Gap Analysis for Improving Service Quality of Service Centers in South Korea

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Abstract

This paper applies a combined approach based on gap analysis, SERVQUAL, and Fuzzy theory to service improvement in service centers of electronics companies. SERVQUAL is adopted to understand customer requirements for service centers. Fuzzy set theory is used to resolve the subjectivity and ambiguity of customer satisfaction and expectation. A case study is implemented with the service centers of electronics companies that operate in South Korea.

Keywords: Gap analysis; SERVQUAL; Service quality; Fuzzy set theory; Service centers

1. Introduction

SERVQUAL has long been used as a survey instrument to measure service quality since Parasuraman *et al.* (1985). The SERVQUAL has 22 statements in five dimensions. Survey results are collected into the 22 statements. The SERVQUAL is also very useful for identifying customer requirements (Paryani*et al*., 2010).

Service quality can be considered a function of service quality gaps (Tsai *et al*., 2011). Customer expectations are beliefs about service delivery, while customer perceptions are subjective assessments of actual service experiences. The gap should be reduced to satisfy customers, so that companies can build long-term relationship with their customers.

Fuzzy set theory is useful for measuring the ambiguity of the concepts associated with human beings' subjective judgments (Benitez *et al*., 2007; Cho *et al*., 2016). Fuzzy-based modeling has also been effective for formulating decision problems, particularly when the information available is imprecise and subjective. Fuzzy set theory is valuable for the comprehensiveness and reasonableness of the decision-making process.

This research uses gap analysis for customer service centers in the electronics industry. The fuzzy set theory is adopted for the subjectivity and ambiguity of customers' subjective judgments. SERVQUAL is also introduced and modified to understand customer requirements in the electronics industry. The rest of the paper is organized as follows. The next section presents a literature survey. Section 3 explains SERVQUAL and fuzzy set theory. A case study is introduced in Section 4 with the service centers in South Korea. Conclusions are provided in the last section.

2. Literature Survey

Research on service centers is not common. Oliva and Sterman (2001) proposed a formal model to integrate the structural elements of service delivery for a service center of a major bank in the United Kingdom. Byers and So (2007) discussed the value of real-time information in selecting optimal control policies for cross-sales of call centers. Jiang and Seidmann (2011) incorporated operational delays and capacity decisions within the incentive contract design for a service center. These papers used mathematical modeling for the service problems of consumer-lending service centers, telephone service centers, or data centers.

Pakdil *et al*. (2012) explained the after-sales services of a construction equipment company based on Quality Function Deployment and SERVQUAL. However, they did not attack the vagueness associated with linguistic judgments used. Cho *et al*. (2016) proposed a systematic approach based on SERVQUAL, Fuzzy set theory, and

Quality Function Deployment (QFD) for service improvement in theservice centers of electronics companies. Their case study is implemented with the service centers of two electronics companies in South Korea. Their analysis, however, focused on only two companies in South Korea and did not use gap analysis to check the difference between the expectation and perception of customers for the service centers they experienced.

3. Methodologies

3.1 Servqual

SERVQUAL has widely been used as a survey instrument to measure service quality (Buttle, 1996; Paryani *et al*., 2010). The SERVQUAL includes 22 statements within five dimensions: Tangibles, Reliability, Responsiveness, Assurance, and Empathy. When the SERVQUAL is adopted for a specific industry, however, it should be modified according to customer requirements in the industry (Paryani*et al*., 2010).

3.2 Fuzzy Theory

Let the universe of discourse *X* be the subset of real numbers *R*.When $\mu_A(x)$ is called a membership function, fuzzy set *A*= $\{(x,\mu_A(x)) \mid x \in X,\ \mu_A(x) \in [0,1]\}$ is a set of ordered pairs. The membership function can take any value from [0,1]. The greater $\mu_A(x)$ is, the greater the truth of statement 'element *x* belongs to set *A*' is (Cho *et al*., 2016).

With triplet (m_1, m_2, m_3), the membership function $\mu_A(x)$ can be defined by equation (1):

$$\mu_A(x) = \begin{cases} \dfrac{x-m_1}{m_2-m_1}, & m_1 \le x \le m_2, \\ \dfrac{x-m_3}{m_2-m_3}, & m_2 \le x \le m_3, \\ 0, \text{ Otherwise} \end{cases} \quad (1)$$

A linguistic term is then characterized by a triangular fuzzy number and denoted by (m_1, m_2, m_3), where m_1 and m_3 are the lower and upper bounds of the linguistic term, m_2 is its most likely value, and $m_1 \le m_2 \le m_3$ (Benitez *et al*., 2007; Cho *et al*., 2016). Table 1 presents the default values used in this research for the linguistic terms. The approximate value range of each triangular fuzzy number is represented between 0 and 7 for the levels of perception and expectation in this paper.

