The Third Party Logistics Supplier Selection and Evaluation

Guoyi Xiu
Harbin University of Science and Technology, Harbin, China
Email: xiuguoyi@126.com

Xiaohua Chen
Harbin University of Science and Technology, Harbin, China
Email: chenxiaohuaha@163.com

***Abstract*—Corporation's own-running logistics are often inefficient, so more and more corporations would like to choose outsource logistics, that is, corporations use the third-party logistics suppliers to provide logistics services. The third-party logistics can simplify the distribution sectors, transport reasonably, use and allocate rationally the existing resources, and avoid the problems of funds used, low transportation efficiency, complicated distribution sectors and urban pollution increase brought by the own-running logistics. The third-party logistics can meet the requirements of low-carbon and environmental protection. When considering the logistics outsourcing, the selection of the third party logistics providers is the most important part, only selecting the appropriate logistics providers, enterprises can improve their competitiveness. To select the appropriate logistics providers, an effective evaluation method is essential. This paper identified a reasonable evaluation index system, and based on it, using the combination method of AHP and entropy to evaluate the third-party logistics providers comprehensively. This paper used analytic hierarchy process to determine the weight of each indicator firstly, then used the information entropy to calculate the options of the third-party logistics providers, and calculated the final score using the integrated calculating method finally, so as to determine the final option. The comprehensive evaluation method can evaluate the logistics providers by the combination of subjective and objective, and ensure enterprises to choose the third-party logistics provider more scientific and reasonable. Finally, this paper took the third party logistics provider selection of an agricultural products processing enterprise as an example in Heilongjiang Province, to prove the method practical.**

***Index Terms*—analytic hierarchy process; information entropy, the third-party logistics providers, evaluation index system**

I. Introduction

With the development of the theory and practice of logistics management, logistics outsourcing has been one of the important ways for many companies, which can reduce logistics cost and improve the logistics service level. The third party logistics can bring many benefits to its users; it is conducive to industry concentration, investment reduction in fixed assets, costs reduction on logistics, the enhancement of corporate image, and so on. However, to make full advantage of third-party logistics play out, we must select the appropriate third-party logistics providers, if you choose incorrectly, the enterprise's logistics outsourcing strategy not only will fail to achieve, but will pose some risks for enterprises. For example, the reduction of the controlling power, the failure management of customer relationship, the joint risk of management and so on. Therefore, selecting the most suitable third party logistics supplier is of great importance for the enterprise's development. And how to select the best partner has been a hot issue concerned by business community and the academia.

The third-party logistics is referred to the external providers providing all or part logistics service for corporations. The services provided by the third-party logistics include mainly transportation, warehouse management, and distribution, and so on [1]. The third-party logistics is neither the supply side, nor the demand side, but a business model provided by the supply-side and demand-side logistics enterprises. The third-party logistics provides not real products, but services.

In order to select the most suitable third party logistics providers, choosing the evaluation methods is essential. We should adopt a reasonable and effective evaluation method to evaluate comprehensively, so as to assure the scientific of results.

II. The Third-Party Logistics Supplier Selection Methods Review

In the process choosing the third-party logistics providers, the methods are mainly two types of qualitative and quantitative. Supplier selection methods are mainly qualitative experience to determine the method, public tender law, selection method consultation, benchmarking method, etc. Currently, domestic and international supplier selection method for the study focused on quantitative models. From the collection of literature, the most commonly used logistic model for supplier selection and evaluation are as follows:

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A. AHP.

Yahya 、 Kingsman[2](1999) tried to get vendor evaluation criteria and their corresponding weights. Tongguo Wu, Leifu Gao.[3] (2005), Jiani Zhao, (2005), Jian Liu [4] (2007) using AHP to select suppliers of logistics. Huayi Shan, Yaorong Cheng [5] (2007) used ANP to carry out the third-party logistics providers and selection.

B. Data Envelopment Analysis (DEA).

Yao Chen、Joe Zhu[6] (2003) used both parties two stages game model to simplify DEA model, to establish a efficiency interval, and to select suppliers. ChuanXu Wang [7] (2004) used the SE-DEA method; YongRui Duan, Tian Peng, WeiPing Zhang [8] (2004), Ao Chen [9] (2007), also used the DEA method to select and evaluate the third party logistics provider.

