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Proposing a framework for airline service quality evaluation using Type-2 Fuzzy TOPSIS and non-parametric analysis

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Abstract: This paper focuses on evaluating airline service quality from the perspective of passengers' view. Until now a lot of researches has been performed in airline service quality evaluation in the world but a little research has been conducted in Iran, yet. In this study, a framework for measuring airline service quality in Iran is proposed. After reviewing airline service quality criteria, SSQAI model was selected because of its comprehensiveness in covering airline service quality dimensions. SSQAI questionnaire items were redesigned to adopt with Iranian airlines requirements and environmental circumstances in the Iran's economic and cultural context. This study includes fuzzy decision-making theory, considering the possible fuzzy subjective judgment of the evaluators during airline service quality evaluation. Fuzzy TOPSIS have been applied for ranking airlines service quality performances. Three major Iranian airlines which have the most passenger transfer volumes in domestic and foreign flights were chosen for evaluation in this research. Results demonstrated Mahan airline has got the best service quality performance rank in gaining passengers' satisfaction with delivery of high-quality services to its passengers, among the three major Iranian airlines. IranAir and Aseman airlines placed in the second and third rank, respectively, according to passenger's evaluation. Statistical analysis has been used in analyzing passenger responses. Due to the abnormality of data, Non-parametric tests were applied. To demonstrate airline ranks in every criterion separately, Friedman test was performed. Variance analysis and Tukey test were applied to study the influence of increasing in age and educational level of passengers on degree of their satisfaction from airline's service quality. Results showed that age has no significant relation to passenger satisfaction of airlines, however, increasing in educational level demonstrated a negative impact on passengers' satisfaction with airline's service quality.

Keywords: airline service quality, passenger satisfaction, non-parametric analysis, Type-2 Fuzzy Set, Fuzzy TOPSIS.

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1. Introduction

Since increasing in air travel rates, competition between Iranian airlines has grown in recent years. Although a lot of researches has been conducted in airline service quality evaluation in different countries, there is still a little research concerning airline service quality in Iran.

Nowadays, delivering high-quality services has become a marketing requirement for airline companies which want to survive in this competitive environment (Ostrowski, O'Brien, & Gordon, 1993). In this competitive environment, delivering service quality in a desirable manner, is essential for the airline's competitiveness and sustained growth because of passenger's high expectations and rapid development of transport technology that has made the world into the global village. In order to better serve passenger needs, airlines have to pay attention to passenger's expectations from their services. Airlines need to discover new ways to increase focusing on essential service items and reduce the time and energy spent on less important service items (Liou, Hsu, Yeh & Lin, 2011). So they can better manage their budget and have the chance of reducing their prices. In this case, they can cope competitive challenges and avoid losing their passenger with maintaining their perceptions of service quality at a moderate level. Trying to deliver high-quality service to airline passengers, results in retaining existing customers and also, enticing other airlines customers and leads to differentiating airline image from competitors. According to sultan and Simpson Jr (2000) customized services, guarantees, and continuous customer feedback are important factors of a successful service quality strategy as a comprehensive measurement of airlines performance.

Chang and Yeh (2002) argue that since service quality is heterogenic, intangible and inseparable, its measurement quality is difficult. In most industries such as airline industry, only customers can investigate the service value and truly evaluate service quality because they are service consumers. In the airline industry, for improving airline service quality performance, airline managers need a framework enabling them to evaluate the quality of services they offer passengers and help them improve quality in required areas. Since the evaluation is produced from the different view of evaluator's linguistic variables, evaluation process must be conducted in an uncertain, fuzzy environment, to gain more accurate data. A fuzzy multi-criteria model is necessary to deal with "qualitative" (unquantifiable or linguistic) or incomplete information (Opricovic & Tzeng, 2003).

Fuzzy MADM techniques are powerful decision-making tools that help managers to involve all aspects of the problem in the decision process. Solving problems and making decision in Fuzzy environment leads to more precise and accurate results in ranking and selecting alternatives. Statistical analysis of passengers' responses empowers airline managers in better understanding of passengers service quality needs and would help them in making effective improvement plans for increasing airlines service quality performance. In this paper, combining Fuzzy MADM and statistical analysis with improving SSQAI scale and redesigning its questionnaire, helped in proposing a stable framework for evaluating airline service quality in Iran.

2. Service quality in airline industry

Quality is one of the primary drivers of business and is used to differentiate organization's service offering. "Quality" lies at the heart of the organization's strategy to gain competitive advantage (Ghobadian, Speller, & Jones, 1994). Offering high-quality services will increase customer satisfaction, leading to consumer retention and encouraging recommendations (Nadiri & Hussain, 2005).

Parasuraman, Zeithaml, and Berry (1985) defined the concept of service quality as a comparison between customers' expectations and actual service performance. Parasuraman, Zeithaml, and Berry (1988) argued that, regardless of the type of service, consumers evaluate service quality using similar criteria, which can be grouped into five dimensions. They proposed their five dimensions' model with 22 items measurement scale (called SERVQUAL). The five Dimensions of SERVQUAL are reliability, responsiveness, assurance, empathy and, tangibles which were developed based on Parasuraman et al.'s (1985) study in which they proposed ten dimensions of service quality. Although SERVQUAL has been widely applied to various industries, including airline industry (Nel, Pitt, & Berthon, 1997; Park, Gilbert, & Wong, 2003; Robertson, & Wu, 2004), this scale has been highly criticized in the literature (Bitner, 1990; Bolton & Drew, 1991; Park, Robertson, & Wu, 2006). Cronin and Taylor (1994) consider that SERVQUAL has a naturally flawed concept because of its ill-judged adoption of the disconfirmation model. Gilbert and Wong (2003) and Liou et al, (2011) state that however SERVQUAL has been widely used to measure service quality in a variety of industries, no two providers of a service are exactly alike. Park et al. (2006) note that the five dimensions with twenty-two items of SERVQUAL scale can't easily be applied to the airline industry because this scale has not mentioned some of the important criteria in airline service quality such as in-flight meals, seating comfort, seat space and leg room.

Cronin and Taylor (1992) developed a performance-based model of service quality called SERVPERF that measures service quality only based on customers' perceptions of the service performance. This model is a variation of SERVQUAL since uses the same criteria of SERVQUAL model. SERVPERF is an applicable and useful tool for measuring service quality. However, Cunningham, Young, and Lee (2004) mentioned that since SERVPERF uses the same dimensions and items of SERVQUAL, it has failed to measure industry-specific dimensions of service quality in the airline industry. As Ghobadian et al. (1994) stated, service quality is a multi-dimensional phenomenon and utility value of its determinants are situation-dependent.

