

# A New Service Quality Improvement Strategy: Integration of the I-S Model and Kano Model

Kuo-Lung Wu and Nai-Jail Zheng

**Abstract**—Importance-satisfaction models(I-S model) can identify service items for improvement but cannot determine which service items can actually improve customer satisfaction. Although the Kano model can find the service items to enhance customer satisfaction, it cannot know the actual feelings of the customer’s satisfaction. We integrate the I-S model and Kano model to identify the high importance and low satisfaction service items that can actually improve customer satisfaction. This can provide decision makers with a more precise quality improvement strategy.Under the premise of not wasting resources and time, the new strategy can enhance service quality with limited human and material resources. We also prove a case study to verify our method. We expect this new model to give managers a more accurate and faster way to achieve the goal of enhancing customer satisfaction.

**Index Terms**—customer satisfaction, importance-satisfaction model, kano model, service quality.

## I. INTRODUCTION

The structure of the Importance-Satisfactionmodel (I-S model) is based on the Importance-Performance Analysis (IPA) proposed by Martillaand James (1977) [1]. The main difference is that the “performance” changes to “satisfaction” (Tongeand Moore, 2007; Yang, 2003) [2], [3]. Sampson and Showalter (1999) indicated the I-S model assumes that consumers attribute satisfaction to expectations and evaluation of the circumstances of their products or services [4]. Matzleret al. (2004) also pointed out that the I-S model can help managers to achieve the high customer satisfaction [5]; the interpretation of the I-S model is graphically presented on a grid divided into four quadrants.Fig. 1.illustrates the IPA grid. The vertical axis reportscustomers’ perceived importance of selected attributes (service items), and the horizontal axis shows customers’ experienced satisfaction in relation to these attributes (service items).The four quadrants are Excellent area, Surplus area, To be improved area, and Carefree area.

- 1) Excellent area: service items are perceived to be very important to customers and at the same time, customers seem to have high levels of satisfaction on these service items.
- 2) Surplus area: this area contains service items of low importance, but relatively high satisfaction. Although

customers are satisfied with these service items, managers should consider the resources on these service items to be possibly surplus.

- 3) To be improved area: service items are perceived to be very important to customers, but with a low satisfaction. Managers need to improve these service items.
- 4) Carefree area: service items have low importance and low satisfaction. Although satisfaction levels may be low in this area, managers should not be overly concerned since the service items in this cell are not perceived to be very important.

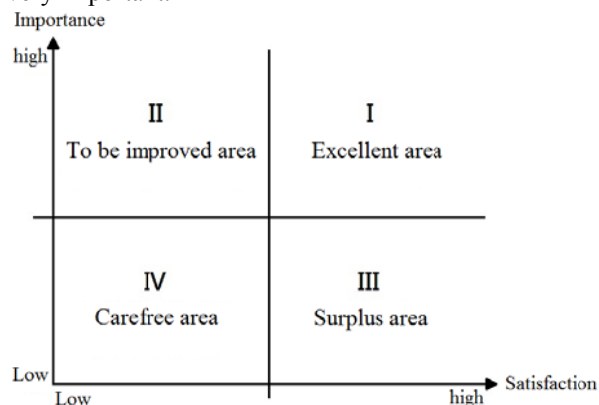


Fig. 1. I-S model.

Noriaki Kano et al. (1984) proposed a two-dimensional quality model illustrated in Fig. 2 [6]. The horizontal axis represents the fulfillment degree of quality items. The vertical axis reports the customer satisfaction degree. Kano model has been widely used in many areas, such as new product development and customer demand analysis (Xuet al., 2009;Menget al., 2011; Tontini, 2007; Chang and Chen, 2011) [7]-[10]. It also combined with a number of tools: FMEA (Shahin, 2004) [11], SEM (EskildsenandKristensen, 2006) [12], and Fuzzy (Lee et al. 2008) [13]. The Kano model is a very effective quality management tool that classifies the service items into Attractive quality, One-dimensional quality, Must-be quality, Indifferent quality, and Reverse quality.

