

Optimization Selection of Logistics Route by Integrating Multi-Objective Genetic Algorithm

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Abstract

with the rapid development of mobile Internet, logistics industry informationization degree deepening, produced huge amounts of data in the process of logistics operation, how to carry on the visualization using multi-objective genetic logistics operation management, is the whole logistics industry at present, the opportunities and challenges facing the application of multi-objective genetic technology can help the logistics enterprises to improve management level and the realization of the aim of intelligent decision-making, accurate forecasts. Starting from the total amount of logistics, regional layout, enterprise scale and multi-objective genetic algorithm, this paper analyzes the current situation of logistics development in China, and puts forward some countermeasures, such as integrating resources, increasing investment and supporting enterprises, in view of the existing problems in logistics.

Keywords: Multi-Objective Inheritance, Logistics Routes, Management Mode

1. Introduction

With the economic globalization, China's total international trade has been growing steadily. In 2013, China's total import and export trade reached 416 billion US dollars, ranking first in the world. As the most important mode of transportation in international trade, logistics occupies more than 80% of the international trade transportation market with its advantages of low freight, huge volume and free route selection, and has become the most active and competitive industry in the logistics industry. Relying on rich logistics resources, China's logistics has developed rapidly. In 2013, The throughput of China's logistics cargo was 10,746.67 billion T, among which the throughput of foreign trade cargo was 3,368.26 billion T. Handled 89.42 million passengers; Container throughput is 190.85 million TEU^[1-3]. Although China's logistics development has entered a new stage, but the overall competitiveness of China's logistics is not strong, and there is still a

big gap with other countries. Therefore, it is of great significance to study the present situation of logistics development in China and put forward relevant countermeasures^[4-6].

2. Analysis of China's logistics development status

2.1. China's total logistics analysis

In 2013, China's logistics cargo throughput reached 10.747 billion T, an increase of 92.94% compared with 2006, nearly doubling, ranking first in the world for nine consecutive years. In 2013, China's logistics container throughput was 190.85 million TEU, an increase of 97.24 million TEU or 103.88% over 2006. The logistics throughput of China over the years is shown in Table 1.

Table 1. Performance of logistics throughput over the years in China.

Years	Cargo throughput (100 million tons)	Growth rate (%)	Container throughput (10000 TEU)	Growth rate (%)
2009	55.70	14.81	9654	23.80
2010	64.10	15.06	11482	21.79
2011	70.22	9.55	12800	12.78
2012	76.67	9.42	12400	5.48
2013	80.21	4.99	13650	7.96
2014	90.17	12.78	14896.78	14.58
2015	99.25	9.86	17861.72	8.06
2016	107.48	7.65	19027.27	18.78

As can be seen from Table 1, from 2006 to 2007, China's logistics development momentum is good, including the cargo throughput growth rate maintained at about 15%, container throughput growth rate of more than 20%. In 2008, due to the impact of the financial crisis, international trade was in a downturn, and logistics was also impacted accordingly, with its growth rate slowing down and cargo throughput showing a low growth rate. However, container throughput showed a great impact and showed a negative growth in 2009. With the release of the financial crisis, China's logistics has shown a rapid growth trend. In 2011, logistics development appeared a small peak, with the growth rate of cargo throughput and container throughput both above 10%. The logistics throughput of China over the years is shown in Figure 2:

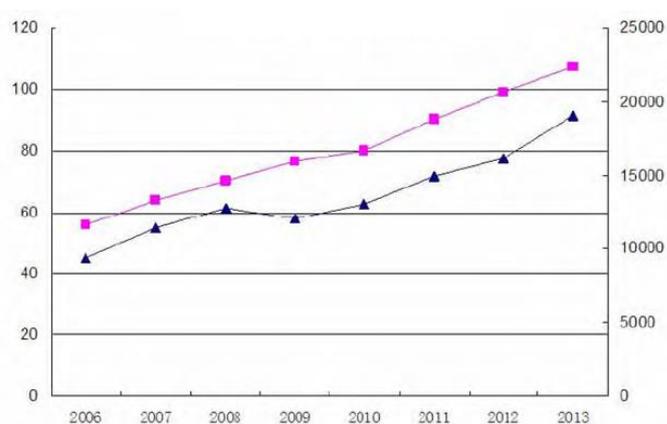


Figure 2. Statistical table of logistics throughput over the years in China.

