Development Planning and Path Analysis of Intelligent Logistics Industry in Big Data Age

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Abstract. Based on the theory of industrial development and modern logistics, combined with the development course, basic characteristics and development trend of intelligent logistics in China, this paper discusses the basic connotation and framework of intelligent logistics, and analyzes the supporting system needed for the development of intelligent logistics from the aspects of policies and regulations. After analyzing the present situation of intelligent logistics development support system construction in our province, the comprehensive score ranks 17th among 30 provinces and cities (except Tibet) in mainland China. It is considered that it can be improved from three aspects: speeding up the construction of information technology, improving the level of logistics modernization, optimizing the talent environment, planting scientific research talents, promoting the development of high quality economy and promoting the upgrading of logistics consumption.

Keywords: Big Data, Smart Logistics, Industry Development, Information Technology

1. Introduction
The rapid development of the new generation of information technology and artificial intelligence, such as the Internet of things, big data and cloud computing, has had a profound impact on economic growth and industrial transformation, not only reshaping the industrial form, but also creating new economic growth points. With the deepening of the practice of intelligent logistics development, it is urgent to explore the theoretical construction of the support system needed for the development of regional intelligent logistics, so as to support the regional intelligent logistics continuously [1].

Scholars at home and abroad mainly focus on the concept definition, public information platform, information system and the application of information technology. From the perspective of industrial development, it is not easy to explore the support system needed for the development of intelligent logistics and evaluate the current situation of its support system construction. Based on the general law of industrial development and the characteristics of intelligent logistics, this study enriches the research object of industrial development and provides new thinking for the theoretical research and
practice of industrial development support system [2]. The analysis of the support system needed for the development of intelligent logistics in this study is helpful to deepen the understanding of the construction law of the regional intelligent logistics development support system, and has certain practical guiding significance to promote the development of intelligent logistics in our province. For other areas of intelligent logistics development to provide reference. Since the concept of "intelligent logistics" was formally put forward, some scholars have put forward different schemes around the structure and function of intelligent logistics information platform. With regard to the support system of industrial development, scholars at home and abroad mainly focus on high-tech industries, cultural and creative industries, strategic emerging industries, and most of them discuss their supporting role in industrial development from some aspects of finance, finance, taxation, manpower and so on [3].

Intelligent logistics is the product of the integration and development of the new generation of information technology, artificial intelligence and traditional logistics industry. The concept of collaborative sharing accords with the development trend of modern logistics automation, intelligence, real-time, visual traceability, and is the future development direction of logistics industry. Based on the theory of industrial development, modern logistics theory, system theory and other related theories, this paper reviews the relevant literature, combs the present situation, characteristics and existing problems of intelligent logistics development, and analyzes the support system needed for its sustainable and healthy development. According to this, the corresponding countermeasures and suggestions are given.

2. Relevant Definitions and Conceptual Elaboration

2.1. Industrial Development Theory

On the basis of life cycle A.U model, G.K model was proposed in 1980s. The theoretical model holds that the development of any industry will go through four stages. The formation period is a process from "nothing" to "have ". In the early stage of industrial formation, the number of enterprises in the industry is small, the products and services are not finalized, and the production technology and technology are immature. The growth period is the stage of industry from "small" to "big" and rapid expansion, with a large increase in factor input and a rapid expansion of output scale. This stage is accompanied by the continuous improvement of technology and management level, and the continuous upgrading of products and services. The mature period is the rapid expansion stage of the industry, the market has become saturated, the growth rate of factor input and output scale has slowed down and even stabilized within a certain range, and the innovation of production technology is weak. Product market share fluctuations, enterprises are difficult to achieve disruptive breakthroughs in products. The recession period is the period when the industry changes from "prosperity" to "decline ". In this period, the products and services of enterprises lag behind the upgrading of consumer demand, the profitability of enterprises is insufficient, and even losses occur. The scale of factor input and output tends to decline. The pace of industry restructuring accelerated. For the industry in the recession period, if there is a major technological change, it is possible to use subversive technology to transform and upgrade, process reengineering, and then achieve industrial transformation [4].

