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Prioritizing factors affecting customer attraction in the aviation industry using fuzzy hierarchical analysis

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ABSTRACT

One of the most important issues in today's business community is attracting and retaining customers. Therefore, every business needs to understand and recognize its customer in order to be able to optimize its product or service and provide it to the customer in the best way and be able to attract their target customers. Therefore, the purpose of this paper is to identify and prioritize the factors affecting customer attraction in the aviation industry. In 2019, this study was conducted as a descriptive-survey and statistical population entered the study by random sampling method. The statistical population is 19 experts in the field of aviation industry. In this research, data collection tool has been through Nami et al. (2007) standard questionnaire; and also, priority analysis was done by hierarchical analysis and fuzzy hierarchical analysis. Findings from hierarchical and fuzzy analysis have shown that in both methods, service quality is the highest priority among the indices, and then in both methods, competitive price, advertising, and e-commerce have the highest priority, respectively. Priority results have shown that the aviation industry must provide high quality services to attract customers.

Keyword:

Priority, Customer Attraction, Hierarchical Analysis, Fuzzy Hierarchical Analysis, Aviation Industry

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1-Introduction

The world has undergone major changes in recent years due to the intense expansion of competition and the dynamism of the economy, the ideals and goals of organizations (Zivyar et al., 2012). In today's competitive world, not only retaining existing resources, but also attracting new ones does not seem like an easy task. Only firms, companies or organizations are successful in this field who are able to increase their competitive power by increasing the quality of goods and services according to the needs of customers (Yaghoubi et al., 2015). Today, the number of customers is declining because they face a large number of firms, companies or organizations, and each organization uses unique advertising and marketing methods to attract customers and ultimately improve the organization's performance. Customer is considered a key and pivotal factor in strengthening the agility of the organization and the orientation of all goals, strategies and resources are around the axis of customer attraction and maintenance (Dalir et al., 2017). Also, considering that customers are the providers of the organization's financial benefits, not only recognizing their obvious needs, but also anticipating, determining and guiding the needs to attract and retain customers is one of the basic pillars of any activity in the organization (Curasi and Kennedy, 2002). If organizations can provide, retain, or increase customer satisfaction, they will be just as successful. Therefore, the leading and transcendent organization is always looking to ensure customer satisfaction (Yaghoubi et al., 2015). Also, one of the most important issues for managers is to attract customers and retain them. A loyal customer, in addition to visiting their favorite organization several times to buy products or use services, acts as a double factor in promoting the organization's products and services, by recommending and ordering to relatives, friends or Other people and play an important role in improving the profitability and improving the image of the organization in the minds of customers (Safarnia et al., 2017). In order to attract customers and increase productivity in this research, a case study of the aviation industry has been considered. The reason for this choice is that today the aviation industry has a special place due to its unique features. The growth of published scientific articles and studies in this field is a clear proof of this fact. Therefore, the purpose of this study is to prioritize the factors of customer attraction in the aviation industry. The next part of this article examines the background of the research. In the third part, the research method is discussed. In the fourth part, the results of the research in order to attract customers are examined and finally in the fifth part, the result of the article is stated.

2-Literature Review

Domestic and foreign studies on customer attraction and this research over the past decades include:

Haghighi and Nayebpour (2017) in an article entitled "Ranking of Iranian Airlines with Combined Fuzzy Assessment and Genetic Algorithm" states that in order to achieve this goal in the first stage, the Euclidean gap between Satisfaction of one by one criteria and general satisfaction using Combined fuzzy evaluation and genetic algorithms were calculated and the weight of the criteria was obtained. In the second phase, using combined fuzzy evaluation, Iranian aviation industry companies were ranked. The statistical sample of this research consists of passengers of several airlines named Aseman, Mahan, Taban, Zagros and Homa. The results of this study show that the importance of criteria in different groups of passengers is different and as a result, the ranking of airline companies is different from the perspective of passengers.

Fazli and Rashidi Astaneh (2014) in an article entitled "The role of effective factors on the success of customer relationship management strategy in car sales representations of Gilan province", states that serious attention to the customer is necessary to continue operating in today's competitive markets. The research findings show that knowledge management, organizational variables, quality of communication and technology are directly related to the success of customer relationship strategy in the province's car sales agencies, but the experience of using customer relationship system does not necessarily lead to success of customer relationship management strategy.

Modiri et al. (2014) in an article entitled "Identification and prioritization of motivational factors affecting knowledge sharing among knowledge workers with a multi-criterion fuzzy decision-making approach" states that this study aims to identify motivational factors affecting knowledge sharing of organizational staff and the prioritization of these factors has been studied. Based on the results of ranking the trust index to management, with the highest weight, it is ranked first.

Akhavan and Rahimi (2013) in an article entitled "Identification and ranking of motivational factors affecting knowledge sharing of an industrial organization", states that in the competitive environment of today's world, one of the main challenges is managers. The results of this study show that in order to share knowledge, effective internal motivational factors have a higher priority than external motivational factors in employees and motivational factors of friendly and intimate communication and career promotion are respectively known as the most important internal and external motivational factors affecting knowledge sharing .

Bahadori et al. (2012) in an article entitled "Prioritizing the components affecting the job motivation of employees of a military center by hierarchical analysis method", states that the purpose of this article is to identify the components affecting job motivation and prioritization of them by analytical method within a military center. The findings of this study show that the component of job security and appropriate salaries are in the first and second priority with coefficients of importance of 0.29 and 0.20 and the components of communication and policy with the coefficient of importance of 0.02 are in the last priority.

Nami et al. (2017) in an article that evaluates the factors affecting customer behavior in Iran's aviation industry using AHP technique, states that this article uses a hierarchical method, namely AHP, to evaluate the indices affecting customer behavior in Iranian Airlines industry. From the data analysis, it can be seen that the competitive price had the highest weight in the criteria.

In an article entitled "The Impact of Service Quality and Confidence in Payment Needs - Pakistan Aviation Industry", Salim and Yassin (2017) examined the effect of

service quality on retaining Pakistani aviation industry passengers with a mediated role of customer satisfaction. Their results show that the quality of services has a positive and significant relationship with passenger satisfaction and increasing passenger satisfaction leads to the recurrence of their purchase.

Hussein (2016) in an article entitled "The mediating role of customer satisfaction: a case study of aviation industry, has examined the mediating effect of passenger satisfaction in the aviation industry. The results of this study through analysis of variance show that the quality of services has a significant relationship with passenger satisfaction. They also reported a significant relationship between satisfaction and perceived value.

