

Research on Development Strategy of Zhengzhou-Europe Block Trains

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Abstract—As an important measure to implement the strategy of “The Belt and Road”, “Zhengzhou-Europe block trains” has been developing rapidly since its birth in 2013. No matter in the frequency, number, freight volume, or the scope of cargo sources, they rank first in the class of China Railway Express. This paper introduces the current operation situation of “Zhengzhou-Europe block trains”. Then combined with the main operation links and transportation business process of “Zhengzhou-Europe block trains”, and based on Analytic Hierarchy Process -SWOT analysis, it is concluded that “Zhengzhou-Europe block trains” should adopt SO strategy, and then WO strategy, ST strategy and WT strategy.

Keywords—Zhengzhou-Europe block trains; analytic hierarchy process - SWOT analysis; development strategy

I. INTRODUCTION

China-EU trade relationship is one of the largest and most dynamic trade relations in the world. Eurasia has become a link between Europe and Asia and the world. In July 18, 2013, the first “Zhengzhou-Europe block trains” was packed in Zhengzhou container central station, and then destined for Hamburg, Germany. As a product of the strategic concept of “The Belt and Road”, The “Zhengzhou-Europe block trains” will build an important platform for opening up to the outside world. It will become an international railway logistics channel connecting Zhengzhou to Europe and communicating with the world. This will effectively promote economic development along the line and promote the development of Sino-European trade. “Zhengzhou-Europe block trains” began in Zhengzhou, exited through Alashankou in Xinjiang, and arrived in Hamburg, Germany via Kazakhstan, Russia, Belarus and Poland, covering a total distance of 10214 kilometers. The running time is 13 to 18 days. Because of its obvious advantages in the competition with aviation and sea transportation, it saves 80% of capital compared with air transportation, and more than 20 days than sea transportation. Since the official opening, from the initial monthly operation, to the normal operation of two shifts per week in September 2014, and then to the normal operation of eight shifts per week in December 2017. “Zhengzhou-Europe block trains” achieved a round-trip equilibrium, full load, full return, normalization of international container cold chain business, and gradually became the “golden train” of the Sino-European land trade.

II. RESEARCH STATUS

Many scholars have conducted studies on the development strategies of China Railway Express.

Tong Xinshun (2014) states Zhengzhou’s status by listing the current situation and advantages in construction of Central Plains Economic Zone in the Silk Road Economic Belt, putting forward some countermeasures on building the logistics hub routes of the Silk Road Economic Belt in Zhengzhou^[1].

Chen Guang (2015) established SWOT matrix of development strategy of the transportation in the Administration, then put forward development strategies on the transportation, which means improving management and operation mechanism of the transportation, consolidating the leading position of the transportation within the area, providing business transformation for international logistic service, reducing operation cost of the transportation and satisfying the requirements on operation qualification of the transportation^[2].

Liu Weifeng (2016) analyzed the current situation of Zhengzhou economy under the influence of Zhengzhou new European railway and the promotion of the economic development of Zhengzhou^[3].

Wang Yangkun (2017) explained that China-Europe rail network enters into a critical period of improvement and development as well as coordination and integration with other areas. It means that China-Europe rail is in sore need of improving relevant systems and mechanisms, taking an integrated approach to coordinate requests of national strategy and local development, transportation, logistics and other relevant industries, Chinese and foreign governmental departments and market entities^[4].

Wang Yanbo (2017) analyzes the factors influencing the development of China Railway Express, including the traffic infrastructure and supported service capacity along the line, trade demand docking, comprehensive transport cost as well as transport time limit. Then puts forward suggestions such as improving international trade corridor, strengthening the construction of logistics hub facilities, increasing the integration of resources, innovating transport service capacity, establishing improved price mechanism, building information service platform and promoting facilitation of big customs clearance^[5].

Yuan Yunge (2018) puts forward proposals such as strengthening Zhengzhou-Russia train line, taking measures to better market Zhengzhou-Europe trains, facilitating Zhengzhou’s development of global trade nodes, supporting Zhengzhou’s modern service industry, strengthening coordination and cooperation with the countries along Silk Road Economic Belt, building an effective platform for the exchange of information in order to attract and cultivate professional talents to Zhengzhou, and so on^[6].

The above research has a good reference for the development countermeasures of Zhengzhou-Europe Block trains proposed in this paper.