Different stages will show different characteristics, and the input of elements needed in each stage of development is also focused, and each stage of the industrial life cycle is closely related and complementary. The development of industry must conform to its own law. At the same time, the sustainable and healthy development of any industry should not only conform to the objective law of industrial development, but also adapt to the specific external environment to which it is attached. For example, the capital market of the United States is relatively developed, and its mature venture capital system plays an important role in the formation and development of high-tech and other industries, while China's market is restricted by some institutional factors. The decisive role of resource allocation in some fields has not been fully played [5].

2.2. Intelligent Logistics and its Basic Characteristics
Since the concept of "intelligent logistics" was put forward in 2009, Chinese scholars have discussed it from different angles. Combined with the research of Wang Zhitai, He Liming, Bao Lin and Zhang Guwei, intelligent logistics is a comprehensive logistics service system with high efficiency, convenience and green [6].

Traditional logistics industry is a typical labor-intensive industry, whether warehousing, transportation, distribution and other logistics links need a large amount of labor input. In addition to the traditional logistics industry, the new concept of collaborative sharing also breaks through the traditional concept of all property rights, sharing the right to use resources without ownership, based on the deep cooperation of enterprise division of labor. Colleges and universities, convenient and green intelligent logistics can greatly reduce the total cost of social logistics and energy consumption, meet the personalized logistics needs of consumers, and promote the transformation and upgrading of traditional logistics industry and high quality development [7].

(1) Foundation - Perception Layer
The basic knowledge layer uses RFID sensors, receivers, bar codes, GPS, GIS and other technologies to complete the data acquisition of all aspects of logistics, and uses various transmission networks and communication technologies, especially mobile communication technology (4G/5G), to track the raw data of logistics in real time.

(2) Data-analysis layer
Data analysis layer is equivalent to human nerve center and brain, its core is to use big data and cloud computing technology processing foundation. The data obtained by the perceptual layer. According to the pre-set standards and rules, algorithms and models, the data is filtered, stored, parsed and managed to provide important data support for decision management in the decision-making application layer.

(3) Decision-making - Application layer
The main applications of decision-application layer are multimodal transport, storage sharing, path optimization, real-time tracking and vehicle scheduling.

2.3. Intelligent Logistics Development Support System
The policy and regulation support system refers to the industrial policy, environmental protection policy, land use planning, industry standard, intellectual property protection, logistics standardization policy and other policies and regulations that are conducive to the development of intelligent logistics. In the modern market economy, the market plays a decisive role in the allocation of resources according to the law of value; but because of the influence of public goods, externality, monopoly and so on, the market mechanism is difficult to allocate industrial resources effectively under certain circumstances, such as the infrastructure needed for the development of intelligent logistics, including railway, highway, waterway and so on [8].

Smith the theory of "systematic failure", which holds that system failure will seriously affect the innovation ability of society and enterprises, and advocates that the government should improve the national innovation system by implementing new innovation policies in order to enhance the innovation ability of society and enterprises. Among them, the theory of "industrial sharing" is based on the basic collective nature of the production and innovation ability of enterprises, and emphasizes that the research and development of high-tech products not only needs a sound manufacturing foundation, but also needs the support of "intermediate system" such as trade associations, trade unions, universities and research institutions [9-10].

2.4. Relevant Formulas
Mathematical model for factor analysis:
The matrix is expressed as:

\[
\begin{align*}
    x_1 &= v_{11}F_1 + v_{12}F_2 + \ldots + v_{1n}F_n + \varepsilon_1 \\
    x_2 &= v_{21}F_1 + v_{22}F_2 + \ldots + v_{2n}F_n + \varepsilon_2 \\
    \vdots \\
    x_p &= v_{p1}F_1 + v_{p2}F_2 + \ldots + v_{pn}F_n + \varepsilon_p
\end{align*}
\]

The matrix is expressed as:

\[ X = AF + \varepsilon \]  

Data standardization formula:

\[ Z_i = \frac{X_i - E(X_i)}{\sqrt{Var(X_i)}} \]

Factor score, combined score and ranking:

\[ F_i = \sum A_i Z_i \]

\[ F = \sum (\beta_i / \sum \beta_i) F_i \]

3. Practice of Intelligent Logistics Industry Development System in Big Data Age

Given that the concept of "intelligent logistics" was formally put forward by the academic community in 2009 and some data were missing in 2012, and the relevant data have not been published in 2018, this paper selects 30 provinces and cities in the mainland of China from 2013 to 2017(except Tibet, because some data are missing) as samples, and uses EXCEL2016, SPSS 24.0 to collect, screen, process and analyze the sample data.