Hajizadeh Moghadam et al. (2014) in an article entitled "Investigating the effect of communication quality on passenger loyalty in the aviation industry, states that the purpose of this study is to understand the impact of relationship quality on passenger loyalty in the field of aviation services." In this paper, the relationship between the dimensions of communication quality (satisfaction, trust, commitment and quality of services) and the dimensions of loyalty (emotional, cognitive and behavioral) is based on the responses of 500 passengers collected in 2013 and structural equation modeling has been used. The results show that satisfaction, trust, commitment and quality of services are the factors that determine the quality of positive relationship with the dimensions of travel loyalty related to emotional, cognitive and behavioral.

Kheiry et al. (2013) in an article entitled "Customer Response to Loyalty Programs: a case study of Mahan Airlines" states that many studies today are conducted on the impact of loyalty programs on customer satisfaction and loyalty, however this type of programs have another aspect of customers such as response and reaction to the implementation of such programs. Based on the research model, it can be claimed that there is a direct relationship between the independent and dependent variables.

3-Research Methodology

The present study is descriptive-survey and applied, and the method of collecting data was from library materials and getting information from experts in the field using questionnaires and the method of data analysis was both qualitative and quantitative. The correlation study in order to attract customers in the aviation industry was conducted in 2019. The statistical population of the present study is experts in the aviation industry who have the conditions to enter the study. The sample size in this study using the formula with 95% confidence level and 80% test power is 19 samples that are selected randomly.

Data collection tool of the present study is a standard research questionnaire conducted by Nami et al. (2007) with 23 items which has been done by aerospace industry experts. This questionnaire consists of 9 dimensions. The dimensions of this questionnaire include: three management experience questions (1 to 3), three e-commerce questions (4 to 6), three advertising questions (questions 7 to 9), two market share questions (10 and 11), two years of brand (12 and 13), three service quality questions. (14, 15 and 18), two customer service questions (16 and 17), two customer loyalty questions (19 and 23) and three competitive price questions (20 to 22). The score of this questionnaire was based on Likert scale. The validity of this questionnaire has been confirmed by 24 experts. In addition to the questionnaire, demographic information, age, gender, education and marital status of the statistical population were also considered. The theoretical definition of each dimension of the questionnaire is as follow:

Customers: The only source of current profit and growth of the organization. Of course, recognizing, attracting and retaining a good customer is always difficult due to the increase in customer awareness and as a result, changing the level of their expectations and also the existence of close competition (Tarzi and Blorian Tehrani, 2012).

Advertising: Advertising in the airline business is a means of motivating customers to buy and use the products and services of the airline or to ensure continuous marketing efforts (Al Koch, 2004).

Product Quality: Product quality in the airline business consists of a process that begins with the purchase of a ticket and includes the behavior and characteristics of the crew and cabin managers (Gurses, 2006).

Competitive Price: Proper calculation of service costs in aviation business plays a decisive role in determining ticket costs (Nami et al., 2017).

Customer Loyalty: Airlines are constantly developing and improving their products and services to meet customers' needs (Yildirim, 2004).

Market share: Market share is one percent of the total market that a company provides for certain categories of products or a specific product (Karasu, 2007).

Customer Service: Airlines must be aware of the needs of their customers when planning products and services. Services offered in the airline business include: cabin orders, aircraft type, reservation ticket privileges, exact time and travel time services (Shaw, 1986).

E-Commerce: Although air travel is one of the fastest types of travel, it is very expensive for many people. Therefore, airlines need to invest in e-commerce infrastructure and expand their operations to get the most out of e-commerce and be able to meet the demands of their customers as well as increase their profits (Kaya and Kuyucak, 2004).

Management experience: Aircraft management is very important to maintain costs. Management should guide employees to use effective strategies to reduce costs. Employee motivation is one of the key factors in doing job in a better way and reducing costs (Nami et al., 2017).

Brand: The American Marketing Association considers a brand as a name, phrase, design, symbol, or any other feature that can distinguish manufactured goods or services provided by suppliers from the goods or services of other suppliers (Tabatabai Nasab and Avarpour, 2016).

The implementation steps of the research are shown in Figure 1. First, the research questions are translated and asked by the customers of the aviation industry. Then, after filling out the questionnaire and collecting the samples, prioritizing the factors of attracting customers is done by hierarchical and fuzzy analysis method.

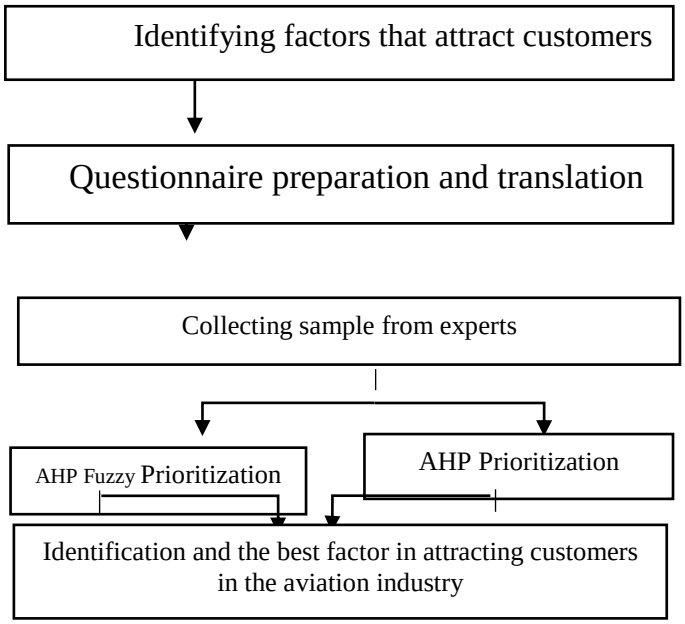

Figure 1. The implementation steps of the research

4- Evaluation and results

In this section, the evaluation and research results are examined.

4-1 Research environment

Excel software is used to analyze the hierarchical and fuzzy hierarchical process of this research. (Super Decisions) software has also been used to obtain the weight of sub-criteria by hierarchical analysis method.

