A Decision Making Method for Improving Service Quality Based on Three-dimension Kano Model

Lu Li, Xu Wang* , Yun Lin, Xingjun Huang

Abstract*—This study examines three-dimensional Kano model which is used to classify and determine the priority for the service modules in quality improvement. The objective evaluation was added as another coordinate in new model to overcome the subjectivity of the traditional Kano model. At first, this study investigates customers' perceptions of logistics service in China using the proposed Kano model. Next, the method of obtaining requirement importance and classification based on three-dimensional Kano model were elaborated. Quality function deployment (QFD) is utilized to transform the indicate values of requirement into the values of services. And then, taking the interaction between services into account, Dematel method is introduced into the model to correct the values of services. In order to improve the accuracy of quality improvement, a matrix with customer satisfaction and module importance as horizontal and vertical coordinates is constructed. The priority of the improvement is judged through the quadrant distribution of the modules in the matrix. Finally, the online shopping logistics service is taken as an example to verify the presented model.

***Index Terms*—quality function deployment; Kano model; DEMATEL; Service quality**

I. Introduction

SERVICE quality is an important index to measure the core competitiveness of an enterprise. In competitive environment, if provided service can’t satisfy the consumers, another service can be chosen easily to replace their business elsewhere [1]. Customer requirement is not only the driving force of service, but also the goal of service[2]. So providing high quality service is the key to improve the competitiveness of enterprises. PA Dabholkar indicates that the increased customer participation will generally improve the quality of service. [3] The critical challenge for enterprises is how to make use of customer evaluations to provide decision support for promotion of service quality. A large amount of methods have been introduced to help companies understand customer requirements better. In order to achieve quality improvement, taking customer requirements and customer satisfaction as indicators. Among them, the Kano model is widely applied to improve the core competitiveness of enterprises and guide enterprises to attach importance to customer satisfaction[4].

In addition, since different attributes have different impact on customer satisfaction and dissatisfaction, the two-dimensional Kano model has been used to sort the attributes which influence customer satisfaction [5]. The classification quality attributes of Kano model can be divided into five categories: must-be attribute, one-dimensional attribute, indifference attribute, attractive attribute and reverse attribute [6].

As mentioned earlier, the two-dimensional Kano model is a method to evaluate customer satisfactory. However, focus on customer evaluation leads to a subjective results which neglect the subjective importance. Even when experts try to increase the accuracy of the method, it is difficult to get an objective evaluation of customer satisfaction. In this study, the concept of three-dimensional Kano model is described, an objective importance index is added into the evaluation model. And then the classification of categories, the evaluation of customer satisfactions and the classification of modules in the three-dimensional model are performed. Finally, the distribution of modules and an example analysis of the model are carried out.

A number of researchers in the service quality have explored the factors affecting the quality of service. There is the direct influence of customer participation and perceived service quality [7]. The relationship between service innovation and service quality was expounded, the result showed that service quality can be achieved by exploitative and exploratory innovation [8]. Yeh, Tsu-Ming recognized the indications which affect service quality in nursing homes by using an improved Kano model. Quality function deployment and Grey relational analysis (GRA) are introduced in to the improvement of medical service standards. [9]

These years the importance of service quality and how to improve it become a heated issue. Nadi indicated that service quality should be focused on and more necessary quality should be created on the basis of current customer evaluation[10]. Reza Dabestani proposed a new method for prioritizing service quality level on the basis of importance-performance analysis (IPA) and data envelopment analysis(DEA), a new method is introduced into comparing the results of the segmented customer group[11].

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A combined model based on DEMATEL and ANP was proposed for quality improvement, and was applied in airline industry [12].

Kano model was proposed to elaborate the relationship between customer requirements and customer satisfaction, and now is utilized to analyse the product satisfaction for quality improvement [13] [14]. Sociologists usually combine Kano model with various methods. Potra, S. A combined the HWWP and a refined IVA-Kano model to design a new product or service for customer delight [15]. Arash Shahin offered a new method for reclassifying indifference attributes to improve satisfaction and dissatisfaction indexes [16]. some researches put forward a product design method based on Kano model and Quality Function Deployment (QFD) to meet the requirements of old people in games and entertainment [17] [18] [19]. Fuzzy analytical hierarchy process and fuzzy Kano model were combined to evaluate customer preferences [20] [21]. Kano model was combined with the IPA to improve the service quality and investigate the key service quality attributes of chain restaurant industry mobile healthcare industry. [22].

