

Application of Fuzzy MCDM Techniques in evaluation and Ranking of Bank Branches Based on customer satisfaction Case study: Bank Branches of Mellat in Qazvin Province

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Abstract: Decision making is one of the most complex administrative processes in management. The purpose of this paper is to use the AHP and TOPSIS methods based on fuzzy sets for evaluation and Ranking of Bank Branches Based on customer satisfaction. From our research results, the “Done right and without interruption of service” and “Inform customers” are the most important factors for customers’ satisfaction of Mellat Bank, also “Khayyam” and “Azadi” are the most successful Branches. This article is a very useful source of information both for bank managers and stakeholders in making decisions about Improve customer satisfaction. Other banks with other multi-attribute decision making techniques such as ELECTRE, PROMETHEE and ORESTE under fuzzy conditions can be done for further research.

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1. Introduction

For the last two decades, due to an increasingly competitive, saturated and dynamic business environment, retail banks in many countries have adopted customer-driven philosophies to address the rapid and changing needs of their customers. Customer satisfaction, since the early 1990s, has been a source of strategic competitive advantage for many companies worldwide. According to Westbrook and Reilly (1983) satisfaction is an emotional response to the experiences provided by, or associated with particular products or services delivered to customers, the purchasing process, as well as the purchase pattern and buying behavior of consumers. As satisfaction is a multidimensional concept, various definitions have been proposed, which, however, mainly refer to the fulfillment of customer expectations. Satisfaction is also considered to be a customer perception, which means that the specific information is not readily available (Grigoroudis and Siskos 2010). In the financial services sector, the relevance of customer analysis continues to grow (Lees et al., 2007), as provision of the service often requires interaction between the customer and the company’s employees (Michel, 2004). Although banks try to provide error-free services, the service delivery process is complicated by simultaneous production and consumption. Consequently, service failures are quite frequent in the banking industry (Casado-Dí’az et al., 2007), with the subsequent reduction in customer satisfaction and, on

occasions, customer complaint. Numerous research efforts have shown that the long-term business success is closely linked to the organization’s ability to adapt to continuously differentiating customer preferences and needs (see for example Grigoroudis and Siskos 2010). The highly competitive environment in which banks operate, has led them to give more and more importance to the services they provide and to the efficient allocation of their available resources. Bank branches have indeed a crucial impact on the bank’s operating system, since they are the intermediaries between the customer base and the banks themselves. In this context, Soteriou and Stavrinides (1997) argue that branch performance affects the bank directly and systemically.

The banking sector is heavily influenced by the changes in the economic environment and this customer orientation philosophy (see for example Grigoroudis et al. 2002). Banks and the entire financial services industry faced, particularly during the last two decades, a great number of major reforms, to which their adaptation was crucial. The new scene of the competitive environment led at length to radical strategic readjustments of the banks’ role.

The measurement of customer satisfaction has witnessed dramatic growth over the last two decades (Walker et al., 2008). During this period, more than 15,000 scholarly articles and business reports have been published on the topic of customer satisfaction, and many researchers have attempted to develop theoretical and methodological frameworks to

measure customer satisfaction in a more reliable fashion (Meng et al., 2008).

2. Literature Review

2.1. Customer Satisfaction

Most researchers agree that customer satisfaction refers to an attitude or evaluation formed by a customer comparing pre-purchase expectations of what they would receive from the product or service to their subjective perceptions of the performance they actually did receive (cited Drake et al., 1998). Measures of overall customer satisfaction typically capture consumer expectations towards the service provided, as well as how far the provided service is from their ideal (see Soderlund, 2006 Customer satisfaction is a fundamental determinant of long-term consumer behavior (Oliver, 1980; cited in Cooil et al., 2007). In order to control customer defection, most companies focus on managing customer satisfaction (cited in Cooil et al., 2007). Customer satisfaction has gained very much attention in the last few decades in all areas of production. In an increasingly competitive and dynamic environment, greater attention is continuously paid to customer relationships and satisfied customers (Eriksson and Vaghukt, 2000). The concept of satisfaction has been the subject of numerous controversies over the last 30 years. The current tendency is to define it as: A phenomenon that is not directly observable (a psychological state that must be distinguished from its behavioral consequences . . .) . . . an evaluative judgment . . . that results from cognitive processes and that integrates affective elements . . . a global judgment of a consumer experience . . . with a relative character, resulting from the fact that the evaluation is a comparative process between a consumer's subjective experience and an initial reference base . . . (Aurier and Evrard, 1998).