4-2 Proposed method for prioritizing criteria

The first method to prioritize the factors is the hierarchical analysis method. The process of hierarchical analysis is one of the most important multi-criteria decision-making techniques. The AHP algorithm is shown in Figure 2 as follow:

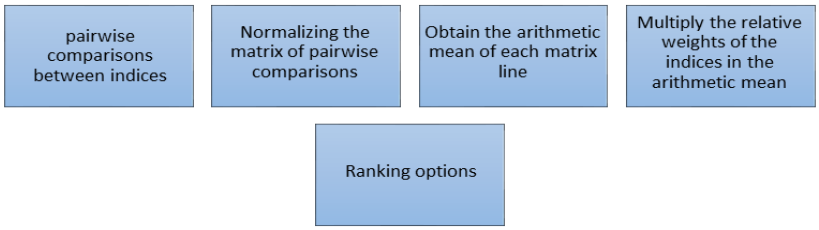

Figure 2. The Algorithm of Hierarchical Analysis Process

First, the decision maker compares the indices in pairs. The number of pairwise comparisons of Equation 1 is calculated as follow:

$$\binom{n}{2} = \frac{n!}{2!\,(n-2)!} = \frac{n(n-1)}{2} \qquad (1)$$

Then pairwise comparisons are made and the matrix of criteria is formed. In the next step, the sum of each column is obtained according to Equation 2.

$$S_i = \sum_{i=1}^{l} a_{11} + a_{21} + a_{31} + a_{41} \qquad (2)$$

In the above equation, i is counter and l is the number of indices, so we get the sum of each column. In the next step, we divide the component of each matrix column by the sum according to Equation 3.

$$D_{ij} = \frac{a_{ij}}{S_i} \qquad (3)$$

In the next step, we sum the rows of the new matrix according to Equation 4.

$$W_{M_i} = (\sum_{i=1}^{l} d_{11} + d_{12} + d_{13} + d_{14})/l \qquad (4)$$

The dimensions of our matrix, weight will be one column and its rows will be the number of indices.

$$M_{Total} = \begin{bmatrix} W_{m_1} \\ W_{m_2} \\ W_{m_3} \\ W_{m_4} \end{bmatrix} \qquad (5)$$

The second method to prioritize factors is the fuzzy hierarchical method. The steps of the fuzzy hierarchical analysis method are given in Figure 3.

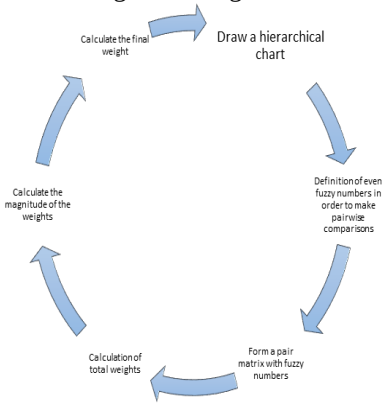

Figure 3. Fuzzy hierarchical analysis process algorithm

In order to make pairwise comparisons, we convert qualitative values into fuzzy numbers, and for absolute numbers we use the fuzzy number membership function. In this study, we used triangular numbers.

One of the most useful fuzzy numbers is the triangular fuzzy number as shown below:

$$\tilde{a} = (m, \alpha, \beta) \quad Or \quad \tilde{a} = (L, m, U)$$

The mathematical form of the membership function is calculated as equation 6:

$$\mu_{\tilde{a}}(x) = \mu_{\tilde{N}}(x) = \begin{cases} \dfrac{x-L}{m-L} & l \le x < m \\ \dfrac{U-x}{U-m} & m \le x \le U \\ 0 & 0.w \end{cases} = \begin{cases} 1 - \dfrac{m-x}{\alpha} \\ 1 - \dfrac{x-m}{\beta} \\ 0 \end{cases} \quad (6)$$

L, m, and U are the first, second, and third components of fuzzy numbers. The algebraic sum and the algebraic subtraction of two triangle numbers are given in Equation 7.

If $\begin{cases} \tilde{a} = (L, m, U) \\ \tilde{b} = (L', m', U') \end{cases}$ then:

$$\begin{cases} \tilde{a} + \tilde{b} = (L + L', m + m', U + U') \\ \tilde{a} - \tilde{b} = (L - U', m - m', U - L') \end{cases} \quad (7)$$

Multiplying, dividing, and reversing triangular fuzzy numbers is not necessarily a triangular fuzzy number that derived from Equation 8.

$$\begin{cases} \tilde{a} \times \tilde{b} \cong (L \times L', m \times m', U \times U') \\ \dfrac{\tilde{a}}{\tilde{b}} \cong \left(\dfrac{L}{U'}, \dfrac{m}{m'}, \dfrac{U}{L'}\right) \\ (\tilde{a})^{-1} \cong \left(\dfrac{1}{U}, \dfrac{1}{m}, \dfrac{1}{L}\right) \end{cases} \quad (8)$$

To convert qualitative values to fuzzy numbers, we follow Figure 4

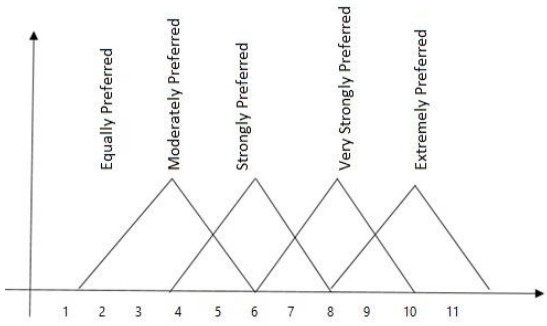

Figure 4. Converting qualitative values to fuzzy number

The conversion of verbal expressions into fuzzy numbers is given in Table 1.

Table 1. Conversion of verbal expression

verbal expressions	triangular fuzzy number	reversing fuzzy number
Equally Preferred	(1,1,1)	(1,1,1)
Moderately Preferred	(1,3,5)	(1/5,1/3,1)
Strongly Preferred	(3,5,7)	(1/7,1/5,1/3)
Very Strongly Preferred	(5,7,9)	(1/7,1/6,1/5)
Extremely Preferred	(7,9,11)	(1/11,1/9,1/7)

After converting fuzzy numbers, a pair matrix is formed. The next step is to calculate the (Si)s from Equation 9. In this study, we have used an approximate linear summation method.

$$S_i = \sum_{j=1}^{m} M_{gi}{}^{j} \otimes \left[\sum_{i=1}^{n}\sum_{j=1}^{m} M_{gi}{}^{j}\right]^{-1} \quad (9)$$

In this case, i indicates the row number and j indicates the column number. $M_{gi}{}^{j}$ In this triangular fuzzy number relation are pairwise comparison matrices. The value $\sum_{j=1}^{m} M_{gi}{}^{j}$ $\sum_{i=1}^{n}\sum_{j=1}^{m} M_{gi}{}^{j}$ and $\left[\sum_{i=1}^{n}\sum_{j=1}^{m} M_{gi}{}^{j}\right]^{-1}$ is Calculated from equations 3-10, 3-11 and 3-

$$\sum_{j=1}^{m} M_{gi}{}^{j} = \left(\sum_{j=1}^{m} L_j, \sum_{j=1}^{m} M_j, \sum_{j=1}^{m} U_j\right) \quad (10)$$

$$\sum_{i=1}^{n}\sum_{j=1}^{m} M_{gi}{}^{j} = \left(\sum_{i=1}^{n} L_i, \sum_{i=1}^{n} M_i, \sum_{i=1}^{n} U_i\right) \quad (11)$$

$$\left[\sum_{i=1}^{n}\sum_{j=1}^{m} M_{gi}{}^{j}\right]^{-1} = \left(\frac{1}{\sum_{i=1}^{n} U_i}, \frac{1}{\sum_{i=1}^{n} M_i}, \frac{1}{\sum_{i=1}^{n} L_i}\right) \quad (12)$$

