Industrial Engineering and Innovation Management (2024)
Clausius Scientific Press, Canada

DOI: 10.23977/ieim.2024.070104
ISSN 2522-6924 Vol. 7 Num. 1

Operation Evaluation of China Railway Express Logistics Alliance Based on AHP-Fuzzy Comprehensive Evaluation Method

Quan Zhou[1,a], Jialiang He[1,b], Ye Yan[2,c,*]

[1]Management College, Beijing Union University, Beijing, China
[2]Graduate Studies Office, Beijing Union University, Beijing, China
[a]20231120210317@buu.edu.cn, [b]20221120210308@buu.edu.cn, [c]xxtyanye@buu.edu.cn
[*]Corresponding author

Keywords: Logistics Alliance; China Railway Express; Analytic Hierarchy Process; Fuzzy Comprehensive Evaluation

Abstract: The growth of the logistics sector is becoming more and more significant as the globalization process proceeds. Leading state-owned logistics company in China, China Railway Express is dedicated to integrating logistics resources and offering top-notch logistics services. It forms agreements with other businesses in the logistics space. In addition to the theoretical research on logistics alliances, the study used China Railway Express as the research object, comprehended the actual circumstances surrounding the logistics alliance it had formed, identified the indicator system needed for alliance evaluation, calculated the weights of each index using hierarchical analysis, and evaluated the alliance development's indexes using fuzzy synthesis. This resulted in the evaluation results of the logistics alliance's overall development as well as the overall development of the China Railway Express Logistics Union.

1. Introduction

A logistics alliance is an organization that supports efficient logistics management, places a strong emphasis on teamwork and innovation, and is essential to increasing logistics productivity. Innovation is regarded as the primary driving factor in the current phase of China's economic development and digital transformation. It is preferable to integrate and optimize resources while encouraging innovation and the growth of the logistics sector through logistics alliances. In light of the recent outbreak of the COVID-19 and the railway corporation's reform of freight transit, many logistics companies are searching for more appropriate ways to grow in the current climate. In addition to being a significant player in China's rail freight industry, China Railway Express has started implementing institutional reform in the country's new growth context [1]. However, it has various issues and has difficulties in market competition and process improvement because of its lengthy history of being a planned economy [2]. As a result, assessing overall operations of China Railway Express Logistics Alliance is especially crucial because it fully utilizes the advantages of a logistical alliance.

Previously, foreign scholars were the first to study the formation of logistics alliances. Logistics alliance is a kind of logistics cooperation relationship based on formal mutual agreement, and the enterprises participating in the alliance seek common interests by pooling, exchanging or unifying logistics resources. Logistics alliance is an effective strategy to optimize the supply chain process, reduce costs and improve efficiency. Through the establishment of logistics alliance, enterprises can better cope with market challenges and improve competitiveness. At the same time, the co-operative enterprises still maintain their independence, that is to say, the logistics alliance is to achieve better results than can be achieved by engaging in logistics activities alone, the formation of mutual trust between enterprises, shared risks, shared benefits of the logistics partnership [3]. Bowersox and DonaldJ [4] first defined the logistics alliance, the purpose of logistics alliance is to reduce costs, flexible response to demand fluctuations, reduce capital investment. With the progress of logistics technology in developed countries, the more frequent exchange of logistics information between enterprises and more comprehensive information sharing, enterprises in the continuous formation of logistics alliances, alliance management has become more and more important, L Brekalo [5] put forward a framework of logistics alliance management functions for identifying the characteristics of a particular logistics alliance, and collected a number of new, potential alliances can be a success factor; S Albers [6] comprehensively assesses and synthesizes existing knowledge on logistics alliance design and management, specifically analyzing the integration of horizontal and vertical logistics alliances and their respective characteristics.