Table 1: Triangular fuzzy numbers

Linguistic terms	very low	low	moderate	high	very high
Fuzzy number	(1.0,1.0,2.0)	(1.5,2.5,3.5)	(3.0,4.0,5.0)	(4.5,5.5,6.5)	(6.0,7.0,7.0)

Then, group opinions of *n* customers are aggregated as the average fuzzy number of *n* triangular numbers for each survey statement by equation (2):

$$A = (m_1, m_2, m_3) = \left(\frac{1}{n}\right) \bullet (A_1 \oplus A_2 \oplus \ldots A_n) \quad (2)$$

$$= \left(\frac{\sum_{j=1}^{n} m_1^{(j)}, \sum_{j=1}^{n} m_2^{(j)}, \sum_{j=1}^{n} m_3^{(j)}}{n}\right)$$

where $\bullet$ is the multiplication of a scalar and a fuzzy number, $A_j = (m_1^{(j)}, m_2^{(j)}, m_3^{(j)})$, j = 1, 2, 3, . . . , n, and $\oplus$ is the add operation of fuzzy numbers. *A* is the overall average of *n* responses for each survey statement.

The last step is defuzzification that converts a fuzzy number into a crisp real number (Cho *et al*., 2016). This paper uses equation (3) for defuzzification:

$$z_A = \frac{m_1 + 2m_2 + m_3}{4} \quad (3)$$

4. Application of the Methodologies

4.1 Companies

Samsung Electronics CO., Ltd. is a multinational electronics company headquartered in South Korea (Wikipedia, 2016a). It has been the world's largest information technology company by revenue since 2009. Samsung Electronics is a major manufacturer of semiconductors, mobile phones, smartphones, tablet computers and so on. Although it has assembly plants and sales networks in about 80 countries, this paper deals with the South Korean market with its headquarters.

LG Electronics Inc. is also a multinational electronics company headquartered in South Korea (Wikipedia, 2016b). It operates its business in several divisions such as home entertainment, mobile communications, home appliance, air conditioning and energy solution, and vehicle components. LG Electronics has about 120 local subsidiaries worldwide; but this paper focuses on the South Korean market only with its headquarters.

This paper deals with not only the two electronics companies, main players in the South Korean electronics market, but also the other minor companies such as Sony, Daewoo, and so on that operate in South Korea.

4.2 Survey

Table 2 shows 22 SERVQUAL statements used as VOC (Voice of the Customer) in this research. The original SERVQUAL was modified to best describe customer requirements considering the nature of repair services provided by the service centers of electronics companies (Cho *et al.*, 2016).A 5-point likert scale was used for the levels of satisfaction and expectation for each VOC in the survey.

Table 2: SERVQUAL Statements in this Research

Codes	Statements
VOC1	Services are provided by the time promised.
VOC2	Staff members actively pay attention to solving customers' problems.
VOC3	Services are provided right the first time.
VOC4	Customers are kept posted on repair progress.
VOC5	Prompt services are provided.
VOC6	Staff members are always willing to help customers.
VOC7	Staff members will never be too busy to respond to customers' requests.
VOC8	Service centers are close enough to visit.
VOC9	Facilities and equipment are up to date.
VOC10	Facilities are visually appealing.
VOC11	Staff members are neatly dressed.
VOC12	A variety of materials and equipment are visually appealing.
VOC13	The behavior of staff members provides customers with confidence and trust.
VOC14	Customers feel safe on their products repaired.
VOC15	Staff members are kind and courteous.
VOC16	Staff members are knowledgeable to answer customers' questions.
VOC17	Customers receive personal attention.
VOC18	Operating hours are convenient for customers.
VOC19	Staff members have customers' best interests at heart.
VOC20	Staff members understand customers' specific needs.
VOC21	Customer waiting lounge is available and comfortable.
VOC22	Costs are low or appropriate for customers.

Table 3: Demographic Characteristics

		Number of responses	%
Gender	Male	71	40.6
	Female	104	59.4
Age	10~20	1	0.6
	21~30	53	30.3
	31~40	32	18.3
	41~50	54	30.9
	51 orabove	35	20
The most recently visited service center	Samsung Electronics Co., Ltd.	99	56.6
	LG Electronics Inc.	50	28.6
	The other companies	26	14.9

The survey was implemented with customers who had experienced repair services at any service center of electronics companies in South Korea. A total of 195 responses were initially collected, but 175 responses were finally selected for gap analysis with 20 unreliable responses excluded. Table 3 presents the demographic characteristics of the 175 respondents of the survey.