In addition, measuring customer satisfaction has several benefits for organisations:

- . Improvement of communication between parties and enabling mutual agreement;
- . Recognition of the demand of improvement in the process;
- . Better understanding of the problems;
- . Evaluation of progress towards the goal; and
- . Monitoring and reporting accomplished results and changes.

2.2. Service quality in bank

The banking sector in Iran virtually remains one of the most significant drivers of economic activities after the oil industry. Amongst other factors, bank dissatisfaction typically stems from rising fees (Colgate and Hedge, 2001; Santonen, 2007), and customers usually switch banks to achieve more

favourable prices (Farquhar and Panther, 2007). Improving customer satisfaction has been identified as one of the major challenges in the bank in the recent decade. A number of reports have highlighted the need for a change, greater efficiency and stronger client focus in the bank (Egan, 1998; Latham, 1994). According to Groenroos (1990), customer-perceived service quality has two dimensions: the functional dimension (process), which denotes "how" in the customer-seller interaction and the technical dimension (outcome), which relates to "what" in the actual service provision. Evidence supports the notion that service management is concerned with not only the technical but also the functional quality (Kang, 2006). A significant implication of this similarity in offered products and services is that retail banks are no longer able to exclusively depend on their product and service offerings to gain a sustainable competitive advantage in the retail banking market (Walker et al., 2008). Thus, retail banks have come to realize the importance of differentiating themselves from their competitors on the basis of superior customer service (Beerli et al., 2004) and relying on effective defensive marketing strategies instead of the traditional offensive ones.

The conceptual definition of service quality developed by Parasuraman et al. (1988) has been largely employed for comparing excellence in the service encounters by customers. Bitner (1990) defined service quality as the customers' overall impression of the relative inferiority/superiority of a service provider and its services and is often considered similar to the customer's overall attitude towards the company (Parasuraman et al., 1998 this definition of service quality covers several points. One of them is an attitude developed over all previous encounters with a service firm (Bitner, 1990).

2.3. Effective Factors on customer satisfaction in bank services

To achieve the purpose of this study, a self-administered questionnaire was developed on the basis of an extensive review of the literature related to service quality and customer satisfaction in banking (e.g. Amin and Isa, 2008; Kassim and Souiden, 2007; Olorunniwo et al., 2006; Parasuraman et al., 1985 and 1988 The review of the extant literature on service quality initially led to the identification of an expanded list of 16 attributes as related to retail banking. However, due to its exhaustiveness and length, it was decided that this pool of attributes needed further inspection and shortening since each respondent as the approach employed in this study dictates would be asked to rate each attribute twice, once according to expectations and once according to perceived performance. At that stage, it was expected that such a length would be cumbersome and hence

would constitute a hindrance to drawing adequate responses from potential participants. Thus, four branch managers from different domestic banks in Iran were invited to participate in a focus group session for the purpose of selecting the most important attributes of the products and services that their banks deliver. The discussions of the focus group resulted in the selection of only 10 attributes out of the 16 identified at first. These attributes are shown in the list below.

- Fast service
- Bank location
- Courtesy of employees
- Done right and without interruption of service
- Inform customers
- Handling of complaints
- Appearance of staff
- Physical Facilities and Welfare Branch
- Appearance of branch
- Cleanliness of branch

2.4. Analytic hierarchy process

The AHP was developed by Thomas L. Saaty at the Wharton School of Business in 1970s. It is an effective decision-making technique based on multi-criteria decision-making methodology. The AHP is perhaps, the most widely used decision-making approach in the world and its validity is based on the many thousands of actual applications in which the AHP results were accepted and used by the cognizant decision makers. AHP is a method of breaking down a complex, unstructured situation into its component parts, arranging these parts or judgments on the relative importance of each variable and synthesizing the judgments to determine which variables have the highest priority and should be acted upon to influence the outcome of the situation (Saaty, 1990). It is a measurement theory that can deal with quantitative and qualitative criteria (Vargas, 1990).

