

Measuring Service Quality of Aviation Industry in Turkey Using Mixed Multi Criteria Decision Making Techniques

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Abstract

In this paper, a hybrid method, AHP-weighted TOPSIS, has been used to determine the service quality of aviation industry as well as the best airlines and major criteria from customer perspective in Turkey. We have decided to choose 7 Turkish domestic airline companies using 9 criteria which have been determined with a survey with 92 participants. 9 criteria have been determined as the most important factors for airline selection for customers as follows: ticket price, flight comfort, time reliability, company image, staff quality, baggage allowance, in-flight service, flight availability per day, number of destination flown. An interview is carried out with 24 people to determine the relative importance of these 9 criteria. 5 expert opinions, who work as manager, have been collected for the relative qualitative comparisons of the criteria. The weight of the criteria obtained by the AHP method is used in the TOPSIS method for the final comparison of the 9 airline companies. The results of the study produced an enriched perspective to determine the service quality of airline companies as well as the best airlines and major criteria from customer perspective.

Keywords;

Service Quality, Multi Criteria Decision Making, Turkish Airline Companies, AHP, TOPSIS, Survey,

1. Introduction

Service quality of airline companies and customer selection in aviation industry is a continuing topic. Service quality has been discussed in many articles (Grönroos, 1982, Parasuraman et al., Li et al., 2002). There are various types of service quality. Aviation industry is the one of the most discussed topic in the service industry and multi criteria decision methods have been used widely for aviation industry. There are various studies regarding multi criteria selection methods (Goceri et al., 2017, Soner et al., 2006, Tsaur et al.2002).

In this study, we tried to determine service quality in aviation industry as well as the best airline companies and the most important criteria for Turkish airlines' customers.

We selected domestic companies for this study. The airline companies listed in this study are denoted as A, B, C, D, E, F, and G which represents Anadolu Jet, Atlas Global, Bora Jet, Onur Air, Pegasus, and Sun Express respectively.

Survey and interview method is used to determine the weights for each method. The weights of criteria have been calculated by using the AHP method. Afterwards, TOPSIS method is used for the final comparison of the 7 airline companies.

2. Literature Review

The primary research was trying to determine what service quality meant to customers (Zeithaml et al., 1996) and the main criteria which place companies in a higher place in the market. Zeithaml claimed that due to characteristic of the service, it was hard to define and evaluate it (Zeithaml, 1981). Since in the previous researches, quality has been defined multi-dimensional (Parasuraman, 1988) there was no agreement about how to evaluate the service quality (Cronin and Taylor, 1992). There are many different service quality models has been developed in various industries i.e. retailing and servicing industry. In 1982, Grönroos also defined service quality dimensions as functional aspect and technical aspect. Later, ServQual by Parasuraman has been developed (1988).

Among all models, ServQual which was defining and measuring service quality was the most cited and discussed article. ServQual had a significant impact on quality of service in literature and industry as well. ServQual was measuring performance (P), customer expectations (E) and quality as follows $Q=P-E$.

After these studies, in 1997 Berry's and Parasuraman published another article regarding quality of system "Listening to the Customer-The Concept of a Service-Quality Information System," This was another remarkable study which encouraged organizations to measure the quality of their customer service.

2.1 Measuring Service Quality

As stated before, even though service quality was hard to be defined and measured, various researchers defined service quality and tried to measure it (Lewis and Booms 1983, Grönroos 1984, Parasuraman et al. 1985 and 1988, Carman 1990, Cronin and Taylor 1992, Teas 1993, Westbrook and Peterson 1998).

Lewis and Booms (1983) looked at the service quality in customer perspective and claimed that service level delivered to customer has to be matched with customer expectations. Grönroos (1984) claimed that consumer's measure (perceived) service quality by comparing their expectations with experiences of the service that they have received. In addition, Parasuraman (1988) pointed out that "perceived service quality is viewed as the level of discrepancy between consumers' perceptions and expectations". The gap between delivered

In this study, survey and interview method is used to determine the service quality. For this purpose, two methods have been used as following: AHP and TOPSIS.