- 1) Attractive quality: although the customers will be satisfied when the service items are fulfilled, dissatisfaction will not be sensed if unfulfilled.
- 2) One-dimensional quality: customer satisfaction is proportional to the fulfillment degree of service items. The higher the degree of fulfillment, the higher the customers’ satisfaction, and vice versa.
- 3) Must-be quality: if these service items are not fulfilled, the customer will be extremely dissatisfied. However, as the customer takes these service items for granted, the fulfillment will not increase their satisfaction.
- 4) Indifferent quality: customers do not care whether the

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service item is fulfilled or not.

- 5) Reverse quality: customers are dissatisfied when the service items are fulfilled, satisfied when they are unfulfilled.

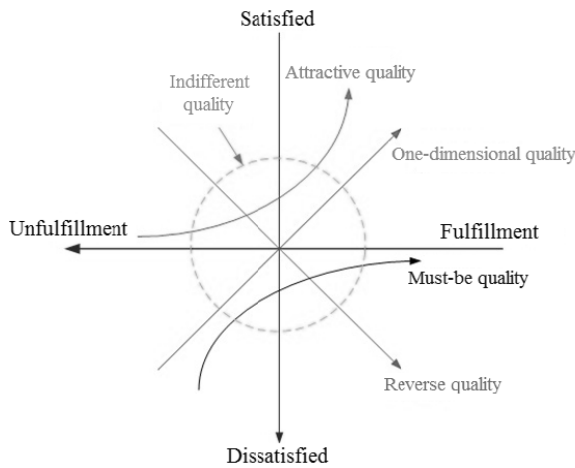


Fig. 2. Kano model.

The I-S model and Kano model are widely used in the application of service quality. The I-S model can analyze the current status of satisfaction and identify service items in need of improvement. The disadvantage is that it cannot determine which service items can actually improve customer satisfaction. For example, if the service items in the Kano model are classified into Must-be quality, improving these service items cannot improve customer satisfaction. Conversely, if the service items in Kano model are classified into the One-dimensional quality, improving these service items will improve customer satisfaction.

The Kano model can classify service items to decide quality strategy. However, the disadvantage is that there is no way of knowing the current status of the satisfaction. Although we can use the Kano model to find out the service items that can actually improve customer satisfaction, we do not know whether the customer is satisfied with these service items. Since both models have their strengths and weaknesses, we try to integrate them in this study. We will use the integrated model to identify the high importance and low satisfaction service items that can actually improve customer satisfaction. We also prove a case study to verify our method to provide decision makers with a more precise quality improvement strategy.

The contents contained in this study are as follows: First, we review the I-S model and introduce how to use it to analyze the current status of satisfaction to find out the high importance and low satisfaction service items. We also explore how to use the Kano model to measure the satisfaction enhancement degree of service items. In Section 2, we propose an index to measure the degree that service items need to be improved and also propose another index to measure the satisfaction enhancement degree of service items. We then combine these indexes to integrate the IS model and Kano model to identify the high importance and low satisfaction service items that can actually improve the customer satisfaction. This can provide the decision makers with a more precise quality improvement strategy. We also prove a case study to verify our method in Section 3 and then explain the data analysis results. The findings of this study are summarized in Section 4.

## II. THE PROPOSED METHOD

### A. The S/I Index and F/U Index

Since the I-S model can analyze the current status of the satisfaction, we define an index to measure the degree that the service items need to be improved. The index is defined by:

$$S / I = \frac{\text{Satisfaction}}{\text{Importance}} \quad (1)$$

A large S/I value means the service item has a high satisfaction and low importance and the degree of improvement of the item is relatively low. Otherwise, if the service item has a small S/I value (low satisfaction and high importance), the degree of improvement of the item will become relatively high.