Pairwise comparisons are basic to the AHP methodology. For pairwise comparisons, this paper uses the nine-point scale developed by Saaty (1980) and it is shown in Table 1. In the above original AHP scale, weak was subsequently changed to moderate and absolute changed to extreme. The intermediate values 2, 4, 6, and 8 are defined as weak or slight, moderate plus, strong plus, and very-very strong, respectively. When activities are very close, a decimal is added to the scale values to show their differences as appropriate, e.g. 1.1, 1.9, 2.1, 2.9, etc. According to Saaty (2008), assigning small decimals is a better alternative way to compare two close activities with other widely contrasting ones, favoring the larger one a little over the smaller one when using the one to nine values.

Table 1. Pairwise comparison scale

Intensity of importance	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective
3	Weak importance of one over another	Experience and judgment slightly favor one activity over another
5	Essential or strong importance	Experience and judgment strongly favor one activity over another
7	Very strong or demonstrated importance	An activity is very strongly favored over another. Its dominance is demonstrated in practice
9	Absolute importance	The evidence favoring one activity over another is of the highest possible order of affirmation
2, 4, 6, 8	Intermediate values between adjacent scale values	For use when compromise is needed
Reciprocals of above non-zero numbers	If the activity i has one of the above non-zero numbers assigned to it when compared with activity j, then j has the reciprocal value when compared to i	A reasonable assumption
Source: Saaty (1980)		

2.5. The fuzzy TOPSIS method

Hwang and Yoon developed the technique for order preference by similarity to ideal solution (TOPSIS) in 1981. TOPSIS has been widely used to rank the preference order of alternatives and determine the optimal choice. TOPSIS views a MADM problem with m alternatives as a geometric system with m points in the n-dimensional space. The method is based on the concept that the chosen alternative should have the shortest distance from the positive-ideal solution and the longest distance from the negative-ideal solution. TOPSIS defines an index called similarity to the positive-ideal solution and the remoteness from the negative-ideal solution. Then the method chooses an alternative with the maximum similarity to the positive-ideal solution (Wang & Chang, 2007). It is often difficult for a decision-maker to assign a precise performance rating to an alternative for the attributes under consideration. The merit of using a fuzzy approach is to assign the relative importance of attributes using fuzzy numbers instead of precise numbers. This section extends the TOPSIS to the fuzzy environment (Yang & Hung, 2007). This method is particularly suitable for solving the group decisionmaking problem under fuzzy environment.

Step 1: Determine the weighting of evaluation criteria
 Step 2: Construct the fuzzy decision matrix and choose the appropriate linguistic variables for the alternatives with respect to criteria

Table 2 Linguistic scales for the importance of each criterion

Linguistic variable	Corresponding triangular fuzzy number
Very low (VL)	(0.0, 0.1, 0.3)
Low (L)	(0.1, 0.3, 0.5)
Medium (M)	(0.3, 0.5, 0.7)
High (H)	(0.5, 0.7, 0.9)
Very high (VH)	(0.7, 0.9, 1.0)

$$D = \begin{matrix} A_1 \\ \vdots \\ A_i \\ \vdots \\ A_m \end{matrix} \begin{bmatrix} x_1 & \dots & x_j & \dots & x_n \\ \bar{x}_{11} & \dots & \bar{x}_{1j} & \dots & \bar{x}_{1n} \\ \vdots & & \vdots & & \vdots \\ \bar{x}_n & \dots & \bar{x}_{ij} & \dots & \bar{x}_{in} \\ \vdots & & \vdots & & \vdots \\ \bar{x}_{m1} & \dots & \bar{x}_{mj} & \dots & \bar{x}_{mm} \end{bmatrix}$$

