The Direction of the Development of Modern Transport Logistics in the Digital Economy

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Abstract: In order to adapt to the new trend of today's digital economy, the digital transformation of modern transport logistics is particularly critical. This paper briefly analyses the background and purpose of developing modern transport logistics, and describes the current situation of logistics development in the context of the economic era. It points out the problems and challenges in the development of modern logistics under the conditions of the digital economy, and proposes a solution strategy based on the existing problems.

Keywords: Digital economy, Modern Logistics, digital transformation

1. INTRODUCTION

Digital logistics is the new development trend in today's transport logistics, and in the present digital economy, modern logistics is still in the primary development stage, so further support for digital transformation of transport logistics is the inevitable development trend of today's time. In the face of the various problems that have arisen by transport logistics under the new situation, need for further solutions and improvements in the future through technological improvements and industrial reforms.

2.BACKGROUND AND OBJECTIVE OF DEVELOPMENT

2.1The digital economy in context of the times

In the 21st, the rapid growth and widespread use of new technologies such as the Internet and big data have not only brought radical changes to people's daily lives, but also to the economic development industry, with modern transport and logistics as the core, which has also been affected by the trend of digital economy. During the term of the "14th Five-Year Plan", in order to achieve the goal of building a strong socialist modern state, Transport should be at the forefront of China's modern development. The transport and logistics sector should realize the development from relatively independent to integrated and synchronized development, from traditional service delivery to digital and smart effective delivery, continuously optimize the development layout, driving intelligent transformation and modernization of infrastructure and equipment, foster the digitization of the entire service, set the development mode, change the development path, increase development dynamics, and encourage the further intensification of

transport integration and logistics, as well as developing the economy and society. Logistics and transport should seize policy opportunities, speed up the digital transformation, focus on the shortcomings of the modern logistics and transport system, and to strengthen the drive for innovation and key capabilities.

Building a digital China is an important Part of the move to modernize according to the Chinese model in the digital era and a strong backbone for building a new competitive advantage for the country. Digital transport is one of the most important areas of development in the digitized economy, and logistics and transport is the second most important factor in the transport industry, to enable scaling up. [2]The development of large-scale information on the Internet and the digital economy brings more opportunities to modern logistics, and the digitization of advanced logistics is also an inevitable trend to adapt to the times. In the context of the digital economy, the high-level development of modern transportation logistics has become the theme of the times, how to play the advantages of data, promote the deeper involvement of digital technology in the real economy, promote the industrial transformation, promote the growth of the new digital economy, promote the establishment of "Digital China", etc., need to play an important role in modern transport logistics. Today's world has entered an era of global connectivity. [1]Against the background of an increasingly developed global logistics industry and the rapid development of digital technology, more and more logistics enterprises have realized that the digital revolution in logistics has become an inevitable development trend. China's economy is in a pivotal stage of transformation and upgrading as it turns from high-speed growth to high-value development, and the logistics industry is also entering a period of exciting strategic opportunities in the context of national political and development policy. Speeding the digital transition of the transport and logistics industry is also necessary for the high-quality development of China's transport infrastructure.[4]

2.2The need for digital transformation of modern logistics

Today's world has entered an era of global connectivity. With the ongoing growth of the global logistics industry and the rapid advancement of digital techniques, more and more logistics companies are aware that the digital reshaping of logistics is a needed tendency. China's economy is moving from high-speed growth to high-value development, and is at a significant stage of transformation and modernization. In the context of national policy and development, the logistics industry has entered a moment of strategic opportunity. Accelerated digital conversion of the transport and logistics system is also an indispensable requirement for the qualitative advancement of China's transport industry[1].