Figure 2 shows that China's logistics cargo throughput and container throughput basically show a steady growth trend, and the growth of container throughput is generally larger than that of cargo throughput.

2.2. Regional analysis of logistics in China

According to the regional situation in Table 2, although the amount of logistics in the Yangtze River Delta region is not as good as that in the Bohai Rim region, the logistics in this region takes the leading position in the cargo throughput. Among them, the cargo throughput of Ningbo-Zhoushan Port is 809.78 million t, ranking the first in China. Shanghai was second only to Ningbo-Zhoushan Port with an advantage of 776 million Tons. Suzhou Port, as a rising star, has developed rapidly in recent years, with a cargo throughput of 454.3 million T in 2013. The logistics development speed in the bohai Rim region is relatively the fastest, among which, Tangshan port ranks the first with a year-on-year growth rate of 22.4%, nearly twice that of Rizhao Port, which ranks the second. With the rapid development of logistics in the bohai Rim region, the logistics competition in this region is intensified, and the adverse effects of the competition radiate to the surrounding Yangtze River Delta region, resulting in the decline of the overall interests of China's logistics.

2.3. Analysis of logistics enterprise scale and multi-objective genetic algorithm in China

At present, the scale of China's logistics enterprises is generally small, and most of them are in the state of independent operation, lack the ability to resist financial risks, competitiveness is not strong. There are only a few shipping companies with a certain scale, such as Logistics Concentrated transport, logistics concentrated transport, Haifeng International, Sinotrans, Quanzhou Axa Shipping, Grand China Logistics, Hainan Fanyang, Shanghai Jinjiang Shipping and Shanghai Haihua Shipping, which still have a big gap with other countries with developed logistics. Then it can analyze and demonstrate the impact of logistics participation on all parties involved in the Marine product supply chain. The supply chain model equilibrium analysis model shown in Figure 2 is constructed as follows:

$$\text{Alpha} = S_x D_d \text{NSX} (1) \sum (M_{ni} - 1) D_D(1)$$

As shown in the above formula: suppose a certain Marine products sales network of supply chain of the communist party of China have m waters, an intermediate n product market and l wholesalers (in order to simplify the model representation and

analysis of the intermediate links between farmers and agricultural market merged into one layer in the middle of the wholesalers, the modeling and solving method can be a simple analogy to contain among multi-level wholesalers).

$$\text{Alpha Wii} = S_x(\alpha + W + \alpha W \dots_{1122} + \alpha \text{WS})_{\text{nmnX}}(2)$$

I (1 ≤ I ≤ m) represents the ith middleman

J (1 ≤ j ≤ n) represents the JTH sea area

K (1 ≤ K ≤ L) represents the KTH product.

Obviously, it can be found that China's mainland logistics enterprises into the top 10 container liner companies in the world have logistics and logistics consolidation. Among them, the logistics group has 166 ships, with a container throughput of 7603.98 million TEU and a multi-objective genetic algorithm share of 4.4%, ranking among the top five container liner companies in the world. The logistics hub has 143 ships, with a container throughput of 602,477 TEU and a multi-objective genetic algorithm share of 3.5%, ranking the ninth among global container liner companies, as shown in Table 3 below:

