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Innovation of Big Data Technology Platform of Transportation Capacity Supply Chain based on Business Ecosystem Theory

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ABSTRACT: *The granulation and fragmentation of transportation supply chain determines the large number of small, medium and micro enterprises in transportation supply chain, large capital demand and long capital cycle.As an emerging science and technology, big data technology integrates fintech into the supply chain of transportation capacity, providing a data platform for the supply chain of transportation capacity, improving the health of the supply chain of transportation capacity, and ensuring the development of small and micro enterprises. In this paper, the characteristics and pain points of the supply chain of transportation capacity are sorted out, and the applicability of big data technology in the supply chain of transportation capacity is analyzed, after which a big data technology platform based on the theory of business ecosystem is built.The applicability of big data technology platform is analyzed and discussed, and finally some Suggestions are put forward.*
KEY WORD*: Supplychain, Big date technology, Business ecosystem theory*

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I. INTRODUCTION

In recent years, with the development of the Internet economy, logistics demand began to show explosive growth. In 2017, China's total expenditure was 12.1 trillion yuan, up 9.2% year on year.The total expenditure on social logistics in 2018 was 13.3 trillion yuan, up 9.8% year on year and 0.7 percentage point higher than the same period last year.Facing the rapid growth of the logistics industry, the corresponding problems of logistics services have become the focus of the society.In the logistics service supply chain, the supply chain providing transport capacity for customers can improve the utilization level of transport capacity resources in the logistics industry. Therefore, how to ensure the risk control and information symmetry of transport capacity supply chain finance has become the research direction of constructing transport capacity supply chain ecology to improve transport capacity supply chain financial service capacity.China supply chain there are a large number of small micro enterprise capacity on the market, these small capacity due to their lack of good the pledge between micro enterprises and improve the financial statements are unable to get a good financing, faced with the condition of no money to lend embarrassed situation, so the capacity enterprise needs to pass own good credit to financial institutions.At the same time, the node enterprises in the transport supply chain are mostly subcontracted layer by layer. In the downstream of the supply chain, they are mostly loose individual car-free carriers or small freight forwarders. The loose relationship and vicious competition among the enterprises make the information barrier very high and cause the phenomenon of information asymmetry in the transport supply chain.This series of problems caused by the transport supply chain in promoting the modernization of logistics industry is facing the transport enterprise fragmentation, granulization;Information asymmetry of transportation enterprises;High transportation costs;The status quo of low level of intelligent transportation.Therefore, the use of big data technology to build a platform based on business ecosystem in the development of transportation supply chain plays a key role in integrating enterprise resources of transportation capacity, breaking data island, reducing cost and increasing efficiency, and building intelligent supply chain of transportation capacity.

In 2014, China included big data technology in the government work report for the first time, and big data quickly became a key technology in the development of local governments.In July 2015, the state council issued several opinions on the use of big data to strengthen the service and supervision of market entities, and in the same year the state council issued the action platform for promoting the development of big data, and big data technology was promoted as a national strategy.In January 2017, the ministry of industry and information technology compiled and issued the big data industry development plan (2016-2020).Development goal: by 2020, a big data industrial system with advanced technology, prosperous application and strong guarantee will be basically formed.

II. LITERATURE REVIEW

2.1Transport supply chain

The fundamental source of the transport supply chain is a branch of the service supply chain. The research on the service supply chain was originally proposed by Ellram (2004), who believed that the service supply chain is the management of information, process, ability, service performance and capital flow in the supply chain between suppliers and customers.The capacity supply chain mainly refers to the ability to complete the transportation business within a certain period of time in the service supply chain, and the transportation service is the main part of the logistics service. Therefore, the research on the capacity supply chain can refer to the research on the logistics service supply chain in the service supply chain.