III. RESEARCH METHODS

"Zhengzhou-Europe block trains" is the China-Europe block train ferry, which is organized by the China Railway Corporation, has characters of fixed trips, route, schedule and transport time, operated in the international railway container intermodal transportation mode in China-Europe along the "The Belt and Road". It is an important symbol of "the Belt and Road" transportation interconnection and an important carrier to promote countries' economic and trade cooperation along the "the Belt and Road".

"Zhengzhou-Europe block trains" is the only Sino-European train station with dual entry and exit ports (Alashankou, Erlianhot Port) and two-channel (West Passage of Alashankou and Erlianhot Middle Passage).

Departure route via Alashankou: Zhengzhou-Urumqi-Alashankou (transfer)-Kazakhstan Dorset (transformation)-Russia-Belarus Minsk-Polish Marashevici (transfer and change)-Hamburg, Germany. The entire journey from Zhengzhou through Xinjiang Alashankou to Kazakhstan, Russia, Belarus, Poland, Germany and other six countries, the freight route mileage of 10,214 kilometers.

Departure routes through Erlianhot: Zhengzhou-Erlianhot (transfer and transformation)-Zamonoud, Mongolia-New Siberia-Yekaterinburg-Moscow-Minsk, Belarus-Malashevich, Poland (transfer and transformation)-Hamburg, Germany, with a freight route mileage of 10484 km.

With the development of "Zhengzhou-Europe block trains" and the continuous optimization of the supply organization, the business volume of Zhengzhou-Europe block trains has doubled, as shown in Table.

TABLE I. BUSINESS VOLUME OF ZHENGZHOU-EUROPE BLOCK TRAINS

<i>Business volume</i>	<i>2013</i>	<i>2014</i>	<i>2015</i>	<i>2016</i>	<i>2017</i>
Volume of scheduled trains (Units)	13	87	156	251	501
Volume of departure Scheduled trains (Units)	13	79	97	139	273
Volume of return Scheduled trains (Units)	0	8	59	112	228
Number of vehicles (Units)	952	3667	6437	10533	47088
Number of departure vehicles (Units)	952	3339	4016	5935	28409
Number of return vehicles (Units)	0	328	2421	4598	18679
Volume of freight (TEU)	1904	7334	12874	21066	41452
Volume of departure freight (TEU)	1904	6678	8032	11870	23110
Volume of return freight (TEU)	0	656	4842	9196	18342

The types of goods sent by "Zhengzhou-Europe block trains" are mainly light textile products such as high-grade shoes and hats, clothing, cloth; industrial products such as molds, metal products, automobiles, automotive accessories, industrial machinery accessories, engineering machinery, medical equipment, communication equipment;. Electronic products

such as laptop and mobile hard disks, as well as tires and abrasives. Among them, the departure products are mainly clothing, shoes, hats, small commodities, mechanical parts and electronic products. The return goods are mainly mechanical equipment, automobiles and food.

At present, "Zhengzhou-Europe block trains" has formed a double hub distribution pattern with Zhengzhou and Hamburg as the core. The radius of collection and evacuation at home and abroad exceeds 1500 kilometers and radiates 2000 kilometers. It covers North China, Central China, Pearl River Delta, Yangtze River Delta and Bohai Rim Economic Circle, and connects with coastal ports in the east. Through air and sea-rail transport, Zhengzhou International Hub Development and Construction Co., Ltd transits Asia-Pacific countries and regions such as Japan and Korea. Four core collection centers and six secondary centers have been established, which are distributed in Hamburg, Warsaw, Prague, Milan, Malashevich, Paris, Minsk, Moscow, Tashkent, Astana and other major cities in Europe and Central Asia.

IV. ANALYSIS OF THE DEVELOPMENT STRATEGY OF ZHENGZHOU-EUROPE BLOCK TRAINS BASED ON ANALYTIC HIERARCHY PROCESS - SWOT MODEL

A. Introduction of Analytic Hierarchy Process and SWOT

Analytic Hierarchy Process (AHP) is a systematic and hierarchical analysis method combining qualitative and quantitative methods. It can decompose a complex multi-objective decision-making problem into multiple objectives or criteria, and then decompose it into several levels of multi-indicators (or criteria, constraints). It can calculate hierarchical single ranking (weights) and total ranking by qualitative index fuzzy quantification method, which can be used as a systematic method for multi-objective and multi-scheme optimal decision-making.