First, the digital integration of logistics can boost the efficiency of logistics. By going digital, logistics can be transformed into intelligent, specialized, visualized and unmanned, supply cycle procedures and management can be significantly improved, the logistics service model can be adjusted, and all the elements of the industrial chain can be maximized. [6]Through the combined effect of intelligent Logistics facilities and equipment, IoT, blockchains and artificial intelligence algorithms, the entire transport chain can be more precisely controlled, logistics-related data can be collected more efficiently, the accuracy and safety of logistics services can be improved, and logistics enterprises can realize high-quality automated sorting and intelligent scheduling of transport and distribution, significantly improve the efficiency of logistics workflows.[15]

Second, the digital integration of logistics can substantially lower logistics costs. Using the latest digital technologies, logistics companies can share resources, reduce labor and material costs, and optimize the links between supply chains and logistics links to reduce warehousing and operating costs. [11]Through the Internet of Things and big data analytics, intelligent transport planning and location tracking, avoiding unnecessary warehousing and transportation costs.

This, in combination with the digital transformation of logistics, has the potential to be a driver of industry transformation and upgrading. and enhance market competitiveness. The digital evolution of modern logistics is an inevitable trend of change in the logistics industry.[10] It promotes the transformation of the logistics industry in terms of intensification, intelligence, standardization and informatization, realizes the transformation and upgrading of the industry, improves the efficacy of resource utilization and promotes the development of the digital economy of society. In the current competitive environment, digital conversion can help logistics companies to share information resources and improve their own service efficiency, thereby strengthening their competitiveness in the marketplace[3].

In conclusion, in line with national and international economic development, the digital revolution in the logistics industry has become an inevitable trend. Only by pushing forward digital transformation can logistics enterprises grasp the opportunities of the times, steadily improve service performance, reduce operating expenses and input, push forward the industry's industrial structural transformation and upgrading, strengthen market competitiveness, and achieve sustainable and rational development.

3. THE PRESENT STATE OF THE ADVANCEMENT OF MODERN LOGISTICS AND THE CHALLENGES IT HAS TO FACE

3.1 Current state of modern logistics development

As the second largest economy in the world, China has a huge economic market and needs an efficient and high-quality transport and logistics system. For China's economy, which is now at a bottleneck in its development, the digital economy can improve the vitality of China's economic development, which has a positive impact on social and economic progress and modernizing[5].

China's digital economy has a catalytic effect on the development of the logistics sector. Modern logistics and e-commerce are closely related, and the development of electronic commerce can promote the scale of logistics and transportation, which reduces transport costs. In additionally, the use of digital technology in the logistics industry can achieve improved operational excellence and visibility of information management, which improves the quality of logistics services.

Informatization

Computerization of logistics is an unavoidable requirement and an important part of social informatization as today's society has entered the information age. The use of information technology in the field of logistics enhances logistics functions such as logistics information

collection, database acquisition, computerized processing of logistical information, standardization of information transfer, and data resource sharing.[5]

Intelligent

Logistics intelligence is formed with the rapidly evolving digital technology. The use of the simulated environment, operations research and other related technologies can correctly and promptly solve various problems of programmed strategy selection, design optimization and adjustment scheduling in the logistics operation process.[10]

Integration

The logistics supply chain is made up of multiple entities and links. In order to increase logistics productivity, the links between the various parts of the supply chain need to be reinforced. This means that a high level of information transfer between up and down stream units is achieved and business processes are closely linked.[8] With the data and technical support of information systems, this integrated logistical framework can make business processes more systematic and standardized, and logistics operations more efficient and responsive.

Socialization

The most obvious trend in the socialization of logistics is the emergence of "third party logistics" or even "fourth party logistics". The trend towards socializing logistics is aimed not only at satisfying the social demand for logistics services, but also at providing a certain social security for logistics activities.[6] Therefore, "third party logistics" and even the possible future development of the "nth type of logistics" are a reflection and inevitable result of the social development of logistics specialization.

Globalization

The trend towards globalization, the function of logistics is to provide high-quality services for international goods and resources, to ensure the quality and quantity of goods at the cheapest available price and with the lowest potential risk in order to achieve international logistical convergence. Facing the new situation of information technology, in order to speed up the pace of the Chinese economy and international economic convergence, China's logistics enterprises must grasp the trend in the development of modern transport logistics, make extensive use of digital management and investment in technology and information technology to boost their competitiveness and general benefits, and improve the logistics industry's management and innovation ability.

3.2 The challenges of modern transport logistics in the digital economy

Inadequate technical and environmental support for logistics in the digital economic environment.

