

# Research on Evaluation of Logistics Distribution Mode of Take-out Platform

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**Abstract.** Under the current background of rapid economic and technological development and government and various departments' policy support, the Internet has developed rapidly, which has also promoted the establishment of the take-out platform and accelerated the development of the traditional catering industry. The take-out platform has broad prospects in China, but it is still in the development stage, and there are still many problems in the establishment of the distribution system. The key to optimizing the distribution system is to have a certain understanding of the distribution mode of the platform and to choose a reasonable distribution mode according to the actual situation. This paper firstly expounds the distribution characteristics of the external sales platform, establishes the evaluation index system of the take-out platform, and then starts from the current situation and problems of the export group of Nantong City, the design of the questionnaire to collect data, and the distribution of the MeiTuan through the AHP method and the fuzzy comprehensive evaluation method. The model is analyzed and evaluated to select a more appropriate distribution model for Nantong City.

**Keywords:** O2O e-commerce; take-out platform; MeiTuan take-out; AHP; fuzzy comprehensive evaluation.

## 1. Introduction

Since 2014, catering take-out O2O has been popular with its personalized service. take-out O2O is a form of sales that combines online and offline production, including merchandise, promotion, distribution, and information management, the most critical of which is the distribution of merchandise. The quality and efficiency of distribution directly affect the business efficiency of the business and the satisfaction of the customer. Hu Shouzhong, Jin Jinhua (2017) used AHP to establish an indicator model to calculate, and concluded that the current e-commerce clothing should be based on third-party distribution in the retail business, and that the distribution capacity should be included in the key considerations[1]. Tang Xiuli, Zhang Dekai, Wang Yajie (2018) studied the distribution mode of college express delivery, and found that there are problems in distribution channels and “door to door” services. According to the characteristics of large amount of express delivery and concentrated time, colleges and universities are introduced in colleges and universities. Crowdsourcing distribution model for research[3]. Xue Sun (2015) analyzed the distribution mode and characteristics of e-commerce logistics at this stage, focusing on the use of AHP to select the distribution mode of e-commerce logistics[4].

## 2. Construction of Logistics Distribution Evaluation System for Take-out Platform

O2O, the dominant catering in the O2O industry, uses the Internet to divert online consumers to offline, boosting the turnover of catering merchants through more traffic; on the other hand, attracting offline consumers to online Ordering activities, to promote customers online multiple orders with faster and more convenient services. The characteristics of take-out O2O distribution are mainly time-sensitive, high-frequency, regionalized and small batch[2].

## 2.1 Logistics Distribution Mode

### (1) Self-operated delivery mode

This mode refers to the delivery task of the goods by the company alone. This type of operation is more systematic, but the adoption of self-operated distribution by smaller companies increases the cost and cost of delivery.

### (2) Third-party logistics distribution model

This model refers to the third party to supply goods for the distribution business. The supply and demand companies do not own the logistics entity, but deliver the product delivery to the third party. This is a form of logistics specialization. This model has entered a stage of development as a novel concept.

### (3) Common distribution mode

This model is a kind of functionally complementary distribution form established by various logistics enterprises in order to optimize the distribution operation. This distribution mode adheres to the principle of mutual benefit and is a cooperative distribution mode. It is already a better logistics distribution model.

## 2.2 Construction of Logistics Distribution Evaluation Index System for Take-out Platform

Through literature and actual interviews, it is found that the delivery time of the take-out platform logistics distribution mainly cannot be guaranteed; the take-out rider violates the traffic rules in order to speed up the delivery; the food safety sometimes cannot be effectively guaranteed; the quality of the take-out distributor is uneven; the distribution cost is higher; the distribution staff's distribution income is lower; the distribution tracking and positioning is not very accurate; the distribution scope is not wide enough.

After comprehensively considering the advantages and disadvantages of the current take-out distribution model, it is found that in the O2O mode, a more cost-effective solution should be formulated for its logistics distribution model based on its actual development and influencing factors. This paper starts with many factors affecting distribution, and refers to the relevant literature. After analysis and summary, it is concluded that the logistics distribution mode has a large influence on the selection:

### (1) Quality of delivery service

In the current business model, price is not the only criterion for judging good or bad. The punctuality of logistics and distribution, the quality of food, the positioning of distribution, the tracking service and the scope of distribution are often the focus of people's attention. The consumer experience is mainly determined by the customer. The quality of the delivery.

