Research on the Paths of Low Carbon Operation and Innovative Development of Wisdom Logistics in F City Under Large Data Environment

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Keywords: Wisdom logistics, Low carbon operation, Innovation.

Abstract. The development orientation of logistics industry has changed from traditional logistics to intelligence, low-carbon and innovation as information technology and low carbon economy continue to develop. F city is an underdeveloped inland city in China where the low carbon operation and innovative development of wisdom logistics still face several problems. Given this and the current situation of logistics development in F city, the problems faced by the low carbon operation and innovative development of wisdom logistics are analyzed in this paper. Also, the future development is discussed, and some tentative suggestions are given to promote the low carbon operation and innovative development of wisdom logistics in F city.

Introduction

With the advent of large data age, IT technologies are developing rapidly, such as Internet technology, Internet of things technology, and cloud computing. It is an opportunity and a challenge for the development of all industries. The requirement standard of modern customers for logistics services these days are becoming progressively higher. Accordingly, a logistics development model based on intelligence, high efficiency, and innovation has emerged as the requests of times. Besides, as China's logistics industry is leaping forward, many logistics companies face plenty of problems, inclusive of high energy consumption and low efficiency operations. As the negative impact on the environment is increasing, the low carbon operation of logistics should be developed urgently.

F city, as a large but underdeveloped inland city in China, has developed rapidly in logistics industry in recent years, whereas some gaps remain as compared with the developed cities abroad and in China. Under the fast advance of information network, it is a good opportunity to develop wisdom logistics and low carbon operation innovation mechanism in F city, which facilitates the rapid and healthy development of the logistics industry in F city. Yet the logistics of F city still fixates on the traditional logistics and lacks the awareness of wisdom and innovation. The logistics enterprises and the government have not paid enough attention to the development of low carbon logistics. Numerous problems exist in the low carbon operation and innovative development of wisdom logistics. These problems should be solved in time to promote the development of logistics in F city in the orientation of intelligence, low carbonization and innovation. On that basis, this paper makes a comprehensive analysis of the problems faced by the low carbon operation and innovative development of F city wisdom logistics, and proactively discusses the solutions. Also, this paper will fixate on the problems and their solutions of the low carbon operation and innovative development of the wisdom logistics to further facilitate the development of logistics and economy in F city.
The Present Situation of Wisdom Logistics Low Carbon Operation and Innovative Development at Home and Abroad

The Present Situation of Abroad Development

From the global perspective, the wisdom logistics in some foreign countries have developed rapidly, especially in the EU, USA and Germany, which also outstrip the low carbon operation and innovation in China. First and foremost, the foreign governments proactively promote the construction of the circulation infrastructure. As far as the EU is concerned, the entire European traffic network plan has been vigorously implemented since 1996. The plan has connected the major ports, airports, inland waterways, highways, railways and other traffic routes in various EU countries, and addressed the problems of cross-border transportation difficulties. Second, the development of foreign information technology is also more advanced. In 2008, the IBM company in the United States had already taken the lead in the implementation of the “wisdom earth” strategy, which installed the sensor into the traffic and transportation roads and various buildings to form the system of Internet of things. Additionally, the U.S. government has issued a number of relevant policies, such as making strict standards for carbon emissions and establishing a reasonable road transport system, in terms of low carbon operations. Moreover, foreign logistics companies uphold and take part in the practice of low carbon operations, for example, the German freight villages. They employ the logistics information systems to combine and transport goods from various logistics companies. This method greatly decreases the vacancy rate of vehicles and increases the transport efficiency. Eventually, the level of innovative development of foreign logistics is also higher than that of our country. Germany's logistics has achieved the level of intensification, informatization and specialization, and it falls into four links: production, supply, sale and distribution of logistics. The division of labor and cooperation in every aspect reflects the concept of high-efficiency service, which enables the logistics system to operate harmoniously, orderly and efficiently. Of course, the logistics development in many other countries and regions is also very flourishing in addition to the above noted several countries and organizations. The development model is very advanced, which is worthy referencing.