The technology currently used in the logistics industry is not sufficient to meet the needs of the digital logistics business. In addition, due to low levels of capital investment and management, some companies do not have advanced logistics facilities and office supplies and are unable to use the latest technology correctly and efficiently. Another significant development challenge of modern logistics in the digital economy is the shortage of highly qualified and skilled logistics

personnel. The establishment of logistics informatics and digital transformation is hampered by the lack of logistics administrative and specialist personnel.[4]

For the logistics industry in the new development situation, the competent public authorities do not have the proper division of management functions, lack of policy support and insufficient industrial reform, which does not create a good environment for the digital transformation and upgrading of modern logistics.

The infrastructural development is not perfect, and the information management level is not in place.

At this stage, the logistics structure and facility network are not yet fully in place, the functional logistics park system has not yet been established, logistics laws and regulations, etc. on the imperfect, logistics transport and distribution network coverage are not complete, logistics facilities and equipment do not match each other, traffic and logistics transport efficiency are low, high cost[14]. The construction of modern logistics information framework has problems of low information management and service level, unequal distribution of logistics resources, and underutilization of information resources. This leads to poor information connection in the process of logistics and transport. As a result, logistics information cannot be transferred in a timely and appropriate manner, and logistics services are inefficient [2].

The system of logistics services is not sound, with a lack of interconnection and interoperability.

At present, the system of China's logistics industry is still not sound enough, lacking a perfect logistics market mechanism, and there are problems such as incomplete management systems and inconsistent standards. The logistics system is inadequate and it is not easy to achieve a reasonable division of labor and articulation due to the lagging construction of comprehensive transport and logistics. [9]Moreover, the age of the digital economy, logistics is not closely enough connected with other related industries, lacks supply chain thinking and an industrial mechanism for synchronized deployment, resulting in poor inter-industry and inter-system links, poor synergy between upstream and downstream industries, insufficient timely access to logistics information, and struggle to share resourcing, which severely hampers integration of resources in the logistics market and the entire operational effect of the supply chain[14].

The international level of modern logistics is low, and international competition is not robust.

Compared with other developed countries, the level of advanced transportation logistics in China is comparatively backward, the proportion of automated facilities and equipment is small, the development of logistics informatization is lagging behind, there is a lack of sectoral planning and design, the level of logistics informatization is low and cannot meet the development demands of modern logistics in the field of digital economy[4]. Logistics enterprises strive to be "big" but not "strong", and they lack the awareness and ability to innovate, lack the advanced logistics technology in the world, are unable to form their own unique competitive advantages, and find it difficult to form an international logistics industry chain with complete services.

4.DIGITAL TRANSPORMATION CAPABILITY EVALUATION MODEL

4.1Construction Process of Enterprise Digital Maturity Evaluation System

Summarize and summarize the concept of digital transformation capability on the basis of theoretical research, and quantify this abstract concept into a specific digital transformation capability index system, and at the same time, based on the characteristics of China's logistics enterprises, and based on the theoretical framework, construct a comprehensive evaluation model of the digital transformation capability of the logistics enterprises through the research methods such as literature research, field research and experts' surveys, and calculate the weights of the digital evaluation index system by applying the hierarchical analysis method (AHP). Digital evaluation index system weights, assess the enterprise's digital level, determine its enterprise digital transformation ability level, and provide improvement measures for the weak links in the digital transformation of logistics enterprises, so that enterprises can carry out digital transformation according to their own characteristics in a targeted manner.

4.2Digital Transformation Capability Impact Indicators

The evaluation of an enterprise's digital transformation capability can be subdivided into 6 secondary and 16 tertiary indicators from three dimensions (primary indicators), as follows shown in Table 1.