Although there are some domestic scholars and enterprises have begun to research and practice logistics alliance, due to the relatively short development time in China, both in theoretical research and practical development, it is not yet sufficient and mature. Most of the domestic scholars analyze the mode operation of logistics alliance and establish an indicator system to further study the development status and characteristics of logistics alliance in China. Chen Yuxin [7] established a logistics alliance warehousing and distribution integration evaluation system based on the logistics alliance formed by platform-based e-commerce enterprises, and applied it to the Alibaba Group of the Rookie Bird Alliance to study the warehousing and distribution model of the logistics alliance. Sun Yanqing [8] analysed the influencing factors of alliance competitiveness by studying the relationship between value chain and competitive advantage and logistics alliance evaluation, constructing logistics alliance partner selection indicator system. Ma Xiaofei [9] conducted an in-depth analysis of the feasibility of logistics alliance warehousing and distribution integration in Guizhou Changhe Changyuan Company.

In the study of China Railway Express enterprise development, Xie Siqian and Yin Bingjie [10] analyse the status quo and shortcomings of the development of cross-border e-commerce logistics alliance under the trade friction between China and the U.S., and put forward its risk prediction and identification paths. Song Yiying and Zhang Zheng [11] take the case of the Qibao logistics alliance to carry out numerical simulation analysis, and put forward a series of recommendations for the stable and healthy operation of the logistics alliance innovation network ecosystem in response to the violation of business ethics in the innovation network of the logistics alliance. Wu Wenjie [12] used PEST model and Porter's five forces model to analyze the environment of China Railway Express, summarize the existing problems, and put forward countermeasures for the development of China Railway Express. Fu Xiaofeng[13], on the other hand, put forward his own insights and thoughts on the transformation and upgrading of China Railway Express. Based on market orientation and enterprise analysis, Wang Peng [14] proposed the development path of China Railway Express regarding logistics market, product, layout, risk and other aspects. In the study of China Railway Express enterprises, there are few studies based on the overall operation of the logistics alliance of China Railway Express, so the evaluation of the operation of the logistics alliance of China Railway Express has a certain guiding significance for the development of the alliance of such state-owned logistics enterprises as China Railway Express.

2. Establishment of evaluation indicator system

Indicator system construction is a more complex process, based on the operation purpose of logistics alliance and the principle of indicator system establishment, and combined with the strategic alliance and strategic objectives of China Railway Express as the core enterprise, through the in-depth understanding of the indicator system established by many domestic scholars researching the logistics alliance, the indicator system that can scientifically and accurately evaluate the logistics alliance of China Railway Express is selected. On the basis of reviewing relevant literature, this paper establishes an operational evaluation indicator system with four first-level indexes of logistics service capability, resource integration and sharing, cooperation and synergy, service convenience and flexibility, and 14 second-level indexes such as cargo integrity, on-time arrival, etc. The complete indicator system is shown in Table 1.

Table 1: Logistics alliance operation evaluation indicator system.

Target level	Factors	Sub-factors
Logistics alliance operation evaluation indicators (T)	Logistics service capability (A)	Goods integrity (A_1)
		On-time deliverability (A_2)
		Timeliness of returns (A_3)
		Emergency response capability (A_4)
	Resource integration and shareability (B)	Degree of corporate convergence (B_1)
		Degree of operational synergy (B_2)
		Degree of sharing of material resources (B_3)
		Degree of sharing of market resources (B_4)
	Cooperative synergy (C)	Degree of work organization (C_1)
		Degree of willingness to cooperate (C_2)
		Reliability (C_3)
	Work convenience and flexibility (D)	Speed of order processing (D_1)
		Advanced information systems (D_2)
		Accuracy of messaging (D_3)

3. Determination of indicator weights based on hierarchical analysis

3.1. Establishment of evaluation indicator weights

In order to ensure the accuracy of the determination of weights, three departmental managers from the Corporate Management Department, Transportation Department and Express Specialized Train Department of China Railway Express, as well as two logistics specialists from the allied enterprises (JD Logistics and S.F. Express), were asked to compare the importance of the indicators of the evaluation indicator system two by two by adopting the 1-9 scaling method, and the actual indexes and the corresponding relationships are shown in Table 2. We distributed the expert scoring questionnaire to 5 experts in order to obtain the judgment matrix of the first-level and second-level indicators. They further calculated the weight of each indicator, using the first expert scoring questionnaire as an illustrative example. Through the analysis of the judgment matrix of the indicators at all levels, the research team was able to derive the weight coefficients, which are presented in Tables 3~7. According to the weights of the first-level and second-level indicators calculated from the five scoring questionnaires, the weight set can be obtained by taking the arithmetic average, as shown in Table 8.

