

Research Article

Study on the Path of Three-Chain Integration of the Logistics Service Industry in Zhengzhou

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Received 7 May 2021; Revised 24 September 2021; Accepted 13 November 2021; Published 10 January 2022

Academic Editor: Sunil Tiwari

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To optimize the spatial layout of modern logistics services in Zhengzhou, build a driving mechanism for the professional development of logistics services, and promote logistics services to give full play to the driving force of coordinated development of regional economy, we must base ourselves on the logistics service industry chain, strengthen industrial innovation, value innovation and integration innovation, and realize the reconstruction of the value chain of logistics service industry. Based on the three-chain integration theory, this paper constructs a fuzzy comprehensive evaluation model for the three-chain integration of logistics service industry, adopts a combination of qualitative and quantitative methods, evaluates the effect of the three-chain integration of logistics service industry in Zhengzhou, and aims at the problems existing in the process of three-chain integration, such as lack of systematic planning, weak competitiveness, and low profitability. Measures such as improving fiscal and tax incentives, clarifying strategic positioning, overall planning of industry layout, strengthening innovation, and integrating new driving forces for the development of logistics service industry will further promote the in-depth integration of logistics service industry chain, value chain, and innovation chain in Zhengzhou.

1. Problem Presentation

With the proposal of “One Belt And One Road” strategy and the approval of Zhengzhou national central cities, Zhengzhou has been entrusted with the important task of building an international logistics center by its superior geographical position and good transportation system; the National Development and Reform Commission has pointed out that Zhengzhou national central city should be built as a logistics center. Therefore, improving the infrastructure construction of logistics service industry, building a large-scale logistics service center and logistics information hub, innovating the operation and management mode of logistics service industry, and promoting the cost reduction and efficiency increase of logistics service industry are the key measures to accelerate the development of modern intelligent logistics service industry in Zhengzhou, so as to meet the expansion of the demand for logistics service

industry by the optimization and upgrading of regional economic structure, realize the optimal allocation of resources in Zhengzhou, and improve the efficiency and effect of economic operation. The key measures to improve the efficiency and effect of economic operation [1]. By promoting the effective integration of the value chain, industrial chain, and innovation chain of the logistics service industry, this can effectively promote the rapid development of the logistics service industry in Henan Province and comprehensively build Zhengzhou into an international logistics hub city and a domestic logistics hub city.

Based on the development status of Zhengzhou’s logistics service industry, this paper combines the research trends of the three-chain integration of logistics service industry, builds an evaluation model of the three-chain integration level of Zhengzhou’s logistics service industry, explores the specific reasons that affect the integration of industrial chain, logistics chain, and innovation chain in the

development process of Zhengzhou's logistics service industry, and plays a certain role in promoting Zhengzhou's logistics planning optimization, comprehensive allocation of logistics resources, and strategic adjustment of logistics enterprises.

2. Research Review and Research Trends on the Three-Chain Integration of Logistics Service Industry

The task of optimizing and upgrading China's economic structure in the next five years is to deploy the innovation chain around the industrial chain and promote the restructuring and upgrading of the value chain of traditional industries by relying on the innovation chain. The logistics service industry optimizes the allocation of resources at each node of the industrial chain through basic means such as storage, transportation, distribution, and information processing to realize the effect of $1 + 1 > 2$ (Jing) [2].

2.1. Research Status of Three-Chain Integration of Logistics Service Industry. The research results of the three-chain integration of the logistics service industry include connotation definition, internal logic, and mechanism of action, but the results are relatively scarce. Given the development trend of the financial industry, manufacturing industry, agriculture, and other industries and the attempt of three-chain integration development, combined with the development status and development trend of the logistics service industry, this paper elaborates from three dimensions:

- (1) Definition of the connotation of three-chain fusion. As for the connotation of three-chain fusion, different scholars emphasize the definition of three-chain fusion due to their different research perspectives. For example, Yee and Seog [3], David et al. [4], and Lee et al. [5] believe that the key of three-chain integration is the integration of innovation chain, which can promote the transformation of scientific research achievements through the reconstruction of innovation chain and further promote the innovation of products and technologies in the industrial chain. Realize the optimization and promotion of the industrial value chain; Jixin et al. Zhijian Lin [6] think that the three-chain integration refers to the integration of industrial chain, innovation chain, and capital chain, and the mechanism of the integration of the three is the interaction mechanism of the three. Taking Zhejiang smart health industry as the research object, it is proposed to optimize financing channels and improve capital chain to promote technological innovation and knowledge innovation and then provide support for industrial development. Zhou [7] proposed that, by integrating all resources in the industrial chain, including capital and scientific and technological innovation, operating costs can be effectively reduced. Market competitiveness and profitability can be improved [7]. Zijiang [8], from the perspective of the

unbalanced situation of logistics space, believes that the development of the logistics service industry can only be stimulated by the coordinated development of the industrial chain, innovation chain, and value chain [8].

- (2) Study on the interaction mechanism of three-chain fusion. This paper studies the development status of the logistics service industry and, through empirical analysis, identifies the key variables that restrict the development of the logistics service industry and then explores the development trend of the logistics service industry. Yao [9] takes the development of Internet e-commerce shopping platform as the logistics supply chain must be integrated with the development of e-commerce industry to build development advantages [9]. Mahour et al. [10], Manuel et al. [11], and Rivera et al. [12] demonstrated empirically that logistics service industry plays a key role in promoting the optimization and upgrading of industrial value chain from the perspective of resource sharing. Yafei [13] used grey correlation analysis degree to analyze the motivation of logistics development in each node city of "One Belt And One Road" and further pointed out that the key to the development of modern logistics service industry was to promote the improvement of the value chain of the logistics service industry by improving the innovation chain [13]. Wenfu [14] used the annual data of logistics development and GDP to establish a mathematical model after taking the natural logarithm of GDP and goods turnover and pointed out that the logistics service industry could effectively promote economic development through the integration of industrial chain, value chain, and innovation chain [14].
- (3) Study on the implementation path of three-chain fusion. As for the implementation path of three-chain fusion, scholars at home and abroad have achieved abundant research results. Rivera et al. [15] and Kumar et al. [16] took the American logistics industry agglomeration as the research object to analyze the integrated development path of logistics service industry in shaping the advantages of industrial agglomeration. Cui and Song [17], Heitz and Dabanc [18], Sakai et al. [19, 20], Dubie et al. [21], Giuliano et al. [22], and Heitz et al. [23] took China, Paris, Tokyo, Chicago, California, Sweden, and other countries or cities as the research objects, combined with the advantages of regional factors. Research and analyze the specific implementation path in the development process of logistics service industry; Liu and Pingfan [24] started from the perspective of upgrading the value chain of traditional industries. Through empirical analysis, it is believed that the key to promoting the industrial agglomeration effect is to develop the eco-industrial chain with advantageous industries as the core, to improve the innovation chain based on technology and knowledge creation,