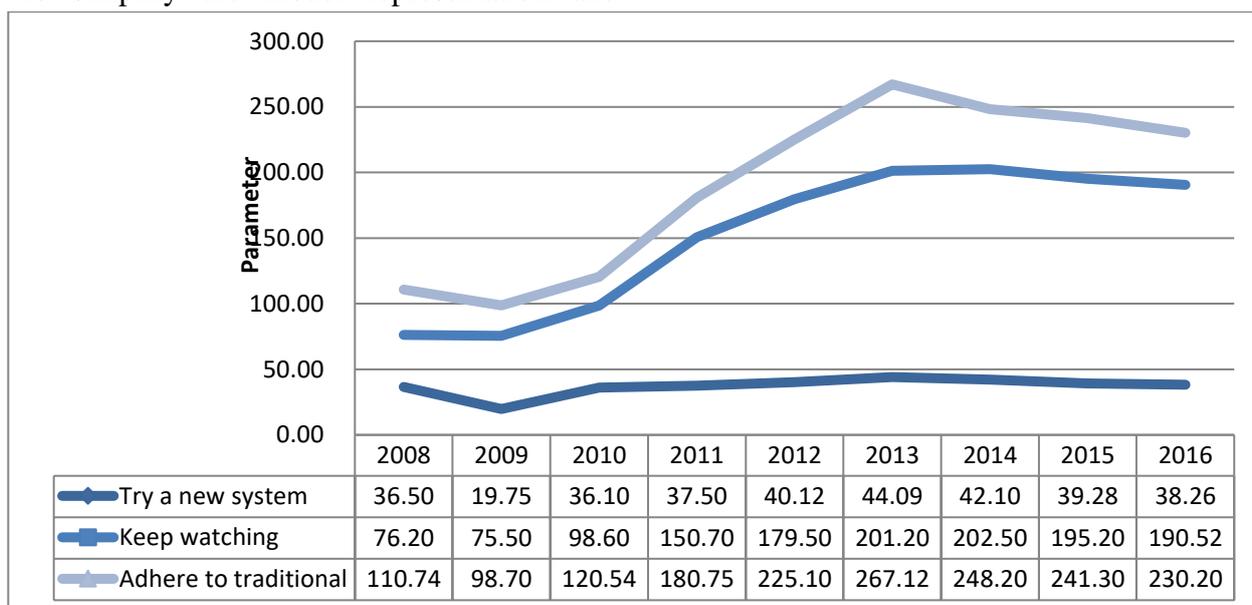


Table 3. A comparative analysis of the innovation and development of China's mainland logistics in recent

years.

As is shown in the figure 3 above: Although the logistics cluster has developed in terms of liner shipping compared with the past few years, it still lags far behind Maersk Line, which ranks the first. Maersk Line's share of capacity and number of ships is more than three times that of the logistics group, while the share of capacity and number of ships of the logistics cluster is less than a quarter of that of Maersk Line. Therefore, China's logistics must take the road of scale, specialization and intensification, in order to have a place in the increasingly competitive logistics market.

3. Overview of logistics routes

3.1. Logistics route introduction

Logistics originated from the physical distribution in the United States in the 1930s. It refers to the organic combination of transportation, storage, handling, loading and unloading, packing and processing, information processing and distribution in the process of moving goods from the supply point to the receiving point, so as to meet the requirements of users according to the actual situation. China's multi-objective genetic algorithm refers to all business activities related to the ocean. Up to now, it is generally defined as maritime transportation between logistics such as general cargo transportation and container transportation. As shown in Figure 4 below, it is the overall process of the logistics route process:

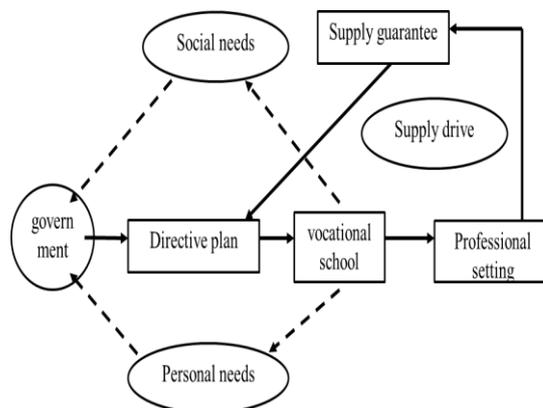


Figure 4.Flow chart of logistics development status.

