck & Christopher, 2003). The high-tech characteristics of pledge of private science and technology enterprises increase the external environment risks and enterprise risks. The dynamic and conductive characteristics of the complex network structure of digital supply chain finance expand the risk sources of supply chain finance from enterprise end to platform network terminal. Secondly, the inadequate application of digital technology has brought technical bottleneck to supply chain finance. The application of block chain, Internet of Things and other technologies in the field of supply chain finance is not mature. The separation of different data systems from the industrial end, financial end and other service end increases the difficulty of exerting big data efficiency. The insufficient application of digital technology has become the barrier of supply chain finance innovation (Guo, Shi, & Wang, 2014). Finally, the legal system related to digital supply chain finance is not perfect. The existing laws and regulations are far from meeting the legal needs of relevant business development. In order to promote the efficient implementation of digital supply chain finance for private science and technology enterprises, it is very important to formulate reasonable strategies for the problems in the development process.

Strict Control Of Risk Sources And Avoiding Risk Of Digital Supply Chain Finance

Digital supply chain finance needs to focus on avoiding risks from external environment, supply chain structure layer and supply chain element layer.

Risk management from the external environment

Changes in the external environment such as economic environment and industrial policy will affect the value of pledge of private science and technology enterprises, especially the rapid development of science and technology accelerates the upgrading of products, which makes it easy for private science and technology enterprises to obtain the value of pledge of supply chain finance services to be misestimated by the market. In addition to force majeure, most of the exogenous risks can be perceived and dealt with (Song & Yang, 2018). The management team of supply chain finance platform is required to be good at using various digital technologies to have good sensitivity and coping ability for the exogenous risks from the economy, supervision and policy related to private science and technology enterprises.

Risk prevention of structure layer in the supply chain

The structural design of supply chain will affect the efficiency and effect of risk management (Craighead *et al.* 2007). The structural risk mainly comes from the two dimensions of network structure and business structure. It is necessary for the supply chain finance platform to plan the network status and role of the participants so that the roles of each subject are clear, the work is clear, and a stable and effective supply chain finance ecosystem is formed. The platform needs to design the business structure reasonably, make each business link connect with each other, and realize the effective closure of business structure according to the characteristics of different pledge of private science and technology enterprises. The uncertainty and potential risks of various trading businesses are prevented through the above measures.

Risk control of element level in the supply chain

Factor level risk mainly comes from financing subject and capital object. The non-bureaucratic control characteristics of the network structure can easily breed opportunism and moral hazard of the financing subject. The nodes with poor credit rating can be excluded by establishing the access and assessment mechanism of upstream and downstream enterprises in supply chain (Dou & Zheng, 2019). In view of the risk of incomplete value evaluation brought by the characteristics of intellectual density and growth of private science and technology enterprises, the platform can increase the non-financial "soft power" assessment such as innovation ability, enterprise quality and transformation ability of scientific and technological achievements based on the assessment of traditional financial indicators such as transaction amount, asset scale and cash flow. Thus, we can create a fair, just and mutually beneficial service environment. The risk control of capital object needs to focus on the highly matching of financial business and supply chain industrial activities, which can control the risk of platform fund raising. The platform follows the self-compensation logic to design the capital return procedure and control the risk of capital release and recovery.

Accelerated Application Of Digital Technology And Enabling Ecological Innovation Of Supply Chain Finance

The technology wave generally goes through two stages: infrastructure, stimulate and harvest the full economic and social potential. At present, digital technology is in the stage of infrastructure construction in China. The immaturity of digital technology and inadequate application of technology restrict the service quality of supply chain finance. Digitalization means that it can be divided and recombined, and each standardized element presents different combinations and structural models, which will bring product innovation and model innovation, and even lead to industrial revolution. Hence accelerating the application of digital technology can give innovation energy to supply chain finance ecology.

Acceleration of digital innovation of industrial ecology

Digital supply chain finance is based on the digital new supply chain business network, and industry digitalization is the premise and key of its operation. Based on the existing knowledge reserve and data, driven by the new generation of science and technology, the industry of private science and technology enterprises should strengthen the deep integration of "industry + technology", complete the digitalization of assets online and the visualization of business process scenarios as soon as possible,

so as to realize the transparency and intensification of the whole industry chain and create good business conditions for the operation of digital supply chain finance.

