



# Research on the Construction of Smart Logistics in Heilongjiang Province Under the Background of New Retail

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**Abstract.** In the face of the rapid development of new retail, the development of smart logistics in Heilongjiang province lags behind. The analytic hierarchy process is used to find out the factors affecting the construction of smart logistics in Heilongjiang Province, and the entropy weight method is used to determine the weight of factors. It is found that there is a lack of smart logistics service platform and large storage center in Heilongjiang Province. Information standardization and sharing degree is low and lack of leading enterprises and industrial cluster effect. The important ways for Heilongjiang to develop intelligent logistics in the new retail context are speeding up the construction of intelligent logistics service platform, intelligent warehousing, information standardization and sharing, application of modern science and technology, and training of intelligent logistics talents.

**Keywords:** new retail · intelligent logistics · intelligent warehouse center · entropy weight method

## 1 Introduction

With the acceleration of the process of building a well-off society in an all-round way, the “new retail” business develops rapidly, that is, to build a new retail business with user experience as the core through the form of online and offline integration and logistics, which is characterized by channel integration, digitalization of operation, intelligent stores, socialization of goods and intelligent logistics. In 2017, the scale of China’s new retail market reached 38.94 billion yuan, and is expected to reach 1.8 trillion yuan by 2022, with a compound annual growth rate of 115%. In 2025, the scale of China’s new retail market is expected to reach 14.86 trillion yuan. As an important part of the new retail implementation, smart logistics is not just about moving offline locations online, but more about the combination of advanced technologies such as the IOT, artificial intelligence, cloud computing and big data, realize the logistics itself self decision, optimal allocation of resources, speed up the supply chain channel integration, reduce the demand for space and manpower, make the “zero inventory” become a reality, make the whole logistics link coordinated integration, accelerate the development of logistics industry chain, so as to achieve the purpose of improving quality, reducing cost and increasing efficiency.

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## 2 Heilongjiang Smart Logistics Development Rating Index System

According to the connotation and characteristics of smart logistics, in accordance with the principle of systemization, scientificity and operability, combined with the development status of smart logistics in Heilongjiang province, and referring to the selection of smart logistics evaluation system indicators [1, 3, 4] by academic circles, the data of Heilongjiang province from 2011 to 2020 are processed by using EXCEL spreadsheet tool. The weight of each factor in influencing the development of smart logistics is obtained, and the evaluation indicator system of smart logistics development in Heilongjiang province is constructed. The weight of each indicator is shown in Table 1. The operation is as follows:

- a. Data standardization. Since the sizes and dimensions of the selected data are different, the selected data should be standardized first, and the standardization formula is as follows:

$$r_{ij} = (r_j - r_{min}) / (r_{max} - r_{min}) \tag{1}$$

- b. In the MTH item and n evaluation indicators, let the evaluation matrix be  $R = (r_{ij})_{m \times n}$ ,

$$r = \begin{pmatrix} r_{11} & \dots & r_{1n} \\ \vdots & \ddots & \vdots \\ r_{m1} & \dots & r_{mn} \end{pmatrix} \tag{2}$$

where  $i = 1, 2, 3 \dots m, j = 1, 2, 3 \dots n$ .  
 Calculate the ratio of the item to the jth index by r:

$$h_{ij} = r_{ij} \sum r_{ij} \quad m_i = 1 \tag{3}$$

- c. Entropy of output of JTH evaluation index  $h_j$ :

$$h_j = \sum -k h_{ij} \ln h_{ij} \quad m_i = 1 \tag{4}$$

$$k = 1 / \ln m$$

- d. Information utility value  $d_j$

$$d_j = 1 - h_j \tag{5}$$

- e. Solve the weight coefficient  $p_j$  of each index

$$p_j = d_j \sum d_{jn} = 1 \tag{6}$$

The  $p_j$  represents the role of the jth index in the selected first-level index. The larger the entropy weight is, the larger the entropy weight is and the greater the integration is. The more important it is to evaluate the results.

