



Research Article

Prioritizing the Effective Factors on the Quality of Electronic Banking Services using Fuzzy Analytical Hierarchy Process (FAHP) (Case Study: Tejarat Bank of Shiraz)

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ARTICLE INFO

Article history:

Received 7 September 2017

Received in revised 17 December 2017

Accepted 23 May 2018

Published 18 June 2018

Keywords:

Quality of service, E-banking, Multi-criteria decision making, FAHP.

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ABSTRACT

One of the fastest and best channels of service distribution to customers, that is used by financial service providers, is e-banking. Delivering better services by e-banking will greatly affect the customers' satisfaction with the bank, which will lead to profitability, retaining customers and greater market share. The present study is a functional research with the aim of determining the effective factors on customers' satisfaction with the quality of electronic services provided by the branches of Shiraz Tejarat banks. These factors are investigated in this case study.

In this research, the qualitative dimensions of e-banking services have been investigated. To this end, using the technology and infrastructures of e-banking-service quality indices were extracted from the existing resources, papers, and researches. Using the FAHP method of multi-criteria decision making, e-banking technologies were ranked based on the quality of services in the existing banking system. The Tejarat bank of this study was selected as the case study and the analyses were conducted based on the opinion and judgment of the experts of this bank.

The results of this research show that among the eight identified dimensions of e-banking, the dimension of availability, efficiency, and confidentiality with the highest possible weight are ranked first to third. Then, accountability, performance, connectivity, service compensation, and the beauty of design are ranked fourth to eighth.

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Introduction

In recent decades, the intensification of competition among economic firms to gain more market share has led them to more accurate and deeper recognition of the needs and demands of customers [1].

Today, the main goal of service-providing organizations, including banks, is to provide appropriate services for customers' satisfaction. As organizations that provide financial service, especially banks, operate in an environment with indistinguishable products, service quality is recognized as a competitive subject [2].

Creating satisfaction with the quality of services requires understanding the needs and demands of customers. Changing customers' demands, needs and expectations is an undeniable fact, so first, it needs to be determined what the customer wants and then attempts to accomplish it [3].

Banking and financial services form an important part of the service industry [4].

The outlook for financial services is changing rapidly in the world [5].

These changes have made in order to create an integrated environment in the banking industry [6].

To meet the changing needs of customers, banks offer a variety of advantages and competitive services using banking technology [7].

Today, all of the things that we call virtual banking have been adopted to achieve superior service quality. Service quality can be seen as the mastermind of the banking operation [8].

The transformation of the world through the use of information technology, Internet, and consequently the E-government and E-commerce, which in turn is derived from information technology, has caused a profound evolution in the communication and information transfer process [9].

In ICT, interactivity is very important due to the time and cost savings, and the increasing importance of data sharing [10].

One of the most important ways of gaining competitive advantage for today's banks is the use of information technology to provide banking services that are referred to as electronic banking services [11].

To gain competitive advantage, banks and financial institutions have invested heavily in providing services based

on these technologies such as Internet banking. One of the examples of IT in banks is electronic banking [12].

Electronic banking is referred to as electronic banking due to providing banking services with new tools and different technologies from traditional banking tools (via electronic ATM, telebanking, home banking, Internet banking and so on). In recent years, the country's banks have taken effective steps to obtain electronic banking services, and to receive bank services, many traditional methods for banking services have been replaced by IT tools. The way of providing services, the quality of services and features that can be considered about electronic banking services, on the one hand, are directly related to the degree of customers' orientation and willingness to use these services and on the other hand, affect the level of e-banking customers' Satisfaction and loyalty[13].

On the other hand, the stiff competition between banks to provide electronic banking services is increasing day by day. In such a situation, the customers of these banks will also have higher expectations for receiving services with higher quality [14].

Banks are expanding across borders by offering diverse benefits and competitive services and rebuilding the structure of their services to use fast technology and to meet the changing needs of customers. Due to these actions, the nature of banking services and relationship with customers has undergone changes. The highly competitive and rapidly changing environment that banks are forced to work on it will lead them to rethink their attitude toward customer's satisfaction and service quality improvements. Many companies have come to this conclusion that providing consistent services with better quality compared to competitors can bring about a strong competitive advantage. All the things that today we call virtual banking are being implemented to achieve superior service quality. Therefore, we can mention the quality of service as the master-mind of banking. As a result, in this research, we attempt to identify the effective factors on the quality of E-banking services and the level of its importance is ranked using the FAHP technique.

Therefore, the most important questions in this research are:

1. What are the effective factors on the quality of E-banking services?
2. How will these factors be prioritized using Fuzzy hierarchy Process Analysis (FAHP)?