and to build an interactive mode among the three by promoting the upgrading of the value chain [24]; Fan [25], from the perspective of steel logistics resource integration, proposed strengthening resource sharing and information exchange among relevant nodes of the industry chain to realize the comprehensive improvement of economic benefits, management benefits, and economic benefits of the logistics service industry [25]. Dongfang [26] made an in-depth analysis of the development status of the logistics industry from the aspects of location conditions, infrastructure, logistics services and industrial environment, government support, and so forth and pointed out that the logistics service industry should strengthen innovation and promote the integrated development of multiple industries [26].

To sum up, although there are few research theories and achievements on the three-chain integration of the logistics service industry, there are many attempts to develop three-chain integration, the development status, and innovation of the logistics service industry, which will provide theoretical support for the research of this topic.

2.2. Internal Mechanism of the Three-Chain Integration of Logistics Service Industry. At each node of logistics service industry chain, there are circulation of innovation and transfer of value. That is, through the innovation of knowledge, technology, products, management methods, and operation mode, the theoretical achievements of logistics development can be transformed into operation management technology of logistics service industry, technology application can promote product innovation, product innovation can strengthen the reform and innovation of development mode of logistics industry, and the innovation chain construction of management innovation of logistics service industry can be realized. Drive the integration and innovation of logistics service content and business modules to promote the increase of added value of the logistics industry, accelerate the structure optimization and development drive mechanism construction of logistics service industry, and realize the systematic development of logistics service industry. The theoretical model of the action mechanism of the three-chain integration of logistics service industry is shown in Figure 1.

First, enhance the industrial value chain based on the value chain. As can be seen from Figure 1, in the logistics service industry chain, demand analysis, design, and development, logistics service and after-sales service belong to high value-added nodes, while the added value of technological innovation, manufacturing, and sales operation is low. On the basis of value chain reconstruction, through innovative operation and management methods and effective use of intelligent information technology, promote the value improvement of each node of the industrial chain and realize the value chain improvement of logistics service industry; that is, realize the integration of industrial chain and value chain [27].

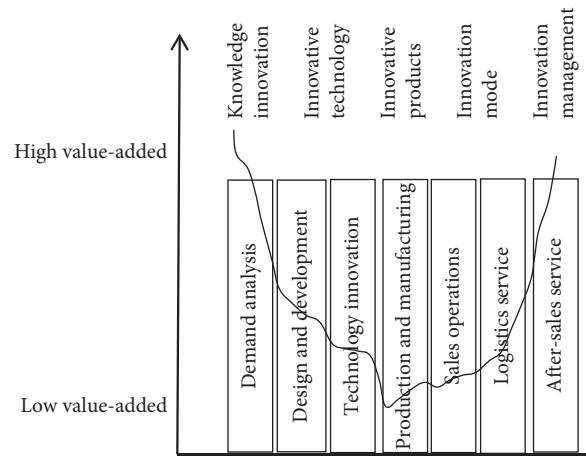


FIGURE 1: Theoretical model of the mechanism of three-chain fusion.

Second, relying on the industrial value chain, accelerate the integration of innovation chain. In the process of upgrading the industrial value chain, relying on the demand for innovation achievements in the layout of the industrial chain, promote more innovation subjects to join the industrial value chain and make accurate positioning, establish cooperative alliances, connect innovation activities, innovation resources, and innovation technologies, and enrich the connotation and forms of innovation activities, so as to optimize and improve the innovation chain and promote the transformation of innovation achievements to meet the development needs of the industrial value chain. At the same time, when the industry develops to a certain extent, it will put forward new requirements for the promotion of the value chain and innovation achievements. Such repetition will realize the coupling and interaction of the industrial chain, the value chain, and the innovation chain, forming a virtuous cycle process of synergy and mutual promotion.

Three-logistics-service-chain integration is the essence of logistics industry value chain, based on the value chain analysis, the traditional industrial chain of a link or entering a new industry chain industry to choose a location, match the knowledge, technology, products, management, and build innovation chain mechanism innovation, with further promotion of industrial value chain [2]. That is to deploy an innovation chain based on the original innovation chain, to realize the codependence and mutual transmission of material, energy, and information among different industries and enterprises, and to realize the flow and circulation of innovation results in different links of the industrial value chain, thus realizing the integration of the three chains. However, the process of three-chain fusion is not one-dimensional. After the innovation chain design, a new industrial chain layout should be started, and then a new value chain analysis and innovation chain design should be carried out. Therefore, the essence of the integration of the industrial chain, value chain, and innovation chain is a dynamic coupling mechanism, which presents a spiral development among the three to meet the needs of industrial economic development at different stages. The dynamic logic model of three-chain fusion is shown in Figure 2.

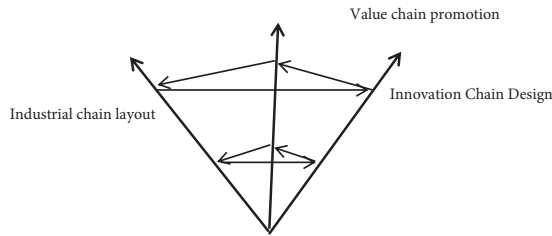


FIGURE 2: Dynamic logic model of three-chain fusion.