Table 2: Meaning of Scale.

Materiality rating	Scale value
Comparison of two factors with equal importance	1
Comparing the two factors, the former is slightly more important than the latter	3
Comparing the two factors, the former is significantly more important than the latter	5
Comparison of the two factors, the former being the most important than the latter	7
Comparing the two factors, the former is definitely more important than the latter	9

Table 3: Judgement matrix for factors.

T	A	B	C	D	Eigenvector	Weights	Maximum eigenvalue	CR
A	1	1	1/2	1/2	0.707	0.1667	4.000	0.000
B	1	1	1/2	1/2	0.707	0.1667		
C	2	2	1	1	1.414	0.3333		
D	2	2	1	1	1.414	0.3333		

Table 4: Judgement matrix for sub-factors A.

A	A_1	A_2	A_3	A_4	Eigenvector	Weights	Maximum eigenvalue	CR
A_1	1	3	2	1/2	1.316	0.2776	4.031	0.012
A_2	1/3	1	1/2	1/4	0.452	0.0953		
A_3	1/2	2	1	1/3	0.760	0.1603		
A_4	2	4	3	1	2.213	0.4668		

Table 5: Judgement matrix for sub-factors B.

B	B_1	B_2	B_3	B_4	Eigenvector	Weights	Maximum eigenvalue	CR
B_1	1	2	1	1	1.189	0.2857	4.000	0.000
B_2	1/2	1	1/2	1/2	0.595	0.1429		
B_3	1	2	1	1	1.189	0.2857		
B_4	1	2	1	1	1.189	0.2857		

Table 6: Judgement matrix for sub-factors C.

C	C_1	C_2	C_3	Eigenvector	Weights	Maximum eigenvalue	CR
C_1	1	3	3	2.080	0.6000	3.000	0.000
C_2	1/3	1	1	0.693	0.2000		
C_3	1/3	1	1	0.693	0.2000		

Table 7: Judgement matrix for sub-factors D.

D	D_1	D_2	D_3	Eigenvector	Weights	Maximum eigenvalue	CR
D_1	1	3	3	0.794	0.2500	3.000	0.000
D_2	1/3	1	1	1.587	0.5000		
D_3	1/3	1	1	0.794	0.2500		

Table 8: Weighting values of indicators for the comprehensive operational evaluation.

Factors	Weight value	Sub-factors	Weight value
Logistics service capability	0.1603	Goods integrity	0.2273
		On-time deliverability	0.2273
		Timeliness of returns	0.4232
		Emergency response capability	0.1222
Resource integration and shareability	0.0953	Degree of corporate convergence	0.1667
		Degree of operational synergy	0.3333
		Degree of sharing of material resources	0.3333
		Degree of sharing of market resources	0.1667
Cooperative synergy	0.4668	Degree of work organization	0.1634
		Degree of willingness to cooperate	0.5396
		Reliability	0.2970
Work convenience and flexibility	0.2776	Speed of order processing	0.2599
		Advanced information systems	0.3257
		Accuracy of messaging	0.4126

3.2. Consistency check

After finding the eigenvectors and maximum eigenvalues of the judgment matrices, the CI values are also calculated for the consistency check of each matrix.

$$CI = \frac{\lambda_{max} - n}{n-1} \tag{1}$$

The smaller the value of CI, the greater the consistency of the judgment matrix. After that, CI needs to be compared with the random consistency index RI to get CR.

$$CR = \frac{CI}{RI} \tag{2}$$

If CR < 0.1, it means that the current judgment matrix satisfies the consistency check and the calculated weights are consistent.