It may be difficult to provide an accurate definition of the quality of services in comparison with the quality of goods. The reason is that the delivery of services involves a lot of behavioral factors. In defining the quality of services, some people emphasize on the satisfying the needs and demands of customers. Others see quality as an index that measures the coordination of provided services with customers' expectations. Some people also refer to the importance of customers' perceptions and attitudes of quality. These perceptions are the result of customers' comparisons between the provided services and their expectations of those services.

Nowadays, with increasing competition and the level of customers' awareness of goods and services, they no longer

tend to accept any kind of goods and services. To preserve their survival and increase their profitability and market share, production organizations are forced to offer products and services with more diversity, higher quality and consistent with customers' demands, tendencies, and preferences. Therefore, improvement of quality as the main factor for remaining in the competition and differentiating an organization from another organization has attracted the attention of managers.

Quality is the concept that covers all parts of the organization and its aim is to increase the organization's efficiency and to full consistent of goods and services with the needs and expectations of the customers, which ultimately leads to their satisfaction. Given the differentiation between goods and services, service organizations are more sensitive to provide high-quality services. In fact, the low quality of the provided services is the customer's expectation difference with the service that it receives and perceives.

In fact, the low quality of the provided services is the perceived difference in customer's expectations with the service that they received. Although the factors used in the production of a service are palpable, the production and sales or provision of services are carried out at the same time and in the presence of the customer, and what the customer perceives of the quality of the service is intangible. This makes the institutions unable to properly understand the views of their customers regarding the services provided. Consequently, the mentality arises that most services cannot be evaluated in terms of quality. Considering the above-mentioned, it can be seen that providing a definition of service quality features is more difficult than defining the quality of goods, whose apparent forms are clearly seen. The reason for the lack of quality in the goods is often the defect in the raw materials and its constituent elements or defects in design, or the production of the goods may not be in accordance with the predetermined specification (defect in production). While weakness in the quality of service directly stems from the behaviors and encounters of the organization's employees in relation to the customer. As a result, most experts consider the quality drop of services to be due to the lack of precision during work, indifference to work, lack of motivation, ignoring time and neglecting of employees.

Quality as one of the most important criteria for evaluating services is the broad concept that various parts of the organization are committed to it and its aims is to increase the efficiency of the whole set, in such a way as to prevent the emergence of disruptive quality factors ~~Service Quality~~ with the minimum cost and with the aim of increasing competence of competitiveness match the entire set with the customer's preferred specifications. When receiving a service, the customer expects to receive value. Therefore, in the category of service quality as a critical factor in creating a competitive advantage for an institution, it can be stated that in general terms, quality services are those that enable the customer to feel that he has received value in a transaction [15].

In general, two attitudes have dominated quality: traditional attitudes and modern attitudes.

The traditional attitude recognizes the quality in the degree of conformity of the product with the predetermined specifications (standard) and declares the final quality level to be the conformity between these two measures

(specifications of the product with standard specifications). This attitude largely stemmed from the years before 1970. In the modern approach which is offered based on the acceptable definitions, quality, in addition to meeting pre-defined specifications, also embraces customer's needs in the present and future. Based on this attitude, quality begins with the recognition of the customer's needs and continues with satisfying this need and recognition of future need. It can be seen that in this view, quality is a never-ending path, a concept that is continuously improving, and because it is the factor of competition, this race endless [16].

In this perspective, in addition to the customer's need, the need of society is also discussed. The environment and any possible contamination is a matter that must be considered in relation to quality. In general, quality in this point of view, in contrast to the "introvert" traditional attitude is an "extrovert" attitude that the customer and his needs make its center.

In traditional attitude, quality is defined by design and production experts, and maximally supervised by official agents (from the government), and necessarily does not embrace customer's demand. In this definition, there is no interaction between feedback and planning and the result, so the flexibility and continuous modification are minimal in it. In the second (modern) view, the customer's needs, whose supply is an important factor in competition is the end. In addition to the previously defined characteristics, satisfying and attracting customers' satisfaction and predicting their immediate need is the most important priority for survival in the competitive market. In this definition, quality is determined and verified by the customer.

Banks and Customers' Expectations

The banking services market can be evaluated in terms of the reciprocal relationship between the customer and the bank or, in other words, their loyalty to the bank. Some people are connected to a specific bank and carry out their operations through that bank. Furthermore' some customers refer to several banks, based on their diverse needs and expectations, use services of different banks. Identifying customer's expectations, analyzing the strengths and weaknesses of the bank and planning within the framework of obtained information in a highly competitive world of today is of great importance. Identifying the weaknesses of the bank or branch leads to actions with more insight and authoritative agents through adopting a consistent approach will be able to change them over time and turn them into strong points.

Solving problems and meeting customers' expectations is one of the key factors in expanding the market and maintaining customers' loyalty to the bank. Unresolved issues and problems have a negative effect on the customer's relationship with the bank and the use of banking services. Dissatisfied customers more than happy one talk about their experience with others [17].