Chang and Yeh (2002) assert that attributes of service quality are context dependent and should be selected based on the service environment investigated. Due to this fact, many researchers have adopted different criteria for evaluating airline service, e.g. Elliott and Roach (1993) evaluated timelines, comfort of the seat, luggage transportation, quality of food and beverage, check-in process and inboard service factors in measuring airline service quality. Ostrowski et al. (1993) defined customer-loyalty, timeliness, Food and beverage quality, and comfort of the seat as the service quality and factors. Liou et al. (2011) found twenty-eight criteria classified under dimensions of Booking service, Ticketing service, Check-in, Baggage handling, boarding process, Cabin service, Baggage claim, Responsiveness to realize passengers' satisfaction of airlines service quality. Truitt and Haynes (1994) offered seven criteria for evaluating airline service quality that are customer complaints handling, check-in process, the convenience of transit, process of luggage, timeliness, clearness of seat, and Food and beverage quality. Laming and Mason (2014) expressed that US Department of Transportation Rates airlines quality with on-time performance, customer complaints denied boarding, mishandled baggage.

Recently, evaluating service quality base on the hierarchical concept is taken into consideration by researchers. Brady and Cronin (2001) suppose that customers form their service quality perceptions on the basis of an evaluation of performance at multiple levels and ultimately combine these evaluations to arrive at an overall service quality perception. Dabholkar, Thorpe & Rentz's (1996), Brady and Cronin (2001) and Wu, Lin and Hsu (2011) Suggest that service quality should be based on a hierarchical concept. In hierarchical concept, Customers make their judgments of service quality based on a series of factors that are specific to the evaluated service. Base on this approach, customers form their evaluation of primary dimensions on assessment of the corresponding subdimensions. Wu and Cheng (2013) introduced SSQAI model with eleven criteria in four dimensions specialized for evaluating airline service quality. The SSQAI model is a performance-based measurement scale on the basis of hierarchical structures in measuring service quality. SSQAI (see Fig. 1) is developed based on Dabholkar et al. (1996), Brady and Cronin's (2001) and Caro and Garcia's (2007) models.

Park et al. (2006) indicate that many airlines can't find a proper scale to evaluate service quality to assess and improve their service performance. However, many studies have used conventional statistical techniques to test hypotheses and generate airline service quality criteria such as Pakdil and Aydin (2007) and Gursoy, Chen and Kim (2005). In recent years the researchers have tended to apply Fuzzy Multiple Criteria Decision-Making (FMCDM) techniques to strength the comprehensiveness and reasonableness of the decision-making process (Tsaur et al., 2002). The researchers have implemented MCDM methods to measure airlines integrated service quality level and to find weak areas and make suggestions for improvement (Chang & Yeh, 2002; Liou & Tzeng, 2007; Tsaur et al., 2002; Liou et al., 2011). Tsaur, Chang, and Yeh (2002) used SERVQUAL dimensions to derivate service quality attributes and performed AHP and TOPSIS in ranking the airlines. They stated that courtesy, safety, and comfort are the most important attributes.

Chang and Yeh (2002) performed fuzzy multi-criteria analysis for ranking four Taiwan's domestic airlines based on the concepts of the degree of optimality and the ideal solution. Fifteen service quality attributes classified in eight dimensions were ranked according to passengers' responses. Liou and Tzeng (2007) applied Fuzzy integral, AHP and Grey Relation Analysis to rank service quality performance of six international airlines. In this paper, the SSQAI model is improved and a framework applicable to measure airline service quality in Iran is designed.

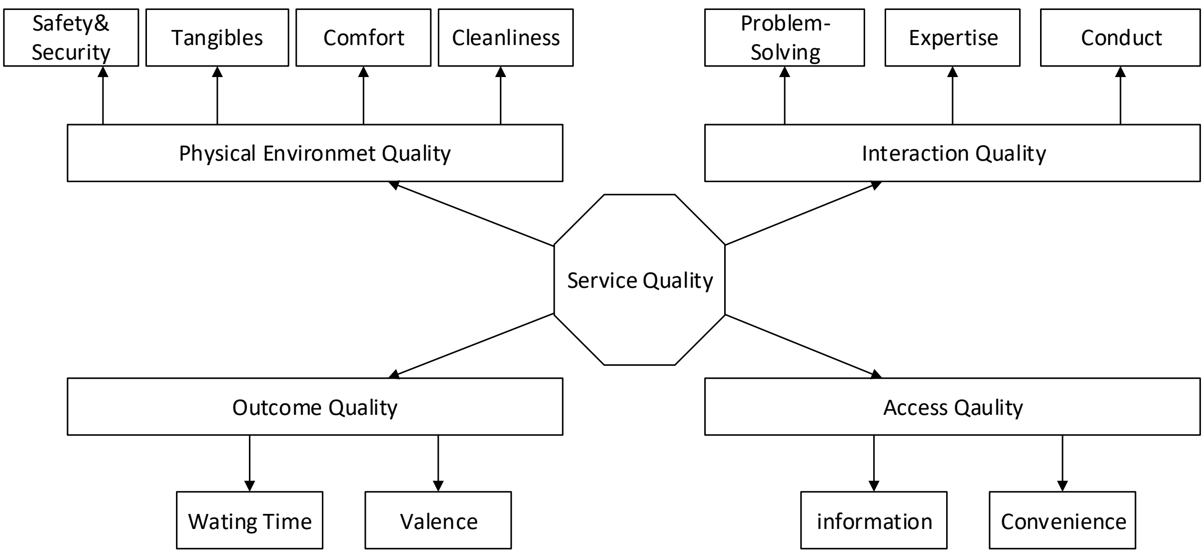
3. Methodology

After reviewing airline service quality criteria, SSQAI scale was adopted in this study, since it represents a valid and reliable tool for assessing service quality in the airline industry (see Fig. 1). the criteria on the SSQAI model and their symbols used in this study are shown in Table. 1. After collecting customer opinions, and using criteria weights determined by experts, ranking of these airlines was calculated using trapezoidal fuzzy TOPSIS. Fuzzy TOPSIS calculation was constructed in excel 2016.

Table 1: Airline measurement dimensions and criteria

Dimensions/Criteria	**Index**
Interaction Quality	
Conduct	C_1
Expertise	C_2
Problem-Solving	C_3
Physical Environment Quality	
Cleanliness	C_4
Comfort	C_5
Tangibles	C_6
Safety&Security	C_7
Outcome Quality	
Valence	C_8
Waiting Time	C_9
Access Quality	
Information	C_{10}
Convenience	C_{11}

Figure 1: Service Quality Dimensions



Using statistical analysis for analyzing customer reviews, firstly, normalization test was taken to determine using parametric or non-parametric tests. Shapiro-Wilk and Kolmogorov- Smirnov (K-S) normality tests showed collected data are not normal, so non-parametric tests were applied for analyzing passengers' responses. Friedman test was performed to demonstrate airline ranks in every criterion separately. Airlines ranked in all criteria due to customer opinions. Variance analysis and post-hoc Tukey test were applied to study the influence of increasing of age and educational level on degree of passengers' satisfaction with airlines service quality performance.

