

Identifying Factors Affecting Bank Customers' Loyalty and Ranking Them Using Fuzzy AHP Technique (Analytical Hierarchy process) Case Study: Bank Mellat -Iran

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ABSTRACT

The most appropriate and useful strategy for the bank is Customer orientation. Several points should be noted for the Customer orientation which the most important ones are clear and explicit accountability to client current needs, which means a variety of services and new and innovative services. This research is trying to specify effective factors and the influence amount of each one on customers' loyalty of Mellat bank by using appropriate techniques. This study is seeking to identify and prioritize factors affecting the customers' loyalty of bank Mellat by combining qualitative and quantitative approaches and using the advantages of both methods. The statistical population of this survey includes employees with over 12 years experience in bank Mellat situated in district 5 of Tehran, that the total size of this population is 275. The method of sampling is stratified random sampling. This study based on the purpose of the research is part of the applicative researches, and based on the method of data collection is part of the descriptive researches. Factors affecting customers' loyalty has been classified into four categories include Indicators related to staff, to services, to access to branches, and to physical aspects. This research has been done by the fuzzy logic method.

KEY WORDS: customers' loyalty; banking; fuzzy logic; Bank Mellat.

INTRODUCTION

Attention to the subject "Customers' Loyalty" in the topic of marketing dates back to the year 1923. Since then the concept of loyalty, as a subject of loyalty, has been discussed as an academic the subject in the marketing literature and number of empirical studies aimed to explain this concept have been designed and implemented. Oliver (1999) expresses that most of the definitions in the literature have been suffered from this problem that what the client does is reported in them, and none of them consider the philosophy and meaning of fidelity. Based on a theory provided by Yakub and Kamiz (1973), Loyalty occurs based on the behavioral response (It's not accidental) and is applied over time by the decision-making units, whether as a part of an individual, family or organization. Different definitions of loyalty are expressed, and then we continue to review them: Oliver (1999) defines loyalty as follows: "Loyalty is known as a strong commitment to re-purchase a best product or a service in the future, so the same brand or product is bought despite the potential and marketing efforts of competitors" (Beerli & et al., 2004, 254-255). Larson and Susannan believe that loyalty is "to create commitment in customers for doing business with the specific organization and purchase goods and services frequently" (Larson & Susannan, 2004, 13). Asael (1992) defines the loyalty as a "Behavior about a brand". So this leads to continuing that brand purchase (Wang et al, 2004). Shomakher and Luis (1999) express that loyalty occurs when customers feel that the considered organization can resolve their relative needs by the best way, so that the organization competitors exit the consumers' considerations set and attempt to purchase from organization exclusively (Elahi, Heidari, 1384). Yakubi and Chistenat⁵ (1978) show psychological meaning of loyalty in an attempt which tries to distinguish it from the definitions of behavior (frequent purchase). Their analysis shows that continuing purchase would be worthless as an indicator of loyalty, due to the method of purchase, the priority of comfort, or if consumers adhere to many brands, the discontinuous purchases can put on the mask on loyalty. If customers do not pass the process of evaluating and decision making carefully, they will not commit to the Bank and the loyalty to the bank will not be created. Customers who are not loyal to the bank, but buy its services, easily absorb through the competitors' efforts of marketing (Bloemer et al, 1998). Customer satisfaction is defined as the degree of which a company's actual performance meets customer expectations. If the performance of company meets customer's expectations, customer will be satisfied, otherwise he will be dissatisfied (Divandary, Delkhah, 1384, 188). The definition of customer's satisfaction that is accepted by many scholars is as follows: Customer satisfaction is an outcome which is perceived by a comparison before purchasing of the expected performance with actual performance and the paid cost is

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obtained (Beerli et al, 2004). Bloemer et al. (1998) expressed that the customer satisfaction is one of the important factors affecting the customer satisfaction in banking. They showed that customer satisfaction affects on the customer's Loyalty and choice in the banking industry. Providing the high quality services and products for customers in order to success and survival in today's competitive banking environment is essential.

Wang et al. (2003) believe that the provision of high quality products and services, increases the reputation of the business unit, enables customers retaining, attracts new customers by the verbal advertising, and increases the beneficial and financial performance.

