Service Quality Evaluation of Restaurants Using the Ahp and Topsis Method

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Abstract. The purpose of this study is to determine the factors affecting service quality at restaurants that operate in the service industry. Three restaurants operating in Trabzon were analyzed in terms of the quality of service they provided. In the study, the simple sampling random method was applied to 300 face-to-face interviews in which 30 surveys were deemed invalid and thus eliminated, resulting in a total of 270 surveys being evaluated. The Analytical Hierarchy Process (AHP) method was used to determine the dimensions of service quality. Subsequently, the service performance of the three restaurants were evaluated using the Topsis method (Technique for Order Preference by Similarity to Ideal Solution) and the best restaurant alternative was ultimately identified. When decision matrix and evaluating the ranking results restaurant A is found 0,0019, restaurant B is 0,0017, restaurant C is 0,0018. When these results are considered in terms of service quality, it can be observed that "A" is the most preferred restaurant by customers in terms of service performance. But the other two restaurants are so closed to "A" restaurant. This result, according to the criteria specified, may be indicative of restaurants operating in Trabzon are offering similar level of service to their customers. This study is limited to only restaurants in food-sector and only in Trabzon. Therefore, not presented any information about the validity of the results for different sectors. Future researches needs to be extended to other restaurants. Researchers also can use another multi-criteria decision making methods

Keywords. Service Marketing, Service Quality, AHP and TOPSIS Method, Restaurant Performance, Customer Satisfaction.

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1. Introduction

Although there is not a generally accepted definition, services defined as a process or performance (Lovelock, 1991: 13) include value-added economic activities as non-physical, consumed when produced and convenient to the recipient, entertainment, comfort and health (Zeithaml ve Bitner, 2003: 3). Service quality can be defined as "the difference between the perceived service and expected service". (Parasuraman et al., 1985: 42). In today's highly competitive environment, having high service quality is important for the survival of the organizations operating in the service industry (Guo et al., 2008: 305). Therefore, the evaluation of the service quality and performance should be evaluated continously by the organizations.

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In the literature, Ahp methos is used to banks (Önüt et al., 2007); airline companies (Önüt at al., 2007) and businesses (Yang and Shi, 2002) performance measurement; employees (Islam and Rahad, 2006) performance evaluation and performance measurement in restaurants (Andaleeb and Conway, 2006) and Topsis method is used to performance evaluation in airline companies (Feng and Wang, 2000) and transport sector (Feng and Wang, 2001). However, there are no studies with the use of AHP and TOPSIS method together for service quality evaluating in restaurants. So, in this study it is aimed to evaluate service quality of three restaurants which operates in Trabzon with Analytical Hierarchy Process (AHP) and TOPSIS method. The first part of the study adressed the literature on service quality concept and service quality assessing criterias in restaurants was determined. In the application, firstly evaluation criterias are weighted and then with Topsis method restaurants are ordered in terms of performance. In the result section findings were interpreted.

2. Literature Research and Service Quality Evaluation Criteria

Commonly used scale for measuring service quality is SERVQUAL scale developed by Parasuraman et al. Exploratory research by Parasuraman, Zeithalm and Berry (1985: 47) revealed ten factors that consumers used to assessing service quality. These factors are tangibles, reliability, responsiveness, communication, credibility, security, competence, courtesy, understanding/knowing the customer and access. Then these criterias were reduced to five dimensions as tangibles, reliability, responsiveness, assurance and empathy (Parasuraman et al., 1988: 23).

In the literature there are many studies about service quality. Yu et al. (2005) investigated service quality in tourism. As a result of regression analysis applied to the data obtained from 596 consumer, reliability and assurance criterias have been found to be key determinants of the service quality. Chow and Luk (2005) used five dimensions of SERVQUAL scale for fast-food restaurants. In the study service quality dimensions ranked in terms of importance with Ahp method and the empathy is determined as the most important criteria. Andaleeb and Conway (2006) aimed to determine the factors affect customers' satisfaction in restaurants. Researchers stated that responsiveness is the most effective factor on satisfaction. The other factors affecting satisfaction are price and food quality. Also it is concluded that physical design and appearance of the restaurant do not affect the satisfaction.