Table 1 Evaluation metrics for enterprise digital transformation capabilities

first class	category B	three-tier
technological change	Digital Foundations	hardware level
		application level
	Digital inputs	automatic
		Informatization
		software level
		Innovative inputs
Organizational management	Digital transformation awareness	Digital Innovation
		Organizational system building
	Organizational strategy	Digitalization strategy
		Human resources management
Digital Transformation Performance	Benefit dimension	QOS
		cost
	Efficiency dimension	market responsiveness
		Efficiency of management decision-making
		Efficiency of production services
		Efficiency of information transfer

4.3 Hierarchical Modeling

Determination of indicator weights

In determining the weights of the factors at each level relative scales are used and two by-two comparisons are made in order to minimize the difficulty of comparing factors of different natures with each other, to improve accuracy, and to rank them according to their degree of importance. a_{ij} For elements i vs. j Importance Comparison Results (as shown in Table 2). The matrix formed by comparing the results of wo by two is called the judgement matrix. The judgement matrix has the following properties:

$$a_{ij} = \frac{1}{a_{ji}}, \tag{1}$$

Table 2 Scale of proportions

Factor i divisor j	Quantitative value
equal importance	1
slightly important	3
more important	5
high priority	7
crucial	9
Intermediate value of two adjacent judgements	2,4,6,8

After obtaining the basic data, in ordo er to compare the degree of influence of the indicators of the same level on the indicators of the previous level corresponding to it, it is necessary to construct a judgement matrix. Let the target level of the enterprise digital transformation capability evaluation system be T, the second-level indicator is $Ti(i = 1\ 2....n)$, the third-level indicator

$$Tij(i = 1, \ 2, \ \cdots, \ n; \ j = 1, \ 2, \ \cdots, \ n), \tag{2}$$

Then

$$T = \begin{matrix} a_{11} & \cdots & a_{1j} & \cdots & a_{1n} \\ \vdots & \ddots & \vdots & \vdots & \vdots \\ a_{i1} & \cdots & a_{ij} & \cdots & a_{in} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ a_{n1} & \cdots & a_{nj} & \cdots & a_{nn} \end{matrix}. \tag{3}$$

Where, when aij Characterized according to the ratio of the importance of the indicator at the upper level to the importance of the indicator at the lower level, the two indicators are the same and equal satisfaction is recorded as 1.

Consistency test：

After constructing the judgement matrix, its eigenvector W and its largest eigenvalue λmax can be obtained by calculation, but in order to avoid obvious logical errors, the consistency test must be carried out on the matrix before using the judgement matrix to find the weights. For the matrix T mentioned above, the steps of consistency test are as follows: ① Calculate the consistency index CI, $CI = (\lambda max - 1)/(n - 1)$, where λmax is the maximum eigenvalue

and n is the matrix order; ② Find the corresponding average random consistency index RI(as shown in Table 3); ③ Solve the CR value under the index by the above formula, specifically $CR = CI/RI$, and characterize the matrix consistency by the final result of CR value to characterize the consistency of the matrix. If the CR is less than 0.1, the consistency can be identified as good, indicating that there is relatively little mutual intervention between the indicators, and they can be used as independent indicators to characterize the digital transformation of the enterprise. On the contrary, the indicator system should be further adjusted so that it can maintain stable consistency. After calculation, the CR value of the indicator system set in this paper ranges from 0.015 to 0.047, which meets the consistency result and can be used as a specific characterization indicator.[12]

e.g. The four tertiary indicators under the organizational management of the first-class indicators are used as an example to illustrate the application of the consistency test in this case, as shown in Table 4 below.

Table 3 Judgement Matrix Mean Random Consistency Indicator RI Value

Matrix order	1	2	3	4	5	6	7	8	9	10
RI	0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49

Table 4 Consistency test results for organizational management

three-tier	judgement matrix	λmax	Consistency test
Digital Innovation	$\begin{bmatrix} 1 & 2 & 1 & \frac{1}{2} \\ \frac{1}{2} & 1 & \frac{1}{2} & \frac{1}{2} \\ 1 & 2 & 1 & \frac{1}{4} \\ 2 & 2 & 4 & 1 \end{bmatrix}$	4.1852	$CR = 0.0686 < 0.1$
Organizational system building			
Digitalization strategy			Passes consistency test
Human resources management			