Three airlines chosen for this research and their symbols are Mahan (A_1), IranAir (A_2) and Aseman (A_3) airlines. These airlines were nominated since they are the three oldest Iranian airlines with a powerful background. Moreover, most flight rates and passenger transportation volume among all airlines in Iran belongs to these airlines.

3.1. Data Collection

3.1.1 Experts

Our experts' Community involved 45 respondents from Tehran and Mashhad. Our experts consist of 12 airline manager, 16 Aviation specialist, 17 Frequent fliers of chosen airline's passengers. Tehran is the capital of Iran and most central airline offices are in Tehran, except Iran Air that its central office is located in Mashhad. So, our experts are from both cities. Questionnaire of this research was designed according to experts' opinions.

3.1.2 Passengers

A sample size of 385 respondents was considered in this study to reduce the influence of the statistical assumptions associated with ANOVA. The questionnaire was distributed to passengers in thirteen airline agencies of Mashhad in about four weeks. Mashhad consists of twenty-six regions. Two agencies were selected from each region and the questionnaires were distributed to passengers of this agencies. The questionnaires were distributed doubled because half of the questionnaires were not properly filled and subsequently were dropped. Only candidates who had flown with all of these three chosen airlines in the last recent year at least one time, were selected for participating in answering questionnaires, so data collection was really time-consuming.

3.2. Questionnaire design

First, all criteria in evaluating airline service quality were gathered. By consulting Iranian airline experts, it was founded that four dimensions and eleventh sub-criteria of SSQAI model are prober for utilizing in Iran. We tried to redesign and specialize SSQAI instrument questionnaire items to fit with Iran's economic and cultural circumstances and Iranian airlines situations, as well. With the help of airline industry experts, SSQAI items were utilized in a way to be simple and clear, not encountered with the problems such as vacuity of questions of prior models like SERVQUAL. It's believed some of the criteria extracted from literature could be involved in the subset of SSQAI criteria items. So, these criteria were added to our framework questionnaire. Also, some items were changed or dropped due to ensure universality of this model and specializing and localizing this model for using in Iran's airline industry, by taking average scores of experts' opinions in the screening questionnaire.

Each expert had to give scores from 0 to 5 to every item. The average test was applied to scalp questionnaire items and improve stability of the instrument. Items with scores more than 3 were selected to be on final instrument to help with increasing endurance. The final version of our instrument has a total of 64 items representing eleventh criteria of SSQAI airline service quality model (See Table. 2). In this paper, the questionnaire was distributed to gather passengers' ratings of three chosen airlines, Mahan, Iran Air and Aseman. Using fuzzy TOPSIS the three Iranian major airlines were ranked based on the passenger satisfaction with these airlines service quality performance.

Table 2: Evaluation criteria and Questionnaire items

Criteria	Items
Conduct	1. Cabin crew are kind and polite to me. 2. The employee of (reservation, sales, ticket issuing, identification, and handling) behave respectfully and politely with me. 3. The airline employees' attitude demonstrates their willingness to help me. 4. I can depend on the airline employees being friendly. 5. The employees' attitude shows me that they understand my needs. 6. The employees' behavior allows me to trust their services. 7. The pilot's speech during flight is clear and soothing. 8. The employees carefully pay attention to passengers depending on the type of traveler (women, men, children, adolescents, persons with disabilities, first class or ...). 9. The employees understand my specific needs. 10. The employees pay attention to every single traveler. 11. The employees always provide me with their best services. 12. The employees try their best to provide services to me.
Expertise	13. The airline employees understand that I relay on their professional knowledge to satisfy my needs. 14. I can count on the airline employees knowing their jobs/responsibilities. 15. The airline employees are competent. 16. Cabin crew speak fluently and coherently. 17. The airline employees of baggage delivery are quick and accurate. 18. The Airline procedure of check passenger identification and Ticketing and boarding pass issuance is quick and accurate.
Problem-solving	19. When I have a problem, the airline employees show a sincere interest in solving it. 20. The employees consume enough time to solve my problem. 21. The employees understand the importance of resolving my complaints. 22. The employees are able to handle my complaints directly and immediately.
Cleanliness	23. The cabin is tidy and clean. 24. The toilet in the cabin is clean. 25. The employees have clean and neat appearance.
Comfort	26. I feel comfortable in Flying with this airline. 27. The seat in the cabin is comfortable. 28. I feel comfortable with the actual temperature in the cabin. 29. There is a variety of newspapers and magazines in flight. 30. Flights entertainment services of this airline are favorable.
Tangibles	31. The on-site queening at the airport is understanding and predictable. 32. I feel comfortable with the volume of noise in the cabin. 33. The airlines facility is well designed. 34. The layout of airlines serves my need. 35. Ticket and travel services offices and counters are pretty and equipped. 36. The Quality of meals and drinks on the plane is favorable. 37. The Way meals are served on the plane, is perfect.
Safety & Security	38. The cabin crew describe how to use safety equipment, such as (oxygen masks, vests, boat, etc.) very well and precisely. 39. There are noticeable sprinkler systems in the cabin.
Valence	40. I believe that the airline tries to give me what I want. 41. I would say that I feel good about what I receive from airlines. 42. I would evaluate the outcome of airlines services favorably. 43. I will recommend Traveling with this airline flights to my friends and acquaintances.
Waiting time	44. The airline tries to minimize my waiting time. 45. The airline understands that waiting time is important for me. 46. Airline employees provide services quickly and in the shortest time. 47. I rarely have to wait long to receive the airline services i need. 48. There is a rare delay before or during aircraft flight and the flight schedules are accurately according to the announced program.
Information	49. The airline keep me well-informed about services i need. 50. The airline tells me the accurate time on which it provides service. 51. The airline understands the information the passengers need. 52. Airlines website has interactive features (for example, online answering to questions).

	53. Airlines offers adequate and proper flight information to passengers. 54. I can Easily access to my required information accurately and up to date in 24 hours a day. 55. Website Instructions explaining how to get airline services are legible and understandable. 56. The Airline website provides suitable information of various services the company offers.
Convenience	57. Airline offers services (before or during the flight) based on schedule formerly announced. 58. The Airline web services are desirable and efficient. 59. The reservation and ticketing systems are convenient. 60. The airline provides me with enough flights and convenient flight schedules 61. Passenger transportation services from the output gate to the aircraft is efficient and desirable. 62. Compensation procedure in case of flight delays or cancelation or air accidents, is proper and convenience. 63. The passenger load displacement process is convenient and efficient. 64. Electronic payment services through airline website are easy and convenient.

Descriptive statistics of the respondents is shown in Table. 3.