Önüt et al. (2007) compared service quality of domestic airline companies in Turkey using with Ahp method. Tangibility that includes cleanliness and comfort of the cabin, takeoff and landing topicality, food quality and beverage and external appearance of personnel sub-criterias has the most importance for service quality. Chow et al. (2008) aimed to examine service quality of restaurants in China. Data collected from 284 consumer demonsrated that there is a significant relationship between customer satisfaction and service quality. Qin and Prybulak (2008) investigated the relationship between service quality, product quality, price, customer satisfaction and behavioral intention in fast-food restaurants. With the application of structural equation modeling and factor analysis researchers determined that product quality is important for customer saticfaction but there is a low level relationship between service quality and customer satisfaction. Broderick and Vachirapornpuk (2008)'s studies for banks, issues such as customer participation level, tolerance level and perceived service quality are identified the key factors that affect service experience. Hacıefendioğlu and Koç (2009) used regression analysis for the fast-food industry. As a result of the study past

experiences, value, reliability and food quality criteria affect customer loyalty. Markovic and Raspor (2010) examined service quality hotels in Croatia by using SERVQUAL scale and factor analysis and found that reliability, accessibility, empathy and tangibles are one of the most important criteria in terms of service quality. Ramzi and Mohammed (2010) investigated customer loyalty and service quality effect in five-star hotels in Jordan. As a result of factor analysis and regression analysis it is found that empathy, reliability, responsiveness and tangibles affect customer loyalty. Qin et al. (2010) examined relations between service quality dimensions and satisfaction. As a result of structural equation model analysis it is found that recoverability, tangibles, reliability, and responsiveness are all important dimensions of perceived service quality. Also food quality, perceived value and service quality have a direct and positive relationship with satisfaction. Bougoure and Neu (2010) investigated relations between service quality, overall service quality perceptions, customer satisfaction, and repurchase intentions in the Malaysian fast-food industry. As a result of structural equation model analysis researchers found that service quality affect perceived service quality and customer satisfaction, also customer satisfaction affect re-purchase intention.

In reviewing the literature based service quality in restaurants, it can be observed that many service quality criteria have been used in studies. Service quality evaluation criteria in restaurants used in this study are as follows (Hacıefendioğlu and Koç, 2009: 151-153):

- Past experiences: Customer experinces with the business over time
- Loyalty: Connecting emotionally to a firm and desire to continue relations
- Value: Value for the price paid by customers to receive a service
- Reliability: Ability to perform the promised service dependably and accurately
- Tangibles: Physical facilities, equipment and appearance of personnel
- Food quality: Food to be served appropriate temperature, freshness, fragrance and quality
- Ambiance: Beautiful and comfortable space
- Responsiveness: Willingness to serve and quick service
- Emphaty: Caring, individualized attention the firm provides its customers
- Assurance: Knowledge and courtesy of employees and their ability to inspire trust and confidence

3. Method

3.1. Purpose of the Study

In reviewing the literature Ahp and Topsis method has not been obtained together to measure the service quality in restaurants. In order to overcome this deficiency, using Ahp and Topsis this study aimed to determine the factors affecting service quality at restaurants operating in Trabzon.

3.2. The Analytic Hierarchy Process (AHP) Method

Analytical Hierarchy Process method developed by Saaty is used to solve problems involving multiple criteria decision technique. 7 steps of AHS method are as follows (Saaty and Tran, 2007: 965-966; Saaty, 1990: 12; Saaty, 2008: 85).

Step 1: Developing Hierarchical Structure: For the purpose of decision-maker, criterias and sub-criterias are determined.

Step 2: Developing Pairwise Comparison Matrix: Pairwise comparison matrix are created by using the scale developed by Saaty in 1994 (Table 1).

TABLE 1. *The Basic Process of Analytic Hierarchy Scale*

Intensity of	Definition	Explanation

importance		
1	Equal importance	Two factors contribute equally to the objective
3	Somewhat more important	Experience and judgement slightly favour one over the other.
5	Much more important	Experience and judgement strongly favour one over the other.
7	Very much more important	Experience and judgement very strongly favour one over the other. Its importance is demonstrated in practice.
9	Absolutely more important.	The evidence favouring one over the other is of the highest possible validity.
2,4,6,8,	Intermediate values	When compromise is needed

Step 3: Developing Eigenvector: After developing pairwise comparison matrix, eigenvector is calculated. For developing eigenvector firstly matrix is normalized and then eigenvector is obtained through normalized matrix averages.