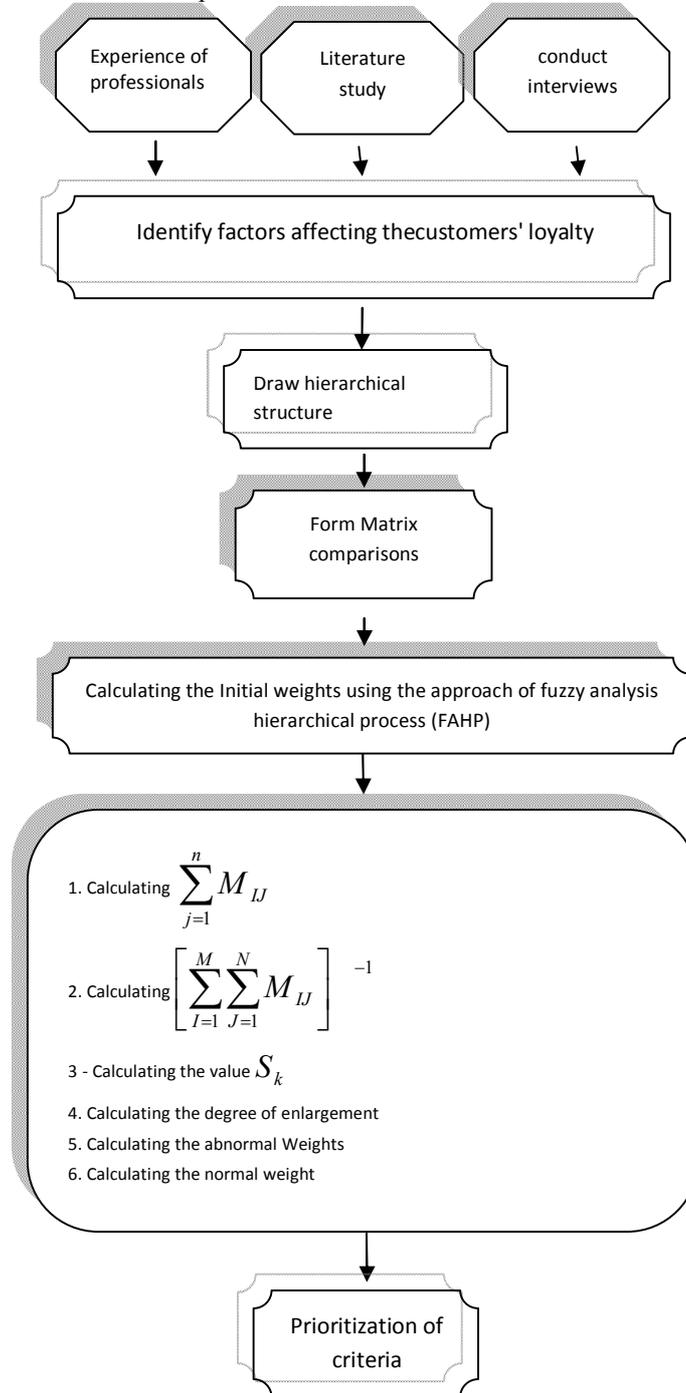


Figure 1 - steps of research

Fuzzy logic which was introduced against the classical logic is considered as a powerful tool for solving problems related to complex systems which are difficult to understand, or are issues depending on

reasoning, decision making and human perception. Fuzzy logic is the best tool for modeling systems with high complexity and no sufficient data available, or for ones that we have vague and imprecise information about (Asgharpour, 1385, 35). Fuzzy systems can be considered as nonlinear dynamic systems, which are capable to approximate the actual systems in any amount of complexity based on experimental data and numerical calculations with certain precision. In an ideal model, qualitative and quantitative data and mathematical models should be used. The fuzzy set theory is an ideal way to achieve this ideal model. (manhaj, 1386). Bank Mellat, based on the approval of the General Assembly dated 09.29.1358, established and incorporated by merging of 10 private banks (Dariush, Tehran, Pars, Etebarat Taavoni & Tozie, Iran & Arab, Bein-al-melalie-Iran, Omran, Bimeh-Iran, Tejarat Khareji Iran and Farhangian). The main strategies of Mellat Bank are declared as the development of information and communication technology, customers' relationship management, improvement of service quality, Human Resource development, and improvement of performance indicators.

RESEARCH METHODOLOGY

This study based on the purpose of the research is part of the applicative researches, and based on the method of data collection is part of the descriptive researches. In order to achieve the research objectives in the present case study, the methodology should be designed and developed. This methodology includes several steps. Figure 1 illustrates these steps.

In order to depict the hierarchical structure the factors affecting the considered case should be identified and be placed in a hierarchical structure. In this research, after reviewing research literature and receiving expert's opinions, a relatively comprehensive list of factors affecting customer loyalty was formed, and then these factors were placed in four groups. These factors are shown in Figure 2. At this stage, considering the hierarchical structure, paired comparisons are performed. These comparisons are as follows:

- ◆ Paired comparisons between the indicators, according to its higher level (ie. target level).
- ◆ Paired comparisons between the sub-indicators according to its higher level (ie. The index level).

Table 1 - triangular fuzzy numbers related to each verbal variable

Verbal variables	fuzzy numbers
Completely equal importance	(1,1,1)
Equal importance	(1,2,1,3,2)
Slightly important	(1,3,2,2)
Relatively important	(3,2,2,5,2)
Very important	(5,2,3,7,2)
Completely important	(3,7,2,4)

In order to perform paired comparisons, a fuzzy range has been used as described in Table 1. According to experts' studies and using fuzzy defined numbers, the relative importance of indicators towards each other is calculated and the matrix of paired comparisons \tilde{A}' is formed based on it. In which, \tilde{a}'_{ij} is a triangular fuzzy number and indicates the relative importance of i index to j index (Asgharpour, 1385, 145). Based on the matrix of paired comparisons between each of assess indexes and sub-indexes, judgment matrix \tilde{A} is formed by merging decision makers' comments with using the following equations. In which ij indicates the relative importance of i index to j index. If \tilde{U}_{ijk} is a triangular fuzzy number which indicates a K special judgment for the relative importance of two indices $C_i - C_j$, Then we have:

\tilde{a}_{ij} is the merged comments of K decision makers.