A lot of researches have been made on the improvement of service quality, A variety of methods were introduced into this topic. Kano model is a very common method, but few of them improve the subjectivity of the two-dimensional model. This paper introduces a three-dimensional Kano model, which reduce the subjectivity and unreliability of the model.

II. Customer Requirements Analysis of Three-Dimensional Kano Model

Considering the subjectivity of Kano model and the potential requirement of customers, customer evaluation may be on the low side. An objective importance of requirement is introduced into the model as a correction factor. Thus, a three-dimensional Kano model is proposed to evaluate customer requirements objectively for customer-driven service quality improvement. And then the importance degree and customer satisfactory are calculated based on the proposed model. The research framework is shown in Figure 1.

A. *A proposed three-dimensional Kano model*

In traditional Kano model, the XY plane is used to evaluate the degree of customer satisfaction. The x-coordinate is the level of fulfilment of one specific customer requirement and the y-coordinate represents the fulfilment level of customer satisfaction. The z-coordinate is added to represent the objective importance of requirement. The z-coordinate represents the importance valued by experts.

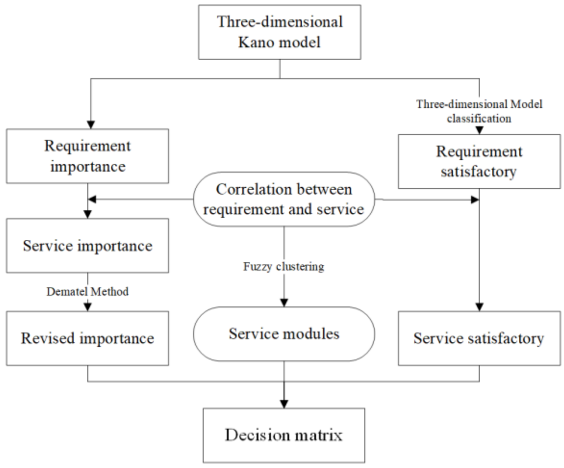

Fig.1. Three- dimensional Kano Model.

A three-dimensional Kano quantification model is proposed based on the traditional Kano model. Using this model, Kano questionnaire can be shown in Table I and Table II as follows.

TABLE I

Traditional Kano Questionnaire

requirement	Satisfied	Must be	neutral	Bearable	dissatisfied
Functional	(0.8,1]	(0.6,0.8]	(0.4,0.6]	(0.2,0.4]	[0,0.2]
Dysfunctional	[0,0.2]	(0.2,0.4]	(0.4,0.6]	(0.6,0.8]	(0.8,1]

TABLE II

Traditional Kano Questionnaire

	unimportant	A little important	important	Very important	Indispensable
z_i	[0,0.2]	(0.2,0.4]	(0.4,0.6]	(0.6,0.8]	(0.8,1]

1) Two-dimensional Kano model

The Kano model begins with calculating the average satisfaction of customer. Suppose there are J customers to be surveyed. And the service requirements set is defined as $F_1=\{f_i \mid i=1,2\cdots n\}$, x_{ij} and y_{ij} represent the satisfaction evaluation of customer i . Correspondingly, $\overline{X}_i$ and $\overline{Y}_i$ are the average customer satisfaction when the attribute f_i is implemented and not implemented. $\overline{Y}_i$ represents the average customer satisfaction if the attribute f_i is not implemented. The function is described below:

$$\overline{X}_i = \frac{1}{J}\sum_{j=1}^{J} w_{ij}x_{ij} \quad (1)$$

$$\overline{Y}_i = \frac{1}{J}\sum_{j=1}^{J} w_{ij}y_{ij} \quad (2)$$

2) Two-dimensional Kano model

Delphi method and entropy weight method (EW) are introduced to derive the objective importance z_i of service attribute f_i.