As shown in figure 4 above, with the rapid development of Internet technology, it is expected to realize the integration of land and sea transport. Multi-objective genetic algorithm (ga) volume is very big, the cost is relatively low, routes and multi-objective genetic algorithm is developed, and is beneficial to the development of international trade, so a large part of our country's import and export of goods using multi-objective genetic algorithm, the new century, also in the rapid development of industry in China.

3.2. Classification of multi-objective genetic algorithm

According to the different modes of vessel operation, it can be divided into liner transport and charter transport. According to different regions, it can be divided into domestic trade and foreign trade. The former is mainly introduced in this paper:

3.2.1. Analysis of multi-objective genetic algorithm

Liner transport is generally adopted for the transport of containers, general cargo and other goods. This mode of transport has three main characteristics:

First, the shipping schedule, logistics, shipping lines and freight rates and other factors are relatively fixed;

Second, the composition of freight includes handling

charges, requiring the ship to be responsible for the loading and unloading of the logistics department;

Thirdly, shippers can book space according to actual needs, and the quantity of goods transported is not particularly fixed.

3.2.2. Application of multi-objective genetic algorithm

Chartering the whole ship means chartering the ship. Compared with liner, the price of chartering the ship is lower, and the direct requirements can be satisfied in the route selection. Therefore, the way of chartering is generally adopted when transporting bulk goods. The charter can be divided into fixed voyage charter and time charter: a fixed voyage charter takes the voyage as the basis of the charter, and according to the needs of the contract ship to complete the voyage of the cargo transport task and responsible for the management of the ship and all kinds of expenses during the transport; Time is taken as the basis of ship transportation. The ship shall provide suitable ships for the customers according to the lease period signed in the contract. The charterer may allocate the ships freely in the navigation area stipulated in the contract, but the fuel, loading and unloading, logistics and other expenses of the ships shall be borne by himself.

4. Problems and countermeasures of Logistics development in China

4.1. Problems existing in China's logistics development

With the continuous development of China's economy and international trade, the increase in demand stimulates the growth of logistics throughput, thus laying a foundation for the development of China's logistics. At the same time, under the strong support of government funds, logistics enterprises, such as logistics centralized transport, are gradually growing and becoming the backbone force to

promote the development of China's logistics. Although China's logistics development has unique advantages, but there are still some problems to be solved.

The regional development of logistics is unbalanced, mainly concentrated in Zhejiang and Shanghai in the Yangtze River Delta region and Tianjin and Qingdao in the Bohai Rim region, while the development of other regions is relatively weak; especially the development of the southwest coastal region is extremely slow.

There is a vicious competition in domestic logistics. At present, China's logistics is mainly based on low-level services, which attract ships to dock to obtain supply of goods. The competition is fierce, especially among different logistics in the same region.

Although the total capacity of Logistics enterprises in China ranks relatively high in the world, it is mainly supported by state-owned enterprises, while private logistics enterprises play a small role, which is not conducive to the long-term development of China's logistics.

4.2. China's logistics development countermeasures

In order to promote the sustainable development of logistics in Our country, we should give full play to the resource advantage and location advantage of logistics development in Our country, and improve the deficiencies. Specific countermeasures include:

Integrate resources and improve layout. Due to the continuous expansion of China's logistics scale, the competition between logistics is becoming more and more fierce, leading to some small logistics have no living space, resulting in a waste of resources. Through the integration of resources, so that each logistics can give full play to its advantages, promote the development of logistics.

Increase investment and intensive operation. To

improve the international competitiveness of China's logistics, we must increase the logistics enterprises' investment in transport capacity, through capital and credit policies, support enterprises to buy ships, improve the transport capacity of enterprises. At the same time, it is necessary to increase the input of science and technology, talents, and promote the intensive management of logistics in our country.