As for the research of transport supply chain, some scholars have studied its operation mode. Tian Yu (2003) studied the problem of supplier selection and believed that integrated logistics service providers dominated in the e-commerce environment, and traditional logistics enterprises, upstream manufacturers and downstream retail enterprises would be absorbed by integrated logistics service providers when constructing service networks. Yan Xiuxia, Sun Linyan and Wang Kanchang (2005) proposed the model of logistics service mode, and evaluated the performance of logistics service mode by using entropy technology and analytic hierarchy process.This model can help the demander of logistics service choose the logistics service integrator to make the decision more reasonable. Huang Lijuan (2005) used the method of system dynamics to study the coordination platform of transport capacity supply chain and put forward Suggestions on the development of the platform. Ma Cuihua (2009) believes that the capacity supply chain is a logistics service capability supply chain dominated by logistics service integrators, in which members of the supply chain work together to provide services and improve the efficiency of resource utilization. Wen Longguang (2011) used the principal-agent theory and the operational research planning theory to study the logistics demand of shipper enterprises and the benefit coordination mechanism between logistics contracting enterprises in the transport capacity supply chain, and proposed that logistics contracting enterprises should form logistics alliance to improve their core competitiveness. Shen Tong (2016) made a comparative study of self-established logistics distribution, third-party logistics distribution and logistics supply chain distribution in e-commerce logistics, and put forward a logistics supply chain alliance organization model that combines the advantages of self-established logistics distribution and third-party logistics distribution to realize complementary advantages. In the capacity supply chain, management service ability is also the focus of scholars' research. Shizhen Bai and Lin Zhan (2010) studied the quality control of transport capacity supply chain under the condition of information asymmetry through Nash equilibrium model, and believed that strengthening the competition among enterprises in transport capacity supply chain could effectively improve the service level of transport capacity supply chain. Weihua Liu Meiying, Ge, Wenchen Xie (2013) for capacity in bidding strategy and functional logistics service suppliers in the supply chain order to study the selection strategy, pricing strategy of functional logistics service suppliers only affected by their own costs and industry the highest cost, at the same time, the cost is too low or too high in the industry will affect the industry the performance of the order allocation. Zhang qi (2015) made an empirical analysis of the service quality of Tmall and jd's transport supply chain by using the perception-expectation gap method, and believed that the key to the service of the transport supply chain is efficiency, and logistics efficiency will directly affect the satisfaction degree of final customers to the transport supply chain. Weihua Liu and Yijia Wang (2015) conducted a game analysis on the attitude of logistics service integrators and logistics service providers towards risk control, and believed that logistics service integrators are more inclined to choose logistics service providers with risk preference to provide them with less regulated services. With the progress of fintech, in recent years, more attention has been paid to how to develop the capacity supply chain with the help of fintech. Shi Yongjin (2018) proposed to use the new Internet technology to build a modern logistics distribution center to promote the flow of information and expand network channels to extend the value chain of the transport capacity supply chain.Tan Zheng (2019) based on block chain technology to reconstruct the mode of transport supply chain.Zhang Xin (2019) believes that integrating blockchain into the transport supply chain can improve the trust mechanism in the supply chain, strengthen the collaboration ability of enterprises in the transport supply chain, improve the operation efficiency of the transport supply chain and expand the profit of enterprises.

2.2Business ecosystem theory

The theory of business ecosystem was first put forward by James F. Ore in 1993. He believed that business ecosystem is an economic association composed of organizations and individuals, who interact with each other and develop together in the system.In 1996, James F. McOore systematically introduced The theory of Business Ecosystem in his book 《The Death of Competition :Leadership&Strategy》 in The Age of Business Ecosystem. Shubik et al. (1972) believed that the resource network sharing formed by the aggregation of enterprise resources in the business ecosystem not only improved the utilization rate of resources but also provided enterprises with greater opportunities.Iansiti et al. (2004) believe that business ecosystem mainly includes core enterprises and non-core enterprises, while non-core enterprises include leading enterprises and niche enterprises, and the key

influencing factor of business ecosystem is the management ability of core enterprises.Tan (2015)] et al. believe that core enterprises should take advantage of their rich resources to build a resource platform to attract non-core enterprises into the ecosystem and establish a complete business ecosystem.Hagel (2008) et al. proposed that core enterprises formed a new business ecosystem by integrating new non-core enterprises and integrating resources within the business ecosystem, which could better identify risks and seize opportunities.Rong et al. (2015) argued that the cooperative relationship of enterprises was constantly adjusted within the business ecosystem to create more value, and the resource structure of the system was coordinated externally to form different combination of resource advantages.Xu Nuojin (2005) believed that coordinating the division of labor inside and outside the business ecosystem and achieving the dynamic balance of the system could form the optimal capability structure inside the system and better resist external competition.Thornton et al. (2015) believed that in the whole business ecosystem, non-core enterprises create different values with their own advantages and realize connection and complementing through core enterprises.Core enterprises in the business ecosystem initiate value creation and lead non-core enterprises to realize collective value creation.

