

Prioritization of the Effective Factors in Service Quality and Customers Satisfaction Using Grey Relational Analysis (GRA) Method

Seyyed Javad Iranban*

Department of Management,
Shiraz Branch, Islamic Azad University,
Shiraz, Iran
sji@iaushiraz.ac.ir

Somayeh Mohammadi

Shiraz Branch, Islamic Azad University,
Shiraz, Iran

Abstract. Due to the importance of “service quality and customers satisfaction” subject, this study seeks to investigate and prioritize the factors which are effective on service quality and customers satisfaction using Grey Relational Analysis (GRA) Method. In the case of statistical populations with large sizes, none of the other methods can compete with GRA from the viewpoint of calculation accuracy. The statistical population of this study involves SADERAT BANK branches of Shiraz city. The effective factors in service quality and customers satisfaction are investigated and prioritized by taking account of customers expectations and perceptions. In order for this, 108 questionnaires were randomly distributed among customers and results showed that among the aspects of service quality indicator “communion” and “tangible and physical evidence” respectively have the highest and the lowest priority from the viewpoint of customers expectations and perceptions. The biggest difference between customers expectations and perceptions is observed for “tangible and physical evidence” aspect. Among the indicator factors of customers satisfaction “customers compliments management” indicator has the highest priority, while “service receiving cost” and “service quality” indicators have the lowest priority, respectively

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*Corresponding author

from the viewpoint of customers expectations and customers perceptions. Among all criteria, “paying higher deposit interest rate” and “establishment of friendly relationships with customers” have the highest priority, respectively from the viewpoint of customers expectations and customers perceptions, while the criterion “customers sense of safety in their relationships with bank” has the greatest importance and weight among all criteria.

Keywords: Grey Relational Analysis Method; Shannon Entropy; Service Quality Criteria; Customers Satisfaction Indicators; SERVQUAL Model

1. Introduction

Nowadays, a broad range of activities in society involve services such as postal service, insurance and banking services and so on. Revelation of service importance caused the advent of service quality issue as the chief competitive element for organizations in profitability and customers loyalty. Marketing researchers have determined quality and satisfaction advantages as the main indicators of organization’s competitive advantage [1] (Royter et al, 1997, 388). As the service quality improves, customers satisfaction gets more likely. Customer satisfaction increase will subsequently lead to behavioral results like commitment, tendency to remain (customer retention), creation of mutual award-based relationships (contract) between service provider and service obtainer, increase of customers tolerance towards failure of service, and positive word-of-mouth advertisements about organization [2] (Arasli, 2005). The questions of the current study are as follows:

Primary Question:

How is the prioritization of effective factors in service quality and customers satisfaction in SADERAT BANK branches of Shiraz city using the grey relational analysis method?

Secondary Questions:

- How is the prioritization of effective factors in service quality in SADERAT BANK branches of Shiraz city using the grey relational analysis method?

- How is the prioritization of effective factors in customers satisfaction in SADERAT BANK branches of Shiraz city using the grey relational analysis method?

2. Literature Review

2.1 Quality Concept

- Parasureman interviewed bank managers in his first article in 1985 and found that they define quality as “a set of standards which considers and obviates customers needs” [3] (Parasureman, 1985).
- The fact that received product quality is turning to the most important factor in trade competition has caused the current age of trade to be called “quality age” [4] (Peeler, 1996: 1).

2.2 Service Concept

There are various meanings for the term “service”. Gronroos defines service as a process involving a series of roughly-intangible activities which occasionally occur in interactions between customers and employees or between physical resources or commodities and service providing systems in order to solve customers’ problems [5] (Gronroos, 2000, 46).

2.3 Service Quality Concept

Zeithaml takes service quality as customer’s judgment about the existence of whole advantages and preferences. This is a type of attitude which is gained by comparing perceived expectations and provided service [6] (Ndubisi and Tam, 2005). Sasser knows service as a comparison between what customer feels organization has to provide and what organization provides [7] (Geo and Haire, 2008).

2.4 Customer Satisfaction Concept

Researchers consider customer satisfaction as the future profitability factor. Satisfaction measurement is a performance measurement indicator for organization, industry, and national economy.

Jamal found that there is a positive and distinct relation between satisfaction and loyalty. Higher loyalty level decreases the marketing costs, enhances the capacity for extension of trade name and market share increment, persuades word-of-mouth advertisement, initiates raise of trade name, and is a dominant and crucial factor in bringing competitive advantage and making distinction. [8] (Jamal, 2009).

Rapid changes and the highly-competitive environment in which banks attempt to prosper force them to rethink about customers satisfying policies and service quality improvement. Banking is a kind of industry which requires intensive participation and involvement. Customers are important for banks at both macro and micro scales. Anyway, as electronic banking has been common, customers tend to measure banking service quality in the case of obtaining services in person rather than electronically. Banks currently know that the transfer of service quality to customers is an essential and impartible component of success and survival in today's global and competitive banking environment [2] (Arasli et al, 2005).