Calculation in FAHP

After forming the judgment matrix in previous stage, the weights of each Judgment matrices should be calculated. There are various methods for calculating weights; in the current case study, a Extent Analysis Method which was presented by a Chinese researcher named Chang, is used (Azar, Faraji, 1381, 251). The Extent Analysis Method includes some stages which are:

The calculation of $\sum_{j=1}^n M_{ij}$

To calculate $\sum_{j=1}^n M_{ij}$ the fuzzy numbers in each row of Judgment matrix are added together.

$$\left[\sum_{I=1}^M \sum_{J=1}^N M_{IJ} \right]^{-1}$$

The calculation of

To do this, the total fuzzy numbers in the Judgment matrix are added together.

The calculation of value S_k

In Extent Analysis Method, for each row of a Judgment matrix the value S_k which is a triangular fuzzy number is calculated as the following equation:

In which, M_{ij} is a triangular fuzzy number, k indicates the row number, i and j indicate row and column, respectively.

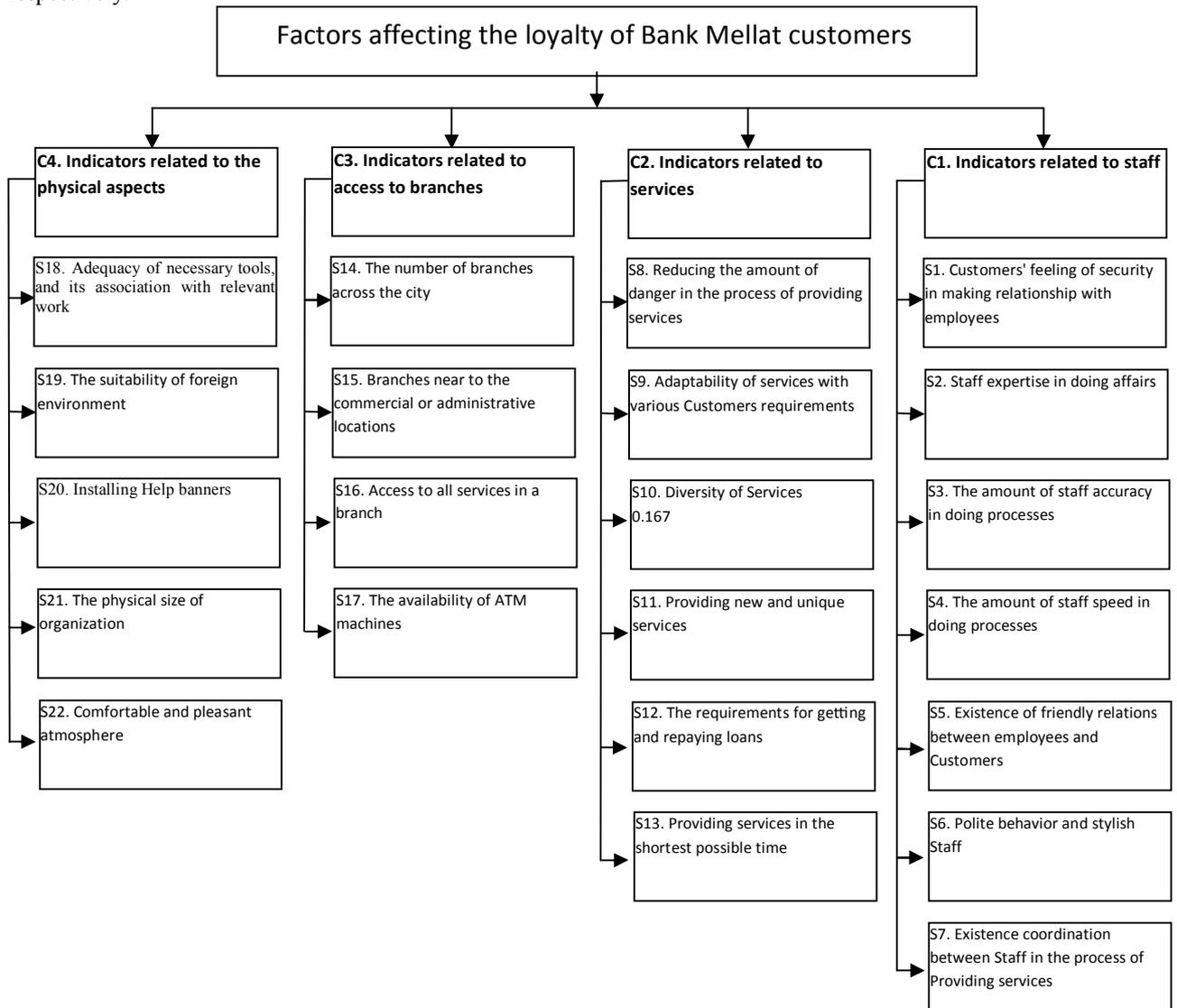


Figure 2 - factors affecting bank customers' loyalty

The Calculation of magnitude degree

Generally, if M_1 and M_2 are two triangular fuzzy numbers, the magnitude degree of M_1 on M_2 is defined as follow equation:

Which we have:

The magnitude amount of a triangular fuzzy number from k triangular other fuzzy number is obtained as the following equation:

$$V(M_1 \geq M_2, \dots, M_k) = V(M_1 \geq M_2) \text{.. and } V(M_1 \geq M_k)$$

The Magnitude degree of triangular fuzzy number M1 compared to triangular fuzzy number M2 is shown in Figure 3.