The Status of Domestic Development

In 2009, our country proposed the concept of wisdom logistics. The state proactively upheld the development of enterprise logistics management in the orientation of information technology, popularizes the application of logistics technology in enterprises, and stressed the development of techniques for Internet of things. In 2011, the State Council continued to highlight the investment of new technology in independent research and development, and let the technology of Internet of things play an exemplary role in the logistics industry. Additionally, the country has rolled out a number of policies to encourage the development of low carbon logistics, and proactively implemented the logistics low carbon operation associated with the planning, some laws and regulations, and the growth rate of the current domestic logistics industry carbon emission has notably decreased. In the field of innovation and development, the National Development and Reform Commission has stated that the mechanism system of the logistics industry should be updated, and the new model of third-party logistics and multimodal logistics and transportation should be vigorously supported.

The perfect results cannot be achieved, though our government has been constantly exploring, supporting and upgrading the wisdom logistics and low carbon operation. This has made the path of low carbon operation and innovation of wisdom logistics in China not so smooth. Generally, the number is less, the scale is smaller, and the distribution is uneven, though some enterprises in China have started to use the Internet of things to promote the development of wisdom logistics. Also, many enterprises do not implement the relevant provisions of laws and policies on environmental protection, and they rely on local government legislation. Their effectiveness is low, and the scope of application of the law is limited. As a result, the low carbon operation of the logistics industry has not been fully realized.
The Main Problems of Low Carbon Operation and Innovative Development of Wisdom Logistics in F City

F city has a relatively late start of the logistics industry, yet it is not mature in all aspects. Some gaps remain as compared with developed countries and domestic developed cities. Adding to the complexity of the logistics industry, wisdom logistics still faces many problems that should be solved. These problems primarily reflected in the following aspects:

**The Government Pays Less Attention to Wisdom Logistics Development**

The development of wisdom logistics is supported by the Internet, and takes the logistics enterprise as the unit, which involves the warehousing, transportation, distribution and other basic links, which requires the support, service and supervision of the government. Yet as far as the current situation is concerned, the F city government does not focus on wisdom logistics. First and foremost, F city’s logistics enterprises are unevenly developed, its layout is scattered, and the business model is backward. The government has insufficient management of logistics companies and yet not formed a complete set of industry management norms. Second, the logistics market is closed, information flow is not smooth, resource allocation does not do well, and effective management measures are lacking, which causes the confusion in management. The government has not effectively regulated this aspect. Finally, the government investment is not enough in the process of logistics transportation and distribution. There are fewer high-efficiency transport vehicles, the transportation management system is imperfect, the functions of various departments are not clearly defined, and the work efficiency is low, which causes the waste of human, material and financial resources, and increases the logistics cost.

**Logistic Enterprises Informatization Wisdom Development Consciousness Is Weak**

Wisdom logistics is based on the Internet, the Internet of things, and sensor networks, and requires the support of information technology \(^4\). The rapid development of logistics information technology has expedited the logistics industry's informatization. The logistics information technology includes Bar Code, Radio Frequency Identification technology (abbreviated as RFID), Electronic Data Exchange technology (abbreviated as EDI), Global Positioning System (abbreviated as GPS), Geographic Information System (abbreviated as GIS), etc., whereas these information technologies have not been broadly applied in F city logistics enterprises \(^5\). For the present situation, logistics enterprises in F city have a weak awareness of the development of informatization and wisdom. Logistics companies stress the development of information technology less, they are less able to make innovation independently, and the degree of wisdom and automation of logistics facilities have a big gap as compared with the developed cities in China and abroad. Besides, the logistics enterprises in F city have not yet realized the value of large data and cloud computing to the development of wisdom logistics. These enterprises lack the strength and funds to perform large data mining technology, and the application platform of information technology has not been popularized. It has low degree of integration.

**The Degree of Logistics Wisdom Is Not High**

In recent years, the logistics development of F city has been accelerated. The logistics industry has largely facilitated the development of the economy. The growth rate of logistics enterprises is faster, and numerous new logistics enterprises are booming. Yet from a general perspective, the wisdom level of logistics development in F city is not high, and the operation model of the enterprise remains in the traditional model of operation. The logistics resources have not been effectively and reasonably integrated, so that a mature logistics information platform has not been completed.

**Incomplete Integration of Logistics Resources.** The support of advanced information technology is required by the integration of logistics resources. It refers to a logistics management system that effectively analyzes and uses the logistics resources within and outside the enterprise. Thus, they can be fully integrated and improve the core competitiveness of the enterprise \(^6\). Yet the integration of logistics resources in F city is imperfect. Various departments within the logistics
enterprise is less effectively coordinated, the division of labor is not clear, the distribution of functions is unreasonable, and the production, supply, and sale links are not coordinated. As a result, the overall internal optimum cannot be achieved. Additionally, the cooperation and share are lacked between the upstream and downstream enterprises. Companies only see their immediate interests and do not take a long-term perspective, provoke price wars between suppliers, lose the trust and cooperation of suppliers. Also, the downstream customer service management is not thoughtful, and it is unable to fully exploit the logistics supply chain.

