Measuring Service Quality Using Complement Methods for Gap Model

Zahra Mokhtary and Behrouz Pazhouh

***Abstract*—The purpose of this study is to empirically assess three comparative approaches to measure service quality: gap model, TOPSIS, and loss function. Statically populations of this research are the insurants of five branches of social security organization in Tabriz that gathered in the second half of the year 2009. Empirically evidence obtained from a sample of four hundreds numbers from customer data in service quality of branches by SERVEQUAL questionnaire. Service quality evaluation obtained by these three distinct methods are compared and tested for their mutual agreement. We answered questions of the research by this data. Findings show that ranking obtained by these methods are Results show that branch three is the best and branch four is the worst of the branches.**

This research provides profound concepts and is a framework for managers to improve service quality. This structure measures service quality gaps, selects an optimal combination of attribute levels to keep customer satisfied, and focuses on reducing the future loss caused by poor quality.

***Index Terms*—Measuring service quality, quality management, Gap analysis, SERVEQUAL.**

I. Introduction

The purpose of this research is to evaluate and compare the efficiency of three different methods in measuring the quality of a service. Gap model is a known method in measuring service quality and is based on SERVQUAL. TOPSIS and loss function are complement methods for gap model. Empirical data gathered from the service quality data of social security organization of Tabriz branches. We will compare the results of these three distinct methods and try to put them in a more useful set.

TOPSIS is a practical technique that chooses the optimal level of quality specifications and simplifies reaching the customer satisfaction. We use this technique in designing the service. We also used loss function to highlight the long-term loss caused by not reaching the standards that customer desire. This approach is a strategy and mostly is suitable to predict long-term performance. Maybe gap model is suitable to highlight the present performance of service provider by identifying the gaps of providing good services.

II. Theorical Background

Parasuraman [1] developed the gap model as an approach to measure service quality. The foundation of the measure rested on the authors' suggestion that service quality should be represented as the difference, or ''gap,'' between service expectations and actual service performance (i.e., the disconfirmation paradigm). Thus, the Gap paradigm implies that service quality is deemed sufficient when consumer perceptions of service performance are equal to or greater than the expected level of service. Using the disconfirmation paradigm as a theoretical basis, Parasuraman et al. [2] devised the SERVQUAL scale. This instrument employs a pair of 22-item scales, each identical with the exception that one assesses the perceived performance of a service provider, the other the consumers' expectations regarding the level of service to be received. Calculating the difference between the 22 items each of five dimensions forms the service quality measure (i.e., SERVQUAL). Those five dimensions that are proposed to be generalized to virtually any service provider are: (1) the reliability of the service provider, (2) the responsiveness of the service provider, (3) the tangible aspects of the service, (4) the assurance provided by the service staff, and (5) the empathy shown to consumers. Cronin and Taylor suggest the measurement based on preference (SERVPERF), that with the most adoptability by recent approach and customer satisfaction literature have some privilege on perceptions-expectations approach.

Some of computational and operational criticism of the gap model can be solved by TOPSIS technique. In gap model we try to compute the differences between perceptions and expectations of customer using SERVQUAL. But the big problem is to encounter the negative signs in gap scores. Positive and negative deviation may cause unreal results, because dissatisfaction in one dimension may not ignored by satisfaction in another dimension. TOPSIS can solve this problem by positive and negative ideal solution. TOPSIS is one of the most popular techniques in multi-criteria decision making. It has been used to choose a balanced nutrition [3], to measuring performance in a manufacturing system [4], and managing the quality of water by minimizing the water pollution [5].

The loss function approach was introduced by Taguchi [6]. We suggest using the concept of service quality loss when the dissatisfaction caused loss in service.

III. Methodology

A. Instrument

Since SERVEQUAl have been accepted and tested in service sectors, we decided to use it in measuring service quality of social security organization-Tabriz five branches. Our instrument has 19 questions in SERVQUAL five dimensions that include four sections.

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First section is demographic questions.

Section two provide the definition of the five dimensions in our modified SERVQUAL and elicited the relative importance of the dimensions using a constant sum rating scale, where respondents were asked to distribute 100 points among the five dimensions according to the order of importance.

In section three, the items within each of the five dimensions were described and the respondents were again asked to distribute 100 points using a constant sum rating method among these items under each dimension according to their order of importance.

Section four required respondents to rate their expectations from a best branch and their perceptions on their own branch on each item under our modified SERVQUAL.

All items were coded in a four point Likert scale with 1 denoting completely disagree and four denoting completely agree. Reliability of the dimensions was checked by Cronbach's alpha. The average value of 0.888 and the minimum value of 0.810 were both more than the required value of 0.7 [7], thus showing high degree of internal consistency. The reliability coefficients are furnished in table I.