The next step is to calculate the magnitude of the (Si)s. In general, if $M_1 = (L_1, m_1, U_1)$ and $M_2 = (L_2, m_2, U_2)$ are two fuzzy triangular numbers, the magnitude of M1 related to M2 is defined as follow and is calculated according to Equation 13.

$$V(M_1 \ge M_2) = hgt(M_1 \cap M_2) = \mu_{M_2}(d)$$

$$= \begin{cases} 1 & if(m_1 \ge m_2) \\ 0 & if(L_1 \ge U_2) \\ \dfrac{L_2 - U_1}{(m_1 - U_1) - (m_2 - L_2)} & others \end{cases} \quad (13)$$

On the other hand, the magnitude of a triangular number from k triangular number is obtained according to Equation 14.

$$V(M \ge M_1, M_2, \dots M_k) = V[M \ge M_1 \text{ and } M \ge M_2 \text{and } \dots . \text{and } M \ge M_k]$$

The next step is to calculate the weight of the criteria and options in the pairwise comparison matrix with Equation 15.

$$d'(A_i) = \min V(S_i \ge S_k) \qquad k = 1,2,3,\dots,n \quad k \ne i \quad (15)$$

Therefore, the non-normalized weight vector will be according to relation 16.

$$W' = (d'(A_1), d'(A_2), \dots . , d'(A_n))^{T} \qquad A_i (i = 1,2,3,\dots,k)$$

Finally, to calculate the final weight, we must normalize the weight vector in the previous step. In this study, we will use linear normalization which obtained from Equation 17.

$$W_{ij} = \frac{x_{ij}}{\sum x_{ij}} \quad (17)$$

4-3 Validity and reliability of the questionnaire

In reviewing the validity and reliability of the questionnaire, it should be stated that its validity has been tested by two methods of Face validity and KMO and Bartlett test and for reliability, two methods of Cronbach's alpha and double halving method have been used, which are as follow.

In review by Face validity method, the results show that the relationship between customer attraction in the aviation industry and the total score of 1832 has a strong limit. In the KMO and Bartlett test, the results are shown in Table 1, which shows the good quality of the data.

Table2. Measuring KMO and Bartlett test for the sample quality

Statistical value	**extent**	
KMO Index	**0.767**	
	Statistics	**87.67**
	df	**36**
	Probability (sig)	**0.0001**

The reliability of the questions with Cronbach's alpha method was 0.919 and with the double-half method was 0.853, which indicates the good reliability of the questionnaire and its dimensions. The reliability of each criteria of the questionnaire is given in Table 2.

Table 3. reliability of each questionnaire index

index	Cronbach's alpha
Management experience	0.759
E-commerce	0.871
Advertisement	0.814
Market share	0.567
Brand	0.539
Service quality	0.696
Customer Service	0.569
Customer Loyalty	0.491
Competitive price	0.143
Total Cronbach's alpha coefficient	0.919

4-4 Examining the normality of the data

Analyzing normality using skewness and kurtosis has shown that most of the questions in the questionnaire are in the range of (-2 , 2), so it shows that the data is normal and with the Kolmogorov-Smirnov test, it can be said that most of the data are normal with high confidence.

4-5 results

In the study of demographic information, most of the male statistical population is over 41 years old (42%), And the percentage of master graduates is 42% and married people are 74%.

The results of the hierarchical analysis method are as follow:

The indices must first be compared in pairs. The number of pairwise comparisons are calculated from Equation 1 and are as follow:

$$\frac{n(n-1)}{2} = \frac{9*8}{2} = 36$$

Therefore, 36 pair comparisons should be done. Pair comparisons have been made according to experts, according to which the paired matrix of indices is formed. Table 4 shows the values extracted from the pairwise comparisons and its matrix. In the next step, we obtain the sum of each column according to Equation 3 which is shown in Table 5.

$$\sum_{i=1}^{I} 1 + 0.5 + 3 + 0.14 + 0.2 + 3 + 0.16 + 0.16 + 3 = \frac{11}{16}$$

Table 5. Total columns

Total Column 1	Total Column 2	Total Column 3	Total Column 4	Total Column 5
11.16	9.99	8.89	33.99	33.66
Total Column 6	Total Column 7	Total Column 8	Total Column 9	
3.22	34.5	34.5	8.42	

In the next step, we divide the component of each matrix column by the sum according to Equation 3. The results are given in Table 6.

$$\frac{1}{11.16} = 0.089 \qquad \frac{0.2}{11.16} = 0.044 \qquad \ldots.$$

Table 6. division of the sum of each column by each component

0.089	0.2	0.037	0.175	0.148	0.102	0.173	0.173	0.039
0.044	0.1	0.337	0.175	0.148	0.102	0.173	0.173	0.039
0.268	0.033	0.112	0.2	0.178	0.155	0.202	0.202	0.059
0.012	0.014	0.013	0.025	0.089	0.037	0.086	0.086	0.014
0.0179	0.02	0.017	0.008	0.029	0.049	0.086	0.086	0.016
0.268	0.3	0.224	0.2	0.178	0.310	0.202	0.202	0.23
0.014	0.016	0.015	0.008	0.009	0.043	0.028	0.028	0.23
0.014	0.016	0.015	0.008	0.009	0.043	0.028	0.028	0.23
0.268	0.3	0.224	0.2	0.207	0.155	0.014	0.014	0.118

2.12	0.403	0.403	1.50

In the next step, we sum the rows of the new assembled matrix according to Equation 4. The results are shown in Table 7.

Table 7. sums of each row

Total row 1	Total row 2	Total row 3	Total row 4	Total row 5
1.14	1.29	1.41	0.37	0.334
Total row 6	Total row 7	Total row 8	Total row 9	

In the follow of equation 4, we must divide the weight of each row by the number of indices s so that the final weight is obtained. The results are given in Table 8.

$$\frac{1.138}{9} = 0.1265$$

Table 8. final weight

Brand	market share	advertising	e-commerce	management experience
0.037125	0.04218	0.157011	0.143939	0.126669

Competitive price	customer loyalty	customer service	service quality
0.167237	0.044793	0.044793	0.236253

To make sure that weights are correct, if we add the obtained weights together, it will be equal to 1. As a result, the prioritization of customer attraction factors by hierarchical method is shown in Figure 5.