3. The Foundation of the Three-Chain Integration of the Logistics Service Industry in Zhengzhou

The logistics service industry plays a key role in promoting industrial integration and industrial structure optimization and upgrading, promoting foreign economic and trade activities, and driving more employment. As a key node city in central China and One Belt And One Road, Zhengzhou is located from east to west and from south to north, and the development of the logistics service industry is of great significance for promoting the optimization and upgrading of industrial structure and accelerating the construction of central China urban agglomeration. However, the logistics service industry in Zhengzhou has not yet formed an intelligent, intensive, and collaborative management mode, and there are problems such as high logistics cost and lack of new technology application, through the guidance of perfect logistics services to support and management system, and vigorously to build large international logistics center development, pay attention to the introduction of big data and cloud platform and Internet technology. A relatively intelligent management mode of logistics service industry has been initially formed. Therefore, the basis of promoting the three-chain integration of Zhengzhou logistics service industry is mainly presented in the following aspects.

3.1. Focus on Regional Advantages and Strengthen the Radiation-Driven Effect of the Logistics Service Industry. By virtue of its location advantage, Zhengzhou has become an important transportation hub city in China. There are not only two railway arteries, Beijing-Guangzhou and Longhai, which meet here, but also many national and provincial trunk roads, such as 310 National Highway and Lianhuo Expressway, which run through Zhengzhou, and Xinzheng International Airport. Convenient traffic conditions lay the foundation for the development of logistics service industry. By the end of March 2021, the number of enterprises engaged in logistics-related business in Zhengzhou was 32,713, accounting for 2/5 of the total number of logistics service enterprises in Henan Province. More than 100 logistics enterprises have a certain scale of development. Through industrial agglomeration, Zhengzhou's modern logistics service industry has begun to take shape, and its industrial driving capacity has been significantly enhanced. At the same time, relying on the "One Belt And One Road" strategy, we will implement the strategy; Zhengzhou vigorously

develops air rail intermodal transport and sea rail intermodal transport to connect the maritime Silk Road. The development of economic and trade activities along the Silk Road and the operation of Zhengzhou-Europe trains have promoted the rapid development of Zhengzhou's logistics service industry. Its business radiates to 34 provinces, autonomous regions, and municipalities directly under the central government and more than 100 foreign countries. The internationalization of the logistics service industry extends the industrial chain of Zhengzhou's logistics service industry and strengthens the construction of value chain and innovation chain to provide a basis for development.

3.2. Promote the Adjustment of Industrial Structure and Strengthen the Agglomeration Effect of the Logistics Service Industry. Under the organization and guidance of the provincial party committee and the provincial government, Zhengzhou has accelerated the construction scale and speed of Zhengzhou logistics service industry park by actively undertaking the advantageous industries of coastal cities, increasing the investment in the infrastructure construction of logistics service industry, improving the management policies of logistics service industry, and attracting investment, so as to continuously optimize the logistics service industry structure of Zhengzhou and improve the overall economic development situation. With the optimization of industrial structure and commercial reform in Zhengzhou, Zhengzhou has undergone qualitative changes in international trade. At present, the ten characteristic industries in Zhengzhou, such as medical medicine, food cold chain, automobile manufacturing, textile and clothing, and grain and flowers, have a good development momentum. The logistics parks and third-party logistics enterprises based on the ten characteristic industries have also entered a stage of rapid development, innovating the operation mode of new business forms of the logistics industry, such as cross-border e-commerce, cold chain distribution, and assembly manufacturing and distribution industry. It provides a basic guarantee for Zhengzhou to cultivate and expand logistics enterprises, establish an international logistics service system in line with the world, promote the intelligent and intensive development of logistics service industry, and improve the core position of Zhengzhou in China's logistics service industry structure.

3.3. Increase the Investment Scale and Make the Distribution of the Logistics Service Industry Reasonable. Clarify the strategic positioning of logistics service industry in Zhengzhou, increase investment, and improve the function of logistics comprehensive information platform through the introduction of modern equipment. Effectively strengthen the service capacity of logistics informatization, build a modern logistics hub, and make the industrial layout of logistics service industry in Zhengzhou more reasonable. Five international logistics hub service areas will be formed, namely, the North Logistics Service Area, the West Logistics Service Area, the South Logistics Service Area, the International Logistics Service Area, and the Aviation Logistics

Service Area. At the same time, Zhengzhou and Henan Investment Group Co., Ltd. have jointly established Henan Zhongyuan Modern Logistics Co., Ltd. and plan to complete the development and operation of five modern logistics hubs in Zhanyang, Xuedian, Shangjie, Guangwu, and Zhengzhou International Logistics Park in Zhengzhou by 2023. The total investment scale of the project reaches 12 billion yuan, and the annual freight service volume is expected to exceed 50 million tons. It provides power for extending the material strip of Zhengzhou logistics service industry and promoting the value promotion of logistics industry chain. In particular, the construction of the international inland port in the economic development zone, which connects the railway port, highway port, port, and airport to realize the linkage of four ports, not only promotes the integration of logistics resources and the agglomeration of the logistics industry in Zhengzhou but also promotes the development of the export-oriented economy in the inland areas. Through several measures, the layout of the logistics service industry in Zhengzhou is more reasonable, and multimodal transport, information intelligence, and cost minimization are realized. Among them, Zhengzhou international inland port core opening support is Zhengzhou-Europe international freight train.

4. Establishment of Evaluation Mechanism Model of Three-Chain Integration in Logistics Service Industry

4.1. Thoughts on Evaluation of the Three-Chain Integration Level of the Logistics Service Industry. The evaluation of the three-chain integration level of the logistics service industry is a comprehensive evaluation of the effect of the three-chain integration of the logistics service industry. According to the goal of three-chain integration of logistics service industry in Zhengzhou, this paper comprehensively evaluates the effect of three-chain integration of logistics service industry by constructing a scientific and reasonable evaluation index system and selecting appropriate evaluation methods. The purpose of the evaluation of the three-chain integration level of logistics service industry is to scientifically and objectively reflect the effect of the three-chain integration of logistics service industry, timely find the problems existing in the process of the three-chain integration of logistics service industry in Zhengzhou, and take corresponding measures for correction and improvement, so as to continuously improve the three-chain integration level of logistics service industry in Zhengzhou. The specific evaluation ideas can be as follows: determine the evaluation index system, collect and process data, determine the evaluation method and model, model evaluation, and output evaluation results.