### (2) Distribution security

Safety is emphasized at any time and under any circumstances. In take-out logistics, distribution security mainly includes distribution of food safety, distribution staff health and safety, and distribution traffic safety.

### (3) Distribution costs

Among the distribution costs of take-out platform, the cost accounts for a large part, mainly based on distribution labor cost, distribution management cost and distribution assembly cost.

### (4) External environment

The level of logistics development in different regions and the government's policies are different. The external environment affecting the take-out distribution model mainly includes the logistics environment, government policies, and economic development.

## 3. Empirical Research: Taking MeiTuan Take-out Platform of Nantong as an Example

The MeiTuan take-out is a platform launched by the MeiTuan to provide consumers with catering services through the Internet. Today, more than 250 million users subscribe to online orders through the MeiTuan, and there are more than 2 million cooperative merchants with 500,000. The number of

distribution riders has been broken, and its service outlets cover more than 1,300 cities nationwide, with orders exceeding 21 million per day. There are more than 20 regional sites for the sale of the beauty group in Nantong City, and the number of full-time distributors of the MeiTuan has exceeded 1,500.

### 3.1 The Status of Meituan Take-out Distribution

#### (1) Special Mission of the MeiTuan

"MeiTuan special match" is a self-built distribution team of the MeiTuan to improve the efficiency of delivery. The members belong to the official staff of the MeiTuan. After joining the company, the US Youth League will conduct comprehensive and unified induction training for all employees and irregular professional training. In order to improve the professional quality and professional level of the rider. Formal employees are usually equipped with uniform clothing and equipment, healthy and under 40 years of age [2].

#### (2) crowdsourcing distribution

As a new mode, crowdsourcing distribution is a crowdsourcing form to complete logistics distribution. The public has undertaken the distribution of goods, making the logistics distribution force more social and fragmented. In the crowdsourcing distribution mode, the rider can choose the delivery task according to his own situation. However, crowdsourcing distribution is different from the MeiTuan delivery and third-party logistics distribution. The distributors do not belong to any organization, and the flexibility is strong. However, it is difficult to complete the uniform management, and the physical condition and professional quality of the delivery staff are uncertain. There are many factors.

### 3.2 Evaluation of the Delivery Mode of the Meituan in Nantong City

#### 3.2.1 Determine the Weight of Each Indicator

Through the design of an open-ended questionnaire survey, 50 outsourced questionnaires were sent to relevant industry personnel including regional supervisors, distribution personnel and merchants. The final data was obtained by taking the average. The scale index scale criterion of the AHP method constructed by the pairwise comparison method is used as the scale criterion of the judgment matrix.

(1) The judgment matrix  $C$  is about the judgment matrix of the target layer  $G$ , and the corresponding weights of the criterion layer are calculated by using yaahp software, as shown in Table 1;

Table 1. judgment matrix and consistency of g-c level

Choose the right delivery mode $g$	Quality of service $c1$	Distribution safety $c2$	Distribution cost $c3$	External environment $c4$	$W_i$
Quality of service $c1$	1	1	1/3	3	0.20 1
Distribution safety $c2$	1	1	1/2	5	0.25 72
Distribution cost $c3$	3	2	1	5	0.47 19
External environment $c4$	1/3	1/5	1/5	1	0.07

The calculation result  $CR=0.0296<0.1$ , which proves that the judgment matrix conforms to the consistency check. It can be seen from the calculation results that among the selected four factors affecting the distribution mode, the primary factor in selecting the distribution mode is distribution security.

(2) Subdivision b the judgment matrix of the criterion layer  $c$  is calculated by using yaahp software, and the service quality judgment matrix is taken as an example, as shown in Table 2;

Table 2. Quality of Service Judgment Matrix

Quality of service $c_1$	Distribution punctuality $b_1$	Delivery meal quality $b_2$	Distribution positioning and tracking $b_3$	Delivery range $b_4$	$W_i$
Distribution punctuality $b_1$	1	1	3	5	0.4073
Delivery meal quality $b_2$	1	1	3	3	0.3547
Distribution positioning and tracking $b_3$	1/3	1/3	1	1/2	0.1051
Delivery range $b_4$	1/5	1/3	2	1	0.1329

The calculation result is  $CR=0.0534<0.1$ , which proves that the judgment matrix conforms to the consistency test. It can be seen from the calculation results that the most influential factor in the above-mentioned influencing factors on the quality of logistics service is the punctuality of distribution. Therefore, we can improve the quality of service by starting from the aspects of distribution positioning and tracking and distribution.