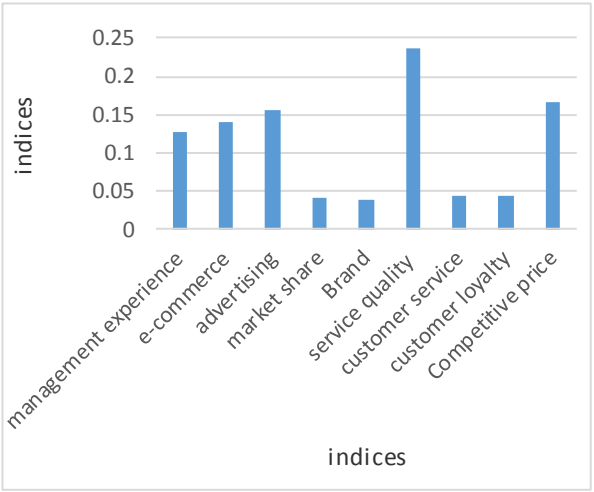

Figure 5. The value of the weight of each index for prioritization with hierarchical analysis

The priority of indices s based on the hierarchical analysis method respectively are: service quality, competitive price, advertising, e-commerce, management experience, customer service, customer loyalty, market share and brand.

The results obtained from Super Design software for sub-criteria or the same questions are given in order of priority in Figure 6.

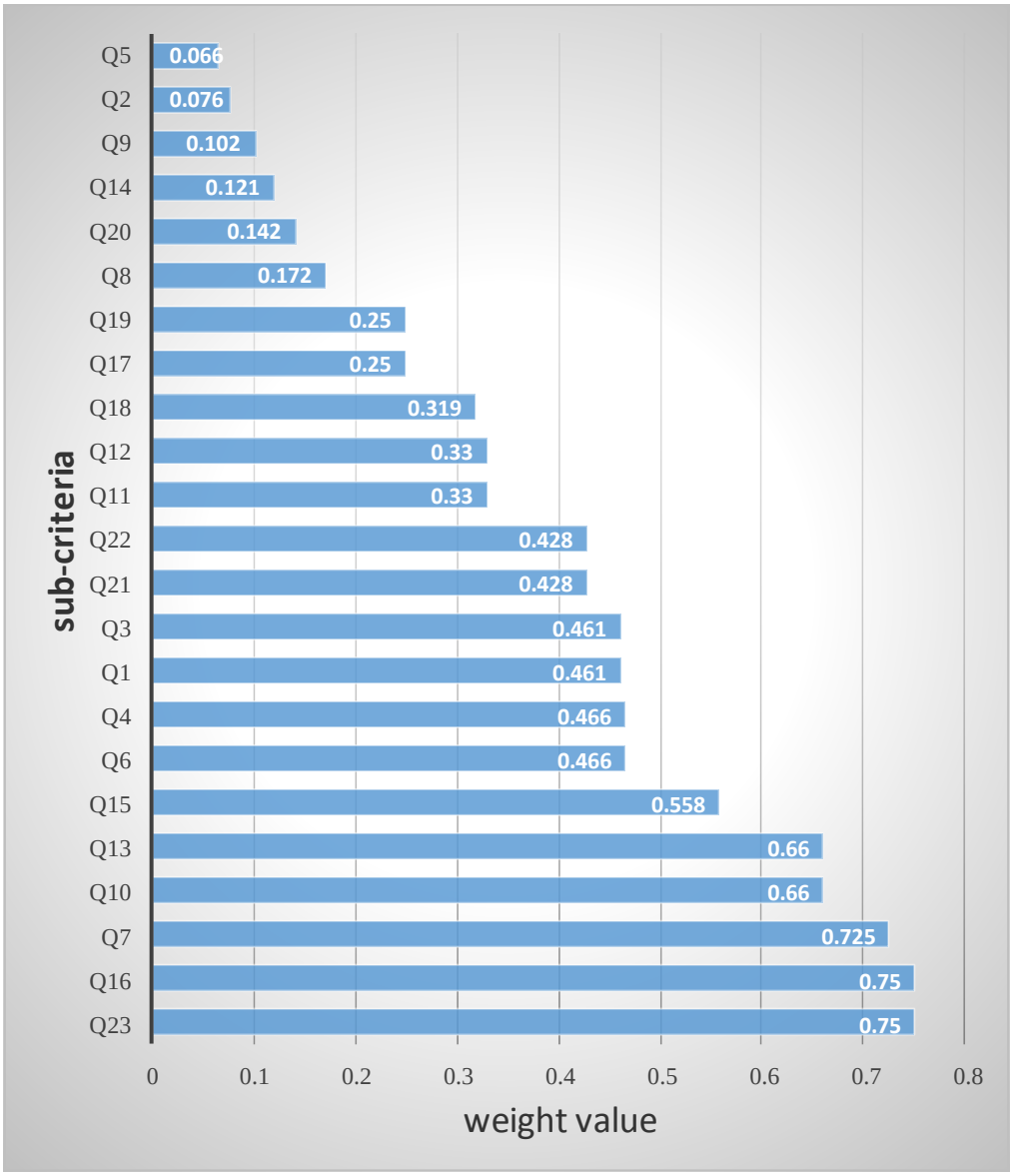

Figure 6. Prioritizing the weight value of each sub-criterion by the hierarchical method

The results of the hierarchical analysis method are as follow: The reasons for using fuzzy systems in this study are that fuzzy logic first helped solve many decision-making problems today, so that in most cases, it produces the best decision based on inputs, and fuzzy logic is based on human decisions. The second reason is that fuzzy logic is used when problems are associated with uncertainty and their evaluation information is more qualitative. Like this research, which covers both of the above reasons, it may provide better results for prioritizing indices. In order to make pairwise comparisons, qualitative values must be converted to fuzzy numbers, and for absolute numbers, the membership function of triangular fuzzy numbers is used. Pair comparisons of Table 4 and, pair matrix of table 1 is given in Table 9.

