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Research on Logistics Service Quality Improvement Based on A-KANO Model: An Application of Express Industry in China

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Abstract: Literatures indicate that service management has become a strategic issue for companies in the new millennium. By improving logistics service quality (LSQ), logistics companies can increase customer satisfaction (CS) and gain market shares. This study aims to establish a logistics service attributes analysis model to extract customer knowledge for logistics service quality improvement based on analytical Kano (A-Kano) model. By the building of Kano quantitative satisfaction index and importance index, an objective classification method and the decision-making rule to improve LSQ are proposed. It can be seen from the results that different value propositions should be given to LSQ attributes among the same Kano classification according to the decision index. At last, the method has been demonstrated by means of a real case application, which refers to a Chinese express company.

Keywords: Logistics service quality, Customer satisfaction, A-Kano model, Express Industry

1. INTRODUCTION

With this explosive growth of the logistics service economy, Chinese logistics companies face fierce competition, especially due to varying, fast-changing and customized requirements from their customers. To logistics companies, the total value of a lifetime customer is almost unquantifiable, and allows firms to achieve competitive advantage against competitors [1]. While customers are unlikely to engage in the long-term relationships typically associated with contract logistics if a company does not deliver good service quality [2]. Bailey [1] stresses the significant role of service quality in achieving competitive advantage, conversely, the weak importance of sales and profits. Thus, increasing logistics companies' service quality would expand their portfolio by higher-revenue services, which require a high quality level.

According to Robledo [3], customers evaluate service by comparing their perceptions of the service received with their expectations, thus, the gap between customer expectations and perceptions is a synthetic measure of CS. Since customers will be satisfied when perceptions exceed their expectations, understanding these requirements is an imperative for firms. Therefore, understanding customers' expectations so as to achieve high CS is essentially important for logistics companies' strategies. Research by Millen et al. identifies significantly improved CS as a key benefit of LSQ [4].

Traditionally, the relationship between CS and quality attributes is treated as linear. The relationship is not that simple, for some quality attributes, CS can be greatly improved with only a small improvement in performance; while for some others, CS can only be improved a little even when the performance of the service has been greatly improved. Using the traditional way to improve CS, it is possible that the customer will not be satisfied with a certain quality attribute, or maybe the CS target will be over-fulfilled [5]. Therefore, understanding the service quality attributes is beneficial to improvement of service quality. This research is

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based on Kano's quality model for logistics quality dimensions and their attributes' categorization, and provides suggestions to logistics administrators on LSQ improvement.

1.1 Kano model

The Kano model has been widely applied as an effective and useful tool to classify and prioritize product/service quality attributes. In practice, the model allows the identification of five categories of product/service quality attributes with respect to the relationship between their effectiveness and CS, as is shown in Figure1. They are namely attractive quality attributes, one-dimensional quality attributes, must-be quality attributes, indifferent quality attributes, reverse quality attributes.

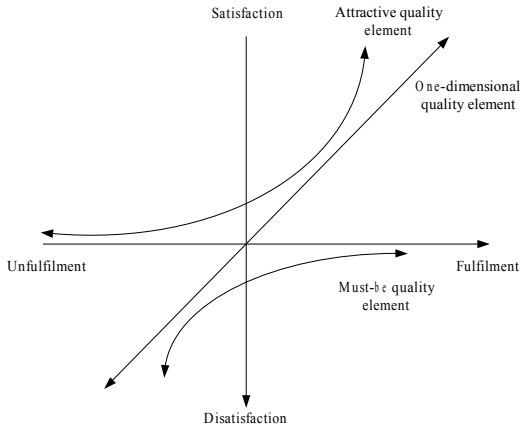

Figure1. Kano model of quality attributes

Three main tools are used in this research, namely the Kano questionnaire, the Kano evaluation table and the Kano diagram. The Kano model classification of quality attributes specifies the direction for quality improvement. When it comes to the must-be quality, it is necessary to ensure the basic quality characteristics meet specifications (standards). If it is the one-dimensional quality at issue, whether it meets the standards or not does not matter, while the way to improve specifications (standards) itself， and continuously improving the quality characteristics and CS are important. However, meeting potential needs and providing unexpected new quality are significant when it comes to the attractive quality.

1.2 Critical review of Kano model

From the review of literatures, some considerations arise. Firstly, the three tools which are used to collect customer perception information are fuzzy, since customer perception is hard to represent accurately [6]. The classification criterion is ambiguous. Furthermore, it does not mention the priority of the same quality attributes categories.

These limitations not only decrease Kano model's decision-making functions, but also result in its using with methods such as conjoint-analysis, QFD[7][8][9], FMEA[10]. In order to take into account the above considerations, an A-Kano model is applied. Compared to the traditional Kano model, A-Kano model is much more quantitative and useful for decision- making.