TOPSIS (the Technique for Order of Preference by Similarity to Ideal Solution) method has been used for order preference by similarity to ideal solution (Hwang and Yoon, 1981). The best alternative is the solution, which has the shortest distance to the ideal solution and the longest distance from the negative ideal solution.

Similarly, AHP, (Analytic Hierarchy Process), developed by Thomas Saaty is used for organizing and analyzing complex decisions. In this study, we used a hybrid approach which combines AHP with TOPSIS. The weights of criteria have been calculated by using the AHP method. Afterwards, TOPSIS method is used for the final comparison of the 7 airline companies.

3. Results

The steps in this can be described as follows:

Step 1. Decision makers (DMs) who has year experience, regarding airline companies, are defined. In AHP method, decision-makers (i.e. D1, D2, ..., Dk) decided the weight of each criteria by comparing each criterion (i.e. C1, C2, ..., Cn) . The importance averaged weights that obtained using AHP are given in Table 1.

Table 1. Weights for Criteria

Ticket price	Flight comfort	Time reliability	Company image	Staff quality	Baggage allowance	In-flight service	Flight availability per day	Number of destination flown
0.26	0.04	0.07	0.07	0.05	0.21	0.24	0.03	0.03

In Table 1, we used 5 experts' opinions for each criterion. We asked them to rank and compare each criterion. Afterwards, we normalized the findings.

Step 2. A decision matrix has been composed using the second survey. A Likert scale of 9 is used. We collected all survey responses and find the averaged weight value for each criterion.

Table 2. Decision Matrix

Airline Companies	Ticket price	Flight comfort	Time reliability	Company image	Staff quality	Baggage allowance	In-flight service	Flight availability per day	Number of destination flown
A	5.04	4.92	5.79	5.42	5.54	5.58	5.42	5.58	5.38
B	5.17	5.08	5.71	5.42	5.58	5.71	5.79	5.58	5.67
C	4.75	4.63	5.46	4.38	4.96	5.54	5.33	5.21	5.38
D	5.92	5.17	5.88	5.54	5.38	5.54	5.42	5.71	5.75
E	6.00	5.63	5.88	5.88	5.71	5.71	5.46	6.29	6.42
F	5.13	5.17	5.75	5.17	5.38	5.54	5.17	5.42	5.63
G	6.08	7.79	7.50	8.29	7.67	6.88	7.42	7.46	8.08

Step 3. Normalization has been calculated as follows:

The decision matrix is $X = (x_{ij})_{m \times n}$ and normalized criteria is r_{ij}

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^m x_{ij}^2}} \text{ for maximization, where } i = 1, 2, \dots, m \text{ and } j = 1, 2, \dots, n \quad (1)$$

Table 3. Normalized Decision Matrix

Airline Companies	Ticket price	Flight comfort	Time reliability	Company image	Staff quality	Baggage allowance	In-flight service	Flight availability per day	Number of destination flown
A	0.35	0.33	0.36	0.35	0.36	0.36	0.36	0.36	0.33
B	0.36	0.34	0.36	0.35	0.36	0.37	0.38	0.36	0.35
C	0.33	0.31	0.34	0.28	0.32	0.36	0.35	0.33	0.33
D	0.41	0.35	0.37	0.36	0.35	0.36	0.36	0.36	0.36
E	0.42	0.38	0.37	0.38	0.37	0.37	0.36	0.40	0.40
F	0.35	0.35	0.36	0.33	0.35	0.36	0.34	0.34	0.35
G	0.42	0.53	0.47	0.54	0.50	0.45	0.49	0.47	0.50

Step 4. $V = (v_{ij})_{m \times n}$ the weighted normalized decision matrix has been calculated as follows:

$$v_{ij} = r_{ij} \cdot w_j \text{ where } i = 1, 2, \dots, m \text{ and } j = 1, 2, \dots, n \quad (2)$$

where w_j is the relative weight of the j^{th} criterion obtained in Step 1, and $\sum_{j=1}^n w_j = 1$

After obtaining the normalized matrix, the weighted normalized decision matrix has been calculated using Equation 2 and shown below in Table 4. We multiple the weights found in AHP with normalized data generated Table 4.