2.5 Effective Factors in Customers Expectations

The chief purpose of high-quality service offering is to satisfy customers. Customer satisfaction and dissatisfaction is a function of the difference between his/her primary expectations and the actual performance [9] (Bolton and James, 1991).

3. Research Methodology

This study is an applied research because its results can serve as a basis for service quality promotion and customers satisfaction increment in banks. Furthermore, this is a descriptive-survey-cross sectional research.

3.1 Statistical Population and Statistical Sample

The studied population includes the customers of SADERAT BANK branches in Shiraz city. Simple random sampling was used to select the study sample among chosen branches in order to extend the results

from sample customers to the entire statistical population. To select the sample branches statistical sample size was determined using the formula for finite population since the number of branches was finite. Considering the advantage that grey relational analysis method requires at least 3 samples, 36 out of total 75 branches of SADERAT BANK in Shiraz city and subsequently, a total number of 108 samples were chosen for the study.

3.2 Data Collection Tools

The tool for data collection in this study is questionnaire. It has two sections. First section investigates 35 reciprocal propositions about customers views on desired condition and bank's current condition using a 7-point Likert scale. In second section, the importance of the aspects is evaluated base on a 10-point scale (1 for completely unimportant and 10 for completely important) and finally, a 7-point Likert scale is used to question quality level of the service provided by SADERAR BANK, total satisfaction level of customers, customers awareness of banking information and issues. It is worth mentioning that the questionnaire is standard and has previously been used in numerous researches.

3.3 Validity and Reliability

Validity of the questionnaire has been evaluated in previous studies. The main point of the questionnaire is its enjoyment of both validity and reliability characteristics. Reliability of the questionnaire has been investigated in previous studies using SPSS software and Cronbach's Alpha Coefficient and results showed a coefficient of 90% which suggests a high reliability for it. To ensure the reliability of this questionnaire, Cronbach's Alpha Coefficient was recalculated by SPSS software to be 94.57% which suggests a high reliability of used questionnaire.

3.4 Conceptual Model

This model has been prepared by surveying proficient banking experts and its validity has been confirmed. 16 indicators have been classified in

the form of 5 major indicators as the components of theoretical model. This model is shown in figure 1. Delphi method was applied to measure its reliability (Appendix 3).

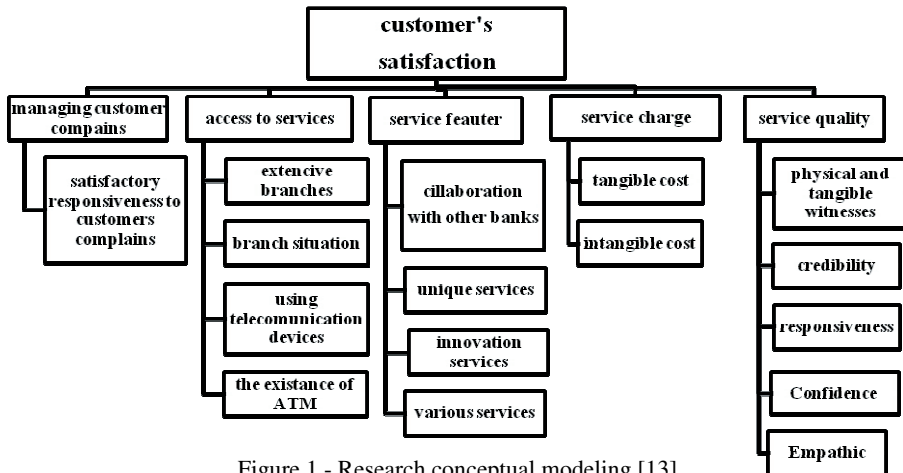


Figure 1 - Research conceptual modeling [13]

3.5 Grey Relational Analysis Method

In this study descriptive statistical methods and grey relational analysis method have been employed respectively to describe collected information indicators and to prioritize the factors. Grey relational analysis method is a quite suitable method for solving group decision making problems in the case of uncertainty and lack of confidence.

In 1960, professor Dong carried out numerous researches on the methods of predicting and controlling economic systems and Fuzzy systems during which he found some systems with a high level of uncertainty. These systems' indicators could hardly be described by Fuzzy mathematics or by statistics and probabilities. In Fuzzy Mathematics, uncertainty issues can be expressed by discrete or continuous membership functions and in statistics, it is necessary to define related distribution functions with large sample size in order to reach the required validity. Dong propounded grey theory for the cases in which the number of experts is small, the level of analysis is low, and membership functions cannot be found or the sample size is finite. The special characters of grey system for the systems including unfinished messages are as follows:

- System parameters are unclear and indefinite
- Factors relations are unclear and indefinite
- The structure of a system is unclear and indefinite
- Assumptions for system operations are not clear.