1) Logistics network density (X1), in km/m km2, with the formula (railway mileage)/area area.

2) Per capita post and telecommunications business volume (XS), its unit is yuan, the calculation formula is (postal business volume telecommunications business volume)/ total area person 13.

3) The technical market turnover (X9) of each scientific researcher shall be 10,000 yuan, and the formula shall be 10"4/ the number of scientific research personnel.

4) The output value rate (X11) of civilian cargo vehicles, in 10,000 yuan, is calculated by the gross output value of the logistics industry/ownership of civilian cargo vehicles.

5) The number of persons with a college degree or above (X12) per 100,000 persons in their units.

6) The proportion of fixed assets investment in the whole social logistics industry (X17), its unit is%, the formula is fixed assets investment in the whole social logistics industry / fixed assets investment in the whole society.

7) Three evaluation indicators for the number of employees in the logistics industry (X13), the total output value of the logistics industry and the fixed assets investment of the whole social logistics industry.

8) Two evaluation indicators for the number of scientific research personnel (X14) and general fiscal expenditure (logistics industry) (X16) are presented.

4. Data Analysis of Intelligent Logistics Industry Development System in Big Data Age

4.1. Applicability Tests

The KMO value is 0.709, between 0.7-0.8, and the P value in Bartlett spherical test is close to 0, less than 0.05. According to the KMO and Bartlett sphericity test standards, the 2017 provincial and municipal index data selected in this paper are suitable for factor analysis.
Table 1. Kvlo and bartlett's sphericity test

| Bartlett sphericity test | Kmo sampling suitability quantity | .709 |
|--------------------------|-----------------------------------|------|
| Approximate chi square   | Freedom                           | 793.881 |
|                          | Significance                       | .000 |

4.2. Extraction of Public Factors

By using principal component analysis, the eigenvalue, variance contribution rate and cumulative variance contribution rate of each factor in 2017 are calculated by SPSS24.0, and the results are shown in Table 2.

Table 2. Interpretation of total variance

| Initial eigenvalue | Total Variance | Variance percentage | Cumulative% | Extract the sum of squares of loads | Sum of squares of rotating loads |
|--------------------|----------------|---------------------|-------------|------------------------------------|---------------------------------|
|                    | Initial        | Sum of squares      | Sum of       | Total                              | Variance percentage | Cumulative% |
|                    | Eigenvalue     | of loads            | rotating     |                                    |                   |            |
|                    |                |                     | loads        |                                    |                   |            |
| 1 9.911            | 55.061         | 55.061              | 4.91        | 2                                  | 55.061             | 55.061     |
| 2 3.069            | 17.049         | 72.111              | 3.069       | 3                                  | 17.049             | 72.111     |
| 3 1.618            | 8.987          | 81.098              | 1.618       | 4                                  | 8.987             | 81.098     |
| 4 1.002            | 5.567          | 86.667              | 1.002       | 5                                  | 5.567             | 86.667     |

Extraction method: principal component analysis.

4.3. Factor Load Analysis and Nomenclature

Figure 1 shows that, Regional gross domestic product (X2), express delivery volume (X4), number of patent authorizations (X8), number of employees in the logistics industry (X13), full-time equivalent of regional R&D personnel (X15), general fiscal expenditure (logistics industry)(X16), regional R&D expenditure (X18), These variables reflect the macroeconomic environment, human resources and scientific research of the development of regional intelligent logistics, Therefore, The first public factor is called the economic, human and scientific factor, F1. Recorded

Figure 1. Rotated component matrix
The disposable income of urban residents (X3), the per capita postal and telecommunications business volume (X5), Internet penetration rate (X6), mobile phone penetration rate (X7), regional R&D input intensity (X10), civilian cargo vehicle output rate (X11), the number of people with college degree or above per 100,000 population (X12) have higher load on the second public factor. These variables reflect the degree of popularization and utilization of modern information technology in the region, embodies the regional information construction situation. Therefore, the second common factor is named information factor, F2.