Step 3: Normalize the fuzzy decision matrix

$$\tilde{x}_{ij} = (a_{ij}, b_{ij}, c_{ij}) \quad \tilde{w}_j = (\alpha_j, \beta_j, \chi_j)$$

$$\tilde{r}_{ij} = \bar{x}_{ij} (/) x_j^+ = \left(\frac{a_{ij}}{c_j^+}, \frac{b_{ij}}{b_j^+}, \frac{c_{ij}}{a_j^+} \right)$$

$$\tilde{r}_{ij} = \bar{x}_j^- (/) \tilde{x}_{ij} = \left(\frac{a_j^-}{c_{ij}}, \frac{b_j^-}{b_{ij}}, \frac{c_j^-}{a_{ij}} \right)$$

$$\tilde{v}_{ij} = \tilde{r}_{ij} (\times) \tilde{w}_j = \left(\frac{a_{ij}}{c_j^+}, \frac{b_{ij}}{b_j^+}, \frac{c_{ij}}{a_j^+} \right) (\times) (\alpha_j, \beta_j, \chi_j) = \left(\frac{a_{ij}}{c_j^+} \times \alpha_j, \frac{b_{ij}}{b_j^+} \times \beta_j, \frac{c_{ij}}{a_j^+} \times \chi_j \right)$$

$$\tilde{v}_{ij} = \tilde{r}_{ij} (\times) \tilde{w}_j = \left(\frac{a_j^-}{c_{ij}}, \frac{b_j^-}{b_{ij}}, \frac{c_j^-}{a_{ij}} \right) (\times) (\alpha_j, \beta_j, \chi_j) = \left(\frac{a_j^-}{c_{ij}} \times \alpha_j, \frac{b_j^-}{b_{ij}} \times \beta_j, \frac{c_j^-}{a_{ij}} \times \chi_j \right)$$

Step 4: Determine the fuzzy positive-ideal solution (FPIS) and fuzzy negative-ideal solution (FNIS)

$$M(v_{ij}) = \frac{-a_{ij}^3 + c_{ij}^2 + a_{ij}.b_{ij} + c_{ij}.b_{ij}}{3(-a_{ij} + c_{ij})}$$

Step 5: Calculate the distance of each alternative from FPIS and FNIS

$$D_{ij}^- = 1 - \sup_x \left\{ \min \left[a_{vij}^-(x), a_{vj}^-(x) \right] \right\}$$

$$D_{ij}^+ = 1 - \sup_x \left\{ \min \left[a_{vij}^+(x), a_{vj}^+(x) \right] \right\}$$

Step 6: Obtain the closeness coefficient and rank the order of Alternatives

$$C_i^+ = \frac{S_i^-}{S_i^+ + S_i^-}$$

3. Research Methodology

The problem is the evaluation and Ranking of Bank Branches Based on customer satisfaction. For this reason, a two-phase AHP and TOPSIS methodology is used to realize the evaluation. For this purpose, the weights that are gained from AHP calculations are considered and used in TOPSIS calculations. Then TOPSIS is operated for the evaluation problem and the final ranking of the Bank Branches.

3.1. Sample

The target population of this study includes all customers of Mellat banks in Qazvin Province. Ideally, to make generalizations about such a population, one should start with a sampling frame from which a random sample would be drawn. We selected eight branches Between Mellat banks in Qazvin Province. These branches are: Khayyam, Takestan, Asad Abadi, Mohammadyeh, Bonyad, Valiasr, Azadi and Norouzian. However, due to the absence of the prospect for obtaining lists of existing customers and their contacts, a convenient sampling approach was followed as the best possible alternative. To ensure a high degree of representation of customers in the sample, it was decided to distribute as many questionnaires as available resources would permit and to reach customers in different locations. A total of 200 questionnaires were distributed. Out of these questionnaires, 100 were assessed as usable, establishing a response rate of (50 percent). The demographic characteristics of this study's participants are disclosed in Table 3.