**The Construction of Logistics Information Platform Is Not Mature.** The logistics information platform under the large data environment is the platform for gathering and arranging massive data information from multiple participants to provide logistics services, specifically to form information resources to be delivered to users via the Internet. The logistics information platform includes logistics information services, online transaction functions, and logistics operations management functions, which involve various fields, inclusive of government functional departments, logistics information integrated financial service companies, logistics demand link enterprises, and logistics infrastructure supply industries. The construction of the logistics information platform in F city remains in the exploration. Many logistics enterprises are suspicious of the construction of logistics information platform. The problems of distribution of interests, work process and functions is not clear, so that the construction of logistics information platform remains in the initial stage of exploration and cannot play a great role for the time being.

**Logistics Companies Lack of Low Carbon Operation Ability**

In recent years, China's economy has been developing continuously. Yet with the development of economy, environmental problems are progressively emerging, and become an existence that cannot be ignored. As a result, low carbon economy is formed. Low carbon economy is proposed under the large strategic background of sustainable development strategy. The aim is to reduce carbon emissions by improving energy utilization, developing new energy, expediting the industrial transformation, and upgrading technology development, to ultimately achieve a win-win situation of economic development and environmental protection. The logistics industry, as a high-end service industry, must also implement the low carbon concept. Yet many logistics enterprises in F city are less able to conduct the low carbon operation, and a mature low carbon operation system is not formed. The logistics enterprises hold a wait-and-see attitude for low carbon operation. They do not realize the waste of resources brought by the traditional operation model. The data of energy consumption and carbon emissions (The carbon emissions are calculated based on the total industrial energy consumption, and the data are derived from the "F City Statistical Yearbook".) of F city's logistics industry in the past six years from 2012 to 2017 are presented as fig 1.

![Figure 1. Data of logistics energy consumption and carbon emissions over the years.](attachment:image.png)
From 2012 to 2017, the energy consumption and carbon emissions of the logistics industry in F city have shown a trend of fluctuation and increase, as directly suggested from the figure. The low carbon operation ability of logistics enterprises should be improved.

**Logistics Enterprises Lack Environmental Awareness and Environmental Pollution IsSerious.** The transportation is the largest part of carbon emissions in the process of logistics operation. At present, logistics enterprises still follow the traditional model of transportation management. Yet the traditional transportation management does not understand the real-time information of the road, which causes the traffic congestion, increases the exhaust emissions and pollutes the environment. Besides, the company does not have a good plan for the irrational transportation route. There is circuitous transportation increasing the vehicle vacancy rate, which results in waste of resources and increases the carbon emissions. Besides, there are numerous waste phenomenon in logistics packaging. By using wood and other non-renewable resources, logistics packaging consumes a large part of the resources, such as pallets, packaging boxes, etc. If using the logistics packaging unreasonably will cause a large amount of waste of non renewable resources.

**The Energy Consumption Is Large during the Operation of Logistics Enterprises.** Logistics enterprises are involved in the use of a large number of logistics equipment in operation, whereas many logistics enterprises have no awareness of protecting the logistics equipment when using logistics equipment, which causes damage to the logistics equipment. For instance, the phenomenon of vehicle overload is frequent, and the service life of vehicles decreases. Additionally, the technological innovation ability of logistics enterprises is low. They still use traditional logistics equipment. It consequently consumes considerable amount of energy resources other than saves resources in the process of operation.

**The Logistics Innovation Development Degree of F City Is Not High**

Innovation is a critical condition to facilitate the development and progress of enterprises, and we should fully mobilize the initiative of enterprises. In the advent of the large data age, people's demand for innovation is becoming progressively higher, and the innovation of logistics industry is also imminent. Now many developed city logistics enterprises have begun to embark on the path of innovation and development, such as Jiangsu's EMS joint CNSS to build a new logistics model. EMS is equipped with a very strong back-end logistics network and a high-quality service delivery system. The CNSS is able to efficiently package and sort goods, as well as distributing the warehouse. This cooperation improves the operational efficiency of logistics enterprises, and builds a new model of e-commerce logistics.