Suppose m experts are invited in the field to evaluate the importance of f_i , e_{ij} represents the importance of f_i evaluation by expert j .

$$E=\begin{Bmatrix} e_{11} & e_{12} & \cdots & e_{1n} \\ e_{21} & e_{22} & \cdots & e_{2n} \\ \vdots & \vdots & & \vdots \\ e_{m1} & e_{m2} & \cdots & e_{mn} \end{Bmatrix}$$

The entropy H_i for service attribute f_i can be expressed as follows where k represents Boltzmann constant:

$$H_i=-k\sum_{t=1}^{m} f_{it}\ln f_{it}, i=1,2,3\cdots,n \quad (3)$$

$$f_{it}=r_{it}/\sum_{t=1}^{m} r_{it}, k=1/\ln m \quad (4)$$

Then the entropy weight of f_i can be defined as:

$$v_i=(1-H_i)/\sum_{i=1}^{n} H_i, (0\le v_i\le 1) \quad (5)$$

The maximum entropy weight of the service requirement is 1. Thus, the importance degree Z_i of the service requirement can be computed as:

$$Z_i=v_i/\max v_i \quad (6)$$

B. Calculating the importance of customer requirement

We define the vector f_i □ $\vec{r}_i$ that represents a degree of importance, and the r_i can be calculated as: $r_i=|\vec{r}_i|=\sqrt{\bar{X}_i^2+\bar{Y}_i^2+Z_i^2}$ $(0\le r_i\le\sqrt{3})$. Thus, the coordinate value is $(\bar{X}_i,\bar{Y}_i,Z_i)$ accordingly as shown in the Figure2.

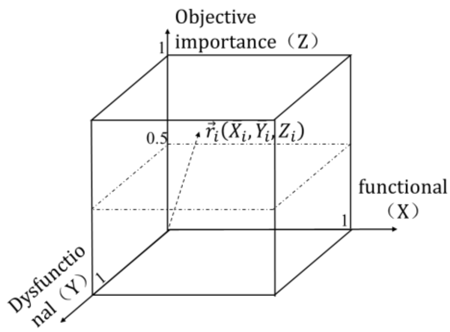

Fig.2. Three- dimensional Kano Model.

C. Classification of service attributes

Each service quality attribute is then classified into the six categories of the Kano model with the aid of Fig 2. The basis of the classification are the values of x-coordinate and y-coordinate.

Every requirement is classified into one kind of the categories by comparing the number of responses (Kano et al., 1984). But sometimes, the difference between 'Attractive' category and 'One-dimensional' category is only seven. In this situation, the position of this requirement is in somewhere between Attractive and One-dimensional requirements, since quantity of responses in both categories are the same. As shown in Figure3.

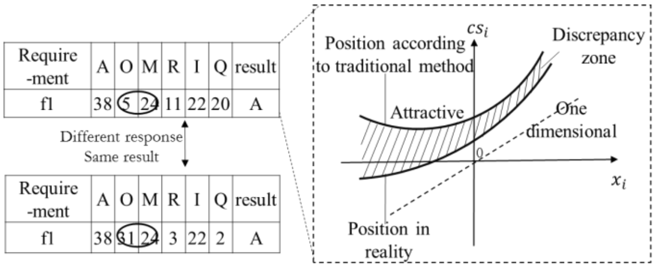

Fig.3 The Classification Method.

In order to express the actual impact of requirements on degree of satisfaction, a different evaluation sheet for categorization is proposed based on The Type IV Kano model (Peter Madzík). The category of every requirement is determined according to the result of multiplying weight p and response number of different categories. The category of the requirements are determined by p_s which is the value of Kano parameter k for the requirement. And the weight of requirements and the value of p_s are as follows:

1. Attractive requirement: p_1=3, p_s is in [2.5,3] ;
2. one-dimensional requirement: p_2=2, p_s is in [1.5,2.5) ;
3. indifferent requirement: p_3=0, p_s is in [-1,0.5);
4. must-be requirement: p_4=1, p_s is in[0.5,1.5) ;
5. reverse requirement: p_5=-2, p_s is in [-2,-1);
6. questionable requirement: these requirements are excluded from the analysis, the respective cases will show a missing value;

$$p_s=\frac{1}{n}\sum_{i=1}^{5} n_i p_i; \sum_i n_i = n. \quad (7)$$

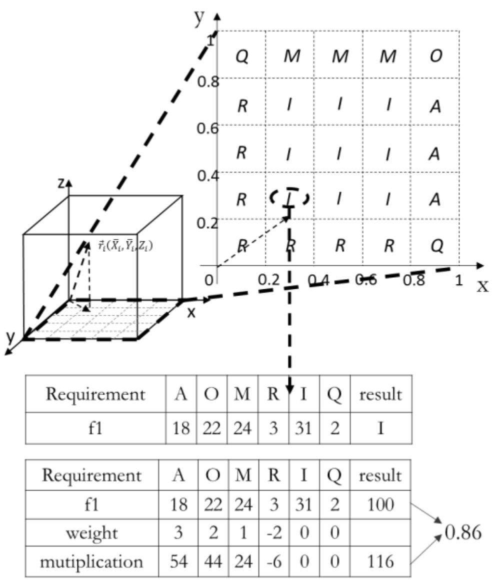

Fig.4. Process of attribute classification.