According to the above calculation principles and steps, taking the first scoring questionnaire as an example, the maximum eigenvalue and eigenvector of each index of the comprehensive operation of China Railway Express Logistics Alliance were calculated respectively, and the eigenvector was normalized, and the consistency check was performed on the judgment matrix, and the eigenvector, i.e., the consistency ratio CR, was shown in Table 3~7. In the first expert scoring questionnaire, all the CR values are less than 0.1, and pass the consistency check. The weight vectors for the indicators at all levels of the China Railway Express Logistics Alliance operation are as follows:

$$\mathrm{W} = (\mathrm{W_A}, \mathrm{W_B}, \mathrm{W_C}, \mathrm{W_D}) = (0.2081, 0.2239, 0.3282, 0.2398)$$

$$\mathrm{W_A} = (0.3040, 0.2250, 0.2305, 0.2405)$$

$$\mathrm{W_B} = (0.2422, 0.2525, 0.2391, 0.2662)$$

$$\mathrm{W_C} = (0.2920, 0.3140, 0.3940)$$

$$\mathrm{W_D} = (0.3627, 0.3727, 0.2646)$$

4. Determination of operating class based on fuzzy comprehensive evaluation

Fuzzy comprehensive evaluation method is a comprehensive evaluation method based on fuzzy mathematics. It is based on the affiliation theory of fuzzy mathematics and transforms qualitative evaluation into quantitative evaluation, and this method is characterized by strong systematic and clear results, which can better solve all kinds of non-deterministic problems. Based on the established evaluation index system for the operation of China Railway Express logistics alliance the satisfaction is divided into five satisfaction levels, so the dynamic comment set $\mathrm{U} = \{\mathrm{u_1}, \mathrm{u_2}, \mathrm{u_3}, \mathrm{u_4}, \mathrm{u_5}\} = \{\text{Very dissatisfied, dissatisfied, general, satisfied, very satisfied}\}$.

In order to visualize the results more, the set of ratings is assigned with corresponding numerical values. In this paper, five values of 50, 60, 70, 80 and 90 are chosen to correspond to the five rating levels of "very dissatisfied, dissatisfied, general, satisfied and very satisfied". Therefore, the comment weight set $\mathrm{P} = \{\mathrm{p_1}, \mathrm{p_2}, \mathrm{p_3}, \mathrm{p_4}, \mathrm{p_5}\} = \{50, 60, 70, 80, 90\}$ can be determined.

In order to evaluate the operation effect of the China Railway Express logistics Alliance, we adopted a questionnaire survey to send questionnaires to the senior management of China Railway Express and the employees of the alliance members, asking them to fill in and obtain the evaluation of the operation of the China Railway Express logistics alliance. In order to ensure the authenticity and validity of the questionnaire, according to the first-level indicators in the comprehensive evaluation index system of logistics alliance operation, the questionnaire was issued to the people including cargo handling and distribution personnel, enterprise executives, the person in charge of business transfer between alliance enterprises and customer service personnel. The evaluation content of the questionnaire is "very dissatisfied, dissatisfied, general, satisfied, very satisfied", 120 questionnaires were returned after 7 days of questionnaire distribution, and 115 valid questionnaires were obtained after finishing, with the recovery rate of the questionnaires reaching 95.8%.