(3) The decision matrix of decision-making layer A on the subdivision layer b is calculated by yaahp, as shown in the example of the distribution mode of the distribution mode in Table 3;

Table 3. Distribution Mode About Distribution Punctuality Judgment Matrix

Distribution punctuality $b_1$	MeiTuan special with $a_1$	Crowdsourcing delivery $a_2$	Common distribution $a_3$	$W_i$
MeiTuan special with $a_1$	1	1/3	1/2	0.1638
Crowdsourcing delivery $a_2$	3	1	2	0.539
Common distribution $a_3$	2	1/2	1	0.2973

The calculation result  $CR=0.0089<0.1$ , which proves that the judgment matrix conforms to the consistency test.

It can be seen from the calculation results that compared with the MeiTuan's special allocation and common distribution mode, the punctuality of crowdsourcing distribution is more advantageous; and because the MeiTuan specialization is unified training and supported by background programs, Therefore, in terms of food quality, distribution positioning and tracking, distribution scope, distribution staff health and safety, and distribution traffic safety, the weight of the MeiTuan's special allocation is higher than the other two distribution modes; due to the operation of the platform and the scale, The cost of the special allocation is much higher than other distribution modes; from the external environment, the common distribution is more efficient.

### 3.2.2 Fuzzy Comprehensive Evaluation Method

(1) Determine the object set, factor set and evaluation set of the evaluation

Object set: The distribution mode available for the platform, including the MeiTuan special allocation mode, crowdsourcing distribution mode, and common distribution mode. Therefore, the evaluation object set  $o=\{o_1, o_2, o_3\}$ .

Factor set: The set of indicators to be considered in selecting the distribution mode, where the first evaluation factor:  $b=\{b_1, b_2, b_3, b_4\}=\{\text{service quality, distribution security, Distribution cost, external environment}\}$ ;

The above primary indicators can also be divided into multiple secondary indicators:

$b_1=\{c_1, c_2, c_3, c_4\}=\{\text{distribution punctuality, delivery food quality, delivery positioning and tracking, delivery range}\}$

$b_2=\{c_5, c_6, c_7\}=\{\text{delivery food safety, distribution staff health and safety, distribution traffic safety}\}$

$b_3 = \{c_8, c_9, c_{10}\} = \{\text{distribution labor cost, distribution management cost, distribution assembly cost}\}$

$b_4 = \{c_{11}, c_{12}, c_{13}\} = \{\text{logistics environment, government policy, economic level}\}$

Evaluation Set: This article uses the following evaluation levels: "good, better, fair, poor", with  $q = \{q_1, q_2, q_3, q_4\} = \{\text{good, better, fair, poor}\}$ . Considering the qualitative index to select a reasonable distribution mode, the four values of 0.4, 0.3, 0.2, and 0.1 are assigned to four evaluation levels, making it easier for relevant personnel to make quantitative comparisons.

(2) Building an evaluation matrix

In order to make the data more convincing, in the evaluation process, 100 questionnaires were distributed to relevant personnel in the industry, including regional supervisors, distributors and merchants, and 98 valid questionnaires were collected. The factors affecting the selection of the MeiTuan's take-out delivery mode are evaluated in the form of a single factor. The method of membership is used in the statistics and analysis of the data, and the results as shown in Table 4 are obtained.