2. A-KANO MODEL

2.1 Designing Kano model indices

Matzler pointed out that a convenient way to quantify the Kano model is to evaluate the CS or dissatisfaction level towards products or service performance [11]. Table1 is designed to perceive CS scales of positive or negative problems. As the positive answer is stronger than the negative one, the asymmetry scale is

designed to reduce the impact of negative evaluation [6].

Since the traditional Kano model doesn't consider the customer importance perception regarding each attribute. Combined with Yang's research results [12], customer importance perception is integrated in the questionnaires. The specific scale is showed in Table 2.

Table 1. Satisfaction scale of positive or negative problems

		I like it very	It must be this	neutral	I can live with	I don't like
Product or service	With the attribute	1	0.5	0	-0.25	-0.5
	Without the attribute	-0.5	-0.25	0	0.5	1

Table 2. Importance scale

Unimportant	Somewhat important	Important	Very important	Extremely important
0-0.2	0.2-0.4	0.4-0.6	0.6-0.8	0.8-1.0

2.2 Designing decision indices

If an attribute is expressed as $F=\{f_i / i=1,2,...,I\}$, F is the attribute set, f_i is the ith attribute, J is the total amount of the interviewed customers, according to the redesign Kano questionnaire, customers' evaluation towards each attribute is gained $f_i=(\forall_i=1,2,...,I)$:

$$e_{ij}=(x_{ij},y_{ij},w_{ij}) \tag{1}$$

Among them, x_{ij} is the jth customer's evaluation towards the negative problem of attribute f_i; y_{ij} is the jth customer's evaluation towards the positive problem of attribute f_i; w_{ij} is the jth customer's importance evaluation towards the attribute f_i.

For each attribute f_i, the average CS level of the negative problem is defined as $\overline{X_i}$; the average CS level of the positive problem is defined as $\overline{Y_i}$, so there are,

$$\overline{Y_i}=\frac{1}{J}\sum_{j=1}^{J} w_{ij}y_{ij},\ \overline{X_i}=\frac{1}{J}\sum_{j=1}^{J} w_{ij}x_{ij} \tag{2}$$

The value of $(\overline{X_i},\overline{Y_i})$ can be traced in a two-dimensional coordinates chart, the horizontal dimension is the customer dissatisfaction degree towards attribute f_i, and the vertical dimension is the satisfaction degree. Most $(\overline{X_i},\overline{Y_i})$ should be in the range of 0-1, the negative value is the reverse quality factors or the questionable answers which shouldn't be included in the calculation of the average value. So the attributes f_i can be described as a vector, namely $\vec{r_i} \equiv (r_i,\alpha_i)$, where, $\left|\vec{r_i}\right|=\sqrt{\overline{X_i}^2+\overline{Y_i}^2}$, $\alpha_i=\tan^{-1}(Y_i/X_i)$

The distance of vector (r_i) is called Kano importance index $0\le\left|\vec{r_i}\right|\le\sqrt{2}$. Angle (α_i) is called as Kano satisfaction index $0\le\alpha_i\le\pi/2$.

If Kano satisfaction index and Kano importance index are used as two dimensions, the domain of attributes can be divided into four quadrants. As is showed in Figure 2, $\overline{r}$ is the average of the importance index of all the attributes and $\overline{\alpha}$ is the average of the satisfaction index.

- Quadrant Ⅰ is called "Care-free" area. Both customer perception of satisfaction index and importance index towards these attributes are low. So the enterprises do not need to spend more resources to improve these attributes.
- Quadrant Ⅱ is known as "Surplus" area. Customer perception of satisfaction index is high, but importance perception degree is low. To cut out cost, these attributes can be eliminated in the first place without incurring a significant negative impact on CS.

• Quadrant Ⅲ is "Excellent" area. These attributes are what customers considered to be important, and their performance is satisfactory to customers. So the performance level should be maintained.

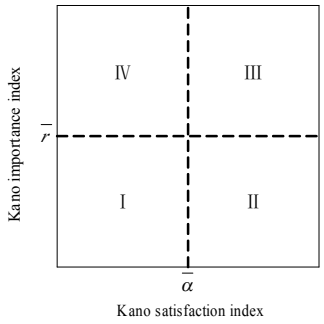

Figure2. LSQ improvement matrix based on A-Kano model

• Quadrant Ⅳ is “To be improved" area. These attributes are considered important but their performances do not meet with expectation.