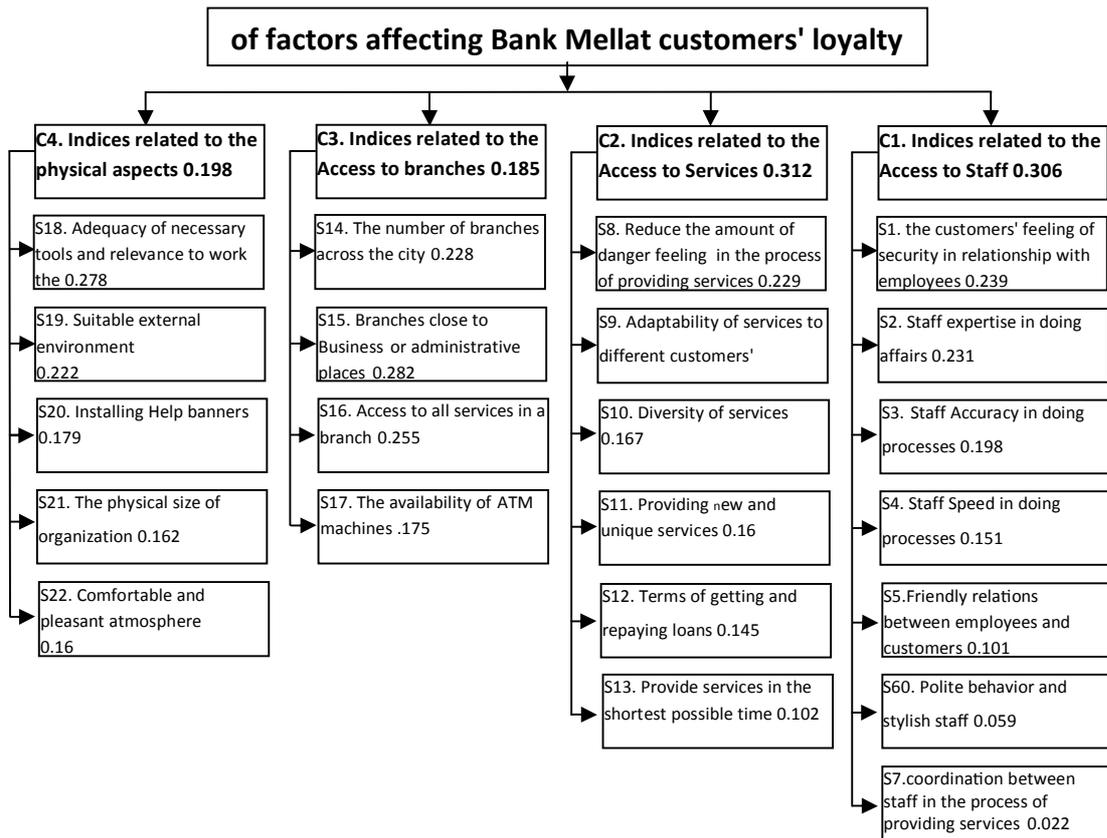


Figure 3- The model of factors affecting customer's loyalty

Figure 3 - the magnitude degree M1 compared to M2

Abnormal Weights Calculation

At this point, the lowest amounts of elements in each column of the Stage table are achieved. These values are as abnormal weights. Thus the weight vector of indices will be as follows:

Normal vector Calculation

After the abnormal weights were obtained at this stage, to get the normal vector of the weights we can do as following:

This process is used for all judgment matrices of the present case study until the normalized weights are gained. According to the normal vectors obtained from the criteria and sub -criteria, the final priority will determined. The statistical population of this study contains all employees with over 12 years experience in bank Mellat situated in district 5 of Tehran. The total size of this population is 275, which are shown in Table 2 by Separation of educational levels.

Table 2 - Total number of research statistical population separated by educational levels

Education	Below Diploma	Diploma	Advanced Diploma and BS	MA and Ph.D.	Total sum
Total	17	129	103	26	275

The sampling method and determination of sample size

Sampling of the Statistical population was done in a way which ensures that there is a representative sample of society. In fact the better choices create the more reliable results can be generalized to the community. Therefore the two conditions were met in sampling; first, the adequacy of sample, and the other being equal in chance of selecting each member of statistical population. In this study, the random stratified sampling method was used for sampling. Thus, first sample size was calculated using the following equation, then based on a distribution manner of statistical population among educational levels, sample size was distributed proportionately among them.

In this equation:

N: Total size of statistical population

$Z_{\alpha/2}$: The amount of Normal variable corresponding to confidence level $\alpha-1$

P: Homogeneity and heterogeneity in response to questions

q: 1-p

\mathcal{E} : The amount of allowable error

n: Total size of statistical sample

In this study, confidence coefficient was considered 95% (Normal variable amount corresponding to the confidence level 95% equals to 1.96), Permissible error 1%, and due to the inaccessibility to the variance of the variables research, the maximum possible variance of the $p=0.5$ was considered.