4.2. Construction of the Evaluation Index System for the Three-Chain Integration Level of the Logistics Service Industry. The evaluation index system of the three-chain integration level of the logistics service industry is the premise and foundation of the evaluation of the three-chain integration level of the logistics service industry. Therefore, it is

necessary to construct a scientific and reasonable evaluation index system for the three-chain integration of the logistics service industry according to the connotation, mode, and operation mechanism of the integration of the logistics service industry.

According to the research status at home and abroad and the development status of logistics service industry in Zhengzhou, this paper constructs the evaluation index system of three-chain integration level of logistics service industry from the perspective of supply and demand from four aspects: logistics infrastructure resource integration level, industrial chain related organization resource integration level, logistics innovation service integration level, and logistics organization income level, as shown in Table 1.

4.2.1. Integration Level of the Logistics Infrastructure Resources. The main goal of the three-chain integration of the logistics service industry is to effectively improve the value positioning of the logistics service industry in the industrial chain by innovating the mode and connotation of the logistics service industry. According to the characteristics of the logistics industry, the operation process mainly involves the use of storage, transportation, and information integrated system platform. Therefore, the utilization efficiency of resources such as storage, transportation, and information integrated system platform is used to measure the resource integration level of logistics infrastructure.

- ① Warehouse logistics utilization rate reflects the efficiency level of storage resources, expressed by the ratio of the total logistics demand to the total storage facilities.

Warehouse logistics utilization rate = total demand for steel logistics / total storage facilities.

- ② The average logistics utilization rate of freight vehicles reflects the efficiency level of transport resources, which is expressed by the ratio of the total logistics demands to the number of freight vehicles. The average logistics utilization rate of freight vehicles = the total demand of steel logistics / the number of freight vehicles.

- ③ Utilization rate of information integrated system platform reflects the use of information platform, which is expressed by the ratio of the total amount of information integrated system platform to the demand of the logistics platform.

The utilization rate of information integrated system platform = demands of logistics platform / total amount of information integrated system platform.

4.2.2. Resource Integration Level of Industrial Chain Related Organizations. Integrating the three chains of the logistics service industry needs the cooperation of all enterprises in the industry chain. To some extent, the level of resource integration of industrial chain related organizations is determined by cooperation among various organizations, on the one hand, technology research and development service

TABLE 1: Evaluation index system of three-chain integration of logistics service industry in Zhengzhou.

| | | |
|---|--|---|
| Evaluation index system of three-chain integration of logistics service industry in Zhengzhou | Integration level of logistics infrastructure resources | Utilization rate of warehouse logistics Average logistics utilization rate of freight vehicles Utilization rate of information integrated system platform |
| | Resource integration level of industrial chain related organizations | Organizational resource sharing level Complementation of logistics resources Cooperation trust |
| | Logistics innovation service integration level | Logistics demand response speed Accuracy of logistics activities Logistics service flexibility |
| | The level of profitability of the logistics organization | Economic benefits Management of earnings Technical benefits |

enterprises, manufacturing enterprises, logistics and distribution enterprises, after-sales service enterprises, and other related enterprises under the guidance of a certain operation mechanism, to achieve the common, sharing, and complementary logistics service resources and, on the other hand, production enterprises, marketing enterprises, logistics enterprises, and other related enterprises through cooperation can quickly respond to the logistics service demand and can share or disperse part of the risk. Given this, the resource integration level of related organizations in the industrial chain is measured by the indexes of resource sharing level, complementation, cooperation trust, and so on.

- ① Sharing level of organizational resources: it reflects the sharing degree of organizational resources among relevant subjects of the industrial chain. The greater the openness of information and resources of each subject, the higher the level of sharing income.
- ② Complementation of logistics resources: it reflects the differentiation and complementation of logistics resources. The integration of logistics resources of different organizations in the industrial chain can promote and realize the complementation of the logistics resources of various enterprises.
- ③ Cooperative trust: cooperative trust is the premise of cooperation between enterprises. The higher the trust of each enterprise through cooperation, the more conducive to the improvement of the three-chain integration level of the logistics service industry.

4.2.3. Logistics Innovation Service Integration Level.

Logistics service innovation on the integration of industrial chain of each node resources position, function, demand, state, and target customers to effectively integrate organizational relationships and service already achieved the goal of service innovation; logistics service mode innovation is the content of the response speed and accuracy of logistics activities by logistics demand and flexible logistics services to measure.

- ① Logistics demand response speed: It reflects the service demand of the logistics enterprise and the

processing speed of the logistics demands of the enterprise, and it is expressed by the time to complete the relevant service.

- ② Accuracy of logistics activities: It is the basic requirement of logistics services. Accuracy of logistics activities is by customer requirements, the product by the specified time and place of good delivery.
- ③ Logistics service flexibility: It reflects the ability to adapt to the change of logistics demand and service.

4.2.4. The Income Level of Logistics Organization.

Through the integration of the three chains of the logistics services, it can not only give play to the function of logistics service industry in the whole industrial chain but also further expand the scope of the logistics service through service innovation and value innovation, comprehensively improve the service level of the logistics service industry, and effectively reduce and avoid the repeated investment and construction of logistics resources. The fundamental purpose of the three-chain integration of the logistics service industry is to maximize the economic benefits of all parties in the logistics service industry, maintain a cooperative game relationship through innovation and value reconstruction of the industrial chain, and realize the goal of bringing benefits to all parties of supply and demand. Therefore, the income analysis in the integration of logistics resources is used to measure the income level of the logistics service industry from three aspects: economic income, management income, and technical income.

- ① Economic income: Reflecting the integration of the three chains of the logistics service industry for technical service enterprises, production enterprises, marketing enterprises, logistics enterprises, and other interest related enterprises brought the most direct income, which is also the most important income, that is, economic income. The profit growth rate is used to measure the direct benefits generated by the integration of three chains in the logistics service industry.