In addition, to solve the problem of improving priority among the same kind of quality attributes，combining with Xu’s [6] research results, there the decision index ρ_i is

$$\rho_i = \frac{2\sqrt{2}}{3}\left(1 - \frac{\alpha_i}{\pi}\right) r_i$$

It can be seen that given a particular α_i, the configuration index ρ_i is proportional to the importance index r_i, which means the more important a service attribute is，the more improvement it should be attached. While for a specific value of r_i, ρ_i decreases with an increase of the satisfaction index α_i ,which reflects that customers are satisfied with this service attribute，and the enterprises do not need to spend too much to improve it.

3. LOGISTICS SERVCIE DECISION-MAKING PROCESS

The purpose of analyzing logistics service attributes is to identify the key component attributes of logistics service from customer perspective, and to prioritize attributes for quality improvement decision-making. The process is shown in Figure 3.

3.1 Distinguish logistics service attributes

To distinguish logistics service attributes, the whole logistics service process need to be reconsidered, so as to acquire relevant information from customer perspective. Since customers’ consumer behaviors reflect their inner desire, the Means-end chain could be used to analyze each logistics service and distinguish key logistics service attributes.

3.2 LSQ attributes classification

Survey and collect questionnaires. After summarizing the data based on the A-Kano evaluation table, attributes are classified. And LSQ attributes categories are distinguished. This knowledge will support logistics companies to serve right market segments and make appropriate strategic business decisions in the logistics service development plan and marketing activities.

3.3 Analyze CS classification results of service attributes

To prioritize service attributes among the same classification, it is necessary to compute A-Kano decision indices. And to ensure the maximization of CS, enterprises can give different weight to the logistics service attributes which are to be improved based on the usage pattern acquired from customer samples.

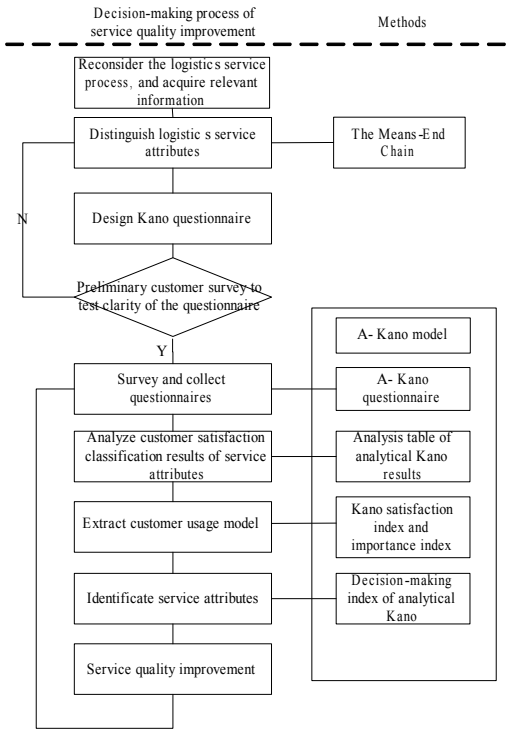

Figure3. LSQ improvement decision-making process

4. CASE ILLUSTRATION

The proposed method is applied to an express company in china.

4.1 Design of Kano questionnaires

The first part of the questionnaire is related to demographic characteristics of customer-related information. The second part is the survey of express service-related attributes, a total of 26 pairs of entries were designed. The upper row is the positive problem part of Kano questionnaire, while the lower row is the negative problem part of Kano questionnaire. The questionnaire integrates the Kano questionnaire survey methods and traditional 5 scale survey methods.

4.2 Data collection

The respondents were randomly selected from an express company's customers from May 1, 2010 to May 31, 2010, and the survey was conducted in two forms: E-mail and face to face survey. 130 questionnaires were distributed. And finally, 87 questionnaires were recovered, 83 questionnaires were available, the effective questionnaires response rate was 63.8%.

4.3 Service quality attributes categories

In order to detect the category of the express quality service attributes, supposing the value of importance indicators is 0.5, for service attribution f_i, if $x_i < 0.5$ and $y_i < 0.5$, f_i is considered unimportant and divided into indifferent quality; and if $x_i \geq 0.5$ and $y_i < 0.5$, f_i is considered as must-be quality. Similarly, if $x_i \geq 0.5$ and $y_i \geq 0.5$, f_i is thought to be one-dimensional quality; if $x_i \leq 0.5$ and $y_i \geq 0.5$, f_i is called as the attractive quality. This can be shown in Figure4.

4.4 Results and conclusion

According to different levels of satisfaction and importance, targeted services management decisions are proposed.

- **"Care-free" area**

As can be seen from Figure5, service attributes f1, f7, f16, f17, f22, f23 are in this area, and f1, f7, f16, f24 are also indifferent quality attributes, so the enterprise does not need to spend resources on these attributes.