According to the questionnaire filling volume of each indicator in the indicator layer, the membership grade of each indicator can be obtained, after which the corresponding fuzzy evaluation matrix of the indicators in the criterion layer can be determined, which is expressed by $\mathrm{R_i}$. The fuzzy evaluation matrices corresponding to indicators A, B, C and D are $\mathrm{R_1}$, $\mathrm{R_2}$, $\mathrm{R_3}$, $\mathrm{R_4}$ respectively, the details are as follows:

$$\mathrm{R_1} = \begin{pmatrix} 0.0696 & 0.1217 & 0.2261 & 0.2870 & 0.2957 \\ 0.0348 & 0.1391 & 0.2957 & 0.2261 & 0.3043 \\ 0.0957 & 0.1304 & 0.1739 & 0.2609 & 0.3391 \\ 0.0609 & 0.1217 & 0.2087 & 0.2522 & 0.3565 \end{pmatrix}$$

$$\mathrm{R}_2 = \begin{pmatrix} 0.1130 & 0.1391 & 0.4174 & 0.2348 & 0.0957 \\ 0.0783 & 0.1652 & 0.4000 & 0.2522 & 0.1043 \\ 0.0957 & 0.1565 & 0.4000 & 0.2870 & 0.0609 \\ 0.0783 & 0.1478 & 0.5304 & 0.1913 & 0.0522 \end{pmatrix}$$

$$\mathrm{R}_4 = \begin{pmatrix} 0.0783 & 0.0522 & 0.2522 & 0.2000 & 0.4174 \\ 0.0696 & 0.0957 & 0.1913 & 0.1739 & 0.4696 \\ 0.0696 & 0.0609 & 0.2000 & 0.2348 & 0.4348 \end{pmatrix}$$

$$\mathrm{R}_4 = \begin{pmatrix} 0.1739 & 0.4087 & 0.2435 & 0.1217 & 0.0522 \\ 0.2174 & 0.3913 & 0.2174 & 0.1304 & 0.0435 \\ 0.2087 & 0.4174 & 0.2174 & 0.1304 & 0.0261 \end{pmatrix}$$

Through the corresponding fuzzy evaluation matrix of the criterion layer, its corresponding evaluation vector, denoted by $E_i (i = 1,2,3,4)$ can be derived. Taking the logistics service capability indicator as an example, the evaluation vector corresponding to its criterion layer is specified as follows:

$$\begin{aligned} \mathrm{E}_1 &= \mathrm{W}_\mathrm{A} \times \mathrm{R}_1 \\ &= (0.3040, 0.2250, 0.2305, 0.2405) \begin{pmatrix} 0.0696 & 0.1217 & 0.2261 & 0.2870 & 0.2957 \\ 0.0348 & 0.1391 & 0.2957 & 0.2261 & 0.3043 \\ 0.0957 & 0.1304 & 0.1739 & 0.2609 & 0.3391 \\ 0.0609 & 0.1217 & 0.2087 & 0.2522 & 0.3565 \end{pmatrix} \\ &= (0.0657, 0.1276, 0.2255, 0.2589, 0.3223) \end{aligned}$$

Similarly, the evaluation vectors corresponding to the indicators of resource integration and shareability, cooperation synergy, work convenience and flexibility can be obtained as follows:

$$\mathrm{E}_2 = \mathrm{W}_\mathrm{B} \times \mathrm{R}_2 = (0.0909, 0.1522, 0.4389, 0.2400, 0.0780)$$

$$\mathrm{E}_3 = \mathrm{W}_\mathrm{C} \times \mathrm{R}_3 = (0.0721, 0.0693, 0.2125, 0.2055, 0.4406)$$

$$\mathrm{E}_4 = \mathrm{W}_\mathrm{D} \times \mathrm{R}_4 = (0.1993, 0.4045, 0.2269, 0.1272, 0.0421)$$

The comprehensive fuzzy evaluation matrix, denoted by R, can be obtained from the evaluation vectors of the criterion level indicators obtained in the first level fuzzy evaluation.

$$\mathrm{R} = \begin{pmatrix} 0.0657 & 0.1276 & 0.2255 & 0.2589 & 0.3223 \\ 0.0909 & 0.1522 & 0.4389 & 0.2400 & 0.0780 \\ 0.0721 & 0.0693 & 0.2125 & 0.2055 & 0.4406 \\ 0.1993 & 0.4045 & 0.2269 & 0.1272 & 0.0421 \end{pmatrix}$$