TABLE I: THE RELIEBILITY COEFFICIENT

Responsiveness: 0.810
Assurance: 0.823
Empathy: 0.890
Tangible: 0.818
Reliability: 0.825

B. Comparative Service Performance Measure Using Gap Model

The service gap is described by the following equation:

$$SQ = \sum w_i [P_{ij} - E_{ij}] \quad (1)$$

where P_{ij} is the perception of dimension j, and E_{ij} is the expectation of service dimension i for respondent j, w_i is the weight of dimension i.

C. Comparative Service Performance Measure Using TOPSIS

TOPSIS is describing by the following equations:

$$\Delta_i^+ = \left[\sum w_i \left(P_{ij\ max} - E_{j\ max}\right)^2\right]^{\frac{1}{2}} \quad (2)$$

$$\Delta_i^- = \left[\sum w_i \left(P_{ij\ max} - P_{j\ min}\right)^2\right]^{\frac{1}{2}} \quad (3)$$

$$d_i^+ = \left[\sum w_i \left(P_{ij\ actual} - P_{j\ max}\right)^2\right]^{\frac{1}{2}} \quad (4)$$

$$d_i^- = \left[\sum w_i \left(P_{ij\ actual} - P_{j\ min}\right)^2\right]^{\frac{1}{2}} \quad (5)$$

With overall closenss rating(OCR):

$$OCR = [\Delta_i^- / (\Delta_i^+ + \Delta_i^-)][d_i^- / (d_i^+ + d_i^-)] \quad (6)$$

The graphical representation of TOPSIS is provided in Fig. 1. Where in it Emax is the maximum of all expectations. Pmax and Pmin are maximum and minimum of perceptions respectively. Finally Pactual is the perceptions we gathered from customers.

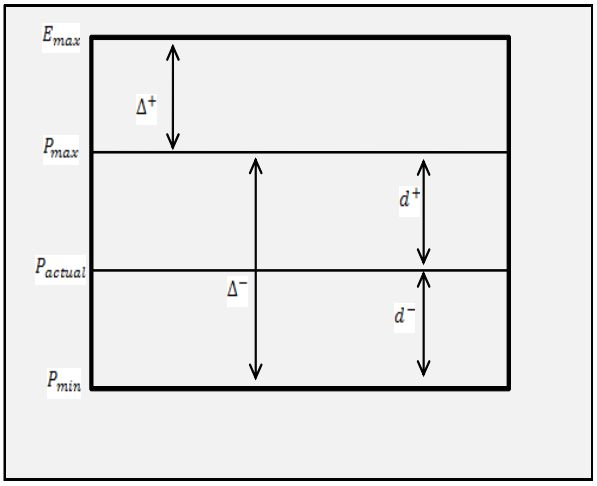

Fig. 1. Service level comparison using two stage TOPSIS (d for perceptions and Δ for expectations)

D. Comparative service Performance Measure Using Loss Function

We then used loss function as a measure of service quality. Modified loss function was used and the overall service loss was calculated based on the performance along the five SERVQUAL dimensions.

Modified loss function is described by the following equation [8]:

$$L(z) = \sum w_k \left[max\ 0, 1/(\mu_k - z_k)^2\right].\left[1 + 3s_k^2/(\mu_k - z_k)^2\right] \quad (7)$$

The graphical representation of Modified loss function is provided in Fig. 2.

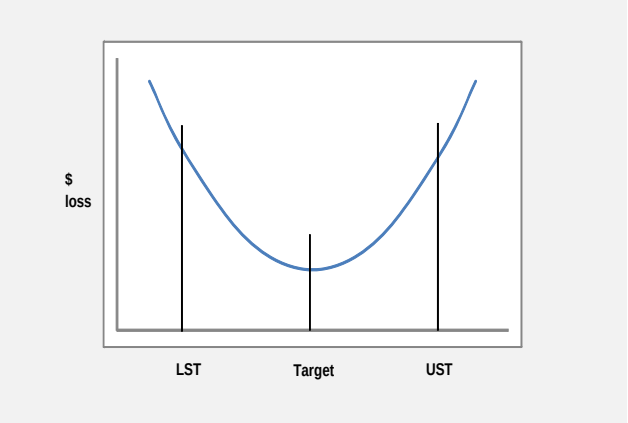

Fig. 2. The loss function with the lower and upper customer tolerence

E. Sampling and Data Collection

Tabriz five branches of social security organization were chosen for this study. The insurants were the statically population of this research. Our sample was 400 people.