Replacing the above values in the formula, the numbers of 71 were selected as statistical sample. The method of statistical sample calculation is as follows.

The desired number of samples has been distributed between them based on the contribution ratio of each education level. The statistical sample, based on the separation of educational levels, is presented in Table 3.

Table3- statistical sample, based on the separation of educational levels

Education level	Statistical population	Statistical sample
Below diploma	17	5
Diploma	129	33
Advanced Diploma and BA.	103	26
MA. And Ph.D.	26	7
Total sum	275	71

RESULTS AND DISCUSSION

Fuzzy calculation was performed by the Chang method, and here, the review of the calculation and performed steps are provided briefly.

Step 1 - Calculating mean matrix (the criteria compared to target)

In order to combine comments of 71 respondents, the geometric mean is used. The Fuzzy mean matrix of criteria level compared to target is presented in Table 4.

Table 4: The Fuzzy mean matrix of criteria level compared to target

	C ₁			C ₂			C ₃			C ₄		
C ₁	1	1	1	0.49	1.01	1.5	1.02	1.54	2.12	1.1	1.54	2.04
C ₂	0.667	0.99	2.041	1	1	1	1.03	1.49	2.04	1.12	1.63	2.02
C ₃	0.472	0.649	0.98	0.49	0.671	0.971	1	1	1	0.56	1.02	1.18
C ₄	0.49	0.69	0.909	0.495	0.613	0.893	0.847	0.98	1.178	1	1	1

Step 2 – Calculating the row total of Fuzzy numbers

In this step, using the presented relationships in Chapter 3, the row total of Fuzzy numbers is calculated. The results of these calculations are shown in Table 5.

Table 5: the row total of Fuzzy numbers

	L	M	U
R1	3.61	5	6.66
R2	3.817	5.11	7.101
R3	2.522	3.34	4.131
R4	2.833	3.284	4.588

Step 3 - Calculating the columnar total of Fuzzy numbers

In this step, the columnar total of matrix step 2 is calculated.

Table 6: the columnar total of Fuzzy numbers

SR	12.78	16.73	22.48
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Step 4 - Calculating values of each row of the matrix

Using the relations presented in Chapter 3, the values are calculated. The calculations of this step are presented in Table 7.

Table 7- the value of S_K

	L	M	U
S1	0.161	0.299	0.521
S2	0.170	0.305	0.556
S3	0.112	0.200	0.323
S4	0.126	0.196	0.359

Step 5 - Calculating the magnitude degree of S_j compared to S_i

In this step, a magnitude degree is also calculated by the relationship provided in the Chapter 3. The results of this Calculating are presented in Table 8.

Table 8 - the magnitude degree of S_j compared to S_i

	S1	S2	S3	S4
S1	1	1	0.621	0.659
S2	0.982	1	0.592	0.634
S3	1	1	1	0.986
S4	1	1	1	1

Step 6 - Calculating the abnormal weights

The obtained abnormal weights are shown in Table 9.

Table 9- The abnormal weights

W_i	W1	W2	W3	W4
abnormal weights	0.982	1	0.592	0.634

Step 7 - Calculating the normal weight

By dividing each of the abnormal weights by the total sum of abnormal weights, the normal weight is achieved which is shown in Table 10.

Table 10- Normal weights

W_i	W1	W2	W3	W4
Normal weights	0.306	0.312	0.185	0.198

In order to Calculating Fuzzy weights in the levels of sub-criteria, the same can be done. The results associated with the sub-criteria are presented in the following steps:

Step 1 - Calculating average matrix

The Fuzzy average matrix in level of sub-criteria compared to the level of criteria is presented for each level in tables 11 - 14.

Table 11 - Fuzzy Average matrix of staff criteria

C1	S1			S2			S3			S4			S5			S6			S7		
S1	1	1	1	1.05	1.15	1.18	0.54	1.08	1.46	1	1.55	2.08	1.58	2.1	2.48	1.98	2.55	3.06	2.22	3.1	3.44
S2	0.85	0.87	0.95	1	1	1	0.52	0.98	1.54	1.06	1.48	2.02	1.55	2.12	2.54	2.03	2.6	3.02	2.46	3.04	3.48
S3	0.68	0.93	1.85	0.65	1.02	1.92	1	1	1	0.46	1.02	1.48	0.99	1.56	2.03	1.54	2.1	2.56	1.99	2.52	3.12
S4	48	0.65	1	0.5	0.68	0.94	0.68	0.98	2.17	1	1	1	0.51	1.03	1.48	1.02	1.5	2.1	1.48	2	2.64
S5	0.40	0.48	0.63	0.39	0.47	0.65	0.49	0.64	1.01	0.68	0.97	1.96	1	1	1	0.48	1.02	1.55	0.98	1.5	2.03
S6	0.33	0.39	0.51	0.33	0.38	0.49	0.39	0.48	0.65	0.48	0.67	0.98	0.65	0.98	2.08	1	1	1	0.52	1.02	1.46
S7	0.29	0.32	0.45	0.29	0.33	0.41	0.32	0.40	0.50	0.38	0.50	0.68	0.49	0.67	1.02	0.68	0.98	1.92	1	1	1

