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Research on Joint Distribution Mode of Courier End Based on AHP Analytic Hierarchy Process

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Keywords: End distribution; Co-distribution; Analytic Hierarchy process.

Abstract. The quality of delivery end distribution restricts the development of China's express industry. Taking the joint distribution mode of courier end as the research object, this paper constructs the service Weight index of joint distribution based on analytic hierarchy process, so as to determine the optimal scheme of joint distribution at the end of express delivery.

Foreword

Introduction Terminal distribution is the most important link in the process of logistics distribution, but there are many problems, such as insufficient human resources, excessive investment of distribution resources and other issues are restricting the development of terminal distribution services bottleneck. At the same time, the problems such as high cost, aging difference and low satisfaction in the end of logistics distribution have become more and more serious and obvious with the rise of electronic commerce, which has brought negative influence to the economic benefit and development planning of the end distribution link.

Man-Yu ZHANG Reference to the domestic distribution model, taking Jing dong Mall as an example, analyzes the development status and distribution mode of terminal distribution; Li-hong WANG, Shuo-lun ZHANG and Wen-Si YU, Qing- wen LI and Zhu Chen The factors influencing the service quality of the innovation mode of terminal distribution in colleges and universities are studied by using the principles and methods of statistics. Yun-fang, WANG and Xiao-Ying LI introduced the method of using flowchart and management to improve the mode of logistics service development. In view of the above research, the researchers discussed the mode of terminal distribution through the relevant methods, clearly introduced the terminal distribution model, but the deficiency is that the index affecting the end distribution mode is not analyzed, and the corresponding decision is not found through the actual situation.

In this paper, the weight is constructed based on AHP analytic hierarchy process, and the index of influencing factors is constructed by analyzing, so as to further compare the obtained schemes, and finally choose the best process scheme of end distribution.

Evaluation Index System of Service Quality of End Distribution Problem

Construction index

Taking the street community of Hai dian District College Road as an example, 52 households were surveyed in the form of a questionnaire. In the process, according to the results of the survey, four kinds of indicators affecting the quality of service were determined: service personnel, relevant prices, pickup time, product quality: (1) Service personnel. Refers to the overall quality and service attitude of the staff responsible for the custody of the goods in the end distribution. (2) Product quality. Refers to the product is shipped to a third party, whether to maintain a state of no loss, in the delivery to the customer's hands whether to maintain a complete product quality, product quality is the most basic requirements for customers to buy goods.

(3) Pickup time. Pickup time is an important aspect for the delivery end distribution problem. It is about the convenience of shoppers in obtaining express delivery, in the face of special circumstances, can safely and on time to collect courier.

(4) Relevant prices. Price level refers to the establishment of prices by a common distribution agency.

Table 1. Evaluation Index System of service quality of "last kilometer" co-distribution:

Index	First level index	Two level index
End Distribution Quality U	Service personal	Overall quality(A11)
		Service attitude(A12)
	Picking time	Speed of pick-up(A21)
		Picking time(A22)
		Punctual(A23)
	Product quality	Preserved(A31)
		Damage(A32)
		Insurance(A33)
	Price	Insurance(A41)

The Establishment of Analytic Hierarchy Process and Hierarchical Structure

The model structure of AHP is divided: Target layer, criterion layer, sub-criterion layer, tectonic matrix, through mutual comparison, calculation, so as to determine the weight of each target factor, find out the main and secondary factors of the impact.

Using AHP to Establish Weights

AHP Related Computation

Survey of 52 users in the street community of Hai dian District College Road, Beijing, according to $\mathbf{Wi}=\frac{\mathbf{Bj}}{\sum \mathbf{Bj}}$,

Table 2. Relative importance of each indicator

A	A1	A2	A3	A4
A1	1	7	5	3
A2	1/7	1	1/5	1/7
A3	1/5	5	1	1/3
A4	1/3	7	3	1
sum	1.676	20	9.2	4.476

Table 3. Eigenvector values for each factor and percentage of importance

B	B1	B2	B3	B4	sum	W	W%
B1	0.597	0.35	0.543	0.67	2.16	0.54	54%
B2	0.085	0.05	0.022	0.032	0.189	0.047	4.70%
B3	0.119	0.25	0.109	0.074	0.552	0.138	13.80%
B4	0.199	0.35	0.326	0.223	1.098	0.274	27%
SUM	1	1	1	About 1	About 4	1	100%

Existence Significance and Consistency Test of Matrix

Compared with 0.1, less than 0.1 of the certified values remain at a significant level. According to formula, $\lambda = (\sum(AW)i)/nWi$, Calculate the maximum feature root, the above matrix W: [0.571, 0.055, 0.105, 0.269]. Based on the above criteria layer matrix A: AW column matrix: [2.399, 0.192, 0.574, 1.203], AW/W: [4.442, 4.08, 4.162, 4.3]; characteristic root: 4.246. Consistency indicators: C.I. =λmax-n/n-1. Average Stochastic consistency indicator: C.R.=C.I./R.I. The above formula R.I.

Represents a constant indicator of mean stochastic consistency, which is: C.I. = (4.246-4)/3=0.082. Known R.I. The value is 0.9, test: 0.091<0.1. Index weight: (0.571, 0.055, 0.105, 0.269), A1=(A11, A12)=(0.833, 0.167), A2=(A21, A22, A23)= (0.714, 0.186, 0.1), A3=(A31, A32, A33)= (0.579, 0.311, 0.11), A4=1

Table 4. 2 Level Indicator weight set

	A1	A2	A3	A4	Comprehensive weights W
	0.54	0.047	0.138	0.27	
A11	0.833				0.451
A12	0.167				0.091
A21		0.714			0.034
A22		0.186			0.009
A23		0.1			0.005
A31			0.579		0.08
A32			0.311		0.043
A33			0.11		0.015
A41				1	0.27

Weight: (0.451, 0.091, 0.034, 0.009, 0.005, 0.08, 0.043, 0.015, 0.27)

The Inverse Matrix and Eigenvectors of the Sub-criterion Layer of the Scheme Layer

The inverse matrix of the solution layer to the sub-criterion layer is Cn, the weight vector is W, and the approximate eigenvectors of the inverse matrix calculated, follows: C1=(0.513,0.399,0.088); C2=(0.565,0.359,0.076); C3=(0.369,0.518,0.113); C4=(0.081,0.439,0.482); C5=(0.429,0.429,0.142); C6=(0.455,0.455,0.09); C7=(0.139,0.139,0.722); C8=(0.538,0.371,0.091); C9=(0.696,0.225,0.079).

The obtained 9 weight vectors are the column vectors to form the 3x9 matrix.

Table 5. Weight vectors of the scheme layer to the target layer

0.513	0.565	0.369	0.081	0.429	0.455	0.139	0.538	0.696
0.399	0.359	0.518	0.439	0.429	0.455	0.139	0.371	0.225
0.088	0．076	0.113	0.482	0.142	0.09	0.722	0.091	0.079

Calculated obtained: (0.542, 0.349, 0.111). The best results were A, followed by B and C.

Conclusion

This paper mainly studies the distribution mode scheme in the end distribution link. In this paper, the factors affecting the end distribution are constructed by AHP analytic hierarchy process, and then the first level and level two indexes are established for the end distribution through the principle of AHP analytic hierarchy process. In order to find the optimal effect scheme. According to the optimization scheme to be found, the correct calculation and analysis according to AHP method, to find out the optimal scheme and reduce the influence index factors restricting the development of China's logistics industry can not only save resources and promote the development of logistics industry, but also bring a good logistics end receiving experience to the customers receiving goods.

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