In order to identify whether functions offered will satisfy customers or prevent the customer from dissatisfaction, CS_i and NS_i are calculated to identify the relative values of meeting customer satisfaction or not. The functions are as follows:

$$CS_i=\frac{A+O}{A+O+M+I} \quad (8)$$

$$NS_i=-\frac{O+M}{A+O+M+I} \quad (9)$$

III. MODULE PARTITION AND CALCULATION OF IMPORTANCE AND SATISFACTION

A. Module partition

The modularization of service is implemented by using Fuzzy clustering approach. And according to the principle of strong coupling and weak coupling, service is divided into different modules.

Suppose that there are n service processes which are ready to be classified: $E=\{e_1,e_2,...,e_k\}$. λ_{ik} is defined as the Interaction between requirement $F_i(i=1,2,...,m)$ and service process $e_k(k=1,2,...,n)$. The diagonal elements of each answer matrix E are all set to zero. λ_{ik} is an integer valued $0,1,3,6,9$. Different value represents different kinds of correlation (1= weak correlation, 3 = general correlation, 6= strong correlation, 9 = inseparable relation, 0 = irrelevant relation). v_k is the weight of service process O_k under the influence of service requirement.

Quantity product formula is introduced into the calculation. The correlation matrix of service process is influenced by the service requirement. The correlation degree of service processes $\mu_{(k,l)}$ is calculated as follows：

$$D=\left[\mu_{(k,l)}\right]_{n\times n}$$

$$\mu_{(k,l)}=\begin{cases}1, & k=l\\ \dfrac{1}{\mu}\sum_{i=1}^{m} r_i\cdot\lambda_{il}\cdot\lambda_{ik}, & k\neq l\left(\mu=\max\limits_{g\neq l}\left(\left|\sum_{i=1}^{m} r_i\cdot\lambda_{ik}\cdot\lambda_{il}\right|\right)\right)\end{cases} \quad (10)$$

Transitive closure method is introduced into the fuzzy classification. The minimum fuzzy equivalent matrix is constructed from the fuzzy equivalence matrix which can be explained by:

$$R^*=R^{2^\sigma}=R\circ R\circ\cdots\circ R,\text{where } \sigma\le\log_2(n-1) \quad (11)$$

Where R^* indicates minimum fuzzy equivalent matrix； R is transitive closure；“。”is Zadeh operator ∧ ∨. The rules for defining matrix are as follows:∧ means selecting the bigger one, ∨means selecting the smaller one. And the expression $R^*=R^{2^\sigma}$ is feasible when $R^{2^{\sigma-1}}=R^{2^\sigma}$.

After calculating the fuzzy equivalent matrix, an appropriate threshold λ is selected to cut the modules to get a suitable granularity.

B. Calculation of module importance and satisfaction

1) Transformation based on QFD

The conversion of customer demand to service can improve the ability of the enterprise to respond to the market demand. Then the importance of service can be described as：

$$r_k=\sum_{i=1}^{n} r_i\cdot\lambda_{ik}\cdot\frac{1}{x}\left(x=\max r_i\cdot\lambda_{ik}\right) \quad (12)$$

$$CS=\sum_{i=1}^{n} CS_i\cdot\lambda_{ik}\cdot\frac{1}{y}\left(y=\max CS_i\cdot\lambda_{ik}\right) \quad (13)$$

2) Modify the importance degree based on DEMATEL

A novel approach of integrating DEMATEL into Kano model is used to get an accurate importance degree of function requirements.

Calculating the average matrix, $\mu_{(k,l)}$ is the pairwise comparisons between any two factors which is calculated by quantity product formula. A standardized matrix is obtained after processing $Z=\left[z_{ij}\right]_{n\times n}$.