Table 12 - Fuzzy Average matrix of service criteria

C2	S8			S9			S10			S11			S12			S13		
S8	1	1	1	0.55	1.05	1.62	1.08	1.48	2.12	1.04	1.52	2.08	1.02	2.03	2.49	1.55	2.08	2.48
S9	0.62	0.95	1.82	1	1	1	0.48	1.02	1.56	0.54	1.06	1.61	1.02	1.48	2.02	1.54	2.06	2.44
S10	0.47	0.68	0.93	0.64	0.98	2.08	1	1	1	1.05	1.08	1.18	0.53	1012	1.54	1.02	1.48	2.02
S11	0.48	0.66	0.96	0.62	0.94	1.85	0.85	0.93	0.95	1	1	1	0.51	1.02	1.62	1.05	1.54	1.98
S12	0.40	0.49	0.98	0.50	0.63	0.98	0.65	0.89	1.98	0.62	0.98	1.96	1	1	1	0.54	1.06	1.52
S13	0.40	0.48	0.65	0.41	0.49	0.65	0.50	0.68	0.98	0.51	0.65	0.95	0.66	0.94	1.85	1	1	1

Table 13 - Fuzzy Average matrix of Access to branches criteria

C3	S14			S15			S16			S17		
S14	1	1	1	1.05	1.12	1.18	0.52	0.98	1.54	1.02	1.48	2.02
S15	0.85	0.89	0.95	1	1	1	0.58	1.02	1.55	1.12	1.58	2.12
S16	0.65	1.02	1.92	0.65	0.98	1.72	1	1	1	0.98	1.02	1.12
S17	0.50	0.68	0.98	0.47	0.63	0.89	0.89	0.98	1.02	1	1	1

Table 14 - Fuzzy Average matrix of Physical aspects criteria

C4	S18			S19			S20			S21			S22		
S18	1	1	1	0.55	1.06	1.48	1.02	1.54	2.14	1.08	1.48	2.03	1.48	1.98	2.44
S19	0.68	0.94	1.82	1	1	1	0.54	1.02	1.52	0.51	1.05	1.54	1.05	1.55	2.02
S20	0.47	0.65	0.98	0.66	0.98	1.85	1	1	1	1.06	1.08	1.12	0.52	1.06	1.54
S21	0.49	0.68	0.56	0.65	0.95	1.96	0.89	0.93	0.94	1	1	1	0.55	0.98	1.55
S22	0.41	0.51	0.68	0.5	0.65	0.95	0.65	0	1.92	0.65	1.02	1.82	1	1	1

Step 2 - Calculate the row total of fuzzy numbers

In this step, the row total of fuzzy numbers in the Chapter 3 is calculated by presented equations. The results of these calculations are shown in tables 15 - 18.

Table 15 - Row total of fuzzy numbers related to the staff criteria

	L	M	U
R1	9.37	12.53	14.7
R2	9.467	12.09	14.55
R3	7.314	10.15	13.96
R4	5.661	7.831	11.34
R5	4.425	6.08	8.829
R6	3.69	4.92	7.171
R7	3.455	4.195	5.979

Table 16 - Row total of fuzzy numbers related to the service criteria

	L	M	U
R8	6.24	9.16	11.79
R9	5.197	7.572	10.45
R10	4.713	6.336	8.749
R11	4.509	6.087	8.366
R12	3.703	5.102	8.328
R13	3.471	4.235	6.079

Table 17- Row total of fuzzy numbers related to the Access to branches criteria

	L	M	U
R14	3.59	4.85	5.74
R15	3.547	4.493	5.622
R16	3.275	4.021	5.767
R17	2.86	3.289	3.894

Table 18- Row total of fuzzy numbers related to the Physical aspects criteria

	L	M	U
R18	5.85	7.06	9.09
R19	3.776	5.563	7.898
R20	3.705	4.77	6.492
R21	3.585	4.534	6.01
R22	3.199	4.114	6.369

Step 3 - Calculating columnar total of fuzzy numbers

In this Step, the columnar total of Step 2 Matrices is calculated. The results of this calculation are shown in Table 19 - 22.

Table 19- columnar total of fuzzy numbers related to the staff criteria

SR	43.38	57.79	76.53
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Table 20- columnar total of fuzzy numbers related to the service criteria

SR	27.83	38.49	53.76
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Table 21- columnar total of fuzzy numbers related to the Access to branches criteria

SR	13.27	16.38	21.02
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Table 22- columnar total of fuzzy numbers related to the Physical aspects criteria

SR	20.12	26.04	35.86
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Step 4 - Calculating the values corresponding to each row of the matrix

The values of S_k are calculated by using equations presented in Chapter 3. The calculations of this step are presented in tables 23 - 26.