4.3 Results and Discussions

The survey consists of three parts: personal information on the respondents, the level of expectation for each VOC, and the level of perception at the most recently visited service center for each VOC. The survey results were processed by the fuzzy theory to address their subjectivity and ambiguity.

Table 4: Gap Analysis

VOC code	Perception	Expectation	Difference
VOC 1	5.324	5.576	-0.252
VOC 2	5.239	5.501	-0.262
VOC 3	5.014	5.594	-0.58
VOC 4	4.963	5.527	-0.564
VOC 5	5.097	5.551	-0.454
VOC 6	4.943	5.441	-0.498
VOC 7	5.133	5.506	-0.373
VOC 8	3.93	5.594	-1.664
VOC 9	4.507	5.633	-1.126
VOC 10	4.493	5.346	-0.853
VOC 11	5.171	5.344	-0.173
VOC 12	4.689	5.583	-0.894
VOC 13	4.949	5.701	-0.752
VOC 14	4.799	5.846	-1.047
VOC 15	5.294	5.736	-0.442
VOC 16	5.079	5.813	-0.734
VOC 17	4.777	5.604	-0.827
VOC 18	4.296	5.804	-1.508
VOC 19	4.211	5.72	-1.509
VOC 20	4.756	5.71	-0.954
VOC 21	4.829	5.586	-0.757
VOC 22	4.156	5.93	-1.774

The results of gap analysis are provided in Table 4. The results include the values of perception, expectation, and difference between the perception and expectation obtained from the 175 effective responses of the survey. Fuzzy theory was applied to the values of perception and expectation in Table 4. The difference between perception and expectation is *P-E*, where *P* is perception (or satisfaction) and *E* is expectation.

In the 'perception' column of Table 4, statement 'Services are provided by the time promised (VOC 1)' had the highest value of the 22 statements. Also high were the three statements: 'Staff members are kind and courteous (VOC 15),' 'Staff members actively pay attention to solving customers' problems (VOC 2),' and 'Staff members are neatly dressed (VOC 11).' On the other hand, statement 'Service centers are close enough to visit (VOC 8)' had the lowest satisfaction. Low were statements 'Costs are low or appropriate for customers (VOC 22)' and 'Staff members have customers' best interests at heart (VOC 19).'

From the 'expectation' column in Table 4, the highest levels of expectation were shown in three statements: 'Costs are low or appropriate for customers (VOC 22),' 'Customers feel safe on their products repaired (VOC 14),' and 'Staff members are knowledgeable to answer customers' questions (VOC 16).' Low in the level of expectation, on the other hand, were statements 'Facilities are visually appealing (VOC 10)' and 'Staff members are always willing to help customers (VOC 6).' The lowest value was shown in 'Staff members are neatly dressed (VOC 11).'

The 'Difference' column of Table 4is the gap between perception and expectation, that is, *P-E*.The differences of all 22 statements showed negative values, which means that customers were not satisfied for all 22 VOCs, compared with their expectations. Statement 'Costs are low or appropriate for customers (VOC 22)' showed the biggest difference of all 22 statements. This indicates that customers' *relative* dissatisfaction is the highest in VOC 22 in term of expectation. Also high in the values of the 'Difference' column were statements, 'Service centers are close enough to visit (VOC 8),' 'Staff members have customers' best interests at heart (VOC 19)' and 'Operating hours are convenient for customers (VOC 18)'

Statement 'Staff members are neatly dressed (VOC 11),' on the other hand, had the least difference of all 22 statements in the 'Difference' column of Table 4. This means that VOC 11 has the highest relative satisfaction of all 22 statements in terms of expectation. Also, the differences were small in statements, 'Services are provided by the time promised (VOC 1)' and 'Staff members actively pay attention to solving customers' problems (VOC 2).'

5. Conclusions

This research presents an approach based on gap analysis for service improvement in the electronics industry. This paper uses SERVQUAL to understand customer requirements for service centers of the electronics industry. Fuzzy set theory is adopted to attack the subjectivity and ambiguity of human beings' subjective judgments. This approach is applied to the service centers of electronics companies in South Korea.

'Services are provided by the time promised (VOC 1)' received the highest satisfaction from customers of service centers in South Korea. 'Service centers are close enough to visit (VOC 8)' had the lowest satisfaction. Gap analysis provided rather different but more informative results. Customers were not satisfied for all customer requirements, compared with their expectations. 'Costs are low or appropriate for customers (VOC 22)' had the highest *relative* dissatisfaction of all requirements in terms of expectation. Customers' relative satisfaction is the highest in 'Staff members are neatly dressed (VOC 11)' in term of expectation. With the detailed review of the gap analysis, the proposed approach can provide insight into service improvement in service centers of the electronics industry in South Korea.

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