III. CHARACTERISTICS AND PAIN POINTS OF TRANSPORTATION SUPPLY CHAIN

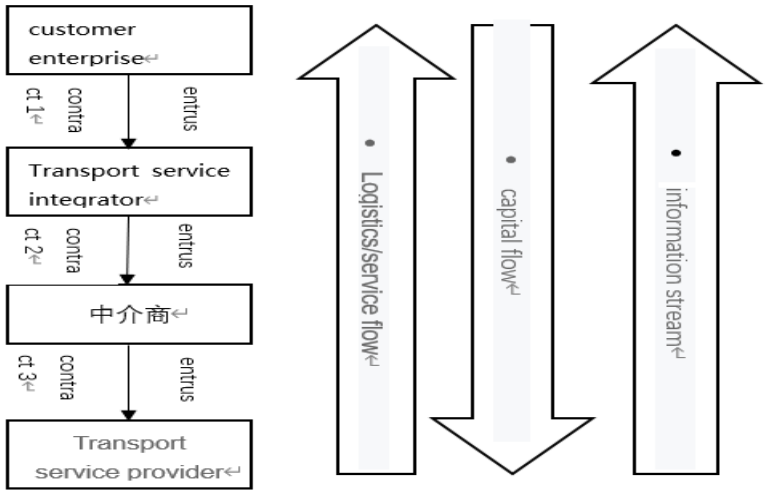
3.1characteristics of transportation supply chain

The traditional supply chain of transport capacity is divided into five types of node enterprises: customer enterprises, transport service integrators, intermediaries and transport service providers.In the transportation supply chain, the upstream node enterprises outsource business to the downstream node enterprises, and the downstream enterprise provides the upstream node enterprises with a series of value creation chains, such as grasping customer demands, formulating transportation plans and providing transportation services.Transport service integrators play the role of core enterprises in the whole transport supply chain. Through the interaction of logistics, information flow, service flow and capital flow, enterprises among nodes can effectively improve the service process, service capability and service performance to create value for the service of the transport supply chain.

In the supply chain of transport capacity, transport service enterprises include logistics enterprises that provide road transport, air transport, railway transport and waterway transport.The transport service integrator obtains the transport business delegation from the consignor, develops an overall transport scheme and assigns the delegation of different business nature to different freight forwarding agencies. Finally, the freight forwarding agencies subcontract the specific transport business to freight companies of different transport nature and finally deliver it to the consignee.In the whole process of value-added supply chain, logistics, commercial flow, capital flow, information flow, and in the logistics service layer after layer of subcontracting relationship between the shipper and the ultimate harvester and continue to add value.

The schematic diagram of specific operation process is shown in figure 1.

Figure 1Flow chart of transportation supply chain



3.2 pain points in the transportation supply chain

Transport supply chain finance is different from commodity supply chain finance in that the credit expansion of the core enterprises enhances the credit of the upstream and downstream enterprises in the whole supply chain.Transport supply chain enterprise is a service supply chain. Enterprises in the transport supply chain

improve the time value and space value of goods by providing transport services.Therefore, the biggest problem in the supply chain finance of transportation capacity is the risk control problem of transportation service provided by transportation capacity enterprises without physical pledge.Specific performance in the following aspects:

3.2.1Transport enterprises are fragmented and traditional financial institutions have difficulties in credit investigation

Because the supply chain is a layer upon layer subcontracting industry, the market for shipping capacity is mixed.Usually, the goods need to go through four or five layers of subcontracting, from logistics companies to freight forwarding companies, and then from scalpers to dedicated lines, and finally from the freight driver to the owner.In this mode of transport capacity service, small, medium and micro-sized enterprises and individual family operation drivers are everywhere. However, most of these small, medium and micro-sized enterprises lack three financial statements and transaction histories, so the authenticity of financial information and transaction cannot be guaranteed.However, the traditional supply chain finance mode requires a strict examination and approval system for small, medium and micro enterprises, and it is basically impossible to provide financial services for small, medium and micro enterprises without statements and transaction records.Therefore, the financing channels of smes in the supply chain of transport capacity can only rely on acquaintance loans and high-interest private loans, resulting in high risk of capital breakage.Because of the network structure of the supply chain, the fracture of the nodes in the supply chain is easy to form a cascade failure and cause the collapse of the whole supply chain.

3.2.2Information asymmetry

Information asymmetry has always been the main research problem in supply chain finance.Due to capacity on each node enterprises in supply chain are the pursuit of self-interest maximization, capacity after service integrators in the mastery of the information advantage would not be Shared with service providers, so the cost of long tail, information transmission capacity supply chain and distribution mechanism is not sound problems become the key of the supply chain to develop capacity.These problems also aggravate the enterprise risk in the supply chain.