Step 4: Calculation Consistency Ratio: Consistency index and consistency ratio is calculated as follows:

TI= $(\lambda max - n)/(n - 1)$

TI= Consistency indicator/Random indicator

TABLE 2. *Table of Random Index*

n	1	2	3	4	5	6	7	8	9	10
Random indicator	0	0	0,58	0,9	1,12	1,24	1,32	1,41	1,45	1,49

Less than 0,1 consistency ratio indicate that pairwise comparison matrix is consistency.

Step 5: Final Sequence Determination: At this stage, in terms of general purpose eigenvectors is determined. Then, the alternative with the highest value is determined by comparing the eigenvectors for each alternative.

3.3. Topsis Method

Topsis is a multi criteria decision method to place the order preference by similarity to ideal solution (Monjezi, 2012: 96). Topsis method steps are as follows (Yurdakul and İç, 2005: 4612-4613; Rao, 2006: 222-224; Monjezi, 2012: 97):

Step 1: Determining the Purpose and Identification of Evaluation Criterias

Step 2: Form the Decision Matrix and Calculate Normalization Values

$$A_{ij} = \begin{bmatrix} a_{11} & a_{12} & ... & a_{1n} \\ a_{21} & a_{22} & ... & a_{2n} \\ . & & & . \\ . & & & . \\ . & & & . \\ a_{m1} & a_{m2} & ... & a_{mn} \end{bmatrix}$$

Xij=wj . zij   i=1,.....n; j=1,.....,k

$$r_{ij} = \frac{a_{ij}}{\sqrt{\sum_{k=1}^{m} a_{kj}^2}} \qquad (1)$$

Step 3: Calculate the Weighted Normalized Decision Matrix: First of all, weighted (ω_{ij}) of evaluation factors are determined. Then, obtained V matrix by multiplying the elements of the each column of matrix with ω_{ij} values.

$V_{ij} = (\omega_{ij} \times R_{ij})$

Step 4: Identification of the A * and **A⁻** Ideal Points: In this stage, maximum and minimum values for each column in a weighted matrix are determined.

$A^* = \{ v^*_1, v^*_2, \ldots v^*_j, \ldots v^*_n \}$ (maximum values)

$\mathbf{A\text{-}} = \{ v^-_1, v^-_2, \ldots v^-_j, \ldots v^-_n \}$ (minimum values)

Step 5: The distance of a company j to the ideal solution (S^*_i) and from the negative ideal solution (S^-_i) are calculated using follows equations:

$$S^*_i = \sqrt{\sum (v_{ij} - v^*_j)2} \qquad i=1,\ldots,m \qquad (2)$$

$$S^-_i = \sqrt{\sum (v_{ij} - v^-_j)2} \qquad i=1,\ldots,m \qquad (3)$$

Step 6: Calculate the Relative Closeness to the Ideal Solution: The relative closeness of the alternative (ranking score) is calculated as follows:

$C^*i = Si\text{-}/ (Si\text{+} + Si\text{-}) \qquad 0 \le C^*i \le 1 \quad (4)$

Step 7: Rank the companies based on the ranking scores (C^*i).

4. Application

In the creation of the pairwise comparison matrix and evaluation of the performances of the restaurants, we benefited from a survey that is applied to three restaurant customers in Trabzon. The simple random sampling method was used to determine the sample.

A total of 300 questionnaire were interviewed but 30 of them were excluded because of unanswered questions. So data for the study consisted of responses obtained from 270 questionnaire. In this context, the practical steps formed as follows.