5. Logistics development analysis

5.1. Analysis of logistics development status

From the perspective of total logistics volume, the amount of multi-objective genetic algorithm in China has been increasing rapidly. In 2013, the amount of logistics goods in circulation has exceeded 10 billion, which has been occupying the first place in the world in recent years. Relevant data show that China's logistics has a good momentum of development in the past 15 years. Only in 2008 was logistics affected by the impact of the financial crisis. After the end of the financial crisis, China's logistics industry showed a trend of rapid growth. From the analysis of the main regional logistics involved, rather than link bohai sea area, despite the Yangtze river delta region has a relatively small number of logistics, but its logistics overall throughput of the goods has been in the leading position, the ningbo - zhoushan port and Shanghai port throughput, respectively, among the top two, suzhou port and logistics in the circum bohai sea region has developed rapidly in recent years. The rapid development of logistics industry in various regions has brought great competitive pressure, which has a certain negative impact on the interests of China's logistics. Figure 5 below is the bar chart of China's logistics development status in recent years

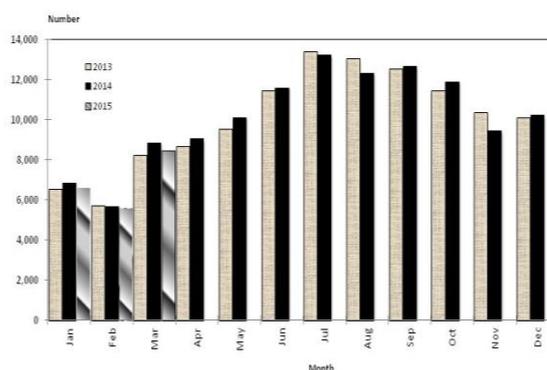


Figure 5. Diagram of logistics profitability over the past three years.

As shown in Figure 5, from the perspective of enterprise scale and ship transport capacity, Logistics in China is mainly undertaken by some small independent enterprises, which have poor ability to withstand financial risks and lack sufficient competitiveness. At present, there are only haifeng International, Shanghai Jinjiang, logistics concentrated transportation and logistics concentrated transportation in China, which are far less mature than developed countries. At the present stage, China's logistics industry should develop towards large-scale professional intensive direction, only in this way can enhance their own industry competitiveness, occupy a certain share of the international market.

5.2. Development trend analysis

At present, the deepening of economic globalization, information and communication, such as high and new technology is rapidly developing, multinational companies to form makes the consumption trend of globalization and localization production increase, at present our country logistics presents six characteristics: first, affected by economic globalization, logistics enterprises competitive pressures, in order to meet the needs of globalization, the scale and scope of logistics should be further expanded, toward the intensive direction, between enterprise merger or cooperation and other measures

should be taken to enhance its influence; Second, the globalization process of logistics service should be accelerated. Customers will not only consider the cost when choosing logistics enterprises, but the social requirements on logistics service will be improved with the globalization of consumption, circulation and production. Logistics service should follow the trend towards globalization and high-quality development. Third, green logistics has become an emerging trend of development. The traditional logistics model not only promotes economic development, but also has a certain impact on the environment, causing a series of problems such as traffic congestion and noise pollution. The logistics industry in the new era should pay attention to environmental protection and realize green logistics. Fourth, with the rise of Alibaba and other e-commerce enterprises, electronic logistics has become another development direction of the logistics industry, which has become the general direction of the development of the logistics industry in the new century. Fifth, content of science and technology of logistics industry and improve management level, the current international large-scale logistics company's technology and equipment has reached a higher level, logistics enterprise system technology as the core technology, the use of information technology, assembly technology, transportation technology, automation technology and packaging technology support, such as modern logistics industries encouraged companies to automation, intelligence, information integration.