C. Fuzzy Comprehensive Evaluation Method.

CebeciU[10] (2001), LiJiang Zhao [11] (2003), KaiYuan Liu [12] (2004), ChengWu Fang, XunPing Lei [13] (2005), MinTun Li [14] (2006), YiXin Shi, DanSong zhang [15] (2006), a large number of studies used fuzzy comprehensive evaluation method to select and evaluate the third party logistics supplier.

D. Statistical Analysis Method.

Rong Chen [16] (2007) adopted the principal component analysis method. ChunXia Chen, ZhiBin Yu (2007) adopted the fuzzy clustering method to select the third party logistics supplier.

E. Other Models Are Also Widely used in the Selection of Logistics Supplier

SeongKo Chang [17] (2000)proposed the usage of the tabu search algorithm on the selection of logistics supplier; Ghodsypour S H, Brien C O [18] (2001) researched the selection of logistics supplier from the perspective of overall costs; Qureshi M N、Dinesh Kumar、Pradeep Kumar[19] and Wadhwa S、Madaan J (2003) adopted multiple strategic decision method to select the logistic supplier respectively; Manoj Kumar[20] (2004) established constraints from three ways - maximum satisfaction, the least net cost and minimum time delay, and used fuzzy optimization theory for supplier selection; Weiqing Zhong [21] (2003) adopted the neural network analysis method; Xuejun Cui and Ji cheng Zhan [22] adopted the improved Gray Correlation Analysis; zhiJiao Lei [23] (2004)used fuzzy clustering analysis method; Sizhi Li and Yanhong Li[24] (2005) adopted the set pair analysis method ;Dong Wang, Bing Tian and Xiaolong Tang[25] (2007) adopted the TOPISIS method; Juning Su and Juhong Su[26] (2006) adopted multilevel grey evaluation method for logistics partner selection.

These evaluation methods evaluated the third logistics more scientific and objective from different angles, but some of them ignored the objective factors, and some of them ignored the presence of uncertainty and opposed factors in reality the operation [27]. So these methods may result in improper choice of logistics providers, and affect the benefits of enterprises. This paper built the model of AHP/information entropy, using the combined method of AHP and information entropy to evaluate and select the third-party logistics providers, and the model can help corporations to choose the third-party logistics providers scientifically and rationally.

III. EVALUATION INDEX SYSTEM

A. The Selection Steps of the Third-party Logistics Supplier

The choice of the third-party logistics providers can be categorized into the following steps[28]:Needs analysis, establish the goals of supplier selection, draw up supplier evaluation criteria, establish the evaluation team, coarse screening to suppliers, comprehensive evaluation to suppliers, select suppliers, implement and maintain the supply chain partnerships, tracked evaluate to suppliers and feedback and improvement. Detail is shown in Figure Ⅰ.

B. The Principles of Setting Up the Index System

- **Overall systematic principle**: It is requested that the established index system not only can reflect the historical performance and status of the supplier enterprise, but also can reflect the cooperation ability and the future development potential of the supplier.
- **Purposely principle**: The index system should be able to describe the substitutive characteristics, structure and its inscapes of the target enterprise objectively, at the same time can state the relevant elements which the cooperation depends on objectively, and services for the assessment purpose, provides the basis for cooperative partners.
- **Scientific practical principle**: The index system should be able to reflect the actual situation of suppliers, objectively and practically. The index system should be in moderate scale. If index system is too large, has too many levels, and the index is too meticulous, it will not reflect the overall evaluation attention. And index system is too small, the index is too thick, it can't reflect the actual levels of suppliers.
- **The principle of combining quality and quantity**: When the target enterprise is in the evaluation, not all the index can be quantified, so it must be combined with quality and quantity.
- **Extended principle**: Because each industry and enterprises in one industry have their own special requirements, therefore, some special index should be added. This requires the index system and the corresponding evaluation models have expanded space.