4.1. The Creation of Hierarchical Structure

Criteria obtained from literature and hierarchical structure that show alternatives were created as in Figure 1.
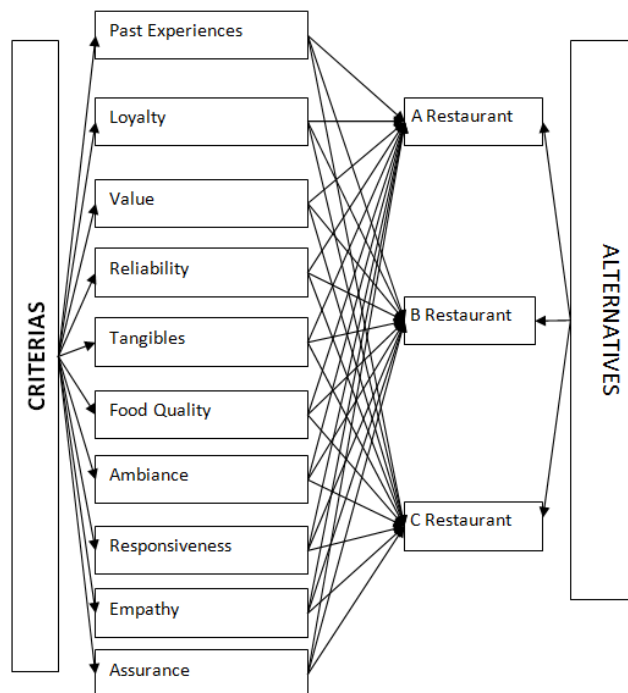

FIGURE 1. *Hierarchical Structure*

4.2. Pairwise Comparison Matrix and Weights

The data obtained as a result of the survey, transformed into a matrix by using Saaty's 1-9 scale and shown in Table 3. Then, the sum of each column in the matrix of pairwise comparisons were taken and the normalized matrix was obtained by divided the value in the row to column totals. The average values of the normalized matrix rows were calculated and criteria weights were determined (Table 3). Consistency ratio calculated less than 0.1 and it can be said that the results are consistent.

TABLE 3. *Pairwise Comparison Matrix and Weights*

	PE	Loy	Val	Rea	Tan	FQ	Amb	Resp	Emp	Ass	Weights
Past Experiences	1	1,0085	0,6926	0,1888	1,2880	0,2084	0,4471	0,3771	0,8888	0,3395	**0,0433**
Loyalty	0,9916	1	0,5285	0,2286	0,7555	0,2589	0,3380	0,7273	0,6031	0,4024	**0,0428**
Value	1,4438	1,8922	1	0,4341	1,4598	0,3927	1,1011	0,9657	1,0018	0,4331	**0,0703**
Reliability	5,2968	4,3742	2,3035	1	3,9514	0,2356	3,3354	1,1724	1,5067	0,8496	**0,1432**
Tangibles	0,7764	1,3236	0,6850	0,2531	1	0,2187	0,5178	0,4829	0,4065	0,1506	**0,0388**
Food Quality	4,7994	3,8622	2,5463	4,2452	4,5732	1	4,2985	3,2303	4,4530	2,6053	**0,2657**
Ambiance	2,2365	2,9584	0,9082	0,2998	1,9313	0,2326	1	1,6919	0,6702	0,2379	**0,0730**
Responsiveness	2,6518	1,3749	1,0355	0,8530	2,0707	0,3096	0,5910	1	0,8301	0,2986	**0,0720**
Empathy	1,1252	1,6580	0,9982	0,6637	2,4599	0,2246	1,4921	1,2046	1	0,2440	**0,0704**
Assurance	2,9455	2,4852	2,3091	1,1770	6,6380	0,3838	4,2033	3,3486	4,0989	1	**0,1804**

According to table 3 "Food Quality" has the highest weight. This criteria is followed by "Assurance" and "Raliability". "Tangibles" criteria has the least importance for customers.

4.3. Service Performance Evaluation by TOPSIS

In this step, first of all, each criterion were evaluated by decision-makers for all the restaurants and decision matrix was formed by taking the average of these values. Then the normalized matrix was obtained by using eq. (1). In the next stage, Weighted Matrix established by multiplying the normalized matrix and criteria weights.