There are various methods of systems analysis. For example, in statistical analysis techniques such as regression analysis, analysis of variance, and principle component analysis are widely used. But all these techniques have some defects in common:

- 1- These methods need a large amount of data, otherwise it will be quite difficult to acquire a statistical result with an acceptable reliability.
- 2- All samples and population should obey a certain sample probability distribution in which the relation between system's principle variables and operative variables is linear. Such a case rarely occurs in real world.
- 3- They usually require complicated and difficult calculations.
- 4- The quantitative result may not match well with qualitative analyses and this fact leads to a misunderstanding of the studied system.

In some countries and for historical reasons, there is finite statistical information with a very low confidence level and in this case such a problem becomes another defect. Grey relational analysis overcomes this problem when analyzing systems. This kind of analysis can be employed for various samples of data with small number and different distributions. Furthermore, this method relatively requires fewer calculations. Generally, the use of grey relational analysis leads to a compatibility between quantitative and qualitative results. Thus, it can be said that grey system compared to other methods enjoys two important advantages:

Firstly, this method requires less data, while multivariate statistical methods need an immense amount of data.

Secondly, this system is capable of confronting the ambiguity of data and information.

If clear data were marked with white color and indefinite and unclear information were marked with black, most of the information of current systems would be neither completely white nor completely black

but a mixture of them, that is, grey. This type of systems, which the incompleteness of corresponding information is their main characteristic, is called grey systems. Being grey means a deficiency and shortage of information and lack of confidence in system (Appendix 2). A program written in MATLAB software was used for Prioritization by this method. Figure 2 illustrates the general concept of grey theory:

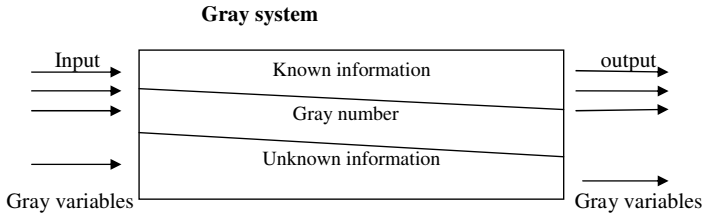


Figure 2 - Totally concept of Gray theory ([14], [15], [16])

3.6 Analysis Method

To calculate the decision matrix for expectations and perceptions, the data which were collected by 7-point Likert scale for the first section of the questionnaire are firstly transformed into grey numbers. The aim of transforming the data into intervals is a better transformation of qualitative data into quantitative ones. To do this, membership function is used and the numbers gained from 7-point Likert scale (1 for complete opposition and 7 for complete agreement) are transformed into grey numbers (Table 1).

Table 1. Transformation of data obtained by Likert scale into grey numbers

Likert Scale Numbers	1	2	3	4	5	6	7
Grey Numbers	(0,1)	(1,3)	(3,4)	(4,5)	(5,6)	(6,9)	(9,10)

3.7 Grey Relational Analysis Steps

1. Calculation of criteria weight by Shannon Entropy

2. Formation of grey decision matrix ‘D’
3. Normalization of grey decision matrix and formation of matrix ‘R’. (the reason for normalization of grey numbers is their placement in the interval [0,1]. To do this, linear normalization method was used. Equation 1 has been used since all related criteria have positive aspects, in other words, are profit criterion type (the more - the better):

$$r_{ij} = \left[\frac{X_{ij}}{X_j^{max}}, \frac{\overline{X_{ij}}}{\overline{X_j^{max}}} \right] \quad , \quad X_j^{max} = \max_{1 \leq j \leq m} \{ \overline{X_{ij}} \}$$

4. Multiplication of weights matrix by normalized decision matrix and formation of weighted normalized matrix R_w
5. Defining ideal and basic series A^* in the form of:

$A^* = [r_{o1}, r_{o2}, \dots, r_{on}]$, where r_{oj} is the best number in each column of matrix R_w

6. Calculation of the distance between ideal and basic series and other options and formation of matrix $H = [\Delta_{ij}]_{max}$

$$\Delta_{ij} = (r_{oj} - r_{ij}) \quad , \quad i = 1, 2, \dots, m \quad , \quad j = 1, 2, \dots, n$$

7. Calculation of grey relational coefficient

$\frac{\min_{\forall i} \min_{\forall j} \Delta_{ij} + \xi \max_{\forall i} \max_{\forall j} \Delta_{ij}}{\Delta_{ij} + \xi \max_{\forall i} \max_{\forall j} \Delta_{ij}}$, where $\xi \in [0, 1]$ is the coefficient of determination and is desirable to be considered as $\xi = 0/5$ in calculations.