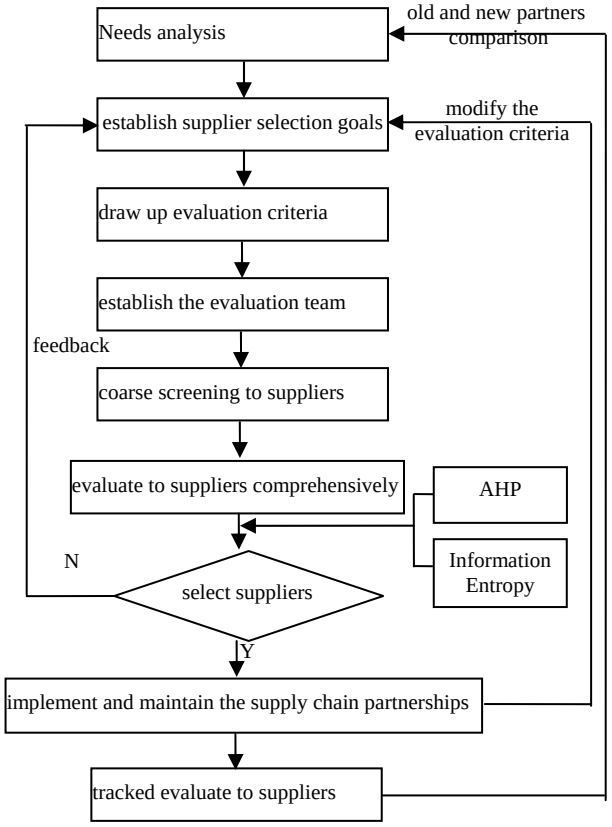

Figure 1. The selection steps of the third-party logistics supplier

C. Access Methods of the Indicators.

This paper used literature research, interviews and questionnaires to obtain the evaluation index of the third party logistics providers. The methods are as follows:

- **Literature research**: Through researching some related literatures at home and abroad, such as the evaluation of the third party logistics provider selection, supplier selection and evaluation of business, and business logistics, and so on, this paper sorted out some evaluation indicators about the third-party logistics supplier.
- **Interview**: Through interviewing with the professors and experts in some university majored in logistics and supply chain, this paper got some indicators affecting companies to choose the third-party logistics providers.
- **Questionnaire**: This paper selected 13 agricultural products processing enterprises in Heilongjiang province as the survey object, and each enterprise is paid 4 to 5 questionnaires. The main investigation subjects are those engaged in purchasing, logistics management and production operations management. This paper obtained some indicators through the questionnaire.

D. Evaluation Index System of the Third-party Logistics Supplier Selection.

Evaluate index system. This paper sorted out the third party logistics supplier evaluation index system by above-mentioned approach (Table 1).

Meanings of indicators. The evaluation index system includes 5 second-level indicators and 21 third-level indicators, and their meanings are as follows:

- **Operational capability**: Operational capability is the most basic capabilities of the logistics enterprises, and it is the base reflects of the competitive advantage of the logistics enterprises. Logistics enterprises only operate with a higher operational capability, low cost and high level of service just to achieve. Operational capacity includes mainly vehicles achieving logistics business, warehouses and logistics centers, and quality capabilities enterprises providing logistics services, and so on. Specific indicators include: transportation and distribution capacity, storage capacity, ability providing value-added services, level of information, and ability of personalize [1].
- **Service levels**: service level is the result of a series of logistics activities in order to meet the logistics needs of customers. The nature of logistics is services, which itself only create space for utility goods and time effectiveness, and do not create the form quality effects. Specific indicators include: order processing efficiency, delivery accuracy, time shipping rate, time delivery rate, customer satisfaction, and network coverage [29].
- **Price level**: Price is one of the most important indicators of enterprises choosing the third-party logistics provider. The price level of the third-party logistics services will not only affect the operating costs of the enterprises, but also reflects from the side the logistics technology capabilities of the selected third-party logistics provider. Specific indicators include: basic service price and variable price [30].
- **Development potential**: The development potential of the third-party logistics providers mainly account of its' future development prospects, so enterprises can decide whether the long-term business cooperation or not. Long-term and stable cooperative relations can reduce costs, mutual understanding and trust, so can improve the logistics system flexibility and reliability. Specific indicators include: corporate culture, corporate reputation, management level, staff quality and technical innovation capability [31].
- **Green level**: The purpose of green logistics is to reduce environmental pollution, and reduce resource consumption. It emphasizes the global and long-term interests and strengthens the full range of environmental and resource concerns while obtaining economic benefits. Specific indicators include: pollutant emissions, energy consumption, reuse of resources [32].