Table 4. Weighted Normalized Decision Matrix

Airline Companies	Ticket price	Flight comfort	Time reliability	Company image	Staff quality	Baggage allowance	In-flight service	Flight availability per day	Number of destination flown
A	0.090	0.013	0.025	0.026	0.017	0.076	0.087	0.010	0.009
B	0.093	0.014	0.025	0.026	0.017	0.078	0.093	0.010	0.009
C	0.085	0.012	0.024	0.021	0.015	0.076	0.086	0.009	0.009
D	0.106	0.014	0.026	0.027	0.017	0.076	0.087	0.010	0.010
E	0.108	0.015	0.026	0.028	0.018	0.078	0.088	0.011	0.011
F	0.092	0.014	0.025	0.025	0.017	0.076	0.083	0.010	0.009
G	0.109	0.021	0.033	0.040	0.024	0.094	0.119	0.013	0.013

Step 5. The positive-ideal (A^*) and negative-ideal (A^-) solutions has been determined using Equation 3 and 4.

$$A^* = \{v_1^*, v_2^*, \dots, v_n^*\} \text{ where } v_j^* = \max_i(v_{ij}) \quad (3)$$

$$A^- = \{v_1^-, v_2^-, \dots, v_n^-\} \text{ where } v_j^- = \min_i(v_{ij}) \quad (4)$$

The Euclidean distances of each alternative from the positive-ideal solution and the negative-ideal solution has been calculated as follows:

$$d_i^* = \sqrt{\sum_{j=1}^n (v_{ij} - v_j^*)^2} \quad i = 1, 2, \dots, m \quad (5)$$

$$d_i^- = \sqrt{\sum_{j=1}^n (v_{ij} - v_j^-)^2} \quad i = 1, 2, \dots, m \quad (6)$$

The distance values can be shown in Table 5.

Table 5. Euclidean Distance of each Alternative

	d_i^*	d_i^-
A	0.0456	0.0087
B	0.0398	0.0138
C	0.0514	0.0028
D	0.0415	0.0222
E	0.0389	0.0245
F	0.0485	0.0081
G	0.0000	0.0529

Step 6: The relative closeness of each alternative to the ideal solution can be calculated as below. The relative closeness of the alternative A_i with respect to A^* is defined as CC_i

$$CC_i = \frac{d_i^-}{d_i^* + d_i^-} \quad i=1, 2, \dots, m \quad (7)$$

The bigger the CC_i , the better the alternative A_i . The best alternative is the one with the greatest relative closeness to the ideal solution.

Table 6. Relative closeness to the ideal solution.

A	0.160
B	0.258
C	0.052
D	0.348
E	0.386
F	0.143
G	1.000

As seen above in Table 6, using the AHP-based TOPSIS method, retail store G, Turkish Airlines, has been determined as the airline company. The main reason behind this selection was ticket price, baggage allowance and in-flight services (which include food, snacks, Wi-Fi, etc.). Ticket price is the most important criteria for flight selection. Additionally, baggage allowance and in-flight services have been found significant for consumers. Even though, majority of domestic flights are than 2 hours in Turkey, flight attendants still demand more baggage allowances and in-flight services such as Wi-Fi, snacks and so on. These two options are offered free by Turkish Airlines which affects its service quality positively from customer perspective. Flight availability and number of destinations flown have been found less important for the customers. Since airline industry is still developing in Turkey and people still using other transportation options, these two least important criteria could be understandable.