8. Calculation of grey relational degree using following equation:

$\Gamma_{oi} = \sum_{j=1}^n Y(r_{oj}, r_{ij})$ where Γ_{oi} is the value of final evaluation related to i^{th} option

9. Prioritization of options [10], [11]

4. Findings

Statistical analysis of the data collected from statistical population and interpretation of acquired results are discussed in following sections:

4.1 Evaluation of the Mean Values and Mean Differences

Table 2 lists the mean values and their differences for expectations and perceptions. Evaluating all 35 criteria for customers satisfaction and service quality, it can be seen that:

The maximum mean value of expectations and perceptions belongs to the criterion “application of telecommunication instruments”. Nonetheless, it still differs from customers’ expected value by 0.287. Thus, required actions should be taken.

1. The maximum mean difference between customers expectations and perceptions is 1.7037 and belongs to the criterion “attractiveness of physical facilities” which should be paid more attention and appropriate policies should be made to decrease this difference between customers expectations of bank and bank performance from the viewpoint of customers.
2. The minimum mean difference between customers expectations and perceptions is 0.0463 which belongs to the criterion “spread of SADERAT BANK branches”. This means that bank actions on spread of its branches is almost in good accordance with customers expectations and no further improvement is needed in this case.
3. For the criterion “the geographical location of bank branches” bank performance is above customers expectations.
4. For “service quality” indicator, the maximum mean difference between customers expectations and perceptions belongs to “physical evidence” aspect. Thus, bank has to take appropriate actions on this aspect.
5. For “service providing cost” indicator, the maximum mean difference between customers expectations and perceptions belongs to “tangible cost” aspect.
6. Bank’s best performance belongs to “service accessibility” indicator which has the maximum mean difference of 0.5325

Table 2. Mean values and their differences for expectations and perceptions

Indicators	Aspects	Criteria	Mean Value of Expectations	Mean Value of Perceptions	Mean Differences	Indicators	Aspects	Criteria	Mean Value of Expectations	Mean Value of Perceptions	Mean Differences	
Service quality	Tangible and physical evidences	Q1	6/0648	4/8241	1/2407	Service providing cost	Tangible cost	Q23	5/1296	3/6667	1/4629	
		Q2	5/8704	4/1667	1/7037*			Q24	4/3148	4/2222	0/926	
		Q3	6/1852	5/5370	0/6482		Intangible cost	Q25	5/5093	4/519	1/1574	
		Q4	5/7963	4/8519	0/9444			Y7Q	5/5000	4/8241	0/6759	
		Q5	5/5185	5/0185	0/5			YVQ	5/7222	5/6759	0/0463*	
	Reliability		Q6	5/8981	5/5093	0/3888	Service accessibility		Y^Q	5/4630	5/6944	-0/2314*
			Q7	5/8889	5/2130	0/6759			Q29	6/2685*	5/9815*	0/287
			Q8	5/7407	5/2315	0/5092			Y•Q	5/6111	5/5000	0/1111
			Q9	5/8056	5/5556	0/25			Y^Q	5/7963	5/3981	0/3982
	responsiveness		Q10	5/6667	4/7870	0/8797	Service property		Q32	6/0833	5/4074	0/6759
			Y\Q	5/9537	5/3704	0/5833			Q33	5/7130	4/9259	0/7871
			Q12	5/6852	5/2130	0/4722			Q34	5/5741	4/9815	0/5926
			Q13	5/7685	5/5093	0/2592			Q35	5/8241	5/0556	0/7685
			Q14	6/0833	5/6852	0/3981						
	Confidence		Q15	6/1019	5/6667	0/4352	Customers Complaints Management					
			Q16	6/1944	5/8333	0/3611						
			Q17	5/9907	5/3611	0/6296						
			Q18	5/6852	5/1204	0/5648						
			Q19	5/7222	5/1667	0/5555						
			Q20	4/5093	4/6852	0/1759						
			Q21	5/3611	4/8241	0/5370						
	Q22	5/4537	5/0741	0/3796								
Communion		Q21	5/3611	4/8241	0/5370							
		Q22	5/4537	5/0741	0/3796							

Now, it is possible to rank all criteria for service quality and customers satisfaction based on resulted mean values. Table 3 shows the ranking of mean values. According to this ranking, the criterion “application of telecommunication instruments like Telephone-bank for service providing” has the highest rank for both customers expectations and perceptions, while the minimum mean value for expectations belongs to “inconsiderable interest on service providing by bank” criterion and for perceptions belongs “payment of higher deposit interest and lower loan interest in comparison with other dominant banks” criterion.