Calculate the direct influence matrix $Y=\left[Y_{ij}\right]_{n\times n}$

$$Y_{ij}=\frac{z_{ij}}{\max(\sum_{j=1}^{v} z_{ij},\sum_{i=1}^{v} z_{ij})} \quad (14)$$

Compute the total influence matrix, the total relation matrix T is a $v\times v$ matrix and defined as follows: $T=[t_{ij}]=Y\times(1-Y)^{-1}$ .And then the modified function importance is calculated. Define d_i and c_i as the sum of the i th row and the j th column respectively

$$c_i=\sum_{i=1}^{v} t_{ij}(i=1,2,3,\cdots,v) \quad (15)$$

$$d_j=\sum_{j=1}^{v} t_{ij}(i=1,2,3,\cdots,v) \quad (16)$$

Using the relation r_c to represent the net influence degree of the service function, and centrality r_z shows the importance of that function which can be computed by the following expressions:

$$r_c=d-c=\sum_{i=1}^{v} t_{ij}-\sum_{j=1}^{v} t_{ij}(i=1,2,3,\cdots,v;\ j=1,2,3,\cdots,v) \quad (17)$$

$$r_z=d+c=\sum_{i=1}^{v} t_{ij}+\sum_{j=1}^{v} t_{ij}(i=1,2,3,\cdots,v;\ j=1,2,3,\cdots,v) \quad (18)$$

$$r_t=r_k+r_c \quad (19)$$

$$r=\frac{r_t}{y}\left(y=\max r_t\right) \quad (20)$$

The constructed decision-making method based on three-dimensional Kano model is proposed. As the satisfaction and importance degree were both obtained, companies can ascertain the service quality level. The satisfaction and importance degree of modules are the average value of service quality. Then the decision matrix which that can deliver higher consumer satisfaction and improve service quality was constructed. The matrix is divided into four quadrants according to degree of importance and customer evaluation.

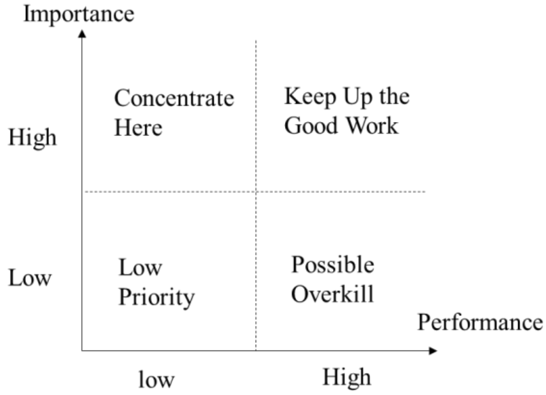

Fig.5. Service module quality evaluation model.

1. Keep up the good work
In this quadrant which means that consumers are very satisfied with the quality of service and the current service. In the future, enterprises should maintain and enhance this level of service, showing that the restaurant met the consumer expectations for the item. In the future, enterprises should keep and enhance the level of service.
2. Possible overkill
Consumers are satisfied with the quality which is in this quadrant. Although service quality met consumer expectations, it is not the most important function for consumers. In the future, enterprises can reduce investment in this kind of function, and focus on the more urgent needs of improvement functions.
3. Low priority
In this quadrant which means that consumers do not pay much attention to the quality of service, and their satisfaction is very low. However, if the quality is improved, they will be able to offer a more complete service quality, helping to improve the overall satisfaction of consumers.
4. Concentrate here
In this quadrant indicates that consumers attach great importance to service quality, but they are not satisfied with the present service. The company should pay attention to the quality of the service immediately to improve the function, improve the customer satisfaction and the overall quality of service.

IV. CASE ANALYSIS

Taking online shopping logistics services as an example. With the continuous development of the online shopping market in China, customers' individualized demand for online shopping logistics service is increasing. The dynamic and uncertainty of online shopping, the rapid expansion of the market scale both make the improvement of online shopping logistics service a difficult problem.

A total of 200 Kano questionnaires were distributed for the formal questionnaire survey in which 185 were valid. Taking delivery punctually as an example. The distribution of customer response and expert evaluation are shown in the Figure 6.

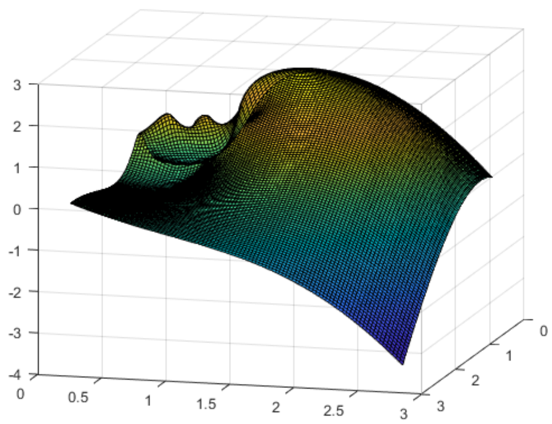

Fig.6. Customer response distribution.