Table II shows the demographic data of sample.

TABLE II: DEMOGRAPHIC DATA OF SAMPLE

Number (%)	Demographic data	
305 (76.25)	Male	sex
95 (23.75)	Female	
51 (12.75)	Under 25 years	age
150 (37.5)	25 years -35 years	
122 (30.5)	35 years - 45 years	
55 (13.75)	45 years -55 years	
22 (5.5)	Above 55 years	
250 (62.5)	Under 300$	salary
111 (27.75)	300-800	
39 (9.75)	Above 800 $	

IV. RESULTS

The analysis was carried out in three stages, as described in this section.

A. Gap Model Results

First we calculate overall service quality and by individual dimensions using modified gap model for all the five branches and ranked them accordingly. We calculated the differences of expectations and perception of each person from each branch under each dimensions and sub dimensions and then multiply the scores by the importance of dimensions and sub dimensions. The importance coefficient of each dimension was shown in table III. The result is overall service quality value. Smaller values show better performance in providing service for the customer. Table IV shows the result of this part.

B. TOPSIS Results

The performance of each branch was calculated by gap model. Since the resources are limited, we should decide about which dimension should be the first to be improved. TOPSIS gives the relative closeness of each branch to the ideal solution and remoteness from the negative solution [9]. Each branch should reach the optimal level of service because the upper and lower values may cause dissatisfaction of customer or overusing of resources. The distance of expectation and perception was given from the gap model before. The maximum expectation and perception sand minimum perceptions for each dimension and branch were calculated. We calculate the optimal level of service quality for each branch using equations (2) – (6). OCR scores show the closeness to the positive ideal solution and distance from negative ideal solution. The large scores are better. Final scores were shown in table V.

TABLE III: RELATIVE IMPORTANCE OF DIMENSIONS

dimensions	Relative importance of dimensions
Responsiveness	26.905
Reliability	23.253
Empathy	18.315
Tangible	15.912
Assurance	15.615

TABLE IV: GAP MODEL RESULTS

sores	RES	ASS	EMP	TAN	REL	SUM
B 1	-0.12923	-0.09404	-0.10053	-0.09465	-.10236	-0.52081
B 2	-0.14855	-0.09969	-0.11837	-0.12329	-0.14714	-0.63705
B 3	-0.13999	-0.07426	-0.08955	-0.06866	-0.09098	-0.46344
B 4	-0.2355	-0.14037	-0.16513	-0.14622	-0.19149	-0.8787
B 5	-0.17651	-0.10138	-0.16288	-0.12057	-0.13598	-0.69732

TABLE V: TOPSIS RESULTS

Branch 1	Branch 2	Branch 3	Branch 4	Branch 5
0.831	0.482	0.926	0.205	0.303

C. Loss Function Results

Finally we used the loss quality concept as an alternative approach in measuring service quality. Taguchi loss function with the characteristic of "larger, the better" was used to calculate the total loss in each branch caused by providing not suitable service. We calculated loss in service in each dimension using equation (7). The importance coefficient was given by the gap model. "Larger, the better" characteristic means that larger values, will be more optimal. Performance of each branch was shown in table VI.

TABLE VI: LOSS FUNCTION RESULTS

Sores	SUM
Branch 1	3.539739
Branch 2	2.264941
Branch 3	3.754366
Branch 4	1.79107
Branch 5	2.326121

D. Comparing Service Quality of Branches

Empirical data was gathered by the questionnaire. Measuring service quality was done by the three methods. Each branch was ranked by noticing the scores of each method. The overall results were shown in table VII.

TABLE VII: OVERALL RESALTS OF RANKING BRANCHES

Gap model	**TOPSIS**	**Loss function**
Branch 3	Branch 3	Branch 3
Branch 1	Branch 1	Branch 1
Branch 2	Branch 2	Branch 5
Branch 5	Branch 5	Branch 2
Branch 4	Branch 4	Branch 4

E. Testing Independence of Ranking Methods

We used Kendall's coefficient of concordance to test the independent of ranking of branches by our three methods. The results show that there is agreement in ranking branches by these three methods.

V. DISCUSSION AND CONCLUSION

In this research we used TOPSIS and loss function as complementary approaches for gap model in measuring service quality. The basic data was gathered and primary

analysis was done by gap model. Then TOPSIS come to calculate the overall closeness rating to know which branch should improve first and in which dimension we should pay attention more. Finally loss function was used to calculate the loss caused by providing bad service. The loss could be available for each dimension separately. The sum um of score for each dimension in each branch shows the overall loss of branch. Management can get the financial loss according to these results and make suitable decision to minimum the loss.

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