**Table 1.** Evaluation index of Smart logistics in Heilongjiang Province

| Second-level indicators            | Third-level indicators  |
|------------------------------------|---|
| Logistics fundamentals A1          | Output value of logistics industry (hundred million yuan) X1 0.065697263<br>Cargo volume (tons) X2 0.07040319<br>Number of logistics employees X3 0.048925198<br>Logistics Fixed Assets investment (ten thousand yuan) X4 0.090902297   |
| Science and technology elements A2 | Number of college students per 10,000 people (number) X5 0.181195298<br>Technology market turnover (million yuan) X6 0.072852565<br>Number of patents granted (pieces) X7 0.054826167<br>Number of R&D activity units X8 0.102377666<br>Internet broadband users (ten thousand households) X9 0.098377669<br>Internet of Things terminal users (ten thousand) X10 0.214442688 |

Secondary index “logistics industry base” in the index contains four level indicators, use “logistics industry production value”, “volume”, “number” logistics industry practitioners as well as “logistics industry investment in fixed assets (with transportation, warehousing, postal service value) of investment in fixed assets” to represent the basis of the traditional logistics industry development in Heilongjiang province. The index of “science and technology elements” contains five three-level indexes, among which “Internet broadband users” and “Internet of Things terminal users” represent the infrastructure aspect of smart logistics. “The number of college students per 10,000 people” and “the number of patent licenses” represent the input talent factors and output results of smart logistics development. “Number of units with R&D activities” and “turnover of technology market” represent the informatization, scientific and technological progress and application level of enterprises in Heilongjiang Province.

Through the analysis of the data, the following conclusions are drawn:

Among the 10 influencing factors, the weight of “Internet of Things terminal users” is the highest, followed by “the number of college students per 10,000 people” and “the number of UNITS with R&D activities”. The weight sum of these three is 0.498015652, approximately 0.5, indicating that these three are the primary factors affecting the development of smart logistics in Heilongjiang Province. The weakest influence is “the number of logistics employees”, indicating that in the process of continuous development of smart logistics, with the input of new technologies and equipment, traditional labor factors are no longer the key factor affecting output, which is also in line with the fact of population loss in Heilongjiang Province. It reflects that accelerating the construction of intelligent logistics is a favorable measure to solve the problem of aging population and net outflow of population in Heilongjiang Province. To sum up, Heilongjiang province should first strengthen the infrastructure construction of intelligent logistics industry,

such as building intelligent logistics service platform and intelligent storage center; Secondly, pay attention to the training of professional talents of intelligent logistics and the transformation and application of scientific and technological achievements, improve the output efficiency of science and technology in the intelligent logistics industry; Finally, on the basis of the traditional logistics industry developed wisdom of the industry leading logistics industry, using leading advantage to promote the wisdom of Heilongjiang province logistics play a high level of industrial agglomeration effect, so as to further promote the industry standardization of information sharing, enhance the core competition of the logistics industry in Heilongjiang province wisdom, provide new momentum for Heilongjiang economic growth.

### **3 Problems in the Construction of Smart Logistics in Heilongjiang Province**

#### **3.1 Lack of Comprehensive Intelligent Logistics Service Platform**

On April 15, 2022, Heilongjiang Public Logistics information Platform (trial version) was put into operation, which to some extent made up for the lack of logistics information platform in Heilongjiang province. However, as smart logistics started late in Heilongjiang Province, compared with Sichuan Logistics big data resource service platform, the comprehensive decision-making ability of Heilongjiang smart logistics platform needs to be improved, and the platform management mechanism needs to be improved. At present, the more than 600 registered logistics enterprises in Heilongjiang province are weakly connected and compete independently, presenting the phenomenon of inefficient homogeneous competition. The logistics enterprises engaged in bulk cargo transportation are not effectively combined with those engaged in sea-rail combined transportation and empty vehicle distribution. Beidahuang Group tries to establish a logistics platform for agricultural products. Although the efficiency in the circulation of agricultural products has been improved, the comprehensive intelligent logistics platform has not been fully established.

#### **3.2 Lack of Large-Scale Intelligent Warehousing Centers**

At present, Heilongjiang province has 26 warehouses of more than 20,000 square meters, including 24 in Harbin, one in Da qing and one in Hegang, but the number of “intelligent” warehouses is zero. Heilongjiang province is located in the alpine region on the inland edge of northeast China, adjacent to Russia, and is an important trade route to Russia. In 2020, the freight volume of Heilongjiang province was 560.31 million tons, accounting for 1.2% of the national freight volume of 46.3 billion tons, reflecting the backward phenomenon of transportation in Heilongjiang Province. With the continuous and healthy development of China’s economy and the rapid rise of China’s logistics industry, there is a huge market demand for warehousing industry. Although the large storage centers in Heilongjiang province have functions of sorting, packaging, transportation and distribution that are more efficient than traditional logistics, they are still in the state of “mechanization” in terms of “intelligence” and have low efficiency.