IV. BIG DATA TECHNOLOGY HELPS THE DEVELOPMENT OF TRANSPORTATION SUPPLY CHAIN

Capacity on existing situation of supply chain is a big data technology excellent scenario for landing, the development of big data technology to enhance the capacity of the supply chain risk management ability, with the existing situation of supply chain is the large capacity data technology excellent scenario for landing, the development of big data technology to enhance the capacity of the supply chain risk management ability, at the same time for the supply chain into a new development opportunity.The integration of big data technology and transport supply chain is a new way of co-evolution of the supply chain ecosystem, which makes it evolve into a supply chain with visible, traceable and controllable risks and responds to the market rapidly, which can effectively make up for the difficult development of transport finance caused by the lack of collateral in the transport supply chain.Based on this, according to the advantages of big data technology in scale, heterogeneity, timeliness and value, this paper analyzes the applicability of transport capacity supply chain, and discusses how to construct the big data technology platform of transport capacity supply chain.

4.1 Strengthen the business data, for the supply chain of transport capacity credit

The application of artificial intelligence, Internet of things and 5g technology has led to an explosive growth in the global data volume. In the supply chain of transport capacity, a large amount of data is faced from the upstream service demand end to the downstream product demand end of the entire network.Compared with the traditional data technology, big data technology can handle massive data scale, and accurately analyze, classify and process heterogeneous data such as network log and sensor network generated by each node.These advantages can help the entire capacity supply chain on the competitiveness of the end products accurate market feedback, the capacity of the supply chain core enterprise according to the feedback information competitive goods to big data technology decision whether to bear the transportation service, so that the capacity of supply chain finance prior to predict more accurately, reduce capacity for credit capacity supply chain supply chain risk.For the supply chain, big data technology can also collect the data of transportation services generated by the transportation enterprises, including transaction records, driving records, cash flow, etc.These real data can help financial institutions evaluate the reputation of transportation enterprises, further strengthen the development of financial business, and enhance the vitality of transportation supply chain.These data can also help strengthen the network structure of small and medium-sized enterprises in the supply chain of transport capacity and effectively cope with the granulation and fragmentation of small and medium-sized and micro transport capacity enterprises.

4.2 Reduce information asymmetry and enhance enterprise vitality in the supply chain of transportation capacity

The phenomenon of information island and the problem of slow information transfer in the supply chain are still a big problem hindering the development of the supply chain.The introduction of big data technology can predict and analyze the market demand. By getting through the data information chain between upstream and downstream enterprises, the market demand information can be transmitted to each node enterprise of the supply chain to reduce the long tail effect and ensure that the transport demand information obtained by the transport enterprise is true and reliable.At the same time caused the capacity of enterprise credit information asymmetry problems, big data technology will work capacity data in a supply chain become more fluid, the capacity of the core enterprise can use big data technology to extend business and financial data layers of subcontracting chains to secondary and tertiary transportation service providers, for the whole supply chain node enterprise credit capacity.Capacity, on the other hand, in view of the supply chain node enterprises in the supply chain caused by opportunistic behavior of both ex ante and ex post information asymmetry, big data technology through long-term data information collection, to each enterprise's long-term trading information, credit information collection processing for supply chain platform to assess the node enterprises in supply chain.This advantage can also effectively enhance the transfer of four flows (logistics, commercial flow, information flow and capital flow) in the supply chain of transport capacity, reducing the cost of information collection and post-loan supervision of financial institutions.