4.4 Evaluation and Analysis of Enterprise Digital Transformation Capabilities

According to the survey research, the frequency of evaluation indicators is taken as the degree of affiliation of the corresponding indicator to this evaluation level. Taking the organizational structure as an example. it is assumed that 40% of the survey respondents consider the degree of enterprise digital transformation to be "excellent" 20% consider it to be "good", 30% consider it to be "medium", and 10% consider it to be "poor". The degree of enterprise digital transformation is"medium"10% of the respondents think that the degree of enterprise digital transformation is "poor", then the evaluation matrix of the degree of enterprise digital transformation is constructed according to $R = \{0.4, 0.2, 0.3, 0.1\}$. The results of the digital transformation capability assessment of logistics enterprises are shown in Table 5 below:

Table 5 Results of the evaluation of enterprise digital transformation capabilities

Indicators	Excellent	Good	Middle	Differ from
hardware level	0.7	0.1	0.1	0.1
application level	0.4	0.2	0.3	0.1
automatic	0.4	0.3	0.1	0.2

Informatization	0.6	0.1	0.2	0.1
software level	0.7	0.1	0.2	0
Innovative Inputs	0.2	0.1	0.6	0.1
Digital Innovation	0.3	0.3	0.2	0.2
Organizational system building	0.3	0.6	0	0.1
Digitalization Strategy	0.5	0.2	0.3	0
Human resource management	0.7	0.2	0.1	0
QOS	0.5	0.2	0.1	0.2
cost	0.3	0.3	0.2	0.2
market responsiveness	0.5	0.3	0.2	0
Efficiency of management decision-making	0.5	0.2	0.2	0.1
Efficiency of production services	0.4	0.4	0.1	0.1
Efficiency of information transfer	0.6	0.2	0.2	0

4.5 Improvement programmers for digital transformation weaknesses

According to the results of the comprehensive evaluation of the hierarchical analysis of the digital transformation of logistics enterprises in various aspects of the strength of the ability to analyze the weak links into the enterprise's future digital planning priorities, can make the effect of digital transformation of enterprises more significant.

Technological change needs to be strengthened

According to the principle of maximum affiliation, logistics companies are doing relatively well in terms of digital foundation and digital investment. The rating of "medium" for digital transformation capability indicates that the enterprise still has deficiencies in digital innovation and needs to improve its digital innovation capability by increasing investment in R&D and the proportion of R&D personnel.[12]

Improvements needed in organizational management

For organizational management. the ability of organizations to adapt to digital transformation is average, so care should be taken to avoid the disruption caused by the adoption of new digital technologies and business models during the digital transformation process. Organizations need to become more fluid and boundary blurring will increase, so companies need to better adapt their organizational structures to perceive and respond to the digital environment as quickly as possible.[13] Organizational strategies developed and executed through the use of digital resources to create differentiated value will devolve decision- making to lower levels of the organization during the digitalization process, and leaders will need to change their leadership styles or form cross-functional teams to better enable greater organizational flexibility.

Digital transformation requires quality and efficiency

In terms of digital performance, the initial stage of enterprise digital transformation is a relatively large investment in infrastructure development so the payback period is long and the benefits are not yet obvious, but the efficiency gains are significant. Enterprises need to optimize

their supply chains in an extended inter-enterprise network to improve efficiency and extend service value. At the same time, they need to make reasonable and scientific investments and optimize the allocation of resources in combination with supportive local government policies.

5.CONCLUSION

Against the backdrop of the digital economy, China's modern transport logistics is facing many problems and challenges. For example, the article talks about the lack of support for the logistics technology environment, deficiencies in the construction of infrastructure, information management and service systems, and the low level of internationalization of logistics in China. We can only meet the trend of social and economic development by grasping the needs of the times and actively promoting the digital transformation and upgrading of modern logistics. We will accelerate the construction of China's transport logistics network, deepen the digital transformation of transport logistics and improve the modern transport logistics system based on the digital information management system and the development of China's digital economy[15]. Understand and grasp the new trends and directions in the development of modern transport logistics, implement the innovation-oriented strategy, speed up the transformation of logistics dynamics, accelerate the integration of social logistics resources, implement the development strategy of "improve quality, increase efficiency and reduce cost", strengthen the logistics interface, promote the synergetic development of digital industry and improve the international logistics service system. Create a new form of digital transport logistics by encouraging the high-quality growth of modern transport logistics.[7]

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