Table 23 - S_k values related to the staff criteria

	L	M	U
S1	0.122	0.217	0.339
S2	0.124	0.209	0.335
S3	0.096	0.176	0.322
S4	0.074	0.136	0.261
S5	0.058	0.105	0.204
S6	0.048	0.085	0.165
S7	0.045	0.073	0.138

Table 24 - S_k values related to the service criteria

	L	M	U
S8	0.116	0.238	0.424
S9	0.097	0.197	0.375
S10	0.088	0.165	0.314
S11	0.084	0.158	0.301
S12	0.069	0.133	0.299
S13	0.065	0.110	0.218

Table 25 - S_k values related to Access to branches criteria

	L	M	U
S14	0.171	0.280	0.433
S15	0.169	0.274	0.424
S16	0.156	0.245	0.435
S17	0.136	0.201	0.293

Table 26 - S_k values related to Physical aspects criteria

	L	M	U
S18	0.163	0.271	0.452
S19	0.105	0.214	0.393
S20	0.103	0.183	0.323
S21	0.100	0.174	0.299
S22	0.089	0.153	0.317

Step 5 – calculating the magnitude degree of S_j compared to S_i

In this step, the magnitude degree for indicators associated with each of the criteria is calculated by using the equations presented in Chapter 3. The results of these calculations are presented in tables 27 - 30.

Table 27- the magnitude degree of S_j compared to S_i related to staff criteria

	S1	S2	S3	S4	S5	S6	S7
S1	1	0.965	0.829	0.631	0.421	0.246	0.096
S2	1	1	0.855	0.651	0.434	0.251	0.094
S3	1	1	1	0.805	0.605	0.435	0.291
S4	1	1	1	1	0.81	0.644	0.504
S5	1	1	1	1	1	0.843	0.71
S6	1	1	1	1	1	1	0.877
S7	1	1	1	1	1	1	1

Table 28- the magnitude degree of S_j compared to S_i related to service criteria

	S8	S9	S10	S11	S12	S13
S8	1	0.863	0.73	0.698	0.635	0.444
S9	1	1	0.871	0.841	0.759	0.584
S10	1	1	1	0.971	0.868	0.705
S11	1	1	1	1	0.894	0.737
S12	1	1	1	1	1	0.869
S13	1	1	1	1	1	1

Table 29- the magnitude degree of S_j compared to S_i related to Access to branches criteria

	S14	S15	S16	S17
S14	1	0.979	0.885	0.609
S15	1	1	0.902	0.629
S16	1	1	1	0.755
S17	1	1	1	1

Table 30- the magnitude degree of S_j compared to S_i related to Physical aspects criteria

	S28	S19	S20	S21	S22
S18	1	0.8	0.645	0.583	0.576
S19	1	1	0.877	0.83	0.792
S20	1	1	1	0.965	0.894
S21	1	1	1	1	0.931
S22	1	1	1	1	1

Step 6 - Calculation of abnormal weights

The gained abnormal weights related to the indicators of each criterion are shown in Table 31- 34.

Table 31- The abnormal weights related to the indicators of staff criteria

W_i	W_1	W_2	W_3	W_4	W_5	W_6	W_7
Abnormal weights	1	0.965	0.829	0.631	0.421	0.246	0.094

Table 32- The abnormal weights related to the indicators of Service criteria

W_i	W_8	W_9	W_{10}	W_{11}	W_{12}	W_{13}
Abnormal Weights	1	0.863	0.73	0.698	0.635	0.444

Table 33- The abnormal weights related to the indicators of Access to branches criteria

W_i	W_{14}	W_{15}	W_{16}	W_{17}
Abnormal Weights	1	0.979	0.885	0.609

Table 34- The abnormal weights related to the indicators of Physical aspects criteria

W_i	W_{18}	W_{19}	W_{20}	W_{21}	W_{22}
Abnormal Weights	1	0.8	0.645	0.583	0.576

Step 7: The calculation of normal weights

Normal weights are achieved by dividing each of abnormal weight by the total of abnormal weights, these weights, based on each indexes of criteria, are shown in Tables 35-38.

Table 35- The normal weights related to the indicators of staff criteria

W_i	W_1	W_2	W_3	W_4	W_5	W_6	W_7
normal weights	0.239	0.231	0.198	0.151	0.101	0.059	0.022

Table 36- The normal weights related to the indicators of Service criteria

W_i	W_8	W_9	W_{10}	W_{11}	W_{12}	W_{13}
normal weights	0.229	0.197	0.167	0.16	0.145	0.102

Table 37- The normal weights related to the indicators of Access to branches criteria

W_i	W_{14}	W_{15}	W_{16}	W_{17}
normal weights	0.228	0.228	0.255	0.175

Table 38- The normal weights related to the indicators of Physical aspects criteria

W_i	W_{18}	W_{19}	W_{20}	W_{21}	W_{22}
normal weights	0.278	0.222	0.179	0.162	0.16

In order to obtain an overall weight of sub-criteria, the local weight of each sub-criterion multiplies in the weight of the relevant criterion level. According to calculations, the effective factors and indicators affecting the customer loyalty in the Bank Mellat are ranked in the table 39.