The technical market turnover (X9) and the number of researchers (X14) per 10,000 scientific research personnel are loaded on the third public factor, which reflects the scale and technical level of the transformation of scientific and technological achievements in the region. Therefore, the third public factor is called the technical factor and is recorded as a F3. factor.

The density (X1) of logistics network is higher on the fourth public factor, which reflects the improvement of the infrastructure of the development of regional intelligent logistics. Therefore, the fourth public factor is defined as the logistics infrastructure factor and recorded as the F4. factor.

4.4. Factor Score

A component score coefficient matrix is obtained by using SPSS 24.0, and the result is shown in figure 2.

![Figure 2. Matrix of component score coefficient](image)

4.5. Analysis and Countermeasures

(1) Speed up information construction and upgrade logistics modernization

According to the previous empirical analysis, although the construction of railway, highway and other logistics infrastructure in our province has made great achievements, it lags behind the vast majority of provinces and cities in terms of per capita postal and telecommunications business volume, Internet and mobile phone popularization rate. Therefore, our province should regard information construction as an important content of economic and social development, speed up the popularization...
of the Internet, especially the mobile Internet, and strive to improve the information level of enterprise operation and people's life. For the development of intelligent logistics in our province to lay a solid micro-foundation.

(2) Optimizing the talent environment, planting the advantages of scientific research talents,

The number of scientific research personnel and the number of logistics industry in our province are in the middle and slightly behind level, compared with the developed provinces and cities such as the eastern coast, there is still a certain gap. Unlike the traditional logistics industry, which has the characteristics of labor-intensive, intelligent logistics presents the characteristics of science and technology-intensive. Therefore, the strength of regional scientific and technological innovation ability will affect the sustainability of intelligent logistics development. Scientific research personnel are the main body of regional scientific and technological innovation and the key to regional future scientific and technological competition. Our province has abundant scientific and educational resources, and creating a good environment for the growth of scientific research talents is the key to retain and attract talents. Therefore, the governments at all levels of our province should continuously optimize the environment for talent growth, construct scientific talent training, talent recruitment and talent growth mechanism from housing subsidies, medical treatment, children's education and so on, and transform rich scientific and educational resources into talent advantages.

(3) Promote high-quality economic development and upgrade logistics consumption

Our province's macroeconomic situation medium preference, strong momentum of development, strong consumption capacity of residents. The logistics demand produced by economic activities provides the motive force for the development of intelligent logistics industry. Our province should speed up the transformation and upgrading of economy while stabilizing the rapid growth of macro economy and lead the development of intelligent logistics with high quality logistics demand. On the other hand, especially the vigorous development of e-commerce, residents' new consumption needs such as green consumption, personalized customization and so on are bound to put forward higher requirements for logistics services, which provides space for the development of intelligent logistics advantages. The relevant departments of our province should take comprehensive measures to guide residents' green consumption concept and promote logistics consumption upgrading.

5. Conclusions

Based on industrial development theory, modern logistics theory and system theory, combined with the research results of intelligent logistics and its development status, this paper explores the characteristics of intelligent logistics and tries to give a definition. At the same time, it analyzes the support system of intelligent logistics development from five aspects: policy, social economy, information technology, talent elements and industrial capital. This study defines "intelligent logistics" as follows: relying on the new generation of information technology, artificial intelligence and modern management concepts, such as big data, cloud computing, to achieve an efficient, convenient and green integrated logistics service system. Overall, there is still a certain gap between the construction of the support system for the development of intelligent logistics in our province and the developed provinces and cities along the eastern coast, some provinces in the central part and some provinces and cities in the Yangtze River economic belt, but the development potential is huge, and the relevant government policy support has an important impact on the development of intelligent logistics.

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