Table 3. Demographic profile of sample

Profile	n	%
Gender	75	75
Male	25	25
Female		
Age		
18-30	42	42
31-50	48	48
51 or older	10	10
Education		
High school or less	7	7
Diploma	21	21
College graduate	28	28
Bachelor	30	30
master Graduate	12	12
PhD	2	2

90 percent of the participants were younger than 50 years. Most of the participants belonged to the college degree category.

4. Results

AHP and TOPSIS approaches were applied for data analysis. Expert Choice soft ware is used to calculating the exact weight of each factor. These scores reflect the importance of each of the specified attributes for the participants of this study As in Table 4. The results from AHP approach show that done right and without interruption of service is of the most important factor in customer satisfaction with weight of 0.2153. Inform customer is the second factor in customer satisfaction with weight of 0.1526. In summary, the attributes with the highest importance scores are done right and without interruption of service, inform customers, Courtesy of employees, Handling of complaints and Fast service.

Table 4. The weights and rank of factors Based on Customers Viewpoint (From AHP approach)

effective Factors on customer satisfaction	weight	Rank
Fast service	0.1321	5
Bank location	0.0412	7
Courtesy of employees	0.2034	3
Done right and without interruption of service	0.2153	1
Inform customers	0.1526	2
Handling of complaints	0.1116	4
Appearance of staff	0.0242	8
Physical Facilities and Welfare Branch	0.0652	6
Appearance of branch	0.0321	10
Cleanliness of branch	0.0223	9

This paper used from TOPSIS approach for selection of the best branch. The results from TOPSIS approach show that the branches with the highest importance scores are Khayyam, Azadi, Norouzian, Valiasr, Mohammadyeh, Bonyad , Takestan and Asad Abadi. The results shown in table 5.

Table 5. final rank of branches based on customer satisfaction

branch	Closeness coefficients	customer satisfaction	Rank
Khayyam	0.9843676	82.38	1
Takestan	0.3217654	51.66	7
Asad Abadi	0.2946754	49.59	8
Mohammadyeh	0.5643276	57.66	5
Bonyad	0.4875688	53.33	6
Valiasr	0.6382346	71.67	4
Azadi	0.7036535	79.66	2
Norouzian	0.6585642	73.33	3

5. Conclusion

The main purpose of this study is to identify the most important attributes that influence customer satisfaction in mellat banks and to determine the level of the overall satisfaction of the customers of these banks. The results of this study showed that the attributes with the highest importance scores are done right and without interruption of service, inform

customers, Courtesy of employees, Handling of complaints and Fast service. Also The results from TOPSIS approach show that the branches with the highest importance scores are Khayyam, Azadi, Norouzian, Valiasr, Mohammadyeh, Bonyad , Takestan and Asad Abadi. Use of a two-phase AHP and TOPSIS methodology offers a number of benefits. First, it is a systematic and reliable method since it is capable of capturing an expert's opinions when complex MCDM problems are considered. Thus, the use of AHP weights in TOPSIS makes the benchmarking process more rational and realistic. Because of this ability, managers can use this method in making their strategic decisions. The combined AHP and TOPSIS method is very flexible and suitable for various decision situations. This article is a very useful source of information both for bank managers and stakeholders in making decisions about Improve customer satisfaction. Other banks with other multi-attribute decision making techniques such as ELECTRE, PROMETHEE and ORESTE under fuzzy conditions can be done for further research. Some limitations were inherent in the present study and are acknowledged here. First, data were collected from a convenient sample, implying that the generalizability of this study's results to the population of the customers of retail banks in Iran should be viewed with caution. Second, a self-administered questionnaire was used as a medium for data collection in this study. This method of data collection has been criticized for being inherently susceptible for the possibility of subject response bias. Third, only a small number of attributes related to the retail banking industry were selected in this study to measure the overall level of customer satisfaction. Several attributes can serve as candidates to be included in this study, and thus their inclusion might have led to different results.

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