But from the perspective of the development of logistics in F city, most of the logistics industry still pertains to the traditional logistics. The traditional logistics companies and warehousing companies are critical for the logistics industry, and control the major social logistics resources. Yet the logistics parties do not share the resources or coordinate the cooperation in the process of operation. There is a lack of a complete logistics system. Besides, logistics companies have a low degree of specialization and their management concepts are relatively backward. They also maintain the traditional management model. Most of them rely on the service of the internal logistics of the enterprises and lack of innovation and motivation.

**Countermeasures for the Problems of Wisdom Logistics Low Carbon Operation and Innovative Development in F City**

The development of the logistics industry in F city has been progressing rapidly, and logistics has also played a significant role in promoting economic development in recent years. Yet from the above listed problems, the low carbon operation and the innovative development path of F city wisdom logistics are not so smooth. Nowadays, as the computer technology is being popularized, logistics must also develop toward higher level, and the voice of wisdom logistics is also becoming progressively higher. F city, as a large inland city, has a long ahead for wisdom logistics low carbon operation and innovation development. Accordingly it is very crucial to give countermeasures
suggestions to solve the problems faced existing in the development of wisdom logistics and low carbon operation in F city.

The Government Should Stress the Development of Wisdom Logistics More

First and foremost, F city government can draw upon the favorable factors of the development of modern network information technology to strengthen the connection with the logistics industry, and establish a set of wisdom logistics management mechanism jointly with the government, logistics enterprises and relevant departments. Additionally, the government can also roll out some new plans to facilitate the wisdom logistics, and encourage the logistics enterprises to use the computer and Internet of things technology to establish a new system of wisdom logistics development. Second, the government should manage and regulate the logistics market effectively, encourage all the logistics links to share information and establish a good logistics market competition system. Thus, all the positive factors to promote the development of wisdom logistics are fully exploited. Eventually, the government should give more financial support to the wisdom development of the logistics industry. For the enterprises developing the wisdom logistics, the government should train a batch of advanced wisdom logistics enterprises using information technology and play a leading role. Also, the government should consider the traffic situation in F city to better construct the transportation infrastructure and establish a perfect transportation system, to ultimately save the cost of logistics transportation and increase the efficiency of enterprise operation.

Increase the Input to the Development of Information Technology in Logistics Enterprises

The development of wisdom logistics is dependent on the information technology, so that the development level of information technology directly affects the entire industry of wisdom logistics. In recent years, China's Internet technology has been leaped forward, whereas the information technology in the logistics industry remains in the unideal state. Logistics enterprises should increase the investment of information technology and employ professionals to develop advanced and special technology, inclusive of the information collection, data mining and communication technology. Also, logistics enterprises should also popularize the application of Bar Code, Radio Frequency Identification technology (abbreviated as RFID), Electronic Data Exchange technology (abbreviated as EDI), Global Positioning System (abbreviated as GPS), Geographic Information System (abbreviated as GIS) and other technologies in the logistics operation. Accordingly, the logistics development of F city is more intelligent. At last, the logistics enterprises should highlight the status of large data and cloud computing for the development of wisdom logistics. The transportation information can be known, the deployment of inventory can be arranged reasonably, and the efficiency of logistics operation can be increased by using large data and cloud computing technology.

Improving the Degree of Logistics Wisdom

Allocate Logistics Resources Reasonably to Achieve Coordinated Distribution of Logistics Resources. The integration of logistics resources involves two aspects, which are the inside and outside place of the enterprise. The enterprise should improve the management of various departments, allocate the work reasonably, make the division of functions clear to ensure that each department performs their function and undertakes their responsibility. Also, the various departments in the enterprises should share the resources and make progress jointly to perform the internal overall optimization. The enterprise should improve the cooperation between the upstream and downstream enterprises, primarily the longitudinal union between the logistics enterprises and the production enterprises. The logistics enterprises should provide the high-quality service for the production enterprises and give play to their own advantages in the supply chain to gain the trust and realize cooperation of other enterprises. This can not only facilitate the logistics enterprises themselves, but also advance the entire supply chain. The logistics enterprises can also carry out horizontal mergers and acquisitions besides the vertical integration of the logistics enterprises in F city. Some large-scale and high-quality logistics companies acquire small and medium-sized
logistics companies and progressively increase their own competitiveness. After mergers and acquisitions, logistics enterprises should integrate the resources from three levels. The first is the strategic level of the enterprise, and the dominant enterprise of the merger and acquisition should be prioritized. The second one is the logistics facilities level, as the logistics facilities should be allocated reasonably. Lastly, the talents should be excavated, and a reasonable competition mechanism for talents should be established in terms of human resource.