Economic income = (profit after the enterprise participates in the three-chain fusion – profit before the

enterprise participates in the three-chain fusion)/profit before the enterprise participates in the three-chain fusion.

- ② Management benefit: The management benefit brought by integrating the three chains of the logistics service industry for production enterprises, iron and steel trading enterprises, logistics enterprises, and other related enterprises. Through the three-chain integration of logistics service industry, relevant cooperative enterprises can learn from each other's advanced business concepts, management methods, and systems to improve their management level. For example, when the third-party logistics enterprises cooperate with the production enterprises, the logistics enterprises can learn from the modern operation and management concepts of the production enterprises. The production enterprises can learn from the professional logistics management methods of the logistics enterprises.

Management income = (the management level after the enterprise participates in the three-chain fusion – the management level before the enterprise participates in the three-chain fusion)/the management level before the enterprise participates in the three-chain fusion

③ Technical benefits: Through the integration of three chains of the logistics service industry, related cooperative enterprises can obtain economic benefits and management benefits as well as various technical benefits. Through the application of modern information technology, such as logistics management information system and positioning system, logistics resources can be scientifically and effectively allocated and then improve the income level of related organizations in the logistics service industry.

Technical benefit = (the technical level after the enterprise participates in the three-chain fusion – the technical level before the enterprise participates in the three-chain fusion)/the technical level before the enterprise participates in the integration.

4.3. Establishment of Evaluation Model for the Three-Chain Integration Level of Logistics Service Industry. In the evaluation index system of the three-chain integration level of the logistics service industry, there are qualitative and quantitative indexes, and the fuzzy comprehensive evaluation method can well integrate the two indexes into the evaluation system. The fuzzy comprehensive evaluation method can deal with the indexes that are difficult to be quantified. The fuzzy

comprehensive evaluation method is used to evaluate the three-chain integration level of the logistics service industry, which makes the evaluation more consistent with the actual situation and more reasonable. A fuzzy comprehensive evaluation is adopted to make the comprehensive evaluation of three-chain fusion transform between qualitative and quantitative indexes. Combined with the mathematical membership theory, the evaluation is more systematic, and the evaluation results are relatively clear. Steps of fuzzy comprehensive evaluation method are demonstrated as follows.

4.3.1. Determine the Evaluation Object Factor Set. The evaluation object factor set consists of several evaluation indexes, and the factor set $U = \{u_1, u_2, u_3, \dots, u_n\}$, where $u_1, u_2, u_3, \dots, u_n$, represents different influencing factors. If the factors affecting the target layer are stratified in the evaluation system, a multilevel model can be adopted.

4.3.2. Determine the Evaluation Set. The evaluation set is used to represent the degree of the merits and demerits of the evaluated objects. According to the specific research needs, the number of the registered merits and demerits of the evaluated objects can be positively defined and represented by V . The evaluation set is $V = \{v_1, v_2, v_3, \dots, v_n\}$.

4.3.3. Establish Fuzzy Membership Matrix. According to the evaluation set, the factor set is evaluated; that is, the fuzzy mapping from U to V is established, which can be described by the fuzzy management matrix R . R_{ij} indicates the degree of subordination to grade J comments on the i th indicator.

$$R = \begin{bmatrix} r_{11} & r_{11} & \dots & r_{1n} \\ r_{21} & r_{21} & \dots & r_{2n} \\ \dots & \dots & \dots & \dots \\ r_{m1} & r_{m1} & \dots & r_{mn} \end{bmatrix} \tag{1}$$

4.3.4. Determine the Weight Vector of Evaluation Factors. $A = (a_1, a_2, \dots, a_m)$ is a weight set, and a_i represents the weight of the i th indicator in the indicator set U .

$$\sum_{i=1}^m a_i = 1. \tag{2}$$

4.3.5. Synthesis Result Vector. Using the operator to synthesize the matrix, the evaluation results based on a fuzzy algorithm can be obtained.

$$A * R = (a_1, a_2, \dots, a_m) * \begin{bmatrix} r_{11} & r_{11} & \dots & r_{1n} \\ r_{21} & r_{21} & \dots & r_{2n} \\ \dots & \dots & \dots & \dots \\ r_{m1} & r_{m1} & \dots & r_{mn} \end{bmatrix} = (b_1, b_2, \dots, b_m) = B. \tag{3}$$

The corresponding results can be obtained by calculating column J of A and R and can be represented by b_j . In contrast, V_j can be used to represent the fuzzy subset of the evaluated object as a whole.

4.3.6. Analyze the Result Vector of the Fuzzy Comprehensive Evaluation. The maximum membership principle is used to analyze the result vector of fuzzy comprehensive evaluation.

4.4. Evaluation on the Effect of Three-Chain Integration of Logistics Service Industry in Zhengzhou. Based on the logistics industry, through value chain reconstruction and innovation chain integration, Zhengzhou's logistics service industry has gathered stakeholders such as technology research and development enterprises, production enterprises, trade enterprises, logistics enterprises, and logistics parks and built an industrial network with certain integration capabilities. Users of the logistics service industry can choose their own products and related logistics services on the platform according to their needs, thus realizing the organic and dynamic integration of the value chain, industrial chain, and innovation chain of the logistics service industry [28]. Through the investigation of major logistics industrial parks and representative logistics enterprises in Zhengzhou, the rationality and feasibility of the evaluation index system and evaluation model of the three-chain integration level of the logistics service industry are verified.

4.4.1. Constructing the Hierarchy Chart of the Evaluation Index of the Three-Chain Integration Level of Zhengzhou Logistics Service Industry. According to the evaluation index system of the three-chain integration level of the logistics service industry in Zhengzhou, the fuzzy comprehensive evaluation hierarchy is constructed, as shown in Table 2.