Table 3. Ranking of mean values for customers expectations and perceptions from highest to lowest

Mean Value Rank	Expectations	Perceptions	Mean Value Rank	Expectations	Perceptions	Mean Value Rank	Expectations	Perceptions	Mean Value Rank	Expectations	Perceptions
1	Q29	Q29	10	Q6	Q6	19	Q19	Q12	28	Q25	Q1
2	Q16	Q16	11	Q7	Q13	20	Q27	Q19	29	Q26	Q21
3	Q3	Q28	12	Q2	Q30	21	Q33	Q18	30	Q22	Q26
4	Q15	Q14	13	Q35	Q32	22	Q12	Q22	31	Q21	Q10
5	Q14	Q20	14	Q9	Q31	23	Q18	Q35	32	Q20	Q25
6	Q32	Q27	15	Q4	Q11	24	Q10	Q5	33	Q28	Q24
7	Q1	Q15	16	Q31	Q17	25	Q30	Q34	34	Q23	Q2
8	Q17	Q9	17	Q13	Q8	26	Q34	Q33	35	Q24	Q23
9	Q11	Q3	18	Q8	Q7	27	Q5	Q4			

4.2 Specification of Weighted Mean of the Criteria

Weighted mean of criteria were specified using the data obtained from the second part of the questionnaire and evaluation of criteria importance from viewpoint of customers.

Table 4. Specification of weighted mean of the criteria

Criteria	W_j	Criteria	W_j	Criteria	W_j	Criteria	W_j	Criteria	W_j	Criteria	W_j
X_1	8/2685	X_7	8/4167	X_{17}	8/3889	X_{11}	8/3426	X_{72}	8/3333	X_{71}	8/8426
X_3	7/9259	X_8	8/6389	X_{15}	8/9352	X_{14}	6/9352	X_{71}	8/6204	X_{77}	8/7037
X_{77}	8/8333	X_4	8/5925	X_{12}	9/1667	X_{13}	7/2963	X_{77}	8/7315	X_{77}	8/3519
X_4	7/9815	X_{11}	8/5926	X_{17}	9/1389	X_{11}	7/8611	X_{11}	8/8981	X_{71}	8/6389
X_2	8/7222	X_{13}	8/6019	X_{17}	8/9352	X_{17}	7/1389	X_{71}	8/9537	X_{72}	8/8241
X_7	8/8241	X_{17}	8/7870	X_{11}	8/1204	X_{11}	7/7130	X_{71}	8/8704		

Resulted weights can be used to rank the criteria for service quality and customers satisfaction based on their importance from the viewpoint of customers. Table 5 shows that the highest importance belongs to the criterion “spread of bank branches”, while the lowest importance was obtained for the criterion “immediate and rapid service providing by bank”. Furthermore, the importance of all criteria is above median, that is, all criteria are important for customers

Table 5. Ranking of Criteria based on their importance from the viewpoint of customers

Ran k	Criteri a	Ran k	Criteri a	Ran k	Criteri a	Ran k	Criteri a	Ran k	Criteri a	Ran k	Criteri a	Ran k	Criteri a
1	Q15	6	Q28	11	Q35	16	Q8	21	Q9	26	Q25	31	Q22
2	Q16	7	Q30	12	Q12	17	Q34	22	Q7	27	Q1	32	Q24
3	Q29	8	Q31	13	Q27	18	Q26	23	Q13	28	Q18	33	Q21
4	Q14	9	Q3	14	Q5	19	Q11	24	Q33	29	Q4	34	Q23
5	Q17	10	Q6	15	Q32	20	Q10	25	Q19	30	Q2	35	Q20

4.3 The Weights Matrix Normalized

Table 6 illustrates the weights matrix which has been normalized using Shannon Entropy method.

Table 6. The weights matrix normalized by Shannon Entropy method

Criteria	W_j	Criteria	W_j	Criteria	W_j	Criteria	W_j	Criteria	W_j
Q ₁	0/0417	Q ₅	0/0300	Q ₁₀	0/0117	Q ₁₅	0/0321	Q ₂₀	0/0176
Q ₂	0/0385	Q ₆	0/0231	Q ₁₁	0/0112	Q ₁₆	0/0874*	Q ₂₁	0/0173
Q ₃	0/0235	Q ₇	0/0191	Q ₁₂	0/0164	Q ₁₇	0/0551	Q ₂₂	0/0205
Q ₄	0/0313	Q ₈	0/0207	Q ₁₃	0/0272	Q ₁₈	0/0341	Q ₂₃	0/0196
Q ₅	0/0320	Q ₉	0/0161	Q ₁₄	0/0275	Q ₁₉	0/0274	Q ₂₄	0/0344
Q ₆	0/0190	Q ₁₀	0/0173	Q ₁₅	0/0784	Q ₂₀	0/0173	Q ₂₅	0/0298
Q ₇	0/0256	Q ₁₁	0/0147	Q ₁₆	0/0469	Q ₂₁	0/0157	Q ₂₆	0/0201

4.4 Ranking of the Effective Criteria and Factors

Table 7 illustrates ranking of the criteria for service quality and customers satisfaction, service quality aspects, and customers satisfaction indicators using Grey Relational Analysis method.