Table 39- The total weight and rank of factors affecting customers' loyalty

Rank	Description of index	The symbol	abbreviation	Criteria	Weight
1	Customer's feeling of safety in communicating with staff	S1		Staff	0.0720
2	Reduce feeling of danger in the process of service delivery	S8		services	0.0705
3	Staff expertise in doing affairs	S2		Staff	0.0696
4	Compatibility of service with customer's different needs	S9		Services	0.0608
5	staff accuracy in doing processes	S3		Staff	0.0597
6	Adequacy of necessary tools and its relevance with relevant work	S18		Physical	0.0558
7	The number of branches across the city	S14		Access	0.0545
8	Branches close to the commercial or official places	S15		Access	0.0534
9	Diversity of Services	S10		Services	0.0514
10	Providing new and unique services	S11		Services	0.0492
11	Access to all services in a branch	S16		Access	0.0483
12	The staff speed in doing processes	S4		Staff	0.0454
13	terms of getting and repaying loans	S12		Services	0.0447
14	The suitability of the external environment	S19		Physical	0.0447
15	Installing Help banners	S20		Physical	0.0360
16	The availability of ATM machines	S17		Access	0.0332
17	The physical size of organization	S21		Physical	0.0326
18	Comfortable and pleasant atmosphere	S22		Physical	0.0322
19	Providing services in the shortest possible time	S13		Services	0.0313
20	Friendly relations between staff and customers	S5		staff	0.0303
21	Polite behavior and stylish staff	S6		staff	0.0177
22	coordination between staff in the process of Providing services	S7		staff	0.0067

Conclusion

The results in Figure 4 are summarized. In this figure, the overall weights of criteria are shown. However, the sub-criteria weight has been as local weights. In order to obtain an overall weight of sub-criteria, the local weight of each sub-criterion multiplies in the weight of the relevant criterion level. According to

calculations, the effective factors and indicators affecting the customer loyalty in the Bank Mellat are ranked in the following table 40.

Considering and thought in the tables above (the results of the hierarchical fuzzy Analytical process) has led to significant results which can be used by the authorities concerned in order to increase customers' loyalty. The results will be described below.

Factors affecting customers' loyalty

As the decision tree (Figure 4) has shown, the factors affecting the customers' loyalty have been divided into 4 categories includes factors related to staff, services, access to Branches, and the physical aspects. The results of Fuzzy hierarchical analysis show that among the above criteria, the services criterion has allocated the highest weight and staff, physical aspects and access to Branches criteria have been in the next rankings.

Indicators relating to staff

According to the decision tree can be seen that the staff indices have been divided into seven indexes. The results show that among the indices relating to staff, Customer's feeling of safety in communicating with staff, Staff expertise in doing affairs, staff accuracy in doing processes, The staff speed in doing processes, Friendly relations between staff and customers, Polite behavior and stylish staff, and coordination between staff in the process of Providing services, have had the greatest importance, respectively. Weight of each index is visible in Table 40.

Indicators relating to services

Indices related to services in the present study have been divided into six indexes. The results of Fuzzy Analytical Hierarchy Process show that among these 6 indices, Reduce feeling of danger in the process of service delivery, Compatibility of service with customer's different needs, Diversity of Services, Providing new and unique services, terms of getting and repaying loans, and providing services in the shortest possible time have had the greatest importance, respectively. Weight of each index is visible in Table 40.

Table 40- The total weight and rank of factors affecting customers' loyalty

Rank	Description of index	The abbreviation symbol	Criteria	Weight
1	Customer's feeling of safety in communicating with staff	S1	Staff	0.0720
2	Reduce feeling of danger in the process of service delivery	S8	services	0.0705
3	Staff expertise in doing affairs	S2	Staff	0.0696
4	Compatibility of service with customer's different needs	S9	Services	0.0608
5	staff accuracy in doing processes	S3	Staff	0.0597
6	Adequacy of necessary tools and its relevance with relevant work	S18	Physical	0.0558
7	The number of branches across the city	S14	Access	0.0545
8	Branches close to the commercial or official places	S15	Access	0.0534
9	Diversity of Services	S10	Services	0.0514
10	Providing new and unique services	S11	Services	0.0492
11	Access to all services in a branch	S16	Access	0.0483
12	The staff speed in doing processes	S4	Staff	0.0454
13	terms of getting and repaying loans	S12	Services	0.0447
14	The suitability of the external environment	S19	Physical	0.0447
15	Installing Help banners	S20	Physical	0.0360
16	The availability of ATM machines	S17	Access	0.0332
17	The physical size of organization	S21	Physical	0.0326
18	Comfortable and pleasant atmosphere	S22	Physical	0.0322
19	Providing services in the shortest possible time	S13	Services	0.0313
20	Friendly relations between staff and customers	S5	staff	0.0303
21	Polite behavior and stylish staff	S6	staff	0.0177
22	coordination between staff in the process of Providing services	S7	staff	0.0067

Indicators relating to Access to Branches

Indices related to Access to Branches have been divided into 4 indexes. The results show that among these 4 indices, The number of branches across the city, Branches close to the commercial or official places, Access to all services in a branch, and The availability of ATM machines have had the greatest importance, respectively. Weight of each index is visible in Table 40.

Indicators relating to Physical Aspects

As it can be seen in the decision tree, Indices related to Physical Aspects have been divided into 5 indexes. The results of Fuzzy Analytical Hierarchy Process show that among these 5 indices, The suitability of the external environment, Installing Help banners, The physical size of organization, and Comfortable and pleasant atmosphere have had the greatest importance, respectively (Table 40).

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