4. Conclusion

In this study, service quality in aviation industry as well as the best airline companies and major criteria from Turkish people perspective has been determined using AHP and TOPSIS method. The results provided valuable information and perspective for airlines' service quality. Additionally, the most important criteria for airline selection from customer perspective have been found. Using AHP based TOPSIS method was an enriched approach to determine the quality of service in airlines companies.

The main weakness of the study was the size of each airline companies because Turkish Airlines is the dominant in the market and other companies' flight network is smaller than Turkish Airlines. This part could be an excellent starting point for further research by comparing Turkish Airlines with the same size companies.

References

- Carman, J. M., Consumer perceptions of service quality: An assessment of the SERVQUAL dimensions, *Journal of Retailing*, 66(1), pp. 33–55, 1990.
- Cronin, J.J. and Taylor, S.A., Measuring Service Quality: A Reexamination and Extension", *Journal of Marketing*, 56(3), p. 55, Jul 1992.
- Goceri, M.S., Uysal O., Sevkli M., and Turkyilmaz A., An Application of AHP Weighted Topsis Method for Livable City Selection" MCDM 2017 Conference, Ottawa, Canada, 2017.

- Grönroos, C., A Service Quality Model and its Marketing Implications, *European Journal of Marketing* 18 (4), pp. 36-44, 1984.
- Hwang, C.L., and K. Yoon, *Multiple Attribute Decision Making Methods and Applications*. SpringerVerlag, Berlin, 1981.
- Lewis, R.C. and Booms, B., The marketing aspects of service quality, *American Marketing Association Proceeding*, pp. 99-104, Chicago, 1983.
- Li, Y.N., Tan, K.C., and Xie, M., “Measuring web service Quality”, *Total Quality Management*, 13(5), pp. 685–700, 2002.
- Parasuraman, A., Zeithaml, V. and Berry, L.L., “A conceptual model of service quality and its implications for future research”, *Journal of Marketing*, autumn, Vol. 49, pp. 41-50, 1985.
- Parasuraman, A., Zeithaml, V. A. and Berry, L.L., SERVQUAL: A multi-item scale for measuring consumer perceptions of service quality, *Journal of Retailing*, 64(1), pp. 12–37, 1988.
- Tsaur, S.-H, Chang, T.-Y, Yen, C.-H., The Evaluation of Airline Service Quality by Fuzzy MCDM, *Tourism Management*, 23, 107-115, 2002.
- Saaty, T.L., *The Analytic Hierarchy Process*, McGraw-Hill, New York, 1980
- Soner, S., Onut, S., Çok Kriterli Tedarikçi Seçimi: Bir Electre-AHP Uygulaması, *Yıldız Teknik Üniversitesi-Sigma Dergisi*, No 4, 110-120, 2006.
- Teas, R.K., Expectations, performance evaluation and consumer’s perception of quality, *Journal of Marketing*, 57(4), pp. 18–34, 1993.
- Westbrook, K.W. and Peterson, R.M., Business-to-business selling determinants of quality, *Industrial , Marketing Management* 27, pp. 51-62, 1998.
- Zeithaml V.A., “How Consumer Evaluation Processes Differ between Goods and Services”, *Services Marketing*, 2nd Edition, Upper Saddle River, New Jersey: Prentice Hall, 1981.
- Zeithaml, V.A., Berry, L.L. and Parasuraman, A., "The Behavioral Consequences of Service Quality," *Journal of Marketing*, pp. 31-46, April 1996.

Biography

Mehmet Goceri is a PhD candidate from Istanbul University, from Industrial Engineering Department. He was lecturing at Fatih University from 2014 to 2016 in Foreign Trade and Industrial Engineering Department. He earned B.S. in Industrial Engineering from Istanbul University, Masters from Fatih University in Industrial Engineering. He taught some courses in Santa Clara University in California. He has published journal and conference papers. His research interests include manufacturing, optimization, scheduling, usability, and user experience.

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