Leading digital transformation of financial business

At present, financial institutions need to do a good job of supply chain finance around the industrial ecosystem and implement digital transformation under the guidance of financial science and technology. Financial institutions should fully integrate supply chain finance and digital technology; besides, they should implement strategic cooperation, system compatibility and platform docking to provide private science and technology enterprises with new digital business processes, digital financial products, digital risk control systems according to the individual characteristics of the enterprises. Namely, Financial institutions and industrial chain should work together to strengthen the industrial and financial ecosystem

Promotion of digital infrastructure construction

Government functional service agencies and social intermediary service agencies should actively promote the open sharing of e-government information and e-service information. Such information sharing can promote the full application and cross validation of various data from different sources in the digital industry and finance ecosystem, jointly enable the innovation and development of digital supply chain finance and create a better financing environment for private science and technology enterprises.

Perfection Of Laws And Regulations System And Standardization Of Development Of Digital Supply Chain Finance

The diversification of participants and business models in digital supply chain finance puts forward higher requirements for the coverage of laws and regulations. In order to solve the problem of legal constraints in the process of digital supply chain finance providing services to private science and technology enterprises, it is very important for the Chinese government to improve the legal and regulatory system from the top-level design.

Amendment and promulgation of relevant laws according to the development process of digital supply chain finance

On the one hand, based on the existing financial laws and regulations such as insurance law, commercial bank law, electronic signature law and securities law, the relevant provisions are revised, improved and supplemented, especially the qualification of platform operators, information transmission mechanism and algorithm technology are regulated from the legal level. Therefore, the financial operation and management of digital supply chain can be governed by laws. On the other hand, new laws and regulations should be issued in time to clarify the responsibilities and obligations of all participants so as to provide legal basis for eliminating the conflicts caused by the imbalance of power allocation and interest distribution in the digital supply chain finance system.

Improvement of the supporting laws and regulations system of private science and technology enterprises

In order to improve the service quality of digital supply chain finance to private science and technology enterprises, it is necessary to improve such laws and regulations as general principles of civil law, contract law, property law and administrative measures for scientific and technological evaluation.

In addition, the guarantee laws and regulations should be revised so as to expand the scope of chattel mortgage from inventory and accounts receivable to intangible assets such as intellectual property, carbon rights, etc. The above measures can provide more legal support for private science and technology enterprises to use intangible assets and other special pledges.

Construction of coordination and supervision mechanism of joint management

Digital supply chain finance needs the coordination of regional regulators because it has obvious cross domain and cross space-time characteristics. Hence Government departments at all levels should clarify the scope of responsibilities of the corresponding regulatory bodies as soon as possible. We should pay attention to the regulatory function of industry association of digital supply chain finance. The trade association regulates all kinds of arbitrage, arbitrage and financing trade activities, curbs all kinds of speculative businesses. In addition, we should also pay more attention to the punishment of illegal activities in the field of supply chain finance. The above measures can provide a good legal environment for private science and technology enterprises to use digital supply chain finance.

CONCLUSIONS

With the mature application of digital technology, supply chain finance presents the characteristics of precise financial services, divergent credit enhancement and intelligent risk management and control. It can break through the service bottleneck of traditional supply chain finance in terms of cost, efficiency and risk control, and provide excellent financial services for more and more private science and technology enterprises. Therefore, digital supply chain finance is a very promising financing scheme for private science and technology enterprises.

Based on the comprehensive influence of various digital technologies such as big data, Internet of Things, blockchain and artificial intelligence on the supply chain finance business model under different application scenarios, we analyze the operation process optimization of digital supply chain prepayment financing model, digital supply chain inventory pledge financing model and digital supply chain receivables financing model in the innovative application of private science and technology enterprises in this paper. Furthermore, according to the characteristics of "light assets, heavy technology" of private science and technology enterprises, we put forward digital supply chain finance based on intellectual property pledge in

this paper. We focus on the process optimization and key point design of the application of these four financing modes in private science and technology enterprises. In order to promote the sound operation of digital supply chain finance in private science and technology enterprises, we put forward corresponding governance strategies for the constraints existing in risk management, technology application and legal system in the process of digital supply chain finance serving private science and technology enterprises in this paper.

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