The Kano model can classify the service items to find out which items can improve customer satisfaction. The traditional Kano model is qualitative and uses the mode statistic to classify service items. Berger et al. (1993) [14] proposed a quantitative Kano model that uses the arithmetic mean to measure the data of central tendency. We follow the quantitative Kano model and proposed an index to measure the satisfaction enhancement degree of service items. The index is defined by:

$$F / U = \frac{\text{Satisfaction of Fulfillment}}{\text{Satisfaction of Unfulfillment}} \quad (2)$$

A large F/U value means that fulfilling the service items will enhance customer satisfaction and not fulfilling them will reduce customer satisfaction. Fulfilling the items with large F/U values will enhance customer satisfaction. Otherwise, if the service item has a small F/U value, fulfilling the service items will not enhance customer satisfaction.

Our object is to integrate both models to identify the high importance and low satisfaction service items which can actually improve customer satisfaction.

### B. The Proposed Model

Similar to the I-S model, the integrated model is graphically presented on a grid divided into four quadrants as shown in Fig. 3. The vertical axis reports the F/U index values of service items and the horizontal axis shows the S/I values in relation to these service items. The four quadrants are: Greatest benefit areas, Difficult promotion area, Continue maintain area and Carefree area.

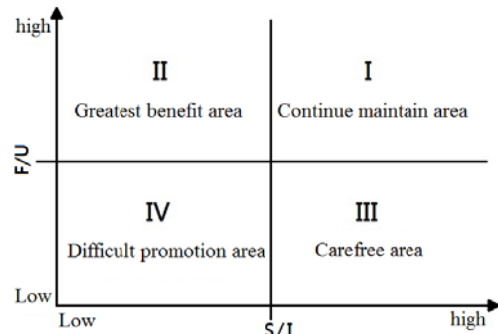


Fig. 3. The integrated model.

- 1) Greatest benefit area: service items located in this area indicate will have lower customer satisfaction and fulfilling these service items can increase customer satisfactions. Improving these service items can ensure the objective of enhancement customer satisfactions.
- 2) Difficult promotion area: although service items have

lower customer satisfactions, fulfilling these service items cannot increase customer satisfaction. Service items in this area are almost belong to the Must-be quality in the Kano model (i.e., if these service items are not fulfilled, the customer will be extremely dissatisfied. However, as the customer takes these service items for granted, the fulfillment will not increase their satisfaction.). Service items in this area are also needed to be improved. Because its ability to improve satisfaction is not high, there is a need to invest in improving more resources.

- 3) Continue maintain area: although service items in this region can enhance customer satisfaction, customers are already satisfied with these service items. So just keep on.
- 4) Carefree area: although service items in this region cannot enhance customer satisfaction, customer satisfaction reaches a certain standard. Customers already are satisfied with these service items. Managers need not care about these service items too much.

In this section, we proposed the S/I index to measure the degree to which the service items need to be improved and also proposed the F/U index to measure the satisfaction enhancement degree of service items. We then combined both indexes to integrate the I-S model and Kano model to identify the high importance and low satisfaction service items that can actually improve customer satisfaction. We expect this new model to give managers a more accurate and faster way to achieve the goal of enhancing customer satisfaction. We now prove a case study to verify our method and explain the data analysis results.

### III. CASE STUDY AND DATA ANALYSIS

The case analysis used the questionnaire as the main research tool and targeted students of a University of Science and Technology Department of Information Management. We used the P.Z.B. (Parasuraman et al., 1985; 1988) [15], [16] service quality model and referenced the literatures of various universities in Taiwan to perform our questionnaire.

In I-S model, the service quality scale measured the importance of service and satisfaction. We used seven scales to measure the importance from “very unimportant” to “very important” and satisfaction from “very dissatisfied” to “very satisfied.” The scores were given 1-7. Each service item score is the total average of the sum of the item scores of all questionnaires. If the item score is closer to 7, the students think of this service item as more important or more satisfied.