Table 4. Pair matrix of indices $\left[\sum_{i=1}^{n}\sum_{j=1}^{m} M_{gi}{}^{j}\right]^{-1}$ from Equations 10, 11 and 12. The results of the sum of the rows are given in Table 10.

indices	Management experience	E-Commerce	Advertising	Market share	Brand	Service quality	Customer service	Customer Loyalty	competitive price
Management experience	1	2	1/3=0.33	7	5	1/3=0.33	6	6	1/3=0.33
E-Commerce	1/2=0.5	1	3	7	5	1/3=0.33	6	6	1/3=0.33
Advertising	3	1/3=0.33	1	8	6	1/2=0.5	7	7	1/2=0.5
Market share	1/7=0.14	1/7=0.14	1/8=0.12	1	3	1/8=0.12	3	3	1/8=0.12
Brand	1/5=0.2	1/5=0.2		1/3=0.33	1				1/7=0.14
Service quality	3	3	2	8	6	1	1	7	2
Customer service	1/6=0.16	1/6=0.16	1/7=0.14	1/3=0.33	1/3=0.33	1/7=0.14	1	1	2
Customer Loyalty	1/6=0.16	1/6=0.16	1/7=0.14	1/3=0.33	1/3=0.33	1/7=0.14	1	1	2
Competitive price	3	3	2	8	7	1/2=0.5	1/2=0.5	1/2=0.5	1

Table 9. Pair matrix triangular fuzzy number of indices $\sum_{j=1}^{m} M_{gi}{}^{j} => \sum_{i=1}^{n} 1+1+0.2+5+3+0.2+3+3+0.2 = 16.6$

The next step is to calculate the (Si)s and is calculated from

indices	Management experience	E-Commerce	Advertising	Market share	Brand	Service quality	Customer service	Customer Loyalty	competitive price
Management experience	(1,1,1)	(1,3,5)	$\left(\frac{1}{5},\frac{1}{3},\frac{1}{1}\right)$	(5,7,9)	(3,5,7)	$\left(\frac{1}{5},\frac{1}{3},\frac{1}{1}\right)$	(3,5,7)	(3,5,7)	$\left(\frac{1}{5},\frac{1}{3},\frac{1}{1}\right)$
E-Commerce	$\left(\frac{1}{5},\frac{1}{3},\frac{1}{1}\right)$	(1,1,1)	(1,3,5)	(5,7,9)	(3,5,7)	$\left(\frac{1}{5},\frac{1}{3},\frac{1}{1}\right)$	(3,5,7)	(3,5,7)	$\left(\frac{1}{5},\frac{1}{3},\frac{1}{1}\right)$
Advertising	(1,3,5)	$\left(\frac{1}{5},\frac{1}{3},\frac{1}{1}\right)$	(1,1,1)	(5,7,9)	(3,5,7)	$\left(\frac{1}{5},\frac{1}{3},\frac{1}{1}\right)$	(5,7,9)	(5,7,9)	$\left(\frac{1}{5},\frac{1}{3},\frac{1}{1}\right)$
Market share	$\left(\frac{1}{9},\frac{1}{7},\frac{1}{5}\right)$	$\left(\frac{1}{9},\frac{1}{7},\frac{1}{5}\right)$	$\left(\frac{1}{9},\frac{1}{7},\frac{1}{5}\right)$	(1,1,1)	(1,3,5)	$\left(\frac{1}{9},\frac{1}{7},\frac{1}{5}\right)$	(1,3,5)	(1,3,5)	$\left(\frac{1}{9},\frac{1}{7},\frac{1}{5}\right)$
Brand	$\left(\frac{1}{7},\frac{1}{5},\frac{1}{3}\right)$	$\left(\frac{1}{7},\frac{1}{5},\frac{1}{3}\right)$	$\left(\frac{1}{7},\frac{1}{5},\frac{1}{3}\right)$	$\left(\frac{1}{5},\frac{1}{3},\frac{1}{1}\right)$	(1,1,1)	$\left(\frac{1}{7},\frac{1}{5},\frac{1}{3}\right)$	(1,3,5)	(1,3,5)	$\left(\frac{1}{9},\frac{1}{7},\frac{1}{5}\right)$
Service quality	(1,3,5)	(1,3,5)	(1,3,5)	(5,7,9)	(3,5,7)	(1,1,1)	(5,7,9)	(5,7,9)	(1,3,5)
Customer service	$\left(\frac{1}{7},\frac{1}{5},\frac{1}{3}\right)$	$\left(\frac{1}{7},\frac{1}{5},\frac{1}{3}\right)$	$\left(\frac{1}{9},\frac{1}{7},\frac{1}{5}\right)$	$\left(\frac{1}{5},\frac{1}{3},\frac{1}{1}\right)$	$\left(\frac{1}{5},\frac{1}{3},\frac{1}{1}\right)$	$\left(\frac{1}{9},\frac{1}{7},\frac{1}{5}\right)$	(1,1,1)	(1,1,1)	(1,3,5)
Customer Loyalty	$\left(\frac{1}{7},\frac{1}{5},\frac{1}{3}\right)$	$\left(\frac{1}{7},\frac{1}{5},\frac{1}{3}\right)$	$\left(\frac{1}{9},\frac{1}{7},\frac{1}{5}\right)$	$\left(\frac{1}{5},\frac{1}{3},\frac{1}{1}\right)$	$\left(\frac{1}{5},\frac{1}{3},\frac{1}{1}\right)$	$\left(\frac{1}{9},\frac{1}{7},\frac{1}{5}\right)$	(1,1,1)	(1,1,1)	(1,3,5)
Competitive price	(1,3,5)	(1,3,5)	(1,3,5)	(5,7,9)	(5,7,9)	$\left(\frac{1}{5},\frac{1}{3},\frac{1}{1}\right)$	$\left(\frac{1}{5},\frac{1}{3},\frac{1}{1}\right)$	$\left(\frac{1}{5},\frac{1}{3},\frac{1}{1}\right)$	(1,1,1)

Equation 9. In this study, we have used an approximate linear summation method. Before that you have to Calculate the value of $\sum_{j=1}^{m} M_{gi}{}^{j}$, $\sum_{i=1}^{n}\sum_{j=1}^{m} M_{gi}{}^{j}$ and $\sum_{i=1}^{n} 1+3+0.33+7+5+0.33+5+5+0.33 = 26.99$

$$\sum_{i=1}^{n} 1+5+1+9+7+1+7+7+1=39 \qquad \sum_{j=1}^{m} {M_{gi}}^{j} = (16.6,26.99,39)$$

Table 10. Total fuzzy number of indices

indices	Fuzzy number set of each row
Management experience	(16.6,26.99,39)
E-Commerce	(16.6,26.99,39)
Advertising	(20.6,30.99,43)
Market share	(4.55,10.7,17)
Brand	(3.87,8.27,13.52)
Service quality	(23,39,55)
Customer service	(3.81,6.15,9.26)
Customer Loyalty	(3.81,6.15,9.26)
Competitive price	(19.4,31.66,45)

To obtain $\sum_{i=1}^{n}\sum_{j=1}^{m} {M_{gi}}^{j}$ we must add the fuzzy number obtained from the sum of each row.