TABLE I.
EVALUATION INDEX SYSTEM

First-level indicators	Second-level indicators	Third-level indicators
The third-party logistics provider selection （A）	Operational Capability (a_1)	Transport and distribution capabilities (a_{11})
		Storage Capacity(a_{12})
		Ability providing value-added services(a_{13})
		Level of information(a_{14})
		Ability of personalize(a_{15})
	Service levels (a_2)	Order processing efficiency(a_{21})
		Delivery accuracy(a_{22})
		Time shipping rate(a_{23})
		Time delivery rate (a_{24})
		Customer satisfaction(a_{25})
		Network coverage(a_{26})
	Price level(a_3)	Prices of basic services(a_{31})
		Variable price(a_{32})
	Development potential (a_4)	Corporate culture(a_{41})
		Corporate reputation(a_{42})
		Management level(a_{43})
		Staff quality (a_{44})
		Technological innovation capability (a_{45})
	Green level(a_5)	Pollutant emissions(a_{51})
		Energy consumption(a_{52})
		Reuse of resources(a_{53})

Ⅳ. INTRODUCTION OF THE EVALUATION METHODS

A. Analytic Hierarchy Process

AHP is abbreviation of the Analytic Hierarchy Process, and it is a systems analysis method originated by T.L.Saaty who is a famous united state operational researcher at the beginning of the seventy's. Now it is widely used in areas such as strategic decision, forecasting and assessment, and so on.

According to the problem's nature and the overall goal, AHP breaks complex problems into different factors in ordered delivery structure which has been grouped by dominating relationship, and then people can determine the relative importance of each factor by the method of comparison of every two factors. Finally, people should consider the results of judgment comparatively to determine the total order of the various factors relative importance. One of the most critical issues is how to get the weight of evaluation indexes and the weight of each program under each evaluation index.

The general process of AHP includes several steps, such as the creation of the analytic structure model, the structure of consistency judgment matrix, the single sorting of hierarchy factors and hierarchical comprehensive ranking.

B. Information Entropy

The concept of entropy is from the thermodynamic, and it describes an irreversible phenomenon in the motion process. Using entropy to represent the uncertainty of things in information theory, and the greater the uncertainty, the greater the entropy, and the greater the amount of information needed. The concept of information entropy is proposed by C. E. Shannon in 1948. Information entropy is used to measure the amount of information, and the more ordered a system, the lower entropy becomes; on the contrary, the more chaotic a system, the higher the entropy. The Entropy is calculation formula is as follows [33]:

$$H(X) = -\frac{1}{\ln m}\sum_{i=1}^{m} p(x_i)\ln p(x_i) \quad (1)$$

Ⅴ. AHP / INFORMATION ENTROPY MODEL

AHP / information entropy model includes three steps:

A. Construction of Matrix with the AHP and calculate the weight of subjective indicators

Select the comparison scale. This paper used1-9 scale method (T.L.Saaty). The meanings of the scale are shown in Table Ⅱ.

TABLE II.
THE MEANING OF 1-9 SCALE

scale	meaning
1	compared to two factors, they have the same importance
3	compared to two factors, a factor is a little more important than another
5	Compared to two factors, a factor is more important than another
7	Compared to two factors, a factor is obviously more important than another
9	Compared to two factors, a factor is absolutely more important than another
2,4,6,8	The median of the two adjacent scale values
reciprocal	Assuming the result of factor i than j is a_{ij}, then the result of factor j than i is $1/a_{ij}$

Construct the judgment matrix. Experts assigned to the importance degree of elements according to1-9 scale, and construct the comparison matrix. The form is as follows:

$$A=(a_{ij})_{n\times n} \quad (2)$$

$a_{ij}>0$，and $a_{ij}=1/a_{ji}$

Calculate the weight and the largest eigenvalue. The weights of evaluation indictors are the eigenvectors of the judgment matrix. This paper used the square root to calculate the weight, and the calculation process is as follows:

- Each row elements of judgment multiply, denoted by M_i;
- Calculating the n-th root M_i, denoted by W_i;
- Normalize to the vector $W = (W_1, W_2, ..., W_n)_t$, as follows:

$$W_i = \frac{W_i}{W_1+W_2+\cdots+W_n}(i=1,2,\cdots,n)$$

$W=(W_1,W_2,\cdots W_n)^T$ ， W is the approximate solution of the eigenvector.

Calculated the to maximum eigenvalue (λ_{max}) of the judgment matrix

$$\lambda_{max} = \sum_{i=1}^{n}\frac{(BW)_i}{nW_i} \quad (3)$$

Consistency test

- consistency test to the judgment matrix by consistency index (CI)
- $$CI = \frac{\lambda_{max}-n}{n-1} \quad (4)$$
- The standards of the judgment matrix are the average random indicators consistency index (RI),

and the indictor is only concerned with the matrix order. Calculate formula is as follows:

$$CR = \frac{CI}{RI} \quad (5)$$

When CR <0.1, the paired comparison matrix has a satisfactory consistency, or its inconsistency degree is acceptable; otherwise adjust the paired comparison matrix till it reaches the consistency of satisfaction.