This results in a comprehensive fuzzy evaluation vector, denoted by E.

$$\begin{aligned} \mathrm{E} &= \mathrm{W} \times \mathrm{R} \\ &= (0.2081, 0.2239, 0.3282, 0.2398) \begin{pmatrix} 0.0657 & 0.1276 & 0.2255 & 0.2589 & 0.3223 \\ 0.0909 & 0.1522 & 0.4389 & 0.2400 & 0.0780 \\ 0.0721 & 0.0693 & 0.2125 & 0.2055 & 0.4406 \\ 0.1993 & 0.4045 & 0.2269 & 0.1272 & 0.0421 \end{pmatrix} \\ &= (0.1055, 0.1804, 0.2693, 0.2056, 0.2392) \end{aligned}$$

Further uniformization yields the following information.

$$\mathrm{Q} = \mathrm{E} \times \mathrm{P}^\mathrm{T} = (0.1055, 0.1804, 0.2693, 0.2056, 0.2392)(50,60,70,80,90)^\mathrm{T} = 72.926$$

According to the results of uniformization, the overall fuzzy evaluation result of the operation of China Railway Express Logistics Union is "general".

5. Conclusions

According to the comprehensive evaluation results of the comprehensive evaluation indicators of logistics alliance operation, it can be found that the evaluation of the indicators of logistics service capability and cooperation synergy is good; the evaluation of the indicators of resource integration and shareability is general; and the evaluation of the indicators of work convenience and flexibility is the worst. China Railway Express employees and alliance companies expressed high levels of dissatisfaction with the speed of order processing, advanced information systems, and accuracy of messaging, so it is worthwhile to focus on the modernized information technology application aspects of the China Railway Express logistics alliance and make targeted proposals for improvement.

According to the research results, this paper focuses on the following three aspects to put forward the optimization and development strategy of China Railway Express logistics alliance.

(1) Build a self-built distribution system.

With the rapid development of e-commerce and logistics industry, China Railway Express logistics alliance is facing great competitive pressure and market demand, although part of the distribution problem can also be solved through subcontracting, but China Railway Express in the end of the distribution of timeliness of the ability to be more and more insufficient for the response to the customer demand more and more sluggish. For this purpose, China Railway Express can meet the demand of the transportation market by building its own distribution system. China Railway Express should develop modern logistics and distribution centers, based on automation and information facilities to improve the efficiency of logistics operations, and actively learn from the experience of logistics and transport enterprises in the alliance, from learning from other logistics enterprises in the alliance of the distribution model slowly transformed into a combination of their own highway and railroad transport resources to create innovative transport modes.

(2) Realize deep sharing of resources.

China Railway Express has become partners with dozens of enterprises in different fields and established a strategic logistics alliance centered on state-owned enterprises. In the process of business cooperation among many suppliers and logistics and transportation enterprises, there are countless resources that can be utilized, and in order to realize the in-depth sharing and application of resources, enhance the synergy of the alliance enterprises, and better serve the customers, the logistics alliance of China Railway Express should establish a scientific cooperation mechanism, and realize resource sharing, information sharing, business integration and synergistic operation among the alliance members to jointly provide customers with comprehensive logistics services. In order to realize the in-depth sharing and application of resources, enhance the synergy of alliance enterprises and better serve customers, China Railway Express Logistics Alliance should establish a scientific cooperation mechanism to realize resource sharing, information sharing, business integration and synergistic operation among the alliance members to provide all-around logistics services for customers.

(3) Establish an intelligent information system.

China Railway Express Logistics Alliance can provide a big data platform with full functions and simple interface, integrating the information of China Railway Express and all the members in the alliance, which can be used to complete the operation of the business and query the information through the webpage or terminal APP. This platform can integrate all kinds of information of the alliance enterprises, including business information, operation data and financial information, etc., and realize rapid and accurate information transmission and data exchange through network sharing technology. This can effectively solve the problem of information islands, while avoiding repeated entry of information and multiple interruptions of the processing. The platform can also control the logistics transportation process in its entirety through intelligent modules, monitor abnormalities in the transportation process in real time, and issue timely warnings to reduce the expenditure of transportation time and cost.