$$\sum_{i=1}^{n}\sum_{j=1}^{m} {M_{gi}}^{j} = \begin{pmatrix} \sum_{i=1}^{n} 16.6+16.6+20.6+4.55+3.87+23+3.81+3.81+19.4, \\ \sum_{i=1}^{n} 26.9+26.9+30.99+10.7+8.27+39+6.15+6.15+31.66, \\ \sum_{i=1}^{n} 39+39+43+17+13.52+55+9.26+9.26+45 \end{pmatrix}$$

$$\sum_{i=1}^{n}\sum_{j=1}^{m} {M_{gi}}^{j} = (112.24,189.9,270.04)$$

At this point we need to get the reverse of $\left[\sum_{i=1}^{n}\sum_{j=1}^{m} {M_{gi}}^{j}\right]^{-1}$.

$$\left[\sum_{i=1}^{n}\sum_{j=1}^{m} {M_{gi}}^{j}\right]^{-1} = \left(\frac{1}{270.04}, \frac{1}{189.9}, \frac{1}{112.24}\right) = (0.003703,0.00535,0.008909)$$

$$\left[\sum_{i=1}^{n}\sum_{j=1}^{m} {M_{gi}}^{j}\right]^{-1} = (0.003703,0.00535,0.008909)$$

Now we should calculate the (Si)s according to the equation $S_i = \sum_{j=1}^{m} {M_{gi}}^{j} \otimes \left[\sum_{i=1}^{n}\sum_{j=1}^{m} {M_{gi}}^{j}\right]^{-1}$. The results are shown in Table 11.

$$S_1 = (16.6,26.99,39) * (0.003703,0.00535,0.008909) = (0.061472,0.144409,0.34747)$$

Table 11. Total weight of indices ' fuzzy number

S_i
(0.061472,0.144409,0.34747)
(0.061472,0.144409,0.34747)
(0.076285,0.165811,0.383108)
(0.016849,0.05725,0.151461)
(0.014331,0.044248,0.120456)
(0.085173,0.208668,0.490021)
(0.014109,0.032905,0.082502)
(0.014109,0.032905,0.082502)
(0.071841,0.169395,0.400927)

The next step is to calculate the magnitude of the (Si)s according to Equation 13. And then $V(s_i \geq s_j)$ should be compared one by one, and the results are shown in Table 12.

Table 12. Magnitude Calculations of indices

$V(s_1 \geq s_2)$	$V(s_1 \geq s_3)$	$V(s_1 \geq s_4)$	$V(s_1 \geq s_5)$	$V(s_1 \geq s_6)$	$V(s_1 \geq s_7)$	$V(s_1 \geq s_8)$	$V(s_1 \geq s_9)$
1	0.9268	1	1	0.8032	1	1	0.916
$V(s_2 \geq s_1)$	$V(s_2 \geq s_3)$	$V(s_2 \geq s_4)$	$V(s_2 \geq s_5)$	$V(s_2 \geq s_6)$	$V(s_2 \geq s_7)$	$V(s_2 \geq s_8)$	$V(s_2 \geq s_9)$
1	0.9268	1	1	0.8032	1	1	0.9268
$V(s_3 \geq s_1)$	$V(s_3 \geq s_2)$	$V(s_3 \geq s_4)$	$V(s_3 \geq s_5)$	$V(s_3 \geq s_6)$	$V(s_3 \geq s_7)$	$V(s_3 \geq s_8)$	$V(s_3 \geq s_9)$
1	1	1	1	0.874	1	1	0.916
$V(s_4 \geq s_1)$	$V(s_4 \geq s_2)$	$V(s_4 \geq s_3)$	$V(s_4 \geq s_5)$	$V(s_4 \geq s_6)$	$V(s_4 \geq s_7)$	$V(s_4 \geq s_8)$	$V(s_4 \geq s_9)$
0.507	1	0.409	1	0.304	1	1	0.415
$V(s_5 \geq s_1)$	$V(s_5 \geq s_2)$	$V(s_5 \geq s_3)$	$V(s_5 \geq s_4)$	$V(s_5 \geq s_6)$	$V(s_5 \geq s_7)$	$V(s_5 \geq s_8)$	$V(s_5 \geq s_9)$
0.37	0.37	0.266	0.888	0.176	1	1	0.279

$V(s_6 \geq s_1)$	$V(s_6 \geq s_2)$	$V(s_6 \geq s_3)$	$V(s_6 \geq s_4)$	$V(s_6 \geq s_5)$	$V(s_6 \geq s_7)$	$V(s_6 \geq s_8)$	$V(s_6 \geq s_9)$
1	1	1	1	1	1	1	1
$V(s_7 \geq s_1)$	$V(s_7 \geq s_2)$	$V(s_7 \geq s_3)$	$V(s_7 \geq s_4)$	$V(s_7 \geq s_5)$	$V(s_7 \geq s_6)$	$V(s_7 \geq s_8)$	$V(s_7 \geq s_9)$
0.158	0.158	0.044	0.729	0.857	0.015	1	0.072
$V(s_8 \geq s_1)$	$V(s_8 \geq s_2)$	$V(s_8 \geq s_3)$	$V(s_8 \geq s_4)$	$V(s_8 \geq s_5)$	$V(s_8 \geq s_6)$	$V(s_8 \geq s_7)$	$V(s_8 \geq s_9)$
0.158	0.158	0.044	0.729	0.857	0.015	1	0.072
$V(s_9 \geq s_1)$	$V(s_9 \geq s_2)$	$V(s_9 \geq s_3)$	$V(s_9 \geq s_4)$	$V(s_9 \geq s_5)$	$V(s_9 \geq s_6)$	$V(s_9 \geq s_7)$	$V(s_9 \geq s_8)$
1	1	1	1	0.889	1	1	1

The next step is to calculate the weight of the criteria and options in the pairwise comparison matrix of Equation 15, and then the lowest number is considered according to Equation 16. The results are given in Table 13.

Table 13. Abnormal weights for each index

Indices	Comparison of (Si)s
Management experience	$V(s_1 \geq s_6)$
	0.8032
E-Commerce	$V(s_2 \geq s_6)$
	0.8032
Advertising	$V(s_3 \geq s_6)$
	0.874
Market share	$V(s_4 \geq s_6)$
	0.304
Brand	$V(s_5 \geq s_6)$
	0.176
Service quality	$V(s_6)$
	1
Customer service	$V(s_7 \geq s_6)$
	0.015
Customer Loyalty	$V(s_8 \geq s_6)$
	0.015
Competitive price	$V(s_9 \geq s_6)$
	0.889

Therefore, the non-normalized weight vector will be as follow:
W = (0.0142,1,0.159,0.0114)

Finally, to calculate the final weight, we need to normalize the weight vector in the previous step, which we will calculate from the linear normalization obtained from Equation 17. The results are given in Table 14.