All requirements were measured and classified in four categories. The requirement classification will be acquired by a three-dimensional method based on Peter Madzík. CS_i and NS_i are determined by using equations (8)-(9). The customer satisfaction of each requirement can be calculated. The results are shown in Table3:

The online shopping logistics service processes are broken down into 41 elements which are shown in the table 4.

TABLE IV

SERVICE PROCESS.

No.	Service process	No.	Service process
1	Receiving preparation	22	Designated transport scheme
2	Receiving customer information	23	Aircraft transportation
3	Staff dispatch	24	Train transportation
4	Door pick-up	25	Vehicle transportation
5	Check package	26	Package receipt
6	Package wrapped	27	Receiving SMS
7	Weigh and charge	28	Home delivery
8	Check customer information	29	Delivery prepare
9	Handover	30	installation service
10	Input information	31	Timing delivery
11	Upload information	32	Cash payment
12	Information inquiry	33	Electronic payment
13	Automatic address matching	34	Return document
14	Classify package	35	Customer feedback
15	Shipment	36	Verification of identity
16	Pick up stand-by	37	Routing list
17	Discharge cargo	38	Fill out waybill
18	Check and sign	39	Vehicle dispatch
19	Automatic sorting	40	Route optimization
20	Manual sorting	41	Omnidistance monitoring
21	Acceptance signature		

TABLE III

RESULT OF CLASSIFICATION

Dimension	No.	Customer service requirement	A	O	M	I	R	Q	Two-d category	Three-d category	CS	NS
Tangible requirement	F1	Delivery punctually	98	52	26	9			A	O	0.811	-0.422
	F2	Complete and clear documents	46	35	82	22			M	M	0.438	-0.632
	F3	Cargo safety	122	48	9	5	1		A	A	0.924	-0.310
	F4	Safety packaging	122	49	13	1			A	A	0.924	-0.335
	F5	staff dressed neatly	8	11	109	57			M	M	0.103	-0.649
	F6	Convenient equipment operation	46	118	12	9			O	O	0.886	-0.703
	F7	Key customer visits	15	25	57	88			I	M	0.216	-0.443
Information requirement	F8	Real-time monitoring	53	86	35	11			O	O	0.751	-0.654
	F9	Information availability	128	50	6	1			A	A	0.962	-0.303
	F10	Information self-service inquiry	85	66	28	6			A	O	0.816	-0.508
	F11	Accurate information	32	48	79	25		1	M	M	0.435	-0.690
reliability requirement	F12	Reasonable charge	59	88	32	6			O	O	0.795	-0.649
	F13	Multiple payment methods	49	42	58	32	4		M	M	0.503	-0.552
Convenience requirement	F14	Pickup convenient	78	86	19	2			O	O	0.886	-0.568
	F15	Simple procedure of Pickup	67	79	29	10			O	O	0.789	-0.584
	F16	Smooth communication channels	57	65	43	18		2	O	O	0.667	-0.590
Individual requirement	F17	Flexible dispatching location	48	92	33	12			O	O	0.757	-0.676
	F18	Time flexibility	77	82	22	4			O	O	0.859	-0.562
	F19	Provision of booking service	58	102	22	3			O	O	0.865	-0.670
	F20	Insurance service	58	32	86	9			M	M	0.486	-0.638
	F21	provide installation service	40	82	38	25			A	O	0.659	-0.649
Empathic requirement	F22	friendly attitude	14	115	18	38			O	O	0.697	-0.719
	F23	Professional staff	49	56	62	18			M	M	0.568	-0.638
	F24	Good reputation	2	56	108	19			I	M	0.314	-0.886
	F25	Fast response to claims	69	78	32	6			O	O	0.795	-0.595
	F26	Fast response to complaints	63	86	28	8			O	O	0.805	-0.616

The importance degree of service processes $\mu_{(k,l)}$ is obtained by equation (10). The fuzzy clustering analysis is used in the module clustering. Then, transfer closure method is realized by using matlab software while the threshold λ is valued 0.82. The service is classified into five modules as shown in the following words. They are data processing module, information processing module, service module, express processing module, preparation module respectively. Then the importance of modules and the satisfaction of modules can be calculated.