V. INNOVATION OF BIG DATA TECHNOLOGY PLATFORM OF TRANSPORTATION CAPACITY SUPPLY CHAIN BASED ON BUSINESS ECOSYSTEM THEORY

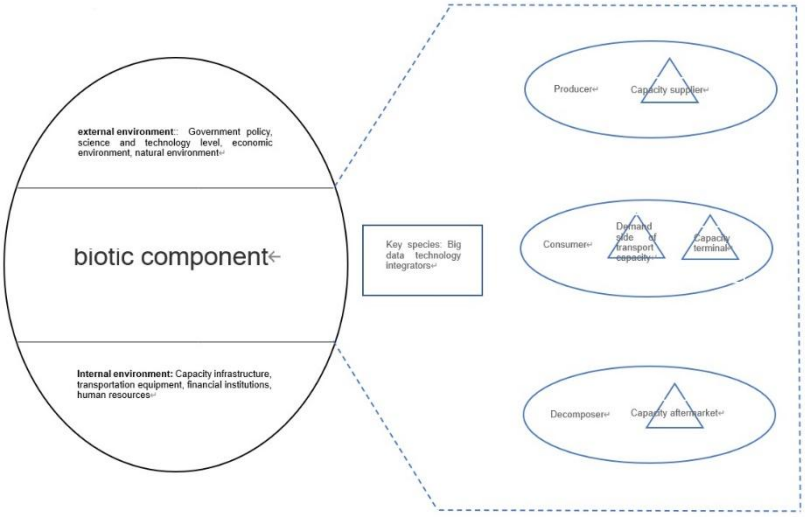
5.1 The construction of big data technology platform for commercial ecology of transportation supply chain

According to commercial ecosystem theory, an ecosystem should consist of biological components and non-biological components, which have equal status as the basis for the survival of biological components.The abiotic components input "energy" and "material" to the biological components and then enter the abiotic components again after passing through the producer-consumer-decomposer in the biological components, forming a closed loop.Therefore, in this paper, biological components and abiotic components are taken as the components of the commercial ecosystem of transport supply chain, and the abiotic components are divided into internal environment and external environment.

The essence of the transport capacity supply chain is a service supply chain. In the whole supply chain, each node enterprise provides transport capacity service around the core enterprise, and its ultimate goal is to add value to the time value and space value of goods transported by transport capacity service.The key species of biological components in the commercial ecosystem of transportation supply chain are the key to drive the coevolution of the whole system.The big data technology platform stands at the center of the transportation capacity supply chain, and relies on the information technology advantages of its own platform to enhance the credit and efficiency of the whole transportation capacity supply chain from the perspective of a third party.Through big data technology, the platform itself can be used as the pre-initiator and post-supervision end of transport capacity service to promote the operation of the whole supply chain of transport capacity.Therefore, this paper takes the big data technology platform as the key species of biological components in the ecosystem.The biological component also includes producers: transport capacity demand side;Consumers: transport supplier and transport terminal;Decomposer: post-capacity market.

Non-biological components of the supply chain include government policy, scientific and technological level, economic environment and natural environment.The internal environment includes transportation infrastructure, transportation equipment, financial institutions, human resources and so on.

Figure 2Capacity supply chain big data technology platform



5.2Analysis on application of big data technology platform of commercial ecology in transportation supply chain

This paper focuses on the application of big data technology platform in transportation supply chain from the perspective of business ecosystem.According to the concept of business ecosystem, key species do not exist independently in the ecosystem. Key species attract enterprises with complementary resources into the supply chain, and promote the co-evolution of enterprises in the supply chain through resource sharing through their own advantages.At the same time, ecosystem includes not only biological components but also non-biological components of the external environment and internal environmental systeneibums.So.This paper analyzes the key species of big data technology platform from the perspectives of internal and external environment, producers, consumers and decomposers in the supply chain ecology.

5.2.1The key species——Internal and external environment

The supply chain of transportation capacity is huge in the Chinese market, ranging from logistics parks to city-wide distribution. Data information with diverse forms and huge volume has become the scene of big data technology application.Big data technology provides reference for financial institutions after digitizing different forms of data, which can bring more capital injection and lower costs to the supply chain of transportation capacity.In terms of the external environment, key enterprises need to constantly adjust strategy to adapt to the external environment brought about by the transformation, the medium and long-term development of logistics industry planning (2014-2020) "is pointed out that the logistics industry in the important position of national strategy, and in 2019 the people's bank of China issued by the scientific and technological development of the financial planning, further clarify the financial power of micro, small and medium enterprises of science and technology development.The support of foreign countries' policies has promoted the development of big data technology, block chain and other fintech, and the promotion of logistics industry's development status coincides with it, which further increases the vitality for the implementation of big data technology.