Table 4. Single factor evaluation results

Evaluation object	MeiTuan special match				Crowdsourcing				Joint distribution			
	good	better	fair	poor	good	better	fair	poor	good	better	fair	poor
Delivery punctuality	0.4	0.4	0.2	0	0.2	0.2	0.6	0	0.3	0.4	0.3	0
Delivery food quality	0.4	0.3	0.2	0.1	0.2	0.2	0.4	0.2	0.3	0.2	0.4	0.1
Distribution targeting and tracking	0.6	0.3	0.1	0	0	0.2	0.5	0.3	0.2	0.4	0.4	0
Delivery Area	0.4	0.4	0.2	0	0	0	0.4	0.6	0.2	0.2	0.5	0.1
Distribution food safety	0.5	0.2	0.3	0	0.2	0.2	0.3	0.3	0.3	0.1	0.4	0.2
Delivery staff health and safety	0.6	0.2	0.2	0	0.3	0.3	0.2	0.2	0.4	0.3	0.2	0.1
Distribution traffic safety	0.1	0.2	0.1	0.6	0.2	0.2	0.5	0.1	0.1	0.2	0.6	0.1
Distribution labor cost	0.2	0.2	0.4	0.2	0.1	0.2	0.2	0.5	0.1	0.7	0.2	0
Distribution management cost	0.3	0.4	0.3	0	0.1	0.2	0.1	0.6	0.4	0.1	0.5	0
Distribution assembly cost	0.2	0.6	0.2	0	0	0.4	0.5	0.1	0.1	0.7	0.2	0
Logistics environment	0	0.6	0.4	0	0	0.3	0.7	0	0.5	0.3	0.2	0
government policy	0	0.2	0.8	0	0	0.5	0.4	0.1	0.2	0.8	0	0
economic level	0	0.3	0.7	0	0	0.3	0.6	0.1	0	0.4	0.6	0

According to Table 4, the transformation matrix of the fuzzy evaluation, i.e.,  $r$ , is compiled.

The matrix  $r$  of each level of indicators under the MeiTuan's special allocation model is as follows:

$$R_1 = \begin{bmatrix} 0.4 & 0.4 & 0.2 & 0 \\ 0.4 & 0.3 & 0.2 & 0.1 \\ 0.6 & 0.3 & 0.1 & 0 \\ 0.4 & 0.4 & 0.2 & 0 \end{bmatrix}, R_2 = \begin{bmatrix} 0.5 & 0.2 & 0.3 & 0 \\ 0.6 & 0.2 & 0.2 & 0 \\ 0.1 & 0.2 & 0.1 & 0.6 \end{bmatrix}$$

$$R_3 = \begin{bmatrix} 0.2 & 0.2 & 0.4 & 0.2 \\ 0.3 & 0.4 & 0.3 & 0 \\ 0.2 & 0.6 & 0.2 & 0 \end{bmatrix}, R_4 = \begin{bmatrix} 0 & 0.6 & 0.4 & 0 \\ 0 & 0.2 & 0.8 & 0 \\ 0 & 0.3 & 0.7 & 0 \end{bmatrix}$$

The matrix r of each level of indicators in the crowdsourcing distribution model is as follows:

$$R_1 = \begin{bmatrix} 0.2 & 0.2 & 0.6 & 0 \\ 0.2 & 0.2 & 0.4 & 0.2 \\ 0 & 0.2 & 0.5 & 0.3 \\ 0 & 0 & 0.4 & 0.6 \end{bmatrix}, R_2 = \begin{bmatrix} 0.2 & 0.2 & 0.3 & 0.3 \\ 0.3 & 0.3 & 0.2 & 0.2 \\ 0.2 & 0.2 & 0.5 & 0.1 \end{bmatrix}$$

$$R_3 = \begin{bmatrix} 0.1 & 0.2 & 0.2 & 0.5 \\ 0.1 & 0.2 & 0.1 & 0.6 \\ 0 & 0.4 & 0.5 & 0.1 \end{bmatrix}, R_4 = \begin{bmatrix} 0 & 0.3 & 0.7 & 0 \\ 0 & 0.5 & 0.4 & 0.1 \\ 0 & 0.3 & 0.6 & 0.1 \end{bmatrix}$$

The matrix r of each level of indicators in the common distribution mode is as follows:

$$R_1 = \begin{bmatrix} 0.3 & 0.4 & 0.3 & 0 \\ 0.3 & 0.2 & 0.4 & 0.1 \\ 0.2 & 0.4 & 0.4 & 0 \\ 0.2 & 0.2 & 0.5 & 0.1 \end{bmatrix}, R_2 = \begin{bmatrix} 0.3 & 0.1 & 0.4 & 0.2 \\ 0.4 & 0.3 & 0.2 & 0.1 \\ 0.1 & 0.2 & 0.6 & 0.1 \end{bmatrix}$$

$$R_3 = \begin{bmatrix} 0.1 & 0.7 & 0.2 & 0 \\ 0.4 & 0.1 & 0.5 & 0 \\ 0.1 & 0.7 & 0.2 & 0 \end{bmatrix}, R_4 = \begin{bmatrix} 0.5 & 0.3 & 0.2 & 0 \\ 0.2 & 0.8 & 0 & 0 \\ 0 & 0.4 & 0.6 & 0 \end{bmatrix}$$