5.3. Problems in the development of Logistics in China

5.3.1. Uneven regional development

The more mature regions of China's logistics industry are mainly distributed in Zhejiang, Shanghai and other logistics cities in the Yangtze River Delta region and Tianjin, Qingdao and other logistics cities in the Bohai Rim region. The development of the

logistics industry in other regions is relatively slow, among which the development of the southwest coastal areas is relatively backward.

5.3.2. There is a certain level of vicious competition

At the present stage, most of the services provided by China's various logistics are at a lower level, mainly to attract ships to dock through a variety of concessions, so as to obtain supply of goods. This leads to the phenomenon of vicious competition in domestic logistics, especially in the same region each logistics competition is more intense.

5.3.3. Logistics enterprises have insufficient transport capacity

At present, China's logistics industry has made great progress, and the total capacity has been in the forefront of the world. However, China's current logistics industry is mainly supported by large state-owned enterprises, while private enterprises are less powerful and cannot play an adequate role, which hinders the sustainable development of China's logistics industry to some extent.

6. Methods and strategies for the development of China's logistics industry

6.1. Centralized integration of resources to improve logistics layout

China's logistics scale is expanding with the maturity of the logistics industry, so relevant enterprises must take measures to improve their own capacity. In addition, the increasing competitive pressure of each logistics has compressed the living space of some small logistics and wasted some resources at the same time. The integration of resources can ensure that each logistics to give full play to their own advantages, so as to promote the overall development of logistics.

6.2. Establish a fair and just market environment

At present, the lack of perfect laws and regulations in

Our country, the relevant government departments should issue targeted policies to guide the further development of logistics. The government should formulate a general plan for the logistics industry in China. Local governments should conduct macro-control over logistics development areas according to the actual situation, strictly check the investment, and avoid the appearance of overheated investment. At the same time, the government should also provide scientific and reasonable guidance for the development of mature logistics bases, strengthen the construction of logistics related infrastructure, and timely update related technical equipment, so as to lay a solid foundation for the development of the logistics industry.

6.3. Strengthen cooperation with other countries

Since China's accession to the WTO, China's logistics enterprises have been constantly impacted by foreign enterprises, so logistics enterprises must move towards the road of cooperative development. China's logistics industry should strive to build a large backbone enterprise as the core, use equity participation and holding and other ways to achieve global enterprise acquisition, merger and other work, and strengthen the cooperation with other large enterprises. We should actively introduce cooperation projects, form a joint venture of global logistics enterprises, improve the global marketing and circulation network, and achieve global comprehensive services. The government should actively guide some small and medium-sized logistics companies with certain capacity to develop towards intensification and scale, constantly open up domestic and foreign investment markets, and provide capital and market basis for enterprises to expand production scale. In addition, some large domestic shipping enterprises should attach importance to the importance of logistics, promote their diversified development, extend their single advantages to comprehensive fields, and develop new profit sources.

6.4. Improve the service system of the logistics industry

Logistics industry is a professional service industry, which is based on innovation, skill level, quality and adaptability. Therefore, logistics enterprises should advance scientific information and marketing integration. In order to adapt to the fierce competition in the global market, the logistics enterprises of our country should actively promote the service level and service quality, to strengthen the exchanges and cooperation with the technical department, study abroad market price, quality, performance and technical indicators, such as the development of high and new technology, new technology, the introduction of new equipment and new ship form suggests that the first development of the enterprise, achieve the export-oriented development of the enterprise. Enterprises should attach importance to cost accounting and management, try their best to reduce service cost while ensuring service quality, develop modern technology to strengthen the operation and management of logistics, and expand the service scope of information network.

7. Conclusion

Economic globalization has promoted the increase of China's total international trade, and the logistics industry has also entered the stage of rapid development. In recent years, China's cargo throughput has been ranked first in the world. China's logistics industry is now facing the disadvantages of uneven regional development, excessive vicious competition and insufficient enterprise transport capacity. Therefore, the government should encourage enterprises to integrate resources, improve their own scientific and technological level, strengthen the investment in capital, strengthen the process of internationalization of enterprises, and improve their competitiveness.

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