5.2.2The key species——producer

In the transport capacity supply chain ecology, producers are the transport capacity suppliers providing transport capacity services within the ecosystem, mainly including logistics parks, third-party logistics, freight forwarding companies, dedicated logistics, drivers and other transport capacity smes.Big data technology platform as the key species of its own information advantage can effectively attract capacity into the ecological system, relying on big data technology to supply chain of logistics, business flow, cash flow data analysis data processing, the formation of a past transaction data of the transport enterprise of the real evaluation of to further screening of ecological system in the enterprise, will eventually evolution data record bad enterprise forms a chain from the hands of the ecosystem in the capacity of ecological supply chain network.From the perspective of producers in the supply chain ecology of transportation capacity, the big data technology platform will collect and analyze the past data of enterprises and also help small, medium and micro enterprises in transportation capacity to realize the process of data-data assets.The transaction data of small, medium and micro-sized enterprises after data assets can help small, medium and micro-sized transport enterprises effectively cope with the difficulty of credit granting under the traditional credit investigation mode of commercial Banks.On the business side, the big data technology

platform analyzes and predicts the logistics and transportation data in different periods, and integrates the order orders of enterprises at the consumer level in the ecosystem into a complete and efficient transportation plan and then delivers it to qualified transportation service providers.Combining big data technology with GPS technology, optimizing traffic routes through route and traffic data collection and analysis of destructive event data also provides a guarantee for producers to improve overall efficiency.

5.2.3The key species——consumer

The consumers in the supply chain ecology mainly include the demander of transport capacity and the terminal of transport capacity. The demander of transport capacity and the terminal of transport capacity are the initiators of the service demand of transport capacity, which are generally composed of material suppliers, manufacturers and customer enterprises.Big data technology platform can not only provide financial credit enhancement for consumer enterprises in the business ecosystem, but also realize precision marketing by collecting customer consumption preference data and provide support for enterprises to make production and sales plans.This also further improves the transport service plan formulation in the supply chain of the capacity to provide the basis.Because transport capacity node enterprises only assume the transport scheme design and specific transport functions, the real right of goods does not change.The use of big data technology can effectively reduce the cost of goods storage by taking the idle storage capacity in underdeveloped areas as the storage point in the transportation plan and designing the follow-up transportation plan according to the data analysis, prediction and actual ordering situation of downstream enterprises.

5.2.3The key species——decomposer

The market after transportation capacity plays a role of decomposer in the supply chain of transportation capacity. The investment and financing, commercial insurance, transportation capacity maintenance, fuel supply, financial services and other services of small and medium-sized transportation capacity enterprises in the supply chain of transportation capacity are all undertaken by the market after transportation capacity.The application of the big data technology platform has realized the evolution of the ecosystem, thus feeding the post-transport market.Road rescue is established after analysis and evaluation of transportation information collected by big data technology.

VI. COUNTERMEASURES FOR THE DEVELOPMENT OF BIG DATA TECHNOLOGY PLATFORM OF TRANSPORTATION CAPACITY SUPPLY CHAIN BASED ON THE THEORY OF COMMERCIAL ECOSYSTEM

6.1Government-enterprise cooperation to build the big data technology platform ecosystem

The external environment in the supply chain ecology has great influence on the biological components in the supply chain ecology.Especially in the rapid development of supply chain finance, how to build a more agile, adapt to the market, integration ability of the supply chain big data technology platform requirements are constantly rising.The core ecosystem enterprises should rely on the government dividend, integrate the organisms in the chain according to the positive policies and government data provided by the government, and realize the transmission in the ecological chain to maximize the interests of enterprises in the whole chain.On this basis, the rational use of big data technology to achieve the allocation of resources, further enhance the effective interaction between the government and enterprises.

6.2The combination of other fintech and big data technology speeds up the process of digitization of business - data assets

The implementation of the large data capacity supply chain technology platform and leave the other financial the blessings of science and technology, artificial intelligence, blocks of chain, cloud computing, Internet of things and big data technology platform, the combination of a digital system, form a comprehensive business application of Internet of things and blocks of chain on regulation of business data, cloud computing analysis of the data processing using artificial intelligence analysis and processing data of the whole supply chain capacity asset-like process, and realize the business can be realized with controllable visual capacity on the evolution of ecological supply chain.

6.3Standardize the order of transportation enterprises and enhance the ecological competitiveness of transportation supply chain

The granulation and fragmentation of transport supply chain restrict the development of transport supply chain.In this scenario, after collecting and analyzing the real data in the service operation of small, medium and micro enterprises by using big data technology, small, medium and micro enterprises are bundled into the supply chain ecology to improve the industry concentration according to their own information advantages.Relying on the dominant advantages of the core enterprises in the ecology, it restricts the transaction data and supervision data of

the enterprises in the ecology, so as to further strengthen the standardization and order of small, medium and micro enterprises in transport capacity.Through the optimal strategy within the ecology, the information sharing mechanism can eliminate the "small chaos" in the transportation industry, the chaos in the pricing system, the overload transportation and so on, and further improve the competitiveness of the entire ecosystem of the transportation supply chain.

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