4.4.2. Determine the Weight of Evaluation Indicators. According to the hierarchical structure diagram of fuzzy comprehensive evaluation in Table 2, the analytic hierarchy process (AHP) was adopted to calculate the weight of the two-level evaluation indexes.

$$(i) w = (0.135, 0.357, 0.265, 0.243)$$

$$(ii) W_1 = (0.282, 0.285, 0.433)$$

$$(iii) W_2 = (0.242, 0.295, 0.463)$$

$$(iv) W_3 = (0.275, 0.358, 0.367)$$

$$(v) W_4 = (0.171, 0.286, 0.543)$$

4.4.3. Determine the Evaluation Set. The comprehensive evaluation is divided into five levels, from good to bad, that is, the evaluation set. $V = (v_1, v_2, v_3, v_4, v_5) = (\text{Excellent, Good, Normal, Poor, Worse})$.

4.4.4. Determine the Fuzzy Evaluation Matrix. The membership matrix of the second-level evaluation index is obtained by experts after statistical processing of the evaluation data of each index according to the rating set.

$$\begin{aligned} R_1 &= \begin{bmatrix} 0.1 & 0.3 & 0.1 & 0.2 & 0.2 \\ 0.1 & 0.2 & 0.2 & 0.3 & 0.2 \\ 0.1 & 0.2 & 0.2 & 0.3 & 0.2 \end{bmatrix}, \\ R_2 &= \begin{bmatrix} 0.2 & 0.1 & 0.2 & 0.3 & 0.2 \\ 0.1 & 0.1 & 0.1 & 0.3 & 0.4 \\ 0.1 & 0.2 & 0.3 & 0.3 & 0.1 \end{bmatrix}, \\ R_3 &= \begin{bmatrix} 0.2 & 0.3 & 0.1 & 0.3 & 0.1 \\ 0 & 0.2 & 0.2 & 0.4 & 0.2 \\ 0.1 & 0.1 & 0.3 & 0.4 & 0.1 \end{bmatrix}, \\ R_4 &= \begin{bmatrix} 0 & 0.1 & 0.2 & 0.3 & 0.2 \\ 0.1 & 0.2 & 0.2 & 0.3 & 0.2 \\ 0 & 0.2 & 0.2 & 0.4 & 0.2 \end{bmatrix}. \end{aligned} \quad (4)$$

4.4.5. Fuzzy Comprehensive Evaluation Calculation. According to the membership matrix, the membership vector of the first level index can be obtained.

$$V_1 = W_1 * R_1 = (0.282, 0.285, 0.433) * \begin{bmatrix} 0.2 & 0.3 & 0.1 & 0.2 & 0.2 \\ 0.1 & 0.2 & 0.2 & 0.3 & 0.2 \\ 0.1 & 0.2 & 0.2 & 0.3 & 0.2 \end{bmatrix} = (0.128, 0.228, 0.172, 0.272, 0.200). \quad (5)$$

According to this algorithm, the membership vectors of the other four dimensions are obtained.

$$\begin{aligned} V_2 &= (0.124, 0.146, 0.217, 0.300, 0.213), \\ V_3 &= (0.092, 0.191, 0.209, 0.372, 0.136), \\ V_4 &= (0.029, 0.183, 0.200, 0.388, 0.200). \end{aligned} \quad (6)$$

The fuzzy comprehensive evaluation matrix is obtained.

$$R = \begin{bmatrix} 0.128 & 0.228 & 0.172 & 0.272 & 0.200 \\ 0.124 & 0.146 & 0.217 & 0.300 & 0.213 \\ 0.092 & 0.191 & 0.209 & 0.372 & 0.136 \\ 0.029 & 0.183 & 0.200 & 0.388 & 0.200 \end{bmatrix}. \quad (7)$$

TABLE 2: Fuzzy comprehensive evaluation hierarchy structure of three-chain fusion in Zhengzhou logistics service industry.

| | | |
|---|--|--|
| Evaluation index system of three-chain integration of logistics service industry in Zhengzhou | Integration level of logistics infrastructure resources | Utilization rate of warehouse logistics (I_{11}) Average logistics utilization rate of freight vehicles (I_{12}) Utilization rate of information integrated system platform (I_{13}) Organizational resource sharing level (I_{21}) |
| | Resource integration level of industrial chain related organizations | Complementation of logistics resources (I_{22}) Cooperation trust (I_{23}) Logistics demand response speed (I_{31}) |
| | Logistics innovation service integration level | Accuracy of logistics activities (I_{32}) Logistics service flexibility (I_{33}) Economic benefits (I_{41}) |
| | The level of profitability of the logistics organization | Management of earnings (I_{42}) Technical benefits (I_{43}) |

The comprehensive evaluation results are obtained further.

$$V = W^*R = (0.135, 0.357, 0.265, 0.243)^* \begin{bmatrix} 0.128 & 0.228 & 0.172 & 0.272 & 0.200 \\ 0.124 & 0.146 & 0.217 & 0.300 & 0.213 \\ 0.092 & 0.191 & 0.209 & 0.372 & 0.136 \\ 0.029 & 0.183 & 0.200 & 0.388 & 0.200 \end{bmatrix} = (0.093, 0.178, 0.204, 0.337, 0.188). \quad (8)$$

Combined with the survey data of logistics service industry related enterprises and parks in Zhengzhou, according to the principle of maximum membership degree, the evaluation results show that the three-chain integration level of the logistics service industry in Zhengzhou is poor. From the four dimensions of influencing factors of Zhengzhou logistics service industry's three-chain integration level, the three-chain integration of Zhengzhou logistics service industry is poor, which can be seen as follows: the integration efficiency of Zhengzhou logistics service industry's value chain and industrial chain is low, the integration of innovation chain and industrial chain is disjointed, and the integration effect of innovation chain and value chain is poor. Zhengzhou chain present situation and the effect evaluation, and can guide the government in formulating the logistics services guide support policy system construction and logistics enterprise strategy planning is of great significance.

5. Analysis of the Reasons Influencing the Three-Chain Integration of the Logistics Service Industry in Zhengzhou

The integration of the three chains of the logistics service industry in Zhengzhou can promote the logistics service industry, the transformation and upgrading of logistics enterprises, and the construction of the new modern

logistics service system and the upgrading of the value chain of the logistics industry. According to the comprehensive effect evaluation of the three-chain integration of Zhengzhou logistics service industry, it can be seen that the integration effect of Zhengzhou logistics service industry chain, value chain, and innovation chain is poor. The poor integration effect can be analyzed from three aspects: the integration efficiency of value chain and industry chain, the convergence degree of innovation chain and industry chain, and the integration effect of innovation chain and value chain.