Table 3: Descriptive statistics of the respondents

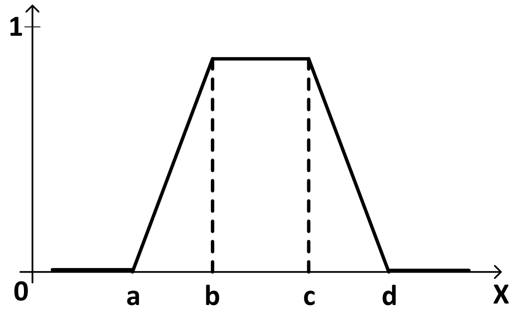
Attributes/Options	Frequency	Percentage
Gender		
Male	288	74.8
Female	97	25.2
Marital status		
Single	56	14.6
Married	329	85.4
Age		
18-29	54	14
30-41	123	32
42-53	102	26.5
54-65	54	14
66-77	39	10.1
78-89	13	3.4
Education		
Below Diploma	36	9.4
High school Diploma	134	34.8
Associate	49	12.7
Bachelor	122	31.7
Master	29	7.5
PhD	15	3.9

4. Fuzzy Set and Type-2 Fuzzy Number

Fuzzy set theory aids in measuring the ambiguity of concepts that are associated with human being's subjective judgment. Lingual expressions, for example, satisfied, fair, dissatisfied, are regarded as the natural representation of the preference or judgment. The fuzzy linguistic variable reflects different aspects of human language. Its value represents the range from natural to artificial language. When the values or meanings of a linguistic factor are being reflected, the resulting variable must also reflect appropriate modes of change for that linguistic factor (Chen & Chen, 2010).

Zadeh (1975) proposed using values ranging from 0 to 1 for showing the membership of the objects in a fuzzy set. The membership degree of the fuzzy set can be described with triangular, trapezoidal, Gaussian, sigmoidal functions or can be formed with different functions. Trapezoidal fuzzy numbers are useful in promoting representation and information processing in a fuzzy environment and their computational simplicity. Trapezoidal fuzzy numbers can be expressed as (n_1, n_2, n_3, n_4). A trapezoidal fuzzy number is shown in Fig. 2.

Figure 2: A trapezoidal fuzzy number



5. Fuzzy TOPSIS

The technique for order preference by similarity to an ideal solution (TOPSIS) was developed by Hwang and Yoon (1981). Based on the concept, any chosen alternative should have the shortest distance from the ideal solution and the farthest distance from the negative-ideal solution (Opricovic & Tzeng, 2003). Trapezoidal fuzzy numbers are useful in promoting representation and information processing in a fuzzy environment and their computational simplicity. In this study, trapezoidal fuzzy numbers are adopted in the fuzzy TOPSIS calculation. A developed method of Fuzzy TOPSIS offered by Chen (2000) is used in this paper. Fuzzy TOPSIS analysis is conducted as follows:

5.1. Define linguistic scale

Linguistic variables used in Fuzzy TOPSIS are shown in Table. 4. This scale had been formerly applied in fuzzy TOPSIS analysis by Ertuğrul and Güneş (2007).

Table 4: Fuzzy Linguistic Variables

Linguistic Variables	Trapezoidal Fuzzy Numbers
Very Poor(VP)	(0,0,1,2)
Poor(P)	(1,2,2,3)
Medium Poor(MP)	(2,3,4,5)
Fair(F)	(4,5,5,6)
Medium Good(MG)	(5,6,7,8)
Good(G)	(7,8,8,9)
Very Good(VG)	(8,9,10,10)

5.2. Establish the initial decision matrix

If A_i=A_1; A_2; ….; A_m are possible alternatives among which decision makers have to choose, C_j= C_1; C_2; ….; C_n are criteria with which alternative performance are measured. X_{ij} is the rating of alternative A_i. If we have K passengers participating to compare alternatives (in this paper, the three airlines), the aggregated fuzzy ratings of K passengers can be calculated as:

$$X_{ijk} = (a_{ijk}, b_{ijk}, c_{ijk}, d_{ijk})$$

$$a_{ij} = \min\{a_{ijk}\}$$

$$b_{ij} = \frac{1}{k}\sum_{k=1}^{k} b_{ijk}$$

$$c_{ij} = \frac{1}{k}\sum_{k=1}^{k} c_{ijk}$$

$$d_{ij} = \max\{d_{ijk}\}$$

W_j is the weight of criterion C_j .The aggregated weights can be obtained directly from expert opinions, with the same technique as aggregated fuzzy ratings of passengers, here P defines the number of experts.

$$W = \left[w_1, w_2, ..., w_n\right]$$

$$w_{j1} = Min\left\{w_{jk1}\right\}$$

$$w_{j2} = \frac{\sum_{p=1}^{p} w_{jk2}}{p}$$

$$w_{j3} = \frac{\sum_{p=1}^{p} w_{jk3}}{p}$$

$$w_{j4} = Max\left\{w_{jk4}\right\}$$

In this paper, the aggregated weights are generated based on experts' responses. The initial fuzzy decision matrix is constructed in Table 5.

Table 5: Fuzzy design matrix

Criteria	A_1	A_2	A_3	Weight
C_1	(5.17,7.26,7.85,9.33)	(3.83,6.23,6.73,8.67)	(3.42,5.55,6.02,8.17)	0.010458
C_2	(4.5,7.71,8.35,10)	(4.33,7.04,7.6,9.67)	(2.67,5.61,6.14,8.33)	0.040405
C_3	(4.25,7.23,7.8,9.75)	(1.75,4.98,5.45,8.5)	(0.25,2.54,3.07,6.5)	0.099067
C_4	(4.33,7.87,8.54,10)	(4.33,7.56,8.18,10)	(3.33,7.02,7.55,10)	0.008452
C_5	(3.8,6.73,7.28,9.6)	(2.6,5.36,5.89,8.4)	(1.4,3.94,4.48,7.2)	0.062
C_6	(3.86,6.41,6.95,9.14)	(2.86,5.35,5.87,8.14)	(1.43,3.73,4.24,7)	0.088996
C_7	(2,5.79,6.39,9.5)	(2.5,5.58,6.16,9)	(1,4.18,4.71,8.5)	0.102017
C_8	(4,7.5,8.1,10)	(3.5,6.65,7.17,9.5)	(2.5,5.4,5.89,8.75)	0.475208
C_9	(4.4,7.22,7.8,9.8)	(3.4,6.21,6.73,9.4)	(1.13,3.4,3.92,6.63)	0.017127
C_{10}	(4,6.65,7.2,9.63)	(2.63,4.88,5.38,8.25)	(1.13,3.4,3.92,6.63)	0.027136
C_{11}	(4,6.46,7,9.13)	(2.88,5.49,6,8.38)	(2,4.47,5,7.5)	0.069135