### 3.3 Low Degree of Information Standardization and Sharing

Heilongjiang Province's "Digital Economy" Development Plan (2019–2025) clearly states that the first step to develop smart logistics is to promote the informatization transformation of traditional logistics enterprises. However, the informatization level of logistics enterprises in Heilongjiang province is about 16%, far behind the informatization level of Beijing logistics enterprises about 38% [2].

The market demand and customer structure of the new retail era have changed, and the service process, information docking, service standards and response speed of logistics enterprises have put forward new development requirements. Logistics data, logistics equipment and logistics cloud are the three fields needed for intelligent transformation of logistics industry. At present, the smart logistics data service market in Heilongjiang Province is still in its infancy. Most logistics data are only transferred from paper media to electronic media without data precipitation, leading to the failure of most logistics data. At the same time, information recording methods among scattered logistics enterprises are different, so logistics information cannot be standardized and shared, which increases the difficulty of smart logistics construction in Heilongjiang Province. Moreover, Heilongjiang province has China cloud Valley capable of processing large data. However, logistics enterprises in Heilongjiang province do not upload their logistics data to the unified information storage, which leads to the blank market of smart logistics cloud service in Heilongjiang Province, dragging down the pace of smart logistics construction in Heilongjiang Province.

### 3.4 Lack of Leading Enterprises and Industrial Cluster Effect

Smart logistics is a capital-intensive and technology-intensive industry, while traditional logistics is a labor-intensive industry. With the rapid development of new retail today, traditional logistics enterprises must be forced to carry out smart transformation. Because smart logistics is capital-intensive and technology-intensive, small enterprises in traditional logistics must be integrated. However, according to the 2020 China Smart Logistics Industry Research Report released by Chuang Yebang, the market concentration of the express delivery industry is high, mainly occupied by Cai Niao and Jing Dong [5]. Logistics enterprises in Heilongjiang Province have lost the opportunity and possibility to develop in the express delivery industry. The LCL logistics industry as a whole presents a state of "small, disorderly, scattered and poor", indicating that Heilongjiang province can vigorously promote the development of enterprises in the LCL field. The intra-city logistics industry is relatively stable and presents a homogenized competition situation as a whole. However, in terms of intra-city distribution in Heilongjiang Province, it is still in a state of high labor input. In the cold chain logistics industry, there are great deficiencies nationwide. Heilongjiang Province should make full use of its industrial foundation and natural foundation to support smart logistics enterprises in the field of cold chain logistics.

## **4 Suggestions on the Construction of Intelligent Logistics in Heilongjiang Province**

### **4.1 Accelerating the Development of a Comprehensive Intelligent Logistics Service Platform**

Platform model is an important business model for enterprises to obtain profits in the Internet era. The number of new retail platforms is increasing, but the smart logistics platform has not kept up. In order to grasp the development opportunities brought by new retail, Heilongjiang province must speed up the construction of smart logistics, and the first thing to do is to speed up the construction of smart logistics service platform. Building a smart logistics platform can realize interconnection, information sharing and data exchange among various systems, greatly reduce the error of logistics transportation, and thus improve work efficiency. Secondly, through the construction of smart logistics service platform, big data of logistics can be acquired and deposited, and data value can be mined to lay a data foundation for the further construction of smart logistics. Finally, the construction of intelligent logistics platform can strengthen intelligent analysis and decision-making, and both horizontal deployment and vertical transmission efficiency can be greatly improved.