- **"Surplus" area**

Service attributes f5, f8, f10, f24 are indifferent quality attributes in this area. This is consistent with the facts. Since customers certainly regard quality attributes that they do not care about as unimportant quality attributes. However, not all of the indifferent quality attributes are in the area. If it is necessary to cut service costs, these are the attributes that can be eliminated without incurring a significant negative impact on the CS.

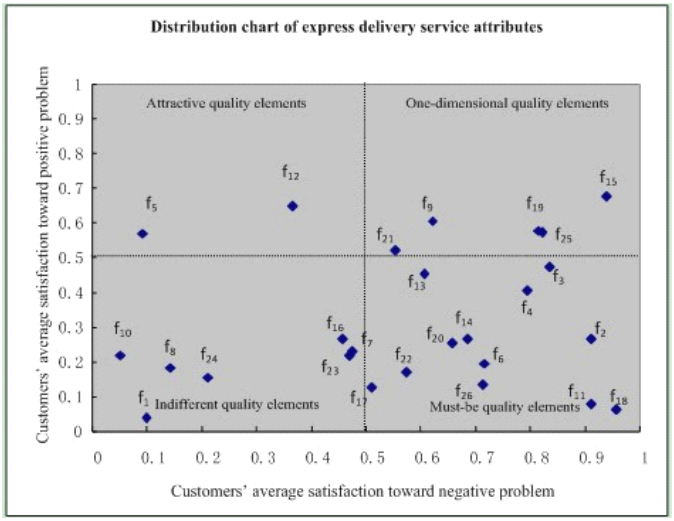

Figure4. Express service attributes classifications based on A-Kano model

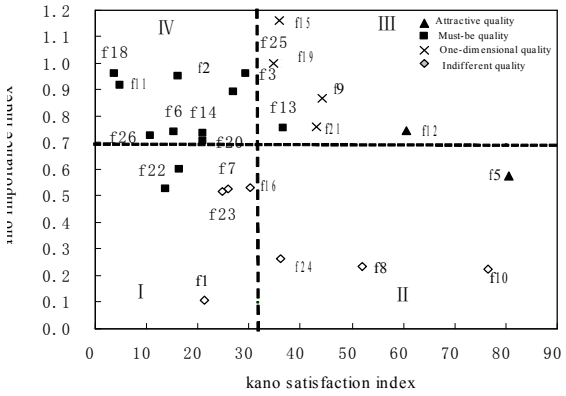

Figure5. Decision matrix based on the index of A-Kano model

- **"Excellent" area**

Service attributes f9, f12, f13, f15, f19, f21, f25 are in this region, and most of them are must-be and one-dimensional quality attributes which only need to remain this way.

- **"To be improved" area**

Service attributes f2, f3, f4, f6, f11, f14, f18, f20, f26 in this area are must-be quality attributes. And the express company should focus on these attributes and make improvement immediately. That is to say, enterprises should take service attributes, namely f3, f4, f6, f11, f14, f18, f20, f26 into account, and give

different proportion to different attributes, since $\rho_{18} > \rho_{11} > \rho_2 > \rho_3 > \rho_4 > \rho_{26} > \rho_6 > \rho_{14} > \rho_{20}$ .Consequently, while making decisions, attribute f18 could be considered improving in the first place, then f11, f2, and so on. As shown in Table3.

Table3. Results table of express service quality improvement bases on A-Kano model

Service classification / Decision Sector	M	O	A	I	R
quadrant Ⅰ	f_{17}, f_{22}			f_1, f_7, f_{16}, f_{23}	
quadrant Ⅱ			f_5	f_8, f_{10}, f_{24}	
quadrantⅢ	f_{13}	$f_9, f_{12}, f_{15}, f_{19}, f_{21}, f_{25}$			
quadrantⅣ	$f_2, f_3, f_4, f_6, f_{11}, f_{14}, f_{18}, f_{20}, f_{26}$				

5. CONCLUSION AND FUTURE RESEARCH

LSQ improvement is a multi-attribute decision-making problem to logistics companies in China. This paper proposed a LSQ improvement method based on A-Kano model. Considering the non-linear relationship between product attributes and CS, Kano's model is used. In order to address the deficiencies of traditional Kano method in qualitative analysis and subjective classification criteria, an A-Kano model is set up. By the building of Kano analytical satisfaction index and importance index, an objective classification method and the decision-making rule are proposed. Then a well-established logistics service attributes analysis model based on A-Kano model has been created.

It found that different value propositions should be given to LSQ attributes according to the decision index. There are some shortcomings in the preliminary discussion about the construction problem of the quantitative Kano model, such as the determination of the threshold value of a classified rule which needs to further research, and the resources constraint should be considered on the analysis process of the decision-making of logistics service detection, which will serve as a fruitful direction for future research.

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