The weight set is combined with the fuzzy evaluation matrix, and a comprehensive evaluation method is adopted to obtain the results of rating each mode:

MeiTuan special matching mode:

$$B1=W1 \circ R1=(0.41 \quad 0.35 \quad 0.11 \quad 0.13) \circ \begin{bmatrix} 0.4 & 0.4 & 0.2 & 0 \\ 0.4 & 0.3 & 0.2 & 0.1 \\ 0.6 & 0.3 & 0.1 & 0 \\ 0.4 & 0.4 & 0.2 & 0 \end{bmatrix}$$

$$=[0.422 \quad 0.345 \quad 0.189 \quad 0.035]$$

$$B2=W2 \circ R2=(0.48 \quad 0.07 \quad 0.45) \circ \begin{bmatrix} 0.5 & 0.2 & 0.3 & 0 \\ 0.6 & 0.2 & 0.2 & 0 \\ 0.1 & 0.2 & 0.1 & 0.6 \end{bmatrix}$$

$$=[0.327 \quad 0.2 \quad 0.203 \quad 0.27]$$

$$B3=W3 \circ R3=(0.66 \quad 0.16 \quad 0.19) \circ \begin{bmatrix} 0.2 & 0.2 & 0.4 & 0.2 \\ 0.3 & 0.4 & 0.3 & 0 \\ 0.2 & 0.6 & 0.2 & 0 \end{bmatrix}$$

$$=[0.218 \quad 0.31 \quad 0.35 \quad 0.132]$$

$$B4=W4 \circ R4=(0.25 \quad 0.16 \quad 0.59) \circ \begin{bmatrix} 0 & 0.6 & 0.4 & 0 \\ 0 & 0.2 & 0.8 & 0 \\ 0 & 0.3 & 0.7 & 0 \end{bmatrix}$$

$$=[0 \quad 0.359 \quad 0.641 \quad 0]$$

$$P=W \circ R=(0.20 \quad 0.26 \quad 0.47 \quad 0.07) \circ \begin{bmatrix} 0.422 & 0.354 & 0.189 & 0.035 \\ 0.327 & 0.2 & 0.203 & 0.27 \\ 0.218 & 0.31 & 0.35 & 0.132 \\ 0 & 0.359 & 0.641 & 0 \end{bmatrix}$$

$$=[0.272 \quad 0.294 \quad 0.3 \quad 0.139]$$

According to the same algorithm described above, the overall evaluation results of the crowdsourcing distribution mode and the common distribution mode can be obtained:

Crowdsourcing distribution mode:

$$P=W \circ R = (0.20 \quad 0.26 \quad 0.47 \quad 0.07) \circ \begin{bmatrix} 0.152 & 0.174 & 0.493 & 0.181 \\ 0.207 & 0.207 & 0.383 & 0.203 \\ 0.082 & 0.240 & 0.243 & 0.445 \\ 0 & 0.332 & 0.593 & 0.075 \end{bmatrix}$$

$$=[0.123 \quad 0.225 \quad 0.354 \quad 0.303]$$

Common distribution mode:

$$P=W \circ R = (0.20 \quad 0.26 \quad 0.47 \quad 0.07) \circ \begin{bmatrix} 0.276 & 0.304 & 0.372 & 0.048 \\ 0.217 & 0.159 & 0.476 & 0.148 \\ 0.149 & 0.611 & 0.250 & 0 \\ 0.157 & 0.439 & 0.404 & 0 \end{bmatrix}$$

$$=[0.193 \quad 0.420 \quad 0.344 \quad 0.048]$$

According to the values assigned to the evaluation set, the scores of the above three distribution modes are calculated as follows:

MeiTuan special matching mode:

$$m1 = 0.272*0.4 + 0.294*0.3 + 0.3*0.2 + 0.139*0.1 = 0.271$$

Crowdsourcing distribution mode:

$$m2 = 0.123*0.4 + 0.225*0.3 + 0.354*0.2 + 0.303*0.1 = 0.218$$

Common distribution mode:

$$m3 = 0.193*0.4 + 0.420*0.3 + 0.344*0.2 + 0.048*0.1 = 0.277$$

### 3.3 Suggestion and Improvements

From the final calculation, the score of the common distribution model is the most impressive. Therefore, the logistics distribution mode of the Nantong MeiTuan take-out platform should be based on common distribution, which is consistent with the current distribution model of Nantong MeiTuan.