5.3. Calculate the normalized decision matrix

To avoid the complicated normalization formula used in classical TOPSIS, the linear scale transformation can be used to transform the various criteria scales into a comparable scale. The normalized value r_{ij} is calculated as:

$$d_j^* = \max d_{ij}$$

$$a_j^- = \min a_{ij}$$

Now, $\tilde{r}_{ij}^*$ and $\tilde{r}_{ij}^-$, can be calculated,

$$\tilde{r}_{ij}^* = \left(\frac{a}{d_j^*}, \frac{b}{d_j^*}, \frac{c}{d_j^*}, \frac{d}{d_j^*}\right)$$

$$\tilde{r}_{ij}^- = \left(\frac{a_j^-}{d_{ij}}, \frac{a_j^-}{d_{ij}}, \frac{a_j^-}{d_{ij}}, \frac{a_j^-}{d_{ij}}\right)$$

Matrix $\tilde{R}$ is constructed as follows:

$$\tilde{R} = \left[r_{ij}\right]_{m\times n} \quad i = 1, 2, .., m; j = 1, 2, ..., n$$

$$\tilde{R} = \begin{bmatrix} r_{11} & r_{1j} & r_{1n} \\ r_{i1} & r_{ij} & r_{in} \\ r_{m1} & r_{mj} & r_{mn} \end{bmatrix}$$

The normalized fuzzy decision matrix is shown in Table. 6.

Table 6: Normalized fuzzy decision matrix

Criteria	A1	A2	A3
C1	(0.55,0.78,0.84,1)	(0.41,0.67,0.72,0.93)	(0.37,0.59,0.65,0.88)
C2	(0.45,0.77,0.84,1)	(0.43,0.7,0.76,0.97)	(0.27,0.56,0.61,0.83)
C3	(0.44,0.74,0.8,1)	(0.18,0.51,0.56,0.87)	(0.03,0.26,0.31,0.67)
C4	(0.43,0.79,0.85,1)	(0.43,0.76,0.82,1)	(0.33,0.7,0.76,1)
C5	(0.4,0.7,0.76,1)	(0.27,0.56,0.61,0.88)	(0.15,0.41,0.47,0.75)
C6	(0.42,0.7,0.76,1)	(0.31,0.59,0.64,0.89)	(0.16,0.41,0.46,0.77)
C7	(0.21,0.61,0.67,1)	(0.26,0.59,0.65,0.95)	(0.11,0.44,0.5,0.89)
C8	(0.4,0.75,0.81,1)	(0.35,0.66,0.72,0.95)	(0.25,0.54,0.59,0.88)
C9	(0.45,0.74,0.8,1)	(0.35,0.63,0.69,0.96)	(0.11,0.35,0.4,0.68)
C10	(0.42,0.69,0.75,1)	(0.27,0.51,0.56,0.86)	(0.12,0.35,0.41,0.69)
C11	(0.44,0.71,0.77,1)	(0.32,0.6,0.66,0.92)	(0.22,0.49,0.55,0.82)

5.4. Calculate the weighted normalized decision matrix

Weights of criteria produced formerly in Fuzzy ANP with experts opinions, are used here. The weighted normalized value is V_{ij} and is calculated as:

$$v_{ij} = r_{ij} \times w_j$$

$$V = \left[v_{ij} \right]_{m\times n} \quad i = 1,2,..,m; j = 1,2,...,n$$

$$V = \begin{bmatrix} v_{11} & v_{1j} & v_{1n} \\ v_{i1} & v_{ij} & v_{in} \\ v_{m1} & v_{mj} & v_{mn} \end{bmatrix}$$

$$v_{ij} = r_{ij} \times w_j = \left(\frac{a_{ij}}{d_j^*}, \frac{b_{ij}}{d_j^*}, \frac{c_{ij}}{d_j^*}, \frac{d_{ij}}{d_j^*} \right) . \left(w_{j1}, w_{j2}, w_{j3}, w_{j4} \right) = \left(\frac{a}{d_j^*} . w_{j1}, \frac{b}{d_j^*} . w_{j2}, \frac{c}{d_j^*} . w_{j3}, \frac{d}{d_j^*} . w_{j4} \right)$$

$$v_{ij} = r_{ij} \times w_j = \left(\frac{a_j^-}{d_{ij}}, \frac{a_j^-}{c_{ij}}, \frac{a_j^-}{b_{ij}}, \frac{a_j^-}{a_{ij}} \right) . \left(w_{j1}, w_{j2}, w_{j3}, w_{j4} \right) = \left(\frac{a_j^-}{d_{ij}} . w_{j1}, \frac{a_j^-}{c_{ij}} . w_{j2}, \frac{a_j^-}{b_{ij}} . w_{j3}, \frac{d}{a_{ij}} . w_{j4} \right)$$

The weighted normalized fuzzy decision matrix is shown in Table 7.

Table 7: Weighted normalized fuzzy decision matrix

Criteria	A1	A2	A3
C1	(52.93,74.43,80.4,95.62)	(39.27,63.79,68.96,88.79)	(35,56.84,61.69,83.67)
C2	(11.14,19.08,20.67,24.75)	(10.72,17.43,18.81,23.92)	(6.6,13.89,15.19,20.62)
C3	(4.4,7.48,8.08,10.09)	(1.81,5.16,5.64,8.8)	(0.26,2.63,3.18,6.73)
C4	(51.27,93.14,101.02,118.32)	(51.27,89.5,96.76,118.32)	(39.44,83.03,89.38,118.32)
C5	(6.38,11.3,12.24,16.13)	(4.37,9.01,9.9,14.11)	(2.35,6.62,7.53,12.1)
C6	(4.74,7.88,8.54,11.24)	(3.51,6.58,7.22,10.01)	(1.76,4.58,5.21,8.6)
C7	(2.06,5.97,6.6,9.8)	(2.58,5.76,6.35,9.29)	(1.03,4.31,4.85,8.77)
C8	(0.84,1.58,1.7,2.1)	(0.74,1.4,1.51,2)	(0.53,1.14,1.24,1.84)
C9	(26.21,43.02,46.48,58.39)	(20.26,36.97,40.1,56)	(6.7,20.24,23.35,39.47)
C10	(15.31,25.45,27.55,36.85)	(10.05,18.68,20.59,31.59)	(4.31,13.01,15,25.37)
C11	(6.34,10.23,11.1,14.46)	(4.56,8.7,9.52,13.28)	(3.17,7.09,7.93,11.89)

5.5. Determine the ideal (FPIS, A*) and negative-ideal (FNIS, A-) solutions

Chen (2000) has got $V_j^+=\{1,1,1\}$ and $V_j^-=\{0,0,0\}$ for simplicity but here for more precise result we have:

$$v_j^- = Min\{v_{ij1}\},\quad v_j^* = Max\{v_{ij4}\}$$

v_j^* is the best value of criteria 'j' respect to alternative 'i', and v_j^- is the worst value of criteria j respect to alternatives i.

$$A^- = \{v_1^-, v_2^-, \ldots, v_n^-\},\quad A^* = \{v_1^*, v_2^*, \ldots, v_n^*\}$$

A^*shows the positive ideal solution and A^- shows the negative ideal solution as demonstrated in Table 8.