Table 7. Ranking of the effective factors in service quality and customers satisfaction using Grey Relational Analysis method

Rank	Expectations	Perceptions	Rank	Expectations	Perceptions	Rank	Expectations	Perceptions	Rank	Expectations	Perceptions
1	Q23	Q20	10	Q5	Q8	19	Q9	Q3	28	Q27	Q13
2	Q20	Q23	11	Q34	Q25	20	Q11	Q31	29	Q17	Q28
3	Q1	Q24	12	Q8	Q4	21	Q31	Q11	30	Q13	Q10
4	Q21	Q21	13	Q22	Q34	22	Q32	Q29	31	Q12	Q17
5	Q2	Q1	14	Q19	Q19	23	Q35	Q32	32	Q14	Q14
6	Q24	Q33	15	Q18	Q18	24	Q6	Q6	33	Q28	Q12
7	Q33	Q5	16	Q7	Q9	25	Q29	Q27	34	Q15	Q15
8	Q25	Q22	17	Q26	Q26	26	Q10	Q35	35	Q16	Q16
9	Q4	Q2	18	Q3	Q7	27	Q30	Q30			

4.4.1 Ranking of the service quality indicator

Ranking shows that for service quality indicator, customers perception of bank performance is in good accordance with their expectations. Although it is a little different from customers desirable and expected level, further attempts by the bank can lead it to realization of its objectives in the field of service quality. Moreover, it is obvious that “communion” aspect has the highest priority, while “tangible and physical evidence” has the lowest priority of customers expectations and perceptions.

Table 8. Ranking of the service quality indicator aspects

Rank	Expectations	Perceptions
1	Communion	Communion
2	Reliability	Reliability
3	Responsiveness	Responsiveness
4	Confidence	Confidence
5	Tangible and physical evidence	Tangible and physical evidence

4.4.2. Ranking of the customers satisfaction indicators

Based on the results shown in table 9, “complaints management” indicator has the highest rank among five customers satisfaction indicators from the viewpoint of both customers and the bank (according to customers perceptions). “Service quality” indicator has the last rank from the viewpoint of bank, while it has the third rank from the viewpoint of customers. Organization’s superior managers should consider that lack of sufficient attentions to service quality may lower customers loyalty level. Therefore, it would be better for them to take required actions in order to raise their service quality level.

Table 9. Ranking of the customers satisfaction indicators

Rank	Expectations	Perceptions
1	Customers complaints management	Customers complaints management
2	Service Property	Service Providing Cost
3	Service Quality	Service Property
4	Service Accessibility	Service Accessibility
5	Service Providing Cost	Service Quality

4.5 The Evaluation of Service Quality Level

The results obtained by the questionnaire can also be used to calculate the level of service quality from the viewpoint of customers. Table 10 lists the results obtained from the service quality level evaluation on the basis of a 7-item scale (from completely dissatisfied to completely satisfied). The mean value of service quality level was calculated 5.46 which is higher than the median value of Likert scale and stands in a position between relatively good and good.

Table 10. The evaluation of service quality level from the viewpoint of customers

Items	Too Weak	Weak	Relatively Weak	Medium	Relatively Good	Good	Very Good
(108) number	0	2	4	14	28	42	18
(100) Percent	0	1/85	3/70	12/96	25/93	38/89	16/67

4.6 The Evaluation of Customers Satisfaction

Customers responses to the level of their satisfaction with SADERAT BANK’s performance are listed in table 11. The table lists the results obtained for the customers satisfaction level on the basis of a 7-item scale (from completely dissatisfied to completely satisfied). The mean value of customers satisfaction level was calculated 5.51 which is higher than the median value of Likert scale and stands in a position between relatively satisfied and satisfied

Table 11. The evaluation of customers satisfaction level

Customers Satisfaction Level	Very Dissatisfied	Dissatisfied	Relatively Dissatisfied	Medium	Relatively Satisfied	Satisfied	Completely Satisfied
Number (108)	1	4	2	10	28	41	22
(100) Percent	0.93	3.70	1.85	9.26	25.93	37.96	20.37

5. Suggestions

According to the results obtained by various analyses, following points can be suggested for SADERAT BANK managers in order to improve service quality and customers satisfaction level.

- Following suggestions are made based on the results obtained from the calculation of mean differences between customers expectations and perception:

1. Improvement of “customers complaints management” indicator can enhance customers satisfaction level since this indicator has the highest importance and the difference between customers expectations and perceptions is quite significant for it.

2. Since there is a big difference between customers expectations and perceptions in the case of “physical evidence” aspect, it is required that organization Managers pay special attentions to this aspect and especially to “attractiveness of physical facilities” criterion so that this difference is reduced and the service quality and finally, customers satisfaction level is raised.

3. The indicator “service providing cost” reveals a significant difference between expectations and perceptions and has the first rank in the case of ranking by differential method. Thus, organization management should take appropriate actions to decrease this gap as well as the amount of the costs afforded by customers. If cost reduction is not applicable because of the considerations about organization profitability, they will have to increase customers satisfaction by raising the level of other important indicators.

4. This conclusion can be made based on the findings of the study:

customers perception of employees performance is in good accordance their expectation. Therefore, bank management should acknowledge and try to retain this motivation of employees to establish effective relationships with customers and to achieve this, persuasive and motivational methods would be a great policy.