TABLE 4. *Decision-Weighted and Weighted Normalized Matrix*

Matrix	Decision Matrix			Normalized Matrix			Normalized Weighted Matrix		
Criteria	A Rest.	B Rest.	C Rest.	A Rest.	B Rest.	C Rest.	A Rest.	B Rest.	C Rest.
Past Experiences	3,72	3,64	3,36	0,3176	0,3205	0,2990	0,0138	0,0139	0,0130
Loyalty	3,44	3,16	3,28	0,2937	0,2783	0,2919	0,0126	0,0119	0,0125
Value	3,76	3,52	3,44	0,3210	0,3100	0,3061	0,0226	0,0218	0,0215
Reliability	3,80	3,64	3,60	0,3245	0,3205	0,3203	0,0465	0,0459	0,0459
Tangibles	3,80	3,60	3,84	0,3245	0,3170	0,3417	0,0126	0,0123	0,0133
Food Quality	4,25	3,78	3,88	0,3629	0,3329	0,3452	0,0964	0,0884	0,0917
Ambience	3,20	4,22	3,32	0,2732	0,3716	0,2954	0,0200	0,0271	0,0216
Responsiveness	3,64	3,28	3,48	0,3108	0,2888	0,3097	0,0224	0,0208	0,0223
Empathy	3,40	3,32	3,52	0,2903	0,2924	0,3132	0,0204	0,0206	0,0220
Assurance	3,92	3,64	3,76	0,3347	0,3205	0,3346	0,0604	0,0578	0,0604

In the next step, the nearest and most distant values from the ideal solution were calculated and Distinction criteria (S * and S-) were determined by using the numbered formulas (2) and (3). In the final stage, Ideal Solution Similarity (C * i) value was calculated by using eq. (4).

TABLE 5. *Relative Closeness to the Ideal Solution and Overall Ranking*

	A Restaurant	B Restaurant	C Restaurant
S*	9,3624	9,3747	9,3684
S⁻	0,0174	0,0158	0,0166
C^*_i	0,0019	0,0017	0,0018
Ranking	1	3	2

According to table 5, within the framework of the criterias, "A" is the most preferred restaurant by customers in terms of service performance. "C" and "B" restaurants follows this restaurant.

5. Conclusion and Discussion

Service quality defined as customer expectations satisfaction (Parasuraman et al, 1985: 42) is related to what kind of service customers expect and the degree to which the expectations are met (Tsaur et al., 2002: 114). Therefore, businesses that want to satisfy customers and want to survive, should maintain high service quality.

In this study it is aimed to determine the most important service quality criteria and evaluate service performance of three restaurants operating in Trabzon. For this purpose, first of all, service quality criteria determined from literature and then these ceriteria ranked by AHS. In the latest stage, using TOPSIS method restaurants were ranked in terms of service performance.

In the study, it is determined that "Food Quality" (0,2657) is the most important service quality criteria for restaurants and "Assurance" (0,1804) and "Reliability" (0,1432) follow this criteria. The least important criteria for consumers is "Empathy". In parallel with the results obtained in this study, in Clark and Wood (1998: 142)'s study that investigate factors affecting customer loyalty they found that "food quality" is the most important factor. In studies related to fast-food restaurants "empathy" criterion (Chow and Luk, 2005: 284) and "food quality" criterion (Hacıefendioğlu and Koç, 2009: 163) is found to be the most important dimensions of service quality and also found that "reliability" and "responsiveness" are the least important criteria.

When evaluating the ranking results in Table 5; restaurant A (0,0019), restaurant B (0,0017), restaurant C (0,0018) and decision matrix gained by TOPSIS Method, it can be observed that the service qualities of the three restaurant enterprises are considerably close to each other. This result, according to the criteria specified, may be indicative of restaurants operating in Trabzon are offering similar level of service to their customers.

In this study, food quality in restaurants was determined as the most important criterion, means customers have expectations of the restaurants in this direction. Therefore, these enterprises should be careful and attentive on keeping food at an appropriate temparature and keeping its nutritious, smell and quality and offering a service in the same direction with the customers' expectations. Following food quality criterion; infusing trust and being reliable was an outstanding criterion and this shows fulfilling the committed service at a place and on time, avoiding order

interruptions, in addition staff being friendly and polite to the customers, having the knowledge to solve problems, will support meeting customer expectations.

Inability to evaluate all the criteria taking place within the literature and not being able to include everyone living in Trabzon, may be stated as the limitations of this study. In addition, this study can be improved in the future, by using different multi-criteria decision making methodologies, such as "Electre Tri" and "Analytical Network Process" and by enriching criteria.

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