SWOT analysis method is an analytical method that can combine subjective and objective, accurately analyze and study the status and countermeasures. It mainly uses systematic analysis method, through internal and external analysis, to find out the factors that are beneficial to its own development. Favorable and worthy factors, as well as factors that are unfavorable to them, need to be suppressed and circumvented, and identify potential opportunities and threats to propose practical development strategies.

The advantage of AHP is to combine qualitative analysis with quantitative analysis. The purpose of using AHP method in SWOT structure is to systematically evaluate SWOT elements and measure the priority weights of these elements with the same criteria. Comparing SWOT elements with each other and applying eigenvalue analysis can enhance the ability of SWOT analysis in strategic decision-making application.

B. AHP-SWOT Analysis

The AHP-SWOT analysis is used to establish a hierarchical model, as shown in Table.

TABLE II. SWOT ANALYSIS HIERARCHY MODEL

Strengths	-Obvious advantages in location s_1 ; -Railway ports have complete functions s_2 ; -Multi-point source collection has a huge advantage s_3 ; -Professional team operations s_4 .
Weaknesses	-Insufficient local supply w_1 ; -High cost, relying on government subsidies w_2 ; -Passing through many countries, the gauge is different and the efficiency is reduced w_3 ; -Railway transportation procedures are cumbersome w_4 .
Opportunities	-“The Belt and Road” strategy implementation O_1 ; -Sino-European trade market demand increases O_2 ; -Rapid development of the logistics industry O_3 ; -National policy, customs coordination O_4 .
Threats	-Other China Railway Express T_1 ; -Reduction in sea transportation prices T_2 ; -Reduction of government subsidies T_3 ; -Disadvantages of transportation distance T_4 .

Establish judgment matrix A, as shown in table.

TABLE III. JUDGMENT MATRIX A

A	S	W	O	T
S	1	2	3	5
W	1/2	1	2	5
O	1/3	1/2	1	7
T	1/5	1/5	1/7	1

Calculated $\lambda_{max}(A)=4.2372$, $CI = \frac{\lambda_{max}(A) - n}{n-1} = 0.07907$.

$$CR = \frac{CI}{RI} = 0.08 < 0.1.$$

So pass the consistency test, its feature vector is normalized to (0.4531, 0.2835, 0.2087, 0.0547).

Similarly, establish an advantage judgment matrix S, calculated $\lambda_{max}(S)=4.154$, $CI = \frac{\lambda_{max}(S) - n}{n-1} = 0.05137$.

$$CR = \frac{CI}{RI} = 0.0571 < 0.1.$$

So pass the consistency test, its feature vector is normalized to (0.5580, 0.0784, 0.1650, 0.1986).

Establish a disadvantage judgment matrix W, calculated $\lambda_{max}(W)=4.1176$, $CI = \frac{\lambda_{max}(W) - n}{n-1} = 0.0392$.

$$CR = \frac{CI}{RI} = 0.04356 < 0.1.$$

So pass the consistency test, its feature vector is normalized to (0.5673, 0.2982, 0.0668, 0.0677).

Establish an opportunity judgment matrix O, calculated $\lambda_{max}(O)=4.0728$, $CI = \frac{\lambda_{max}(O) - n}{n-1} = 0.02427$.

$$CR = \frac{CI}{RI} = 0.02696 < 0.1.$$

So pass the consistency test, its feature vector is normalized to (0.5416, 0.2468, 0.1345, 0.0772).

Establish a threat judgment matrix T, calculated

$$\lambda_{max}(T)=4.1222, CI = \frac{\lambda_{max}(T) - n}{n-1} = 0.04073.$$

$$CR = \frac{CI}{RI} = 0.04526 < 0.1.$$

So pass the consistency test, its feature vector is normalized to (0.5758, 0.1408, 0.2427, 0.0406).

Since the eigenvector normalization calculated by the above matrix is the weight of each factor, the weighting table of each factor can be obtained.

TABLE IV. WEIGHTING TABLE

factor	1	2	3	4
A	0.4531	0.2835	0.2087	0.0547
S	0.5580	0.0784	0.1650	0.1986
W	0.5673	0.2982	0.0668	0.0677
O	0.5416	0.2468	0.1345	0.0772
T	0.5758	0.1408	0.2427	0.0406

The hierarchical total ordering of these four factors can be obtained by multiplying the eigenvector normalization of each of the four sets of factors by the normalized corresponding items of the A matrix eigenvectors, as shown in the table.