B. Determine the Objective Weight by Information Entropy

Shannon said: entropy method is a method of determine the weights by the judgment matrix compose of the value of evaluation indictors in objective conditions

- Constructing a judgment matrix with m programs and n evaluation indictors.

R（x_{ij}）$_{mn}$（i＝1，2，…，m；j＝1，2，…，n）。

- Index standardization. Because the dimensions of each index are different, indictors dimensionless is necessary in order to compare comfortably.

Assume x_{ij} is the result of dimensionless, and the standardized formula is as follows:

$$P_{ij} = \frac{X_{ij}}{\sum_{j=1}^{n} X_{ij}} \quad (i=1,2,\cdots m) \quad (6)$$

The standardized matrix: P＝$\{p_{ij}\}_{m\times n}$.

- According to the definition of entropy, we can determine the information entropy of the indictor j(H_j):

$$H_j = -\frac{1}{\ln m}\sum_{i=1}^{m} p_{ij} \ln p_{ij} \quad j=1,2,\ldots n \quad (7)$$

- Calculate the entropy of the indictor j (W_j^S):

$$W^s_j = \frac{1-H_j}{m-\sum_{i=1}^{n} H_j} \quad (8)$$

- Construct comprehensive evaluation model

The weights determined by AHP reflect the experts' sort on the importance of various indicators. Information entropy reflects the objective existence relationships of properties values based on the supplier, combine the two methods, and consider both the subjective and objective factors, so that we can evaluate the three logistics objectively and reasonably.

Combined the subjective weights from experts and makers W_1^*, W_2^*... W_n^* and the objective weight W_j^s, the final weight of indicators are:

$$W^*_j = \frac{W^z_j W^*_j}{\sum_{j=1}^{n} W^z_j W^*_j}, 0 \le W^*_j \le 1, \sum_{j=1}^{n} W^*_j = 1 \quad (9)$$

W_j^* is for the comprehensive weight, W_j^z is subjective weight determined by AHP, W_s^j is for the objective weight determined by the entropy weight method.

C. Indictors Dimensionless

Given the defect of various dimensionless methods, the paper uses the concept of membership function in fuzzy mathematics to do dimensionless to the maximum and minimum of the score. The conversion formula is as follows:

Fuzzy quantification for the positive indicators class and the evaluation results after treatment strictly monotone increasing.

$$R_j(x) = \begin{cases} \frac{1}{2}+\frac{1}{2}\sin\left[\frac{\Pi}{x_{j\max}-x_{j\min}}\left(x_j-\frac{x_{j\max}+x_{j\min}}{2}\right)\right], x_{j\min} < x_j < x_{j\max} \\ 0, x_j < x_{j\min} \text{或} x_j > x_{j\max} \end{cases} \quad (10)$$

Fuzzy quantification of negative indicators class, evaluation results after treatment strictly monotone decreasing.

$$R_j(x) = \begin{cases} \frac{1}{2}-\frac{1}{2}\sin\left[\frac{\Pi}{x_{j\max}-x_{j\min}}\left(x_j-\frac{x_{j\max}+x_{j\min}}{2}\right)\right], x_{j\min} < x_j < x_{j\max} \\ 0, x_j < x_{j\min} \text{或} x_j > x_{j\max} \end{cases} \quad (11)$$

D. Comprehensive Evaluation Value of indictors

The scores experts on various indicators were R_1, R_2... R_n, after dimensionless the values are R_1^*, R_2^*... R_n^* and the comprehensive weight of various indictors is W_1^*, W_2^*... W_n^*. Then the final score of the third party suppliers:

$$T = [R^*_1, R^*_2, \ldots, R^*_n][W^*_1, W^*_2, \ldots, W^*_n]^T \quad (12)$$

V. USE OF THE MODEL OF AHP/ INFORMATION ENTROPY IN THIRD-PARTY LOGISTICS SUPPLIER SELECTION EVALUATION

Because the development level of logistics technology in Heilongjiang Province is lower, the third party logistics' development of the agricultural products is restricted. At present, the circulation of agricultural products in Heilongjiang Province is still mainly on the way of own-running logistics. In order to reduce energy consumption, and implement green logistics, agricultural products processing enterprises in Heilongjiang province decide to outsource logistics to third-party logistics providers, hoping to reduce logistics costs, reduce environmental pollution and improve the level of competitiveness.