6. Limitations

This paper takes China Railway Express as the research object, and carries out an in-depth study on its logistics alliance. The applied research on the theory of logistics alliance is a very complex issue, and due to my limited research level, the paper still has some shortcomings. First, in order to improve the operational efficiency of the China Railway Express Logistics Alliance, the operational cooperation status of each alliance member should be evaluated, and the alliance enterprises suitable for long-term cooperation should be screened out; this paper only evaluates the existing alliance composition status, and does not study in depth how to select alliance partners. Secondly, logistics alliance is a dynamic and complex system, which is affected by the external dynamically changing environment, so it is necessary to continue to study the logistics alliance of China Railway Express to improve the new problems that keep appearing, which the research in this paper is not yet able to do. Any logistics alliance is in the process of continuous development and change, future research can still be based on the current situation of the operation of the China Railway Express logistics alliance, to further explore the rationality and development trend of its alliance formation, and to carry out continuous research on the China Railway Express logistics alliance.

References

[1] Peng Fu, Kaiyang Sun, Tengfei Jia. Development Strategy of Multimodal Transport of China Railway Express Beijing Branch [J]. Railway Freight Transport, 2022, 40(07):13-18.

[2] Shangsong Long, Yu Gu, Tianyi Gao, Weihua Liu. The Development Strategy Design of the Road-Rail Multimodal Transport Business of Cross-Border E-commerce Enterprises Based on AHP-SWOT Analysis: Taking China Railway as An Example [J]. Supply Chain Management, 2022, 3(02):85-96.

[3] Shengyu He. Establishment and Development of Logistics Alliance in the E-Commerce Era [J]. Reform of Economic System, 2003(03):47-50.

[4] Bowersox D J , Closs D J , Helferich O K .Logistical management : a systems integration of physical distribution management, material management, and logistical coordination / Donald J. Bowersox [J].Nuclear Science IEEE Transactions on, 1986, 18(4):286-289.

[5] Brekalo L, Albers S, Delfmann W. Logistics alliance management capabilities: where are they? [J]. International Journal of Physical Distribution & Logistics Management, 2013, 43(7):529-543.

[6] Brekalo L, Albers S. Effective logistics alliance design and management [J]. University of Cologne, Department of Business Policy and Logistics, 2015(2).

[7] Yuxin Chen. Research on the Integration of Warehouse and Distribution for Platform-based E-commerce Enterprises under Logistics Alliance [D]. Jiangxi University of Finance and Economics, 2017.

[8] Yanqing Sun. Dynamic Logistics Alliance Partner Selection Research based on E-business Value Chain [D]. Huaqiao University, 2018.

[9] Xiaofei Ma. Study on Integrated Operation of Warehousing and Distribution in Guizhou Changhe Changyuan Company's Logistics Union [D]. Guizhou University, 2021.

[10] Sixin Xie, Bingjie Yin. Risk Prejudgment and Strategic Breakthrough of Cross-Border E-commerce Logistics Alliance under Sino-US Trade Friction [J]. China Business and Market, 2019, 33(02):73-82.

[11] Yiying Song, Zheng Zhang. Design of Knowledge Sharing Behavior Supervision System in Alliance Innovation Network [J]. Logistics Sci-Tech, 2022, 45(05):27-30+35.

[12] Wenjie Wu. Research on the market competition strategy of China Railway Express Company [D]. Jiangxi Normal University, 2015.

[13] Xianfeng Fu. Reflections on the Transformation and Upgrading Development of China Railway Express Transportation [J]. Railway Purchasing and Logistics, 2018, 13(02):46-48.

[14] Peng Wang. Study on the Development Path of Modern Logistics of China Railway Express Based on Market Orientation [J]. China Journal of Commerce, 2019, No. 790 (15):17-20.