TABLE V. TOTAL HIERARCHICAL ORDERING OF FACTORS

factor	1	2	3	4
S	0.25283	0.03552	0.07476	0.08999
W	0.16083	0.08454	0.01894	0.019192
O	0.15203	0.06928	0.03775	0.02167
T	0.031496	0.007702	0.01327	0.00222

$$CR=0.04825 < 0.1.$$

Result is in accordance with thermodynamic consistency test. Build the SWOT quadrilateral, as shown in the figure.

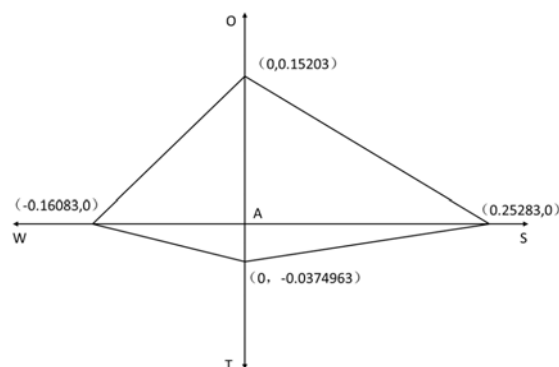


FIGURE I. SWOT QUADRILATERAL.

The area of each triangle is calculated as follows:

$$S_{\Delta SAO} = 0.0192;$$

$$S_{\Delta WAO} = 0.01222;$$

$$S_{\Delta WAT} = 0.002533;$$

$$S_{\Delta SAT}=0.007963.$$

$$S_{\Delta SAO} > S_{\Delta WAO} > S_{\Delta SAT} > S_{\Delta WAT}.$$

"Zhengzhou-Europe block trains" should first adopt SO strategy, secondly WO strategy, thirdly ST strategy and finally WT strategy.

V. DEVELOPMENT COUNTERMEASURE OF ZHENGZHOU-EUROPE BLOCK TRAINS

A. SO Strategy-Actively increasing Source of Goods

Since the birth of "Zhengzhou-Europe block trains" in 2013, the frequency, number, freight volume and the scope of cargo collection in China and Europe are among the top. The main reason for these achievements is that "Zhengzhou-Europe block trains" uses its own advantages such as location and transportation advantages, and the advantages of collecting and distributing goods. At the same time, it seizes the national "The Belt and Road" policy and the opportunities for increased demand in the Sino-European trade market, and continuously improves services level, enhance the ability of source collection, and speed up the organization of trains. Therefore, "Zhengzhou-Europe block trains" should first adopt the SO strategy to develop the source of goods. At present, the freight volume and cargo value of the Central European trains account for only a small portion of the Sino-European trade, which is only a small part of the 10% of the trade. This is also the source of supply that the China Railway Express can actively strive for. Actively open up the cargo demand and source of goods in important cities and stations along the line. Multi-point source collection is the main way of Zhengzhou-Europe block trains.

B. WO Strategy- Simplify Business Process and Develop Local Sources

At present, "Zhengzhou-Europe block trains" is generally composed of 41 vehicles per train, each vehicle can transport two containers. In 2018, "Zhengzhou-Europe block trains" maintained the frequency of "eight departure, eight returns". Keeping the existing transport conditions unchanged, in 2019, we will strive for "ten departure, nine returns". In 2020, "thirteen departure, thirteen returns". "Zhengzhou-Europe block trains" needs to further simplify the business process and speed up the circulation of boxes.

C. ST, WT Strategy-take advantage of local resources and integrate them

ST strategy, that is, to play its own advantages, avoid risks, and reduce the threat of external environment to itself. At present, the main threat of "Zhengzhou-Europe block trains" is the China Railway Express from other cities. Numerous shifts have caused disorderly competition for domestic sources of goods and markets, and at the same time, due to their independent negotiation with foreign countries on customs clearance matters, the cost is too high. WT strategy, namely disadvantage - threat strategy. Under the premise of overcoming its own disadvantages, avoid the adverse effects of external threats.

"Zhengzhou-Europe block trains" should keep itself on its own advantages and continue to maintain the momentum of rapid development. At the same time, it should actively explore

other businesses, such as the integration of transportation and trade, to form its own characteristics, and actively cooperate with the national railway to coordinate and optimize the operation of China Railway Express. Coordinate and optimize the implementation of measures. In the future, with the unified coordination and orderly development of China Railway Express, "Zhengzhou-Europe block trains" will inevitably leaps again with its own huge advantages and professional operations.

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