After the primaries election, there are two logistics providers as the candidate suppliers. We use the five indicators discussed in front of contents as evaluation indictors. Evaluation steps are as follows:

A. Determination of the Subjective Weight

This paper invited two researchers majored in logistics and supply chain and four senior managers engaged in an operation and management in agricultural products processing enterprises in Heilongjiang province, distributed the judgment matrix forms to them, and they completed the forms according to the scale 1-9, and we got the judgment matrix. Finally we use the software of AHP to calculate feature vectors according to the square root of, and calculate the weights of each indictor. The results are as shown in Table Ⅲ.

TABLE III.
SUBJECTIVE WEIGHT

First-level indicators	Second-level indicators	Third-level indicators	Total weight（W）
The third-party logistics provider selection	C_1 Operational Capability（0.20）	c_{11}Transport and distribution capabilities	0.1020
		c_{12} Storage Capacity	0.0520
		c_{13} Ability providing value-added services	0.0260
		c_{14} Level of information	0.0120
		c_{15} Ability of personalize	0.0060
	C_2 Service levels（0.40）	c_{21} Order Processing Efficiency	0.0400
		c_{22} Delivery accuracy	0.0720
		c_{23} Time shipping rate	0.0360
		c_{24} Time delivery rate	0.1080
		c_{25} Customer Satisfaction	0.1280
		c_{26} Network coverage	0.0160
	C_3 Services price（0.12）	c_{31} Prices of basic services	0.0900
		c_{32} Variable price	0.0300
	C_4 DevelopmentPotential（0.07）	c_{41} Corporate Culture	0.0112
		c_{42} Corporate reputation	0.0231
		c_{43} Management level	0.0084
		c_{44} Staff quality	0.0182
		c_{45} Technological innovation capability	0.0091
	C_5 Green Level（0.21）	c_{51} Pollutant emissions	0.1029
		c_{52} Energy consumption	0.0420
		c_{53} Reuse of resources	0.0651

CR=0.01，Consistency test is passed.

B. Data Collection

The evaluation group was established by the six experts determined the weight of indicators in index weights. They score to the two logistics providers according to the evaluation criteria of the evaluation indictors. The evaluation sample matrix is shown in Table Ⅳ.

TABLE IV.
SCORES OF THE TWO LOGISTICS PROVIDERS

indictors		Suppliers 1	Suppliers 2
Rule layer	**Index level**	**Value**	**Value**
Operational capability (c_1)	Transport and distribution capabilities (c_{11})	90	88
	Storage capacity(c_{12})	86	82
	Ability providing value-added services (c_{13})	74	78
	Level of information(c_{14})	82	87
	Ability of personalize (c_{15})	73	70
Service levels (c_2)	Order processing efficiency (c_{21})（%）	91	92
	Delivery accuracy (c_{22})（%）	98	94
	Time shipping rate(c_{23})（%）	97	95
	Time delivery rate (c_{24})（%）	95	96
	Customer Satisfaction (c_{25})（%）	90	91
	Network coverage (c_{26})（%）	67	70
Services price(c_3)	Prices of basic services(c_{31})	83	81
	Variable price(c_{32})	89	90
Development Potential (c_4)	Corporate Culturec$_{41}$)	88	83
	Corporate reputation(c_{42})	91	90
	Management level(c_{43})	87	88
	Staff quality (c_{44})	93	90
	Technological innovation capability(c_{45})	76	80
Green Level c_5)	Pollutant emissions(c_{51})	86	85
	Energy consumption(c_{52})	70	76
	Reuse of resources(c_{53})	71	69

According to the formula (10) and (11), the data processing result to table 4 is shown as Table Ⅴ.