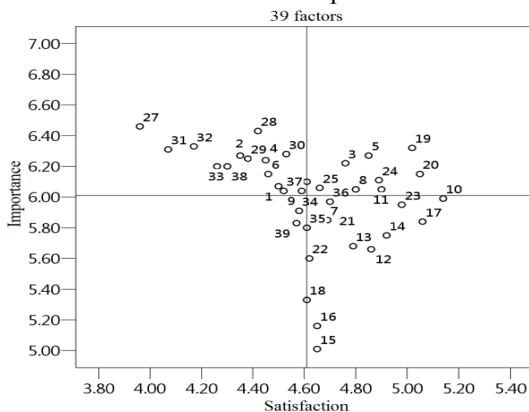


Fig. 4. I-S model for 39 service items.

In the Kano model, we also use seven scales to measure the satisfaction when fulfilling and not fulfilling the service items. The satisfaction options include: “extremely dissatisfied,” “unsatisfactory,” “acceptable,” “no difference or did not feel,” “must be,” “satisfied,” and “very satisfied” and the scores are given as 1 to 7, respectively. The satisfaction scores of fulfillment and unfulfillment of each service item is the total average of the sum of the item scores of all questionnaires. If the item score of fulfillment is more close to 7, fulfilling the service item will enhance students’ satisfaction. Conversely, if the item score of unfulfillment is closer to 7, fulfilling the service item will decrease students’ satisfaction.

#### A. Data Analysis Results

216 valid questionnaires were complete recovered from 430 total questionnaires. In this study, we used the factor analysis of satisfaction items to extract five dimensions, namely, “Responsiveness,” “Reliability,” “Assurance,” “Tangibility,” and “Empathy,” and also used Cronbach’s  $\alpha$  coefficient to test the reliability of questionnaires, with the results shown in Table I. Note that “Fac” and “Com” denote the “factor loading” and “communalities.” The Cronbach’s  $\alpha$ , greater than 0.9, shows a very high degree of consistency. In validity, we implement the factor analysis using principal component extraction and Varimax rotation to extract dimensions with eigenvalues greater than 1, and factor loadings greater than 0.5. Table I. lists the results of factor analysis, which suggested a five-dimension solution, included 39 attributes (service items) and explained 69.487% of the variance in the data.

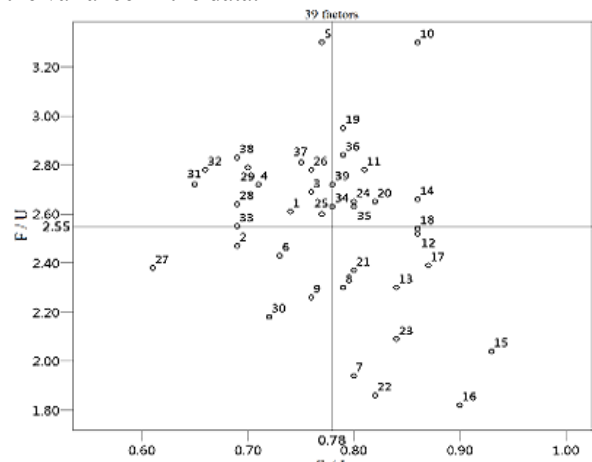


Fig. 5. The integrated model for 39 service items.

Table I. also shows the importance, satisfaction, satisfaction with fulfillment and satisfaction with unfulfillment, which are denoted by “Imp,” “Sat,” “Ful,” and “Unf,” respectively. The I-S model, illustrated in Fig. 4., indicated that service items 27, 31, 32 are with higher importance and relative lower satisfaction, which calls for improvement. Service items 15 and 16 for the respondents were considered relatively unimportant. However, this model cannot tell us whether improving these items can enhance satisfaction. So we combine the Kano model to propose a new strategy to deal with this problem.