- Following suggestions are made based on the results obtained from the Ranking of service quality aspects:

In the case of customers expectations, “communion” is the most important aspect of service quality indicator and since it has a direct correlation and accordance with employees and their relationship with customers, organization should persuade its employees to improve their communicative and marketing skills. According to the findings about “communion” aspect, bank should pay further attention to “performance based on the customers’ best interests and demands” criterion, while it has been giving priority to “establishment of friendly relationships with customers” criterion.

- Following suggestion is made based on the results obtained from the Ranking of customers satisfaction indicators:

Organization managers should pay further attentions to expected service quality and give it higher priority than “service providing cost” and “service accessibility”.

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Appendix 1:

According to the theoretical model of the study, indicators of customers satisfaction evaluation in banking industry can be classified as five major indicators:

1- Indicators which are related to service quality. These indicators, in turn, are composed of secondary indicators:

- Indicators which are related to tangible and physical evidence of service. These indicators are related to the attractiveness of facilities, equipment, and stuff which are used by bank and also natty and spruce appearance of the employees who offer the service.
- Indicators which are in relation with service reliability. Bank's enjoyment of such an indicator means that the bank is capable of providing its service without any mistake and as soon as customers demand, without any delay.
- Indicators which are in relation with responding to customers. Bank's enjoyment of such an indicator means that bank's employees are eager to help customers, always respond to customers demands, inform customers about the due date of service providing, and offer their service to customers rapidly.
- Indicators which are in relation with customers confidence. Bank's enjoyment of such an indicator means that employees' attitude gains the confidence of customers, customers feel secure in bank, employees always behave politely towards customers, and employees have sufficient knowledge to answer customers' questions.
- Indicators which are in relation with bank's and bank employee's communion with customers. Bank's enjoyment of such an indicator means that the bank perceives customers problems, takes actions in accordance with customers favorites, pays personalized attentions to customers, and has a desirable and convenient working time.

2- Indicators which are related to service providing cost. Generally,

each customer meets two types of costs when receiving banking service: tangible or obvious cost and intangible or latent cost. Tangible costs are directly afforded by customers in return for received banking service such as interest, credit interest and so on. Latent costs are indirectly afforded by customers in return for received banking service and are not in cash form such as the cost of missed opportunity, waiting for turn (line,), being stuck in traffic because of the branch location and so on.

3- Indicators which are related to the accessibility of service. Indicators such as branch network size, geographical location of branch, application of telecommunication instruments in service offering, and the accessibility of ATM machines affect the customers' access to banking service.

4- Indicators which are in relation with service's own property. These Indicators involve service diversity, innovation and novelty of service, uniqueness of service, and collaboration with other banks in service providing.

5- Customers complaints management is the last indicator of customers satisfaction evaluation. In this case the method of customers complaints management in bank branches is investigated to find out if customers complaints have satisfyingly been handled or not.

Appendix 2:

Definition 1. Let X is the universal set. Then a grey set G of X is defined its two mappings $\underline{\mu}_G(X)$ and $\overline{\mu}_G(X)$:

$$\left\{ \begin{array}{l} \otimes \underline{\mu}_G(X) = X \rightarrow [0, 1] \\ \otimes \overline{\mu}_G(X) = X \rightarrow [0, 1] \end{array} \right\}$$

Where $\otimes \underline{\mu}_G(X) \geq \otimes \overline{\mu}_G(X)$, $x \in X$, $X=\mathbb{R}$, $\underline{\mu}_G(X)$ and $\overline{\mu}_G(X)$ and $\overline{\mu}_G(X)$ are the upper and lower membership functions in G , respectively. When $\otimes \underline{\mu}_G(X) = \otimes \overline{\mu}_G(X)$ the grey set G becomes a fuzzy set. It shows that grey theory considers the condition of the fuzziness situation.

Definition 2. A grey number is one of which the exact value is un-

known, while the upper and/or the lower limits can

$$\otimes a, (\otimes a = a \Big|_{\underline{\mu}}^{\bar{\mu}})$$

be estimated. Generally grey number is written as.

Definition 3. If the lower and upper limits of x can be estimated and x is defined as interval grey number: $\otimes a = [\underline{a} \quad \bar{a}]$