TABLE IV

CLASSIFICATION OF MODULES

module	process
Preparation module	1、9、16、29
Information processing module	2、8、10、11、12、18、35、36
Service module	4、5、7、21、26、27、28、30、31、32、33、34
Data processing module	3、13、22、37、39、40、41
Express processing module	6、14、15、17、18、20、23、24、25

In the proposed model, the matrix Z can be calculated based on $\mu_{(k,l)}$, and the influence matrix Z is obtained by normalizing the average matrix and are presented in the following expression:

$$Z=\begin{bmatrix} 0.205 & 0.283 & 0.247 & 0.188 & 0.122 & 0.166 & 0.205 & 0.265 & 0.182 & 0.285 \\ 0.406 & 0.611 & 0.529 & 0.368 & 0.237 & 0.330 & 0.384 & 0.648 & 0.301 & 0.721 \\ 0.480 & 0.695 & 0.583 & 0.413 & 0.264 & 0.364 & 0.438 & 0.635 & 0.346 & 0.756 \\ 0.343 & 0.478 & 0.411 & 0.314 & 0.267 & 0.344 & 0.436 & 0.449 & 0.244 & 0.523 \\ 0.314 & 0.440 & 0.374 & 0.346 & 0.179 & 0.324 & 0.321 & 0.479 & 0.223 & 0.467 \\ 0.241 & 0.345 & 0.290 & 0.293 & 0.224 & 0.193 & 0.279 & 0.320 & 0.188 & 0.364 \\ 0.260 & 0.341 & 0.302 & 0.343 & 0.180 & 0.249 & 0.240 & 0.325 & 0.183 & 0.382 \\ 0.463 & 0.775 & 0.616 & 0.440 & 0.273 & 0.377 & 0.475 & 0.633 & 0.341 & 0.837 \\ 0.351 & 0.473 & 0.404 & 0.293 & 0.193 & 0.267 & 0.309 & 0.438 & 0.227 & 0.504 \\ 0.476 & 0.809 & 0.650 & 0.464 & 0.288 & 0.393 & 0.483 & 0.732 & 0.359 & 0.807 \end{bmatrix}$$

Then, an influence-relations map is used in order to visualize the complex relationships among divisions which is a measurement of the difference between the functions. The x-axis and the y-axis are the values of d+c and d-c respectively. Figure 8 presents the influence-relations map of the seven functions..

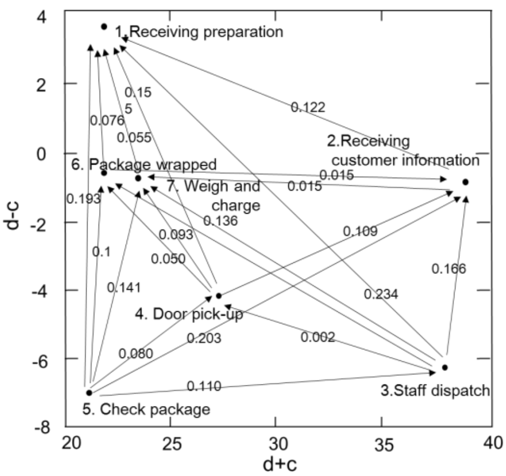

Fig.7. Customer response distribution.

And the importance degree r is obtained by using equations (15)-(20). A new technique is used to prioritize attributes which improves the quality based on customers' evaluation and importance degree. By taking customer satisfaction and objective importance as X and Y axis respectively, a two-dimension matrix is built. The distribution of the module is shown in the Figure8.

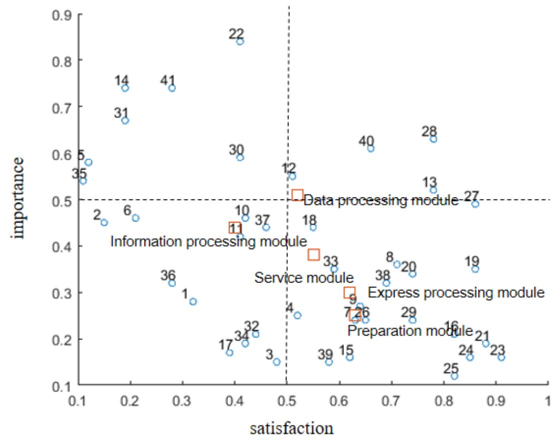

Fig.8. A mutual influence diagram.