The new model is illustrated in Fig. 5. The indexes S/I and F/U, defined in Section 2, are listed in last two columns of

Table I. The S/I index measures the degree to which the service items need to be improved and the F/U index measures the satisfaction enhancement degree of fulfilling service items. Figure 5 shows that service items 31, 32, and 38 need to be improved and fulfilling these service items can enhance satisfaction. Improving these service items (Greatest benefit area) can allow decision makers to gain maximum benefits.

Although service items 27 and 30 also need to be improved, fulfilling them will not enhance the actual experience of respondents. This is because the students think fulfilling “27. Good computer equipment” and “30. Good wireless internet environment” are must-be. Service items falling on this area

(Difficult promotion area) also need to be improved. Although improving these service items cannot upgrade the respondents’ satisfaction, the customer will be extremely dissatisfied if these service items are not fulfilled. Because its ability to improve satisfaction is not high, there is a need to invest in improving more resources. In a real case, we do not want the service items to fall in this area.

In the Continue maintain area, service items 10 fully meet the needs of respondents. Although service items 7, 15, 16, 22, and 23 cannot enhance customer satisfaction, customer satisfaction reaches a certain standard with these items. Policy makers do not need to waste resources in improving this area of service items.

TABLE I: RESULTS OF FACTOR ANALYSIS

<b>Responsiveness (<math>\alpha=0.928</math>)(EV=6.312)(Pct of Var=16.184%)<sup>c</sup></b>	Fac	Com	Imp	Sat	Ful	Unf	SI	F/U
1. Good administrative services	0.770	0.743	6.073	4.497	5.25	2.01	0.74	2.61
2. Effective response to your comments	0.765	0.730	6.270	4.348	5.32	2.15	0.69	2.47
3. Convenient means of information query	0.696	0.739	6.225	4.757	5.31	1.98	0.76	2.69
4. Pleasant staff offering good services	0.692	0.644	6.236	4.446	5.44	2.00	0.71	2.72
5. Correct announcement and message	0.669	0.671	6.270	4.847	5.70	1.73	0.77	3.30
6. Diverse elective courses	0.644	0.722	6.146	4.458	5.25	2.16	0.73	2.43
7. Online teaching system is completely	0.577	0.630	5.853	4.695	4.91	2.53	0.80	1.94
8. Concern over effect of learning on student	0.542	0.672	6.051	4.803	5.30	2.30	0.79	2.30
9. Employing teaching methods as per student’s abilities	0.532	0.690	6.039	4.588	5.10	2.26	0.76	2.26
<b>Reliability (<math>\alpha=0.934</math>)(EV=5.927)(Pct of Var=15.197%)</b>	Fac	Com	Imp	Sat	Ful	Unf	SI	F/U
10. Teacher teaching seriously	0.780	0.781	5.989	5.141	5.62	1.71	0.86	3.30
11. Fair and objective ratings	0.740	0.745	6.051	4.904	5.36	1.93	0.81	2.78
12. Teacher seriously marking students' assignments	0.731	0.738	5.665	4.858	5.34	2.12	0.86	2.52
13. Complete class tutor system	0.681	0.682	5.684	4.785	5.14	2.24	0.84	2.30
14. Complete teaching plans and content	0.664	0.700	5.750	4.920	5.28	1.99	0.86	2.66
15. Complete roll call system	0.635	0.700	5.011	4.652	5.25	2.58	0.93	2.04
16. Complete family mentoring system	0.593	0.578	5.165	4.650	5.03	2.76	0.90	1.82
17. Correct record of student information	0.560	0.599	5.836	5.057	5.18	2.17	0.87	2.39
18. Complete examination system	0.555	0.665	5.331	4.607	5.36	2.11	0.86	2.54
19. Protect student privacy	0.544	0.655	6.322	5.017	5.38	1.82	0.79	2.95
<b>Assurance (<math>\alpha=0.927</math>)(EV=5.604)(Pct of Var=14.368%)</b>	Fac	Com	Imp	Sat	Ful	Unf	SI	F/U
20. Provide certified counseling	0.724	0.752	6.146	5.051	5.36	2.03	0.82	2.65
21. Arrange off-campus professional lecturer	0.722	0.732	5.910	4.723	5.14	2.17	0.80	2.37
22. Provide life counseling	0.698	0.728	5.596	4.616	4.90	2.64	0.82	1.86
23. Provide academic counseling	0.668	0.569	5.949	4.978	5.07	2.43	0.84	2.09
24. Professional faculty	0.655	0.715	6.112	4.887	5.39	2.04	0.80	2.65
25. Courses combine theoretical and practical aspects	0.654	0.752	6.056	4.657	5.29	2.04	0.77	2.60
26. Courses are designed to meet the need of the changing times	0.569	0.656	6.101	4.607	5.39	1.94	0.76	2.78
<b>Tangibility (<math>\alpha=0.900</math>)(EV=5.240)(Pct of Var=13.435%)</b>	Fac	Com	Imp	Sat	Ful	Unf	SI	F/U
27. Good computer equipment	0.810	0.737	6.461	3.955	4.83	2.03	0.61	2.38
28. Good professional classroom	0.795	0.746	6.427	4.416	4.96	1.88	0.69	2.64
29. Good teaching aids	0.748	0.754	6.249	4.375	5.18	1.86	0.70	2.79
30. Good wireless Internet environment	0.701	0.619	6.277	4.531	5.08	2.33	0.72	2.18
31. Comfortable school environment	0.665	0.728	6.315	4.073	5.15	1.89	0.65	2.72
32. Clean toilets	0.641	0.531	6.326	4.169	5.35	1.93	0.66	2.78
33. Good reading rooms and meeting places	0.537	0.574	6.198	4.264	5.32	2.09	0.69	2.55
<b>Empathy (<math>\alpha=0.912</math>)(EV=4.018)(Pct of Var=10.303%)</b>	Fac	Com	Imp	Sat	Ful	Unf	SI	F/U
34. Provide further education counseling	0.657	0.793	5.910	4.582	5.19	1.97	0.78	2.63
35. Arrange students to participate in extracurricular competitions	0.648	0.731	5.798	4.610	5.28	2.01	0.80	2.63
36. Provide employment counseling	0.633	0.821	5.966	4.699	5.43	1.91	0.79	2.84
37. Provide work-study opportunities	0.628	0.707	6.039	4.522	5.36	1.91	0.75	2.81
38. Provide scholarships	0.593	0.656	6.197	4.303	5.44	1.93	0.69	2.83
39. Provide diverse activities	0.530	0.717	5.826	4.571	5.44	2.00	0.78	2.72