### **4.2 Accelerate the Construction of Intelligent Storage Centers**

Intelligent warehousing is an important link in the realization of intelligent logistics. The application of intelligent warehousing can ensure the speed and accuracy of data input in each link of warehouse management, ensure that enterprises can grasp the real data of inventory timely and accurately, and maintain and control enterprise inventory reasonably. Warehousing mainly consists of packaging, weighing and delivery handover. The efficiency improvement of each link will bring significant progress to the overall efficiency improvement. The existing storage enterprises in Heilongjiang province are still labor-intensive industries, which can no longer adapt to the current labor status. Therefore, it is necessary to accelerate the construction of intelligent warehousing, promote the transformation of traditional storage industry to technology-intensive industry, so as to better promote the construction of intelligent logistics and adapt to the rapid development of logistics industry in the new retail era. On the one hand, intelligent warehousing through unified network control and a large number of intelligent equipment investment, effectively achieve accurate control and reduce labor costs; On the other hand, the use of intelligent software improves the level of warehousing visualization and comprehensive informatization, which is conducive to warehouse management. At the same time, in the construction process of intelligent warehousing, we should always pay attention to the problem of information security, the reason is that the information involved in intelligent warehousing must be uploaded to the cloud storage through the network, if the information security is not effectively guaranteed, the benefits of intelligent warehousing will be greatly reduced. In the process of promoting the construction of intelligent warehousing center, reasonable introduction of warehousing center enterprises, according to market forces to build Heilongjiang province smart logistics, such as Jing Dong, Su Ning and other enterprises. The location of intelligent storage center

should first be in the area with smooth traffic and clear routes. Secondly, in order to guarantee the buyer's consumption requirements for "fast", the location should be as close as possible to the area with great buyer's market. Finally, the location should be in the area with strong industrial agglomeration, which is conducive to better play the industrial cluster effect.

### **4.3 Accelerating the Standardization and Sharing of Information**

Information standardization is the premise of information sharing, and information sharing is the important foundation of building intelligent logistics. From the internal perspective of smart logistics enterprises, make good use of the user data brought by the new retail, build a perfect consumer portrait, and realize the internal interconnection of enterprises; From wisdom logistics industry perspective, to form industry alliance between enterprises, do business resources sharing, such as network sharing and storage and sharing, through the Internet of things, big data and cloud computing and artificial intelligence technology to realize intelligent decision-making and the distribution of logistics system, more efficient use of the resources of each individual, Realize the optimal allocation of resources for the whole industry and even the whole society; From the perspective of supply chain management, accelerating the construction of intelligent logistics information standardization and sharing can effectively guide production and consumption and improve social reproduction efficiency. It is not only the information standardization within the logistics industry, but also the logistics information standardization of agricultural products and other commodities and other industries, and the information sharing and standardization construction between industries, so as to realize the interconnection between the whole supply chain. Guide industry associations to play the main role, formulate norms for the development of smart logistics industry, clarify the public nature of data ownership, and emphasize the importance of public rights and interests; Do a good job in data grading, except for enterprise core data to open and share, to build benign development of information system.

### **4.4 Cultivate Smart Logistics Leading Enterprises to Enhance Industrial Agglomeration Effect**

Through the transformation of traditional logistics park into smart logistics park to cultivate the new leader of Heilongjiang province smart logistics industry and enhance industrial agglomeration effect. From the perspective of the role of leading enterprises, cultivating leading enterprises can integrate the resources of the intelligent logistics industry more efficiently, and the standardization and sharing of internal information of enterprises are more convenient, laying a solid foundation for the subsequent promotion of information standardization and sharing of the whole industry. In industrial clusters, leading enterprises can effectively drive small and medium-sized enterprises to transform and upgrade, help them to make breakthroughs, improve the production and operation capacity of small and micro enterprises at the same time, make industry data convergence, which is conducive to the further play of industrial agglomeration effect. From the perspective of cultivating leading enterprises, firstly find several logistics enterprises with large market shares in the industry, and evaluate the difficulty and cycle of

their intelligent transformation; Secondly, the positive transformation of logistics enterprises to give tax rebates and other preferential measures; Finally, leading enterprises should be encouraged to drive small and micro enterprises so as to improve the core competitiveness of the whole industry. Supply chain upstream and downstream from the industry perspective, to strengthen the support of logistics technology research and development enterprise, science and technology is the first productivity, logistics, city of wisdom, and wisdom to carry out digital longjiang without the strong support of science and technology, improve the r&d investment and promote the transformation and application of technological achievements is the key of the construction of wisdom logistics.

## 5 Conclusions

To sum up, the wisdom of Heilongjiang province logistics construction is imperative, in the process of development and construction to promote the wisdom logistics infrastructure construction and talent cultivation, encouraging to cultivate wisdom logistics industry leading enterprises in Heilongjiang province, under the background of the development of new retail digital, promote transformation and upgrading of traditional logistics industry, and enhance the overall competitiveness of the industry, thus promoting economic development in Heilongjiang province.

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