From the overall analysis point of view, there are still many problems that need to be dealt with in the Nantong City MeiTuan take-out delivery. We can adjust from the following aspects:

(1) According to the survey, the distributors, merchants and consumers are satisfied with the punctuality of the delivery of the MeiTuan, so it needs to be maintained in this regard.

(2) For the special group of the MeiTuan, most orders can guarantee the quality of the meal. The group should continuously train the employees in the quality of the meal, emphasizing the importance; and another kind of crowdsourcing Mode, because there is no special management staff, so the quality of the food can not be guaranteed, it is recommended to set up a special management department to organize learning training.

(3) Regardless of the distribution mode, the construction of distribution tracking and positioning should be strengthened. Under the conditions of cost and time, the distribution scope should be expanded as much as possible, so that consumers have more options.

(4) In terms of safety, no matter which distribution mode violates traffic rules, the traffic management department should strengthen the management of road traffic, and should impose certain penalties on the delivery personnel who violate the traffic rules. In addition, the competent department should also strengthen the traffic rules. Propaganda and regular organization of learning; distribution of food safety is also a safety issue that cannot be ignored. Food distribution services should be based on the interests and health of consumers. While emphasizing the safety of both food and transportation, the distribution staff should not be neglected. Health and safety issues, although the official staff of the MeiTuan are required to have a health certificate, but the physical health of the delivery staff should also be regularly checked, in this regard, crowdsourcing needs to improve the entry barrier, requiring personnel involved in the distribution Provide health certificates or regular medical reports.

(5) The cost of the special allocation of the MeiTuan is the highest. From the above calculations, the cost weight of the factors affecting the choice of distribution mode selected in this paper is the

highest. In the cost management process, the weight of labor costs is higher than other types of costs, but the cost in this area is mainly the salary of the dispatcher. It is difficult to control, so it is necessary to start with other distribution management costs and distribution assembly costs, to minimize costs.

(6) As far as the external environment is concerned, the logistics environment and economic level will affect the development trend of various industries, but this is a big environment and it is difficult to improve and optimize. The policies of various regional governments will directly affect the development of the industry. Therefore, the government should actively formulate relevant policies to improve the distribution of staff resources, reduce distribution costs, and provide more development opportunities for the industry.

#### 4. Conclusion

Through the investigation of the relevant personnel of the Nantong MeiTuan take-out and the evaluation of the distribution model of the MeiTuan's take-out logistics, the evaluation and selection of the Meituan take-out logistics distribution model in Nantong City was carried out by AHP and fuzzy comprehensive evaluation method. Research shows that the current US-based take-out distribution in Nantong City should be based on the common distribution model; through the survey of the relevant personnel of the MeiTuan, including regional supervisors, distributors and merchants, no matter which distribution mode is used, the distribution is The punctuality and the quality of the food are guaranteed; however, the distribution positioning and tracking services have not reached the level of satisfaction of the consumers, the accuracy of the positioning is not very high; the scope of distribution has been expanded from the original 5 km Up to now, 6 kilometers, although this aspect has been improved, it still needs to be continuously improved to meet the consumer demand of customers as much as possible. According to the survey, the distributors specially equipped by the MeiTuan are guaranteed in terms of physical health. However, due to the wide range of people involved in crowdsourcing distribution, it is impossible to effectively manage the health of the delivery staff. In this aspect, crowdsourcing distribution needs to improve the entry threshold. For example, the delivery staff must hold a health certificate and submit a medical report regularly; Regardless of whether it is a special group or a crowdsourcing distribution, it is very common for the delivery staff to violate traffic safety. Therefore, the transportation department should increase law enforcement, and the dispatcher should the question should be taken seriously enough; Nantong government did not take effective measures to support the development of the industry in terms of take-out, it may lead to some costs are still too high in the industry, the industry can not form standardization.

#### Acknowledgments

First Level Key Built Discipline Projects of the Business Administration under Jiangsu Provincial "the 13th Five-Year Plan". Project number: SJY201609; Nantong Institute of Technology professor and doctoral research project (201823).

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