<sup>a</sup>Cronbach's  $\alpha$ ; <sup>b</sup>EV: eigenvalue; <sup>c</sup>Pct of Var: percentage of variance explained. 69.487% total variance is explained

#### IV. CONCLUSION

Enhancing service satisfaction is a very important issue for managers. Although the I-S model can analyze the current status of the satisfaction and identify service items in need of improvement, the disadvantage is that it cannot determine which service items can actually improve customer

satisfaction. Though the Kano model can find out the service items that can actually improve customer satisfaction, we do not know whether the customer is satisfied with these service items. Since both models have their strengths and weaknesses, we proposed indexes S/I and F/U to integrate them in this study. The S/I index measures the degree to which the service items need to be improved and the F/U index measures the

satisfaction enhancement degree of fulfilling service items. The new model can identify the high importance and low satisfaction service items which can actually improve the customer satisfaction. This can provide the decision makers with a more precise quality improvement strategy.

In practical terms, improving all low satisfaction items may be consuming too many resources and too much time. Under the premise of not wasting resources and time, adopting our new strategy can enhance the service quality with the situation of limited human and material resources. Fulfilling the service items in the Greatest benefit area can allow decision makers to maximize the benefit. Finding out the service items in the Carefree area allows policy makers to not waste resources and manpower. We expect this new model will allow managers to enhance service satisfaction goals more precisely and quickly.

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