Table 8: The ideal and negative-ideal solutions

	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9	C_{10}	C_{11}
A*	95.621	24.749	10.094	118.315	16.129	11.236	9.802	2.104	58.387	36.851	14.464
A-	35.004	6.600	0.259	39.438	2.352	1.756	1.032	0.526	6.703	4.307	3.170

5.6. Calculate the separation measures

Different from Chen's (2000) approach, Ertugrul, and Gunes (2007) suggest using Euclidean distance for calculating the distance between two fuzzy numbers. The distance between two trapezoidal fuzzy numbers (a_1, b_1, c_1, d_1) and (a_2, b_2, c_2, d_2) can be calculated by using Euclidean distance as:

$$d_v(M_1, M_2) = \sqrt{\frac{1}{6}\left[(a_1-a_2)^2 + 2(b_1-b_2)^2 + 2(c_1-c_2)^2 + (d_1-d_2)^2\right]}$$

It is noteworthy that $d(v_{ij}, v_j^-)$ and $d(v_{ij}, v_j^*)$ are crisp numbers.

The distance of each alternative from the fuzzy positive ideal solution (FPIS) and fuzzy negative ideal solution (FNIS) is calculated as:

$$D_{ij}^- = d(v_{ij}, v_j^-),\quad D_{ij}^+ = d(v_{ij}, v_j^*)$$

Distance of each alternative from FPIS and FNIS is shown in Table 9.

Table 9: Distance of each alternative from FPIS and FNIS

Criteria	A_1		A_2		A_3	
	D^+	D^-	D^+	D^-	D^+	D^-
C_1	56.426	90.353	81.432	66.808	94.914	52.656
C_2	2.804	5.419	3.228	4.859	4.610	3.538
C_3	1.227	3.076	2.100	2.244	2.959	1.396
C_4	13.293	23.401	14.029	22.327	16.986	20.418
C_5	2.185	3.950	2.988	3.095	3.855	2.267
C_6	1.483	2.718	1.950	2.220	2.677	1.552
C_7	1.746	2.290	1.740	2.185	2.281	1.753
C_8	0.262	0.459	0.316	0.397	0.406	0.312
C_9	7.053	15.684	9.198	13.619	15.270	7.443
C_{10}	4.991	9.362	7.331	6.914	9.549	4.783
C_{11}	1.860	3.176	2.443	2.613	3.020	2.055
Sum(S_i)	93.328	159.886	126.754	127.281	156.526	98.173

5.7. Calculate the relative closeness (similarity) to the ideal solution

A closeness coefficient *CCi* is defined to determine the order of all possible alternatives. Before defining *CCi* we have to obtain S_i^* and S_i^- as follows:

$$S_i^* = \sum_{j=1}^{n} d\left(v_{ij}, v_j^*\right)$$

$$S_i^- = \sum_{j=1}^{n} d\left(v_{ij}, v_j^-\right)$$

The closeness coefficient represents the distances to the fuzzy positive ideal solution (A^*) and fuzzy negative ideal solution (A^-) closeness coefficient of each alternative (see Table 10) is calculated as:

$$CC_i = \frac{S_i^-}{S_i^* + S_i^-}$$

Table 10: Closeness Coefficient of each alternative

	A_1	A_2	A_3
S_i^+	93.328	126.754	156.526
S_i^-	159.886	127.281	98.173
$S_i^+ + S_i^-$	253.215	254.035	254.699
CC_i	0.631	0.501	0.385
Rank	1	2	3

5.8. Rank the preference order

According to the closeness coefficient, the ranking order of three alternatives is $A_1 > A_2 > A_3$. Obviously, the best selection is candidate A_1.

6. Non-Parametric Analysis

6.1. Kolmogorov-Smirnov and Shapiro-Wilk test

In statistical analysis, we first have to check normality of data. If data were normal, parametric tests are used in data analyzing, else non-parametric tests should be used.so, Kolmogorov-Smirnov and Shapiro-Wilk tests are used for checking normality of data as shown in Table 11. As shown in Results, data are not normal.

Table 11: Test of normality with Kolmogorov-Smirnov and Shapiro-Wilk tests

Airline_Criteria	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Mahan_C1	0.051	385	0.017	0.993	385	0.055
Mahan_C2	0.095	385	0	0.975	385	0
Mahan_C3	0.107	385	0	0.98	385	0
Mahan_C4	0.128	385	0	0.953	385	0
Mahan_C5	0.087	385	0	0.986	385	0.001
Mahan_C6	0.081	385	0	0.988	385	0.004
Mahan_C7	0.182	385	0	0.934	385	0
Mahan_C8	0.12	385	0	0.972	385	0
Mahan_C9	0.072	385	0	0.982	385	0
Mahan_C10	0.071	385	0	0.99	385	0.007
Mahan_C11	0.077	385	0	0.991	385	0.02
IranAir_C1	0.039	385	.200*	0.991	385	0.025

IranAir_C2	0.076	385	0	0.989	385	0.007
IranAir_C3	0.122	385	0	0.979	385	0
IranAir_C4	0.129	385	0	0.958	385	0
IranAir_C5	0.079	385	0	0.989	385	0.006
IranAir_C6	0.072	385	0	0.986	385	0.001
IranAir_C7	0.171	385	0	0.947	385	0
IranAir_C8	0.117	385	0	0.98	385	0
IranAir_C9	0.074	385	0	0.99	385	0.008
IranAir_C10	0.07	385	0	0.992	385	0.036
IranAir_C11	0.069	385	0	0.993	385	0.09
Aseman_C1	0.052	385	0.014	0.994	385	0.103
Aseman_C2	0.074	385	0	0.99	385	0.011
Aseman_C3	0.139	385	0	0.976	385	0
Aseman_C4	0.157	385	0	0.961	385	0
Aseman_C5	0.151	385	0	0.955	385	0
Aseman_C6	0.102	385	0	0.956	385	0
Aseman_C7	0.297	385	0	0.839	385	0
Aseman_C8	0.139	385	0	0.976	385	0
Aseman_C9	0.083	385	0	0.987	385	0.002
Aseman_C10	0.089	385	0	0.967	385	0
Aseman_C11	0.071	385	0	0.985	385	0.001

6.2. Friedman Test

Due to abnormality of data, Friedman test is performed to find out rank of airlines in each criterion. The Friedman test is the non-parametric alternative to the one-way ANOVA with repeated measures. It is used to test for differences between groups when the dependent variable being measured is ordinal. Due to non-normality of data, non-parametric tests were used, So Friedman test is applied to compare average score of each airline in every criterion from the passenger view. According to results (shown in Table. 12) from passenger view, Mahan airline has performed better in all criteria and placed in the first rank and Aseman airline was placed in third rank due to weak performance in all criteria compared to other airlines.