5.1. Low Efficient Integration for Value Chain and Industry Chain in Logistics Service Industry. The relationship of each link in the value chain is interrelated. The importance of any link and its influence on other links are reflected in its position in the value chain. Given the logistics service, industry value chain can be divided into three links, namely, the upstream link, the intermediate link, and the downstream link, logistics is integration, service development and integration of logistics technology belong to the upstream link, and the ability to create logistics services and supply belong to the intermediate links, and logistics service belongs to the downstream link sales and after-sales service. The core of the upstream link is knowledge creation and technology integration, the core of the midstream link is infrastructure construction and capacity construction, and the core of the downstream link is market demand.

Therefore, it can be seen that the key to the integration of value chain and industrial chain of logistics service industry lies in the reconstruction of the entire industrial value chain, technology application, management innovation and infrastructure configuration, and so forth. The reasons for the low efficiency of the integration of the two can be further analyzed from the following aspects:

- (1) Lack of systematic planning for the development of the logistics industry. Although Zhengzhou occupies a regional advantage, due to the lack of policy guidance and support, the city positioning is not clear enough at the early stage, leading to the late start of the development of modern logistics; the logistics market in the unified supervision and overall planning still need to be strengthened, and the distinctive and professional logistics business mode still needs to be innovated and reconstructed. At the same time, with the established as a national central city of Zhengzhou city, building “three areas, a group of” and “area”, the implementation of the strategic national logistics service function has carried on the relocation of Zhengzhou, the logistics service industry to develop rapidly, but too fast speed makes the development of logistics industry policies and regulations innovation relatively lagging. There are some links of the absence of laws and regulations and the lack of policy and illegal phenomenon.
- (2) Backwardness of intelligent information technology. Zhengzhou’s logistics information technology and equipment are still a bit backward, and the distribution infrastructure is weak. Most logistics companies have not introduced intelligent logistics management information system, which leads to the lack of information chain and the inability to connect information among logistics industries, resulting in the ineffective allocation of resources among logistics industries, which leads to vicious competition between logistics enterprises and the inside and outside of logistics industries. The degree of mechanization and automation of logistics enterprises in some logistics parks needs to be strengthened. The logistics operation is still operated by manual labour, and the office automation technology has not been widely promoted, which leads to the low efficiency of the overall logistics operation and the dilution of the operating benefits of logistics enterprises.
- (3) Low management level. Most of Zhengzhou city logistics park and logistics enterprises lack innovation in the management of service, service content, and the methods of the single, backward management model, business mode, and content of the lack of overall innovation consciousness, transport, and warehousing business content single only for service-oriented business such as foundation, the service, and a lack of internal management rules and regulations, as well as lack of their brand building

awareness and brand management concept. Logistics enterprises exist independently among departments and regions so that rights and responsibilities overlap among departments and regions, and unclear responsibilities and rights lead to low management efficiency.

- (4) The air-ground connection needs to be improved. The development of logistics service industry cannot be separated from the effective support of basic transportation network and information service network. Because of the obvious modularity of administrative management, Zhengzhou's basic transportation network, integrated information service platform, aviation hub, and other functions lack integration, and there is no effective connection between industries, insufficient interaction, and virtuous circle, which greatly reduces the accuracy and safety of logistics, weakens the speed and efficiency of air logistics transportation, and restricts the improvement of logistics service level and the expansion of service scope.

5.2. Disintegration between Innovation Chain and Industrial Chain of Logistics Service Industry. Due to the low degree of connection between the educational mechanism and the market economic mechanism, innovation activities are decoupled from economic activities. On the one hand, economic activities have no mechanism to guide the demand for innovation activities, which leads to the blind lack of systematic planning and direction for the development of entrepreneurial activities. Innovation achievements are independent of each other, and repeated and worthless innovation development consumes many resources. On the other hand, due to the lack of practical support from economic activities, the transformation rate of innovation achievements is low, and the value function of innovation cannot be fully exerted. As a result, many achievements are difficult or not transformed into actual products, and it is difficult to realize the industrialization of scientific research achievements. As a result, the logistics service industry in Zhengzhou has some several problems such as low business innovation ability, lagging business integration innovation mode, and weak competition ability.

- (1) Weak competitiveness. Zhengzhou's logistics service industry is still in the period of development and construction, the agglomeration effect of logistics parks has not been effectively exerted, and the service content, scope, and radiation function of logistics enterprises are still at a low level. For example, the additional services of logistics are relatively lacking, the spatial distribution of service resources is relatively discrete, the scale effect is insufficient, and the business services are scattered and unitary. As a result, domestic logistics services cannot effectively compete with some developed countries. Given this situation, the main reason lies in the lack of effective matching between the logistics service industry and

innovation activities, which leads to the single path of service innovation, scope innovation, and function innovation of the logistics service industry.

- (2) Lack of innovation in the integration mode of the logistics service industry chain. The construction of logistics infrastructure and network system in Zhengzhou needs to be strengthened. On the one hand, the single function of logistics information service platform leads to the lack of integration of logistics resources, lack of sharing among logistics industries and low efficiency, and low utilization rate of transportation and storage facilities. On the other hand, the current logistics transportation mode is backward, the circulation speed is slow, the efficiency is low, the cost is high, and the consumption rate is high. As a result, Zhengzhou logistics service industry has not yet reached the due effect of the international logistics network.
- (3) Low attraction ability of logistics service industry. Although Zhengzhou is currently a key node city of One Belt And One Road and a national central city and strives to build an inland airport in central China, there is still a certain lack of attraction in terms of the city. Internationally renowned logistics enterprises, including transportation enterprises, logistics service enterprises, and professional logistics real estate developers, will prioritize Wuhan, Xi'an, and other inland cities. The main reason for the lack of attraction of the logistics service industry lies in the lack of innovation in the construction of logistics infrastructure and logistics development environment, making the logistics resource foundation weak, and it has not yet formed a perfect logistics ecosystem.