Table 14. Normal weight of indices

indices	Normalized weight	Abnormal weight
Management experience	0.164	0.8032

E-Commerce	0.164	0.8032
Advertising	0.179	0.874
Market share	0.062	0.304
Brand	0.036	0.176
Service quality	0.204	1
Customer service	0.003	0.015
Customer Loyalty	0.003	0.015
Competitive price	0.182	0.889

As a result, the priority of customer attraction factors with fuzzy hierarchical method is shown in Figure 7.

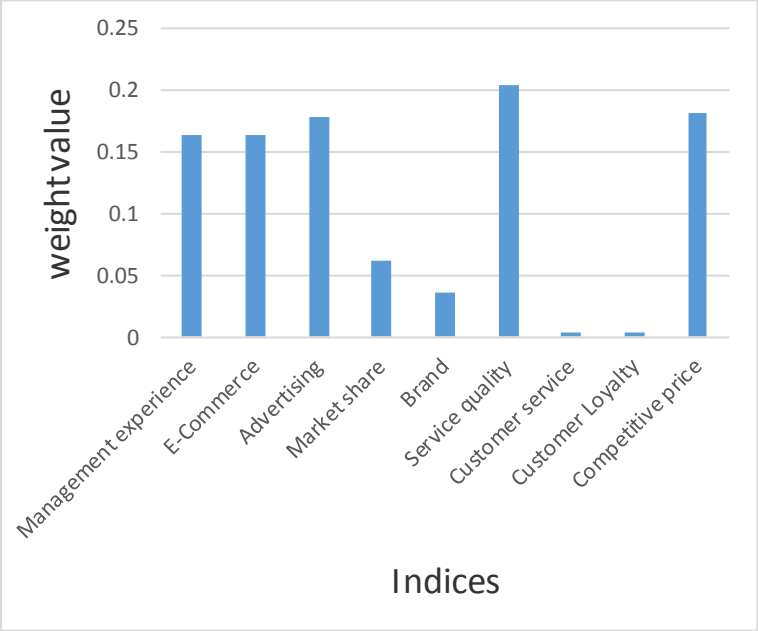

Figure 7. The weight value of each index for prioritization with fuzzy hierarchical analysis

The priority of indices based on fuzzy hierarchical analysis method are respectively: service quality, competitive price, advertising, e-commerce, management experience, market share, brand, customer service and customer loyalty.

Comparison of the two prioritization methods shows that in both methods, service quality is the highest value among the indices, and then in both methods, competitive price, advertising, and e-commerce have more priority. Both methods in other indices of management experience, market share, brand, customer loyalty and customer service are different.

* Comparison of this research with Haghighi and Nayebpour (2017) research in an article entitled "Ranking of Iranian Airlines with Combined Fuzzy Assessment and Genetic Algorithm" states that the weight of service quality criteria indicates the highest importance and value. In this study, with the method of hierarchical analysis and fuzzy hierarchical analysis, the weight value related to the quality of services to attract customers in the aviation industry has been discovered compared to other indices.

* Comparison of this research with Nami et al. (2017) research in an article that evaluates the factors affecting customer behavior in Iran's aviation industry using hierarchical analysis technique, more weight is for competitive price index with 0.244 value and then service quality with 0.195 value compared to other indices. However, in this study, according to experts, the first priority is found for service quality with 0.236 value and then for competitive price with 0.167 value.

5. Conclusion

The transition from an industrial economy and the disappearance of geographical boundaries and, consequently, the intensification of competition in the business environment has led organizations to meet the needs of the environment. One of the most important environmental factors is the customer. If organizations can satisfy, retain, or increase customer satisfaction, they will be just as successful. Therefore, the leading and transcendent organization is always looking to ensure customers' satisfaction. In today's competitive world, not only retaining existing resources, but also attracting new ones does not seem like an easy task. Only firms, companies or organizations are successful in this field who are able to increase their competitive power by increasing the quality of goods and services according to the needs of customers. Experts also consider customer satisfaction management and customer attraction as the most important tasks and priorities of company management and consider the need

for permanent and sustainable commitment of top managers to attract customers and pay attention to customer expectations as the main prerequisite for the success of firms, companies or organizations.

Customer satisfaction is one of the most important indices of success in any business. In today's global economy, companies need to focus all their activities and capabilities on customer satisfaction, because customers are the only source of returning investment. So, today's competitive market requires all organizations to be customer-oriented. A 2008 survey found that what scares customers in general is not the high price of products and services, but the weakness of customer interaction and customer dissatisfaction. Since every business needs to understand and recognize its customer in order to be able to optimize its product or service and provide it to the customer in the best way and be able to attract and target customers, there is a need for firms, companies or organizations, to consider customer behavior, and ways to attract and retain them. Therefore, attracting customers and gaining customer satisfaction in order to improve the level of performance is one of the priorities of firms, companies or organizations, especially commercial enterprises.

In order to attract customers and increase productivity in this research, a case study of the aviation industry has been considered. The reason for this choice is that today the aviation industry has a special place due to its unique features.

Therefore, the aim of this study is to prioritize the factors affecting customer attraction in the aviation industry using fuzzy hierarchical analysis. This research is done in 2019 and the statistical population of the research are the aviation industry experts. Data collection tool of the present study is a standard research questionnaire conducted by Nami et al. (2007) with 23 items which has been done by aerospace industry experts. This questionnaire consists of 9 dimensions. To assess the face validity and reliability of the questionnaire, Cronbach's alpha was used. In face validity, the results show that the relationship between customer attraction in the aviation industry with total score of 1832 has a strong limit. The reliability of the questions with Cronbach's alpha method was 0.919 and with the double-half method was 0.853, which indicates the good reliability of the questionnaire and its dimensions. In this study, SPSS software was used to analyze the samples. Analyzing normality using skewness and kurtosis has shown that most of the questions in the questionnaire are in the range of (-2 , 2), so it shows that the data is normal and with the Kolmogorov-Smirnov test, it can be said that most of the data are normal with high confidence.

The priority of indices based on the hierarchical analysis method are respectively: service quality, competitive price, advertising, e-commerce, management experience, customer service, customer loyalty, market share and brand.

The priority of indices based on fuzzy hierarchical analysis method are respectively: service quality, competitive price, advertising, e-commerce, management experience, market share, brand, customer service and customer loyalty.

Comparison of the two prioritization methods shows that in both methods, service quality is the highest value among the indices, and then in both methods, competitive price, advertising, and e-commerce have more priority. Both methods in other indices of management experience, market share, brand, customer loyalty and customer service are different.

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