TABLE V.
THE RESULTS OF THE DIMENSIONLESS OF THE TWO SUPPLIERS

Index name	Suppliers 1	Suppliers 2
Transport and distribution capabilities (c_{11})	0.0902	0.0144
Storage Capacity (c_{12})	0.0302	0.0254
Ability providing value-added services (c_{13})	0.0094	0.0967
Level of information (c_{14})	0.0242	0.0011
Ability of personalize (c_{15})	0.0501	0.0521
Order Processing Efficiency (c_{21})（%）	0.0837	0.0452
Delivery accuracy (c_{22})（%）	0.0562	0.0061
Time shipping rate (c_{23})（%）	0.0901	0.0456
Time delivery rate (c_{24})（%）	0.0435	0.0882
Customer Satisfaction (c_{25})（%）	0.0902	0.0879
Network coverage(c_{26})（%）	0.0370	0.0521
Prices of basic services (c_{31})	0.0242	0.0976
Variable price (c_{32})	0.0365	0.0030
Corporate Culture (c_{41})	0.0137	0.0723
Corporate reputation (c_{42})	0.0837	0.0947
Management level (c_{43})	0.0010	0.0144
Staff quality (c_{44})	0.0056	0.0947
Technological innovation capability (c_{45})	0.0365	0.0196
Pollutant emissions (c_{51})	0.0629	0.0196
Energy consumption (c_{52})	0.0435	0.0594
Reuse of resources(c_{53})	0.0873	0.0096

- According to the formula (7), the information entropy values are as follows:

H_j=[0.4012， 0.2871， 0.3892， 0.1407， 0.4385，0.5015，0.2783，0.5160，0.5057，0.6214，0.3981，0.4576，0.1995，0.3588，0.6216，0.0981，0.3639，0.2855，0.3622，0.4387，0.3715]

- According to the formula (8), the entropy values are as follows:

W_j^s=[0.0992， 0.1181， 0.1012， 0.1424， 0.0930，0.0826，0.1196，0.0802，0.0819，0.0627，0.0997，

0.0899，0.1327，0.1062，0.0627，0.1495，0.1054，0.1184，0.1057，0.0930，0.1042]

- According to formula (9) , the integrated weights are as follows:

W_j^*=[0.1066，0.0647，0.0277，0.0180，0.0059，0.0348，0.0907，0.0304，0.0932，0.0845，0.0168，0.0852，0.0419，0.0125，0.0153，0.0153，0.0202，0.0113，0.1145，0.0411，0.0714]

- Finally, According to formula (12) and Table 4, we can draw the final evaluation score of supplier Ⅰ and supplier II:

T1=0.6059，T2=0.4574

According to the final score, we can determine the optimal supplier of a third-party logistics enterprise provider is supplier Ⅰ.

This paper built the model of AHP / information entropy for the third-party logistics provider selection. The model combined he subjective analysis and objective analysis. AHP reduced the subjectivity of the decision-making problems to some extent, making the evaluation and selection process can be quantified, and the information entropy method avoided impact of our subjective judgments to the supplier evaluation. Calculation of the model is simple, we can calculate through software and excel spreadsheet, the results are scientific and simple, and more effectively solute the uncertainty questions of the third party logistics supplier evaluation and selection. The example shows that the model of AHP / information entropy has a certain value of promotion and application, and it is an effective way solving the third-party logistics providers choose and evaluation.

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Xiu Guoyi, was born may 7, 1959 in harbin, graduated from Harbin Engineering University, PhD in Management. The title is professor and he is a PhD supervisor now. He is the Dean of colleague of Economics of the Harbin University of Science and Technology.

Work experience:

1991-1995, he worked as an associate director in the management engineering department of the electrical college in Harbin University of Science and Technology;

1995-2001, he worked as the secretary of the Economics and Management College in Harbin University of Science and Technology;

2001-2008, he worked as the dean of Economics and Management College in Harbin University of Science and Technology;

2008-2011, he worked as the dean of Economics College in Harbin University of Science and Technology;

Issues commitment or involved in recent years:

Virtual Enterprise Information System Research (Harbin, Heilongjiang Province, 2006);

Matter-element analysis based on risk assessment model of virtual enterprise (Harbin, Heilongjiang Province, 2007);

Project-oriented organization model and management of virtual enterprise (Harbin, Heilongjiang Province, Xiu Guoyi, 2007);

Recent major research projects are as follows (Heilongjiang Province Development of Private Economy 11552023);

Optimize the financial ecological environment in Heilongjiang Province, countermeasures (No10542172) 2009.10.13-2010.10.13;

Consumption patterns based on eco-enterprises in Heilongjiang Province Green Competitiveness.(2012.1-2015.12).

Xiaohua Chen, was born in Shandong province in 1982. She is a PhD student now. She is studying at Harbin University of science and technology, majoring in management science and Engineering. She is research in green logistics management now.