Definition 4. The basic operation laws of grey numbers $\otimes a_1 = [\underline{a}_1 \quad \bar{a}_1]$ and $\otimes a_2 = [\underline{a}_2 \quad \bar{a}_2]$ can be expressed as follows:

$$\otimes a_1 + \otimes a_2 = [\underline{a}_1 + \underline{a}_2, \bar{a}_1 + \bar{a}_2] \quad (10)$$

$$\otimes a_1 - \otimes a_2 = [\underline{a}_1 - \bar{a}_2, \bar{a}_1 - \underline{a}_2] \quad (11)$$

$$\otimes a_1 \times \otimes a_2 = [Min(\underline{a}_1 \underline{a}_2, \bar{a}_1 \underline{a}_2, \underline{a}_1 \bar{a}_2, \bar{a}_1 \bar{a}_2), Max(\underline{a}_1 \underline{a}_2, \bar{a}_1 \underline{a}_2, \underline{a}_1 \bar{a}_2, \bar{a}_1 \bar{a}_2)] \quad (12)$$

$$\otimes a_1 \div \otimes a_2 = [Min(\frac{\underline{a}_1}{\underline{a}_2}, \frac{\bar{a}_1}{\underline{a}_2}, \frac{\underline{a}_1}{\bar{a}_2}, \frac{\bar{a}_1}{\bar{a}_2}), Max(\frac{\underline{a}_1}{\underline{a}_2}, \frac{\bar{a}_1}{\underline{a}_2}, \frac{\underline{a}_1}{\bar{a}_2}, \frac{\bar{a}_1}{\bar{a}_2})] \quad (13)$$

$$k \in \mathbf{R}^+, k \times \otimes a_1 = [k\underline{a}_1 \quad k\bar{a}_1] \quad (14)$$

Concept of Gray possibility degree is also used to compare two gray numbers.

If $\otimes a_1 = [\underline{a}_1 \quad \bar{a}_1]$ and $\otimes a_2 = [\underline{a}_2 \quad \bar{a}_2]$ are two Gray numbers, Gray possibility degree $\otimes a_1 \leq \otimes a_2$ is defined as below:

$$P\{\otimes a_1 \leq \otimes a_2\} = \frac{max(0, L^* - max(0, b - c))}{L^*} \quad (15)$$

$$L^* = L(\otimes a_1) + L(\otimes a_2) \quad (16)$$

Four equations are being stated between two Gray numbers $\otimes a_1$ and $\otimes a_2$.

$$\text{a) If } \underline{a}_1 = \underline{a}_2 \ \& \ \bar{a}_1 = \bar{a}_2 \Leftrightarrow \otimes a_1 = \otimes a_2, P(\otimes a_1 \leq \otimes a_2) = 0.5 \quad (17)$$

$$\text{b) If } \underline{a_2} \succ \overline{a_1} \Leftrightarrow \otimes a_1 \prec \otimes a_2, P(\otimes a_1 \leq \otimes a_2) = 1 \quad (18)$$

$$\text{c) If } \overline{a_2} \prec \underline{a_1} \Leftrightarrow \otimes a_1 \succ \otimes a_2, P(\otimes a_1 \leq \otimes a_2) = 0 \quad (19)$$

d) If

$$\otimes a_1 \cap \otimes a_2 : \left\{ \begin{array}{l} \otimes a_1 \succ \otimes a_2 \Leftrightarrow P(\otimes a_1 \leq \otimes a_2) \prec 0.5 \\ \otimes a_1 \prec \otimes a_2 \Leftrightarrow P(\otimes a_1 \leq \otimes a_2) \prec 0.5 \end{array} \right\} \quad (20)$$

Definition 5. The Minkowski space distance of two grey numbers $\otimes a_1$ and $\otimes a_2$ is defined as:

$$L(\otimes a_1, \otimes a_2) = [(a_1 - a_2)^\rho + (\overline{a_1} + \overline{a_2})^\rho]^{\frac{1}{\rho}} \quad (21)$$

In our study, $\rho = 2$ is used. It represents Euclidean grey space distance. [11],[12],[13]

Appendix 3

The objective of most Delphi applications is the reliable and creative exploration of ideas or the production of suitable information for decision making. The Delphi Method is based on a structured process for collecting and distilling knowledge from a group of experts by means of a series of questionnaires interspersed with controlled opinion feedback [14].

Baldwin (1975) asserts that lacking full scientific knowledge, decision-makers have to rely on their own intuition or on expert opinion. The Delphi method has been widely used to generate forecasts in technology, education, and other fields [15].

Fowles (1978) describes the following ten steps for the Delphi method:

1. Formation of a team to undertake and monitor a Delphi on a given subject.
2. Selection of one or more panels to participate in the exercise. Customarily, the panelists are experts in the area to be investigated.
3. Development of the first round Delphi questionnaire
4. Testing the questionnaire for proper wording (e.g., ambiguities, vagueness)
5. Transmission of the first questionnaires to the panelists

6. Analysis of the first round responses
7. Preparation of the second round questionnaires (and possible testing)
8. Transmission of the second round questionnaires to the panelists.
9. Analysis of the second round responses (Steps 7 to 9 are reiterated as long as desired or necessary to achieve stability in the results.)
10. Preparation of a report by the analysis team to present the conclusions of the exercise.

On the other hand there have been several studies supporting the Delphi method. The results of the comparison indicated high agreement between the Delphi estimate and the actual number hired and less agreement between quantitative forecasts and the number hired [17].