Table 12: Mean rank of criteria with Friedman test

Airline/Criteria	N	Mean	Deviation	Mean Rank	Airline Rank
Mahan_C1	385	5.6805195	0.5481737	2.96	1
IranAir_C1	385	4.922314	0.5846451	1.91	2
Aseman_C1	385	4.5506494	0.564281	1.13	3
Mahan_C2	385	6.0125541	0.4694682	2.92	1
IranAir_C2	385	5.5194805	0.5908335	2.04	2
Aseman_C2	385	4.604329	0.6041751	1.04	3
Mahan_C3	385	5.5688	0.59414	2.99	1
IranAir_C3	385	4.1013	0.58502	2	2
Aseman_C3	385	2.5188	0.56291	1.01	3
Mahan_C4	385	6.0805195	0.5053347	2.68	1
IranAir_C4	385	5.8969697	0.5713598	2.15	2
Aseman_C4	385	5.5593074	0.5652101	1.16	3
Mahan_C5	385	5.212	0.5989	2.96	1
IranAir_C5	385	4.408	0.6153	2.02	2
Aseman_C5	385	3.587	0.4676	1.02	3
Mahan_C6	385	5.1432282	0.5712889	2.96	1
IranAir_C6	385	4.2938776	0.5992459	1.99	2

Aseman_C6	385	3.6634508	0.397313	1.05	3
Mahan_C7	385	4.612	0.617	2.39	1
IranAir_C7	385	4.592	0.6343	2.36	2
Aseman_C7	385	4.066	0.3905	1.25	3
Mahan_C8	385	5.8312	0.52639	2.95	1
IranAir_C8	385	5.25	0.58575	2	2
Aseman_C8	385	4.4136	0.59581	1.04	3
Mahan_C9	385	5.606	0.6075	2.95	1
IranAir_C9	385	4.867	0.6007	1.99	2
Aseman_C9	385	4.166	0.5566	1.06	3
Mahan_C10	385	5.26883	0.597073	2.99	1
IranAir_C10	385	4.12078	0.553037	2	2
Aseman_C10	385	3.16851	0.510604	1.01	3
Mahan_C11	385	5.13214	0.594802	2.93	1
IranAir_C11	385	4.74123	0.580902	2.04	2
Aseman_C11	385	3.82987	0.576321	1.03	3

6.3. Analysis of Variance (ANOVA)

In this research, for studying to see if there is any relation between age and educational level of passengers with their performance evaluation of airlines in service quality, first meaningful difference in passengers' evaluation of airlines service quality due to their individual characters, age and educational level, should be checked, so Analysis of Variance (ANOVA) is performed.

6.4. Analysis of Variance in Age Levels

Analysis of Variance (ANOVA) in alpha level of 0.05 between all age levels for every airline calculated. The harmonic average is used, because of different size of age groups. According to results, meaningful level of variables is higher than 0.05. So, there is no significant difference between age level and passengers' evaluation level of airlines service quality.

6.5. Analysis of Variance in Educational Levels

ANOVA is also calculated between all educational levels for every airline is calculated with using the Harmonic average. According to results, meaningful level of variables is lower than 0.05. So, there is a significant difference between passengers' educational level and their evaluation level of airlines service quality.

6.6. Tukey's HSD Test

While ANOVA can tell the researcher whether groups in the sample differ, it cannot tell the researcher which groups differ. Tukey's HSD test is a post-hoc test, performed after analysis of variance (ANOVA) test. If the results of ANOVA are positive in the sense that they state there is a significant difference among the groups, Tukey's HSD clarifies which groups among the sample in specific have significant differences.

HSD test is used for studying the degree of difference between educational groups. In our survey, HSD results for one criterion (Conduct) for each airline is shown in Table .13, which demonstrates that individuals with Ph.D. and Master Degrees have close opinions to each other, that in many criteria this two graduate levels placed in a shared group. Also HSD results for other criteria (see Appendix) show almost in all criteria with increasing passengers' educational level, their satisfaction and evaluation level of airlines service quality performance, decreases. As showing in results of HSD test, the numbers of 1 to 6 are used, as symbols of educational levels that are followed as: Below high school Diploma (1), High school Diploma (2), Associate (3), Bachelor (4), Master (5), PhD (6).

Table 13. HSD test for (C1) Conduct criterion of the three airlines

Education	N	Mahan_C1(Conduct)					IranAir_C1(Conduct)					Aseman_C1(Conduct)				
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
6.0	15	4.75					3.98					3.76				
5.0	29	4.93					4.20					3.98				
4.0	122		5.38					4.58					4.25			
3.0	49			5.74					4.97					4.52		
2.0	134				5.98					5.26					4.83	
1.0	36					6.52					5.76					5.36
Sig*.		0.15	1.00	1.00	1.00	1.00	0.09	1.00	1.00	1.00	1.00	0.18	1.00	1.00	1.00	1.00

**Subset for alpha = 0.05*

7. Conclusions and Recommendations

Constructing Fuzzy TOPSIS calculation in excel helped in a precise analysis. After collecting customer opinions, and using criteria weights due to expert opinions, these airlines were ranked with scores generated from Fuzzy TOPSIS analysis. According to results Mahan airline got the best score and placed in the first rank, Iran air and Aseman airline placed in second and third rank, respectively, due to customer views.

Mahan airline got the best score in service quality performance among these three airlines. This demonstrates that passengers are more satisfied with the quality of services they delivered from Mahan airline, among these three airlines. It is obvious that this airline has made a good brand in passengers' imagination .it means that Mahan airline has the potential to provide a diversity of high-quality services to travelers to gain even more market share in air transportation. Iran Air and Aseman airlines should focus on their strategic planning to improve their service quality and satisfy passengers. Results of this research help airline managers to generate a standard guideline and template for developing service quality of airlines.

Using statistical techniques for analyzing customer reviews, the normality of data was checked by Kolmogorov-Smirnov and Shapiro-Wilk test. Due to the abnormality of data, Non-parametric tests were applied. Friedman test demonstrated airline ranks in every criterion separately and Mahan airline got the first rank in all criteria due to customer opinions. Variance analysis and Tukey test showed that age has no significant relation with passenger satisfaction of airlines but increasing in educational level has a negative impact on passenger's satisfaction from airlines quality. One idea about this result is, individuals with postgraduate degrees give more attention to their environment because of their critical view and having more experience of traveling with different airlines. However more research is needed to clarify this issue. Results offer a clearer perspective for airline providers, enabling them in better strategic planning, identifying airline passengers' needs and gaining remarkable market share in the airline industry. Empirical results of this research can provide useful information for airline managers to plan for their airline's service quality improvement.