5.3. Poor Integration of Innovation Chain and Value Chain in the Logistics Service Industry. With the establishment of Zhengzhou as an international logistics hub and central city, the competition of the international logistics service industry has entered the stage of innovation value chain competition from product competition. Only by upgrading and improving the service value chain can the development of the low-end circular logistics service industry be broken through. However, there are still some problems in the process of the integration of the innovation chain and value chain of the logistics service industry in Zhengzhou. Due to the poor integration effect of the innovation chain and value chain, the profit level, management income, and technical income level of the logistics industry have decreased significantly.

- (1) The profit level of logistics enterprises declines. Take Zhengzhou International Logistics Park, one of the four state-level demonstration logistics parks in Henan Province, as an example. In 2020, Zhengzhou International Logistics Park completed the fixed asset investment of 12.58 billion yuan, with a year-on-year growth of 11.3%. Revenue from the service

sector reached 45.7 billion yuan, up 13% year on year. However, the growth rate of the main business cost is significantly higher than the growth rate of the income level, leading to the decline of the profit level. The main reason for its existence is that the rapid growth of workforce, management, rent, and other costs results in a sharp increase in the operating pressure of logistics enterprises and the contraction of profit space, and even some warehousing enterprises and logistics parks appear to suffer from losses.

- (2) Low management efficiency. Due to the lack of guidance, logistics parks and logistics enterprises in Zhengzhou lack effective integration planning, the fragmented phenomenon is still relatively serious, laws, regulations, and policies system and industry integrity system still need to be strengthened and improved, and the market order is relatively chaotic. At the same time, the proportion of traditional logistics is large, the number of logistics enterprises is large, the scale is small, the strength is weak, the function is single, resulting in the logistics service industry concentration being not high, the business is not centralized, the service consciousness is weak, and the maturity is not high.
- (3) The technical efficiency has not been effectively played. For most of the logistics park of Zhengzhou city is still in the initial stage of development, the aviation logistics talent shortage, uneven levels, lack of aviation logistics service concept, service business and service level consciousness, lack of boast, the global consciousness, and the lack of standardized service rules, relative foreign logistics industry service level is low, causing a bigger effect on our country's aviation logistics.

6. Suggestions for Promoting the Three-Chain Integration of Logistics Service Industry in Zhengzhou

Combined with the specific reason why the Zhengzhou logistics service industry value chain, industry chain, and innovation chain fusion effect is poorer, use comprehensive fuzzy analysis matrix involved in the four dimensions of the 12 indicators, the government policy level, logistics service level, and logistics enterprises from the following aspects, to guide the coordination of Zhengzhou city logistics services; for example, at the policy level, the government should improve the policy support and guidance mechanism, expand the scope and validity of the guidance and support to the logistics service industry, and promote the shape and improvement of the value chain of the logistics service industry. At the level of industry development, it is necessary to define the industry development orientation, make overall planning of industrial development layout, and realize the matching and reconstruction of logistics service industry value chain and industry chain. At the enterprise level, we should strengthen innovation, pay attention to the introduction and application of innovative services, and

comprehensively promote the deep integration of value chain, industrial chain, and innovation chain.

6.1. Improve the Policy Support and Guidance Mechanism and Expand the Scope and Validity of Policy Radiation. During the 14th Five-Year Plan period, Zhengzhou should rely on representative industrial parks such as Zhengzhou Airport National Logistics Hub and International Logistics Park to build a hub economy pioneer zone with international influence, improve the policy support and guidance mechanism in promoting the innovative, integrated, and characteristic development of logistics service industry, and realize the expansion and promotion of the radiation range and validity of policies to the logistics industry. This can be done through the following ways:

- (1) We improved the functioning of government policies. Promote the construction of the supervision organization of the logistics service industry in Zhengzhou, enrich the functions and responsibilities of the organization, and play specific functions in the development planning, policy formulation, and integrated information system construction of the logistics service industry. At the same time, improve the identification system of key logistics enterprise projects and logistics parks, optimize the logistics project examination and approval management process, and promote the logistics service industry to be more standardized and effective.
- (2) Strengthen guidance and support. In order to effectively promote the three-chain integration of the logistics service industry in Zhengzhou, the guidance and support for the logistics service industry should focus on three aspects: financial support, preferential land use, and project investment. First, terms of financial support, for enterprises engaged in the logistics business, such as warehousing and transportation enterprise, in the given preferential tax, can be in accordance with the range of 3% to 5% of subsidies for profit.

7. Conclusion

On the basis of defining the logistics service industry and the three-chain integration theory, this paper systematically analyzes the development environment and current situation of the logistics service industry in Zhengzhou. On the whole, Zhengzhou logistics service industry has more opportunities than challenges and more advantages than disadvantages in the future development process. Based on many influencing factors of Zhengzhou logistics service industry, how to build an international logistics center city and a logistics transshipment hub city? From the perspective of logistics service industry value chain, we must dig deep into industrial value and extend industrial value chain. From the perspective of industrial chain, it is necessary to strengthen supporting industries, support deep integration among industries, promote industrial upgrading, and then build industrial networks. From innovation chain's point of

view, it is necessary to strengthen research and development to promote the transformation of scientific and technological achievements. Based on the theory of three-chain integration, through the integration of innovation chain and value chain, the added value of Zhengzhou logistics service industry can be promoted. Through the integration of industrial chain and innovation chain, the degree of industrial integration can be promoted, and then the cost can be reduced and the competitiveness of logistics service industry can be enhanced. Through the integration of value chain and industrial chain, the logistics industry environment can be optimized, and the logistics service industry can be upgraded and transformed.

Data Availability

No data were used to support this study.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

This work was supported by 2021 Henan Education Science "14th Five Year Plan" Project (2021yb0121), 2020 Henan Philosophy and Social Sciences Planning Project (2020bjj066), 2019 Henan Higher Education Teaching Reform Research and Practice Project (2019sjglx058y), 2018 Soft Science Project of Henan Science and Technology Department (182400410151), and Doctoral Research Fund Project of Zhengzhou Institute of Light Industry(2017BSJJ080).

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