**Building a Mature Logistics Public Information Platform.** Information system is a vital support for the development of wisdom logistics. Urban logistics is required to build a mature logistics public information platform. The leading logistics enterprise, as a prosperous logistics company in a city, should proactively uphold and lead the construction of a mature logistics public information platform. First and foremost, we should learn to build a wisdom logistics cloud platform by large data, cloud computing and Internet of things and analyze and integrate the logistics information involving all aspects to share logistics information. The closing state of information between production enterprises, supply enterprises and logistics enterprises should be broke to improve the interaction and communication among enterprises. Besides, it should be known that the road conditions and vehicle information in real time is necessary for the construction of a logistics public information platform. Understanding the real-time status of logistics distribution and transportation is critical for realizing the visualization of the logistics transportation.

Besides, a set of reasonable logistics information standards must be established, which are reflected in the following two aspects:

1. In terms of logistics information release, the timeliness and sharing should be highlighted.
2. In the aspect of logistics information management, the rationalization and standardization should be stressed.

**Logistics Enterprises Should Pay Attention to and Implement Low Carbon Operation**

**Logistics Enterprises should Pay Attention to Environmental Protection and Reduce Carbon Emissions.** The logistics enterprises in F city can know the road information in time and plan the rational transportation route by exploiting large data and cloud computing. Thus, it decreases the transportation mileage and vehicle's empty driving rate and carbon emissions. Additionally, simulation software can also be developed to record carbon emissions data in real-time in the logistics operation. Besides, the environmental protection and low carbon logistics packaging should be used. The packaging materials can be selected for degradation and renewable recycling materials, which can abate the pollution of the environment, and avoid excessive waste of packaging resources. The packing box can also be labelled as the “attention to protect the environment” and other characters on the surface.

**The Logistics Enterprises Should Pay Attention to Saving Energy.** To establish a reasonable system of management of freight vehicles in the process of operation, F city logistics enterprises should stress the protection of logistics equipment, especially the use of transportation vehicles. First and foremost, the transportation volume must be arranged according to the carrying capacity of each vehicle. There should be no overloading. Second, the vehicle is used by the designated driver of the company, and other people are not allowed to drive at will. The driver should not lend the vehicle to anyone other than the company. Eventually, drivers should strictly abide by the rules and regulations of road traffic, and must not over speed at will. Besides, enterprises should introduce advanced logistics equipment and use low energy consumption equipment to increase the utilization efficiency of logistics equipment and the efficiency of enterprises.

**Building an Integrated Logistics Service System**

Integrated logistics refers to the overall analysis, planning and operating of the commodity physical flow of consumers, which connects the procurement activities, manufacturing, sales and market to provide the high service level for the customers and to develop their own competitive advantages. The construction of the integrated logistics service system in F city should be customer-oriented and well consider the operation of each link. Based on information technology, the separated links are
rearranged in line with the integrated logistics service process, to ultimately increase the customer service quality.

The specific construction of F city integrated logistics service system needs to do the following points: first and foremost, each link of the logistics should contact closely, share information, improve the cooperation between the links and increase the efficiency of operation. Second, the corresponding objectives should be established for each logistics role, so that every role can achieve the goal and realize the $1+1>2$. Eventually, each logistics role should learn from each other and improve their professional knowledge to facilitate technological innovation of the entire industry.

**Concluding Remarks**

Under the large data environment, it is extremely important to facilitate low carbon operation and innovative development of wisdom logistics for logistics economy in F city and even the entire country. Yet some of the foregoing problems have obstructed the development of low carbon operation and innovation of wisdom logistics, which are worthy noticing. We should learn from the advanced logistics management and operation models of developed countries when considering our own specific development situation. Also, we should find out the methods and measures to solve the problems of the low carbon operation and innovative development of the wisdom logistics and promote the healthy development of the logistics industry in our country.

**Acknowledgement**

This research was financially supported by the National Science Foundation (71771055), the Key Project of Natural Science in Anhui Province (KJ2017A335, KJ2018A353) and the Project of Social Science Planning in Fuyang City (FSK2017016).

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