The figure shows that four items and data processing module are located in the "keep up the good work" quadrant, indicating that consumers are satisfied with the service quality, and enterprises don't need to spend a lot of resources on these items. Eleven processes and Information processing module are located in the "low priority" quadrant which indicates that consumers don't pay much attention to these items, meaning that they should prioritize other items in quality improvement. There are seven processes fall into the "concentrate here" quadrant, indicating that these processes require great concern from enterprises because they are low in satisfaction and highly valued by customers.

In order to highlight competitive advantage, enterprises should attach importance to these items. As we can see there are nineteen processes and service modules, the module which located in the "possible overkill" quadrant, which means customers are satisfied with these items. But these items can't make a significant contribution to consumer satisfaction. Therefore, enterprises can reduce investment in them and pay more attention to the more urgent items conversely.

The amount of the items distribution in each quadrant is counted. And the result is shown in the Figure9.

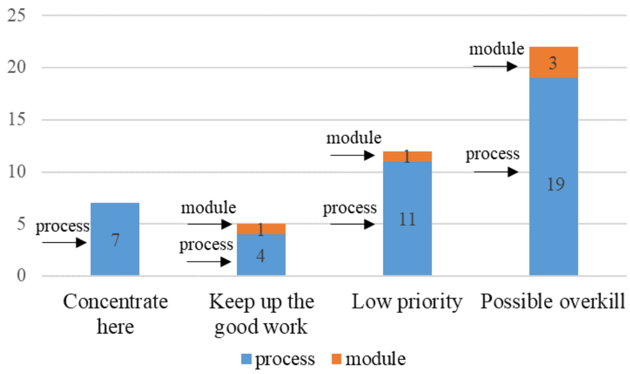

Fig.9. The distribution of processes and modules.

Firstly, from the above results, it is clear that the five modules are classified into three quadrants. And we can see that about twenty percent items located in “keep up the good work” quadrant and “concentrate here” quadrant. Secondly, the result is apparent that the objective importance of the processes and modules and their current status in customer evaluation. And then, with this sorting, it is more accurate to know which module can effectively improve the quality of service. Finally the result can help enterprises make better decisions by positioning quadrant. Prioritizing helps companies allocate resources and energy to modules that are more effective in improving customer satisfaction. In this way, can enterprises improve service quality more effectively according to customer evaluation with minimum cost. Make sure the company's resources get better allocation.

V. Conclusion

This paper is a valuable contribution to the improvement of service quality because it is able to divide service modules to decide which one needs to be improved. And the result can diret a more effectively and more accurately allocatuion of resources. Then this paper also presents a technology which can value the customer satisfactory and current evaluation of online shopping logistics service. A three-dimensional Kano model is introduced based on traditional Kano model which adds the objective importance of expert evaluation as a new coordinate attribute. The three-dimensional Kano model overcome the subjective defects of the customer evaluation. Then, the method of calculating customer satisfaction, requirement importance degree and demand classification under three dimensional models are proposed. Considering the inaccuracy of importance degree calculation method, the dematel method is introduced to modify the importance of service.

The aim of this research is improve the service quality by setting an adequate classification of service modules that consider both the customer evaluation and importance degree themselves. And the calculating method based on three-dimensional Kano model were provided for acquiring more objectiveness with vertical coordinate. In particular, the three-dimensional Kano model for evaluating the requirement was composed of customer satisfactory and importance degree, which can reduce the subjectivity of customer evaluation.

This study could be utilized in a wide range of service industry by constructing a three-dimensional Kano model can help logistics companies determine the priority of logistics service quality attributes. Not only for logistics enterprises, will it be appropriate to other kinds of service industries.

Although the proposed model for service quality improvement is effective, there are still some limitations which should be considered in future. First, the accuracy can be reduced because of the sample data of this study is less. Thus, it is necessary to expand the sample size in future studies to ensure a more reliable conclusion. Second, this paper only picked up a logistics company as an example, the future works can consider covering multiple companies among different service industries to prove the validity of the proposed method. Thirdly, this paper focused on the quality improvement, customer satisfaction and importance degree are the indexes considered, but in the process of implementation, much more indicators need to be considered which can improve the feasibility of the model.

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