Appendix A. Supplementary material

Supplementary data associated with this article can be found, in the online version, at https://jsdtl.sciview.net

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Appendix

Table 14: HSD test for (C2) Expertise criterion of the three airlines

Education	N	Mahan_C2(Expertise)						IranAir_C2(Expertise)					Aseman_C2(Expertise)			
		1	2	3	4	5	6	1	2	3	4	5	1	2	3	4
6.0	15	5.21						4.55					3.82			
5.0	29		5.42					4.8					3.84			
4.0	122			5.75					5.2					4.25		
3.0	49				6.01					5.54					4.66	
2.0	134					6.3					5.86				4.94	
1.0	36						6.65					6.3				5.37
Sig.		0.100	1.00	1.00	1.00	1.00	1.00	0.065	1.00	1.00	1.00	1.00	1.00	1.00	0.51	1.00

Table 15: HSD test for (C3) Problem-Solving criterion of the three airlines

Education	N	Mahan_C3(Problem-Solving)					IranAir_C3(Problem-Solving)					Aseman_C3(Problem-Solving)			
		1	2	3	4	5	1	2	3	4	5	1	2	3	4
6.0	15	4.63					3.11					1.78			
5.0	29	4.83					3.25					1.79			
4.0	122		5.27					3.8					2.23		
3.0	49			5.6					4.17					2.57	
2.0	134				5.88					4.41				2.81	
1.0	36					6.34					4.94				3.18
Sig.		0.311	1.00	1.00	1.00	1.00	0.523	1.00	1.00	1.00	1.00	1.00	1.00	0.94	1.00

Table 16: HSD test for (C4) Cleanliness criterion of the three airlines

Education	N	Mahan_C4(Cleanliness)				IranAir_C4(Cleanliness)					Aseman_C4(Cleanliness)				
		1	2	3	4	1	2	3	4	5	1	2	3	4	5
6.0	15	5.35				5.02					4.57				
5.0	29	5.42				5.19						4.82			
4.0	122		5.82				5.55						5.24		
3.0	49		5.97	6.4				4.92						5.7	
2.0	134				6.73				6.23					5.8	
1.0	36									6.69					6.35
Sig.		0.943	0.384	1.00	1.00	0.288	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.509	1.00

Table 17: HSD test for (C5) Comfort criterion of the three airlines

Education	N	Mahan_C5(Comfort)						IranAir_C5(Comfort)					Aseman_C5(Comfort)				
		1	2	3	4	5	6	1	2	3	4	5	1	2	3	4	5
6.0	15	4.17						3.37					2.99				
5.0	29		4.50					3.95					2.99				
4.0	122			4.86					4.1					3.32			
3.0	49				5.3					4.36					3.6		
2.0	134					5.54					4.76					3.8	
1.0	36						6.07					5.28					4.37
Sig.		1.00	1.00	1.00	1.00	1.00	1.00	0.134	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Table 18: HSD test for (C6) Tangibles criterion of the three airlines

Education	N	Mahan_C6(Tangibles)					IranAir_C6(Tangibles)					Aseman_C6(Tangibles)				
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
6.0	15	4.42					3.31					3.13				
5.0	29	4.43					3.54					3.26	3.26			
4.0	122		4.82					3.95					3.4			
3.0	49			5.14					4.34					3.66		
2.0	134				5.45					4.64					3.87	
1.0	36					5.94					5.1					4.28
Sig.		1.00	1.00	1.00	1.00	1.00	0.106	1.00	1.00	1.00	1.00	0.210	0.181	1.00	1.00	1.00

Table 19: HSD test for (C7) Safety&Security criterion of the three airlines

Education	N	Mahan_C7(Safety&Security)					IranAir_C7(Safety&Security)					Aseman_C7(Safety&Security)				
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
6.0	15	3.7					3.66					3.6				
5.0	29	3.77					3.86					3.73	3.73			
4.0	122		4.29					4.24					3.9	3.89		
3.0	49			4.59					4.58					4		
2.0	134				5					4.94					4.24	
1.0	36					5.3					5.45					4.58
Sig.		0.97	1.00	1.00	1.00	1.00	0.366	1.00	1.00	1.00	1.00	0.420	0.192	0.543	1.00	1.00

Table 20: HSD test for (C8) Valence criterion of the three airlines

Education	N	Mahan_C8(Valence)						IranAir_C8(Valence)						Aseman_C8(Valence)				
		1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5
6.0	15	4.88						4.21						3.51				
5.0	29		5.13						4.47					3.58				
4.0	122			5.58						4.95					4.1			
3.0	49				5.86						5.24					4.5		
2.0	134					6.1						5.58				4.7		
1.0	36						6.61						6.1				5.25	
Sig.		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.971	1.00	0.142	1.00	

Table 21: HSD test for (C9) Waiting Time criterion of the three airlines

Education	N	Mahan_C8(Valence)						IranAir_C8(Valence)						Aseman_C8(Valence)				
		1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5
6.0	15	4.88						4.21						3.51				
5.0	29		5.13						4.47					3.58				
4.0	122			5.58						4.95					4.1			
3.0	49				5.86						5.24					4.5		
2.0	134					6.1						5.58				4.7		
1.0	36						6.61						6.1				5.25	
Sig.		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.971	1.00	0.142	1.00	

Table 22: HSD test for (C10) Information criterion of the three airlines

Education	N	Mahan_C10(Information)					IranAir_C10(Information)					Aseman_C10(Information)				
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
6.0	15	4.42					3.37					2.46				
5.0	29	4.51					3.38					2.56				
4.0	122		4.93					3.8					2.84			
3.0	49			5.3					4.13					3.17		
2.0	134				5.57					4.43					3.45	
1.0	36					6.2					4.95					3.96
Sig.		0.914	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.747	1.00	1.00	1.00	1.00

Table 23. HSD test for (C11) Convenience criterion of the three airlines

Education	N	Mahan_C11(Convenience)						IranAir_C11(Convenience)					Aseman_C11(Convenience)				
		1	2	3	4	5	6	1	2	3	4	5	1	2	3	4	5
6.0	15	4.03						3.81					3.01				
5.0	29		4.41					3.95					3.09				
4.0	122			4.79					4.42					3.52			
3.0	49				5.15					4.81					3.83		
2.0	134					5.49					5.06					4.12	
1.0	36						5.95					5.58					4.7
Sig.		1.00	1.00	1.00	1.00	1.00	1.00	0.499	1.00	1.00	1.00	1.00	0.956	1.00	1.00	1.00	1.00