Unhappy customers can disrupt a particular business. Research conducted in this area has shown that the dissatisfied customers transfer their experiences to ten to twenty people, which is three times more than the number of people that the satisfied customers communicate their good experiences with.

Active banks, as part of their ongoing reform program, are constantly striving to be aware of their customers' expectations, understand their needs and try to improve their services with regard to the interests of the bank. In some cases, these surveys are conducted monthly, quarterly, once in six months, and annually. Even in some of these cases, surveys about a particular bank compared to other banks and about the branches of a bank relative to each other are performed.

In today's developed world, to perform such researches, specific research framework was designed and with the help of special software and skilled researchers, the assessment program of customers' expectations and needs is implemented as an independent and continuous project. The necessary reports are transmitted to the bank's planners in the form of chart and analysis, and the ongoing improvement of the bank is placed on the agenda. Reflection of such an activity will show its role in the better positioning of the bank, i.e., penetration in the customers' minds and, consequently, more profitability.

Literature Review

A study conducted by Shoaib Basri et al. (2011) to measure the quality of E-government services in Malaysia has proposed a conceptual model for measuring the quality of E-government services as well as determining the relationship between E-government services, quality dimensions, and the satisfaction and credit of users. Dimensions of this proposed model are productivity, system availability, privacy, the creation of personal interaction, information and response time which ultimately ranked each of these factors from the point of view of users [18].

A research by Shaun Pather et al., with the aim of measuring the quality of the electronic service dimensions of information systems and by using the Curqal method, has been conducted. In this research, the dimensions of service quality are divided into two categories: action dimensions (active) and inactivity dimensions. The action dimensions include motivation, security (reliability), communication, support, and efficiency (output). the inactivity dimensions include ease of use, appearance, structure, content, etc. [19].

In another study by Health, the relationship between quality of services and customers' satisfaction has been evaluated. The purpose of this study is to conduct business in a business (B2B).

In this research by the use of a questionnaire, the quality dimensions were investigated and then analyzed. The results showed that five dimensions of quality including touchability, reliability, validity, responsiveness, and empathy have a positive impact on customers' satisfaction. Based on these findings, it can be concluded that there is a positive and significant relationship between service quality and customers' satisfaction. Therefore, to manage the quality of the services, it is important to have knowledge of service quality dimensions and continuously monitor their performance in order to maintain their competitive position and be able to achieve their customers' satisfaction and meet their needs [20].

Agnes has considered dimensions to measure the quality of services that emphasize the quality assessment. These dimensions are physical dimensions such as (facilities, physical environment, and service environment),

interpersonal interactions (interaction between the customer and the employee, or the interaction between two customers and the main service (the product)).

Research Method and Statistical Population

In terms of target, this research is functional and in terms of data collection, it is a descriptive survey with a quantitative approach. The ultimate goal of the research is to investigate the effective factors on the identification and assessment of factors affecting the quality of E-banking services. The tool used for data collection is a paired comparison questionnaire designed by the researcher. In this research, 30 senior personnel and managers of Tejarat bank branches were randomly selected as the sample for answering questionnaires.

Analysis of Findings

First, the conceptual and indigenous model of the research, which is the result of a review of past authoritative sources and interview with experts, is presented and then we begin the implementation of the Fuzzy hierarchy process analysis process with an expanded approach.

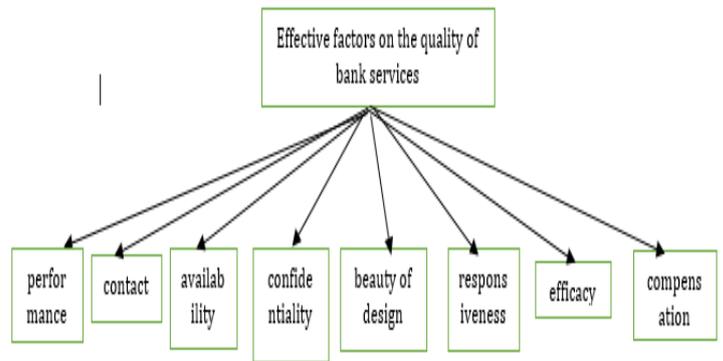
The factors affecting the quality of E-banking services are

1. Efficacy,
2. Implementation,
3. Availability,
4. Confidentiality,
5. Beauty of design,
6. Accountability,
7. Compensation of services and
8. Communication.

Table 1. Eight indicators

Explanation of quality dimensions	Quality dimensions
The speed and ease in the use of services	(Efficiency)
Providing all possible services and products	(Fulfilment)
Accurate and full time function in all places	(Availability)
System security level and the protection of customer's information	(Privacy)
Beauty and attractiveness of the site	(Site aesthetics)
Effective solution of problems and demands through the system	(Responsiveness)
Compensation for the arisen problems of the customers	(Compensation)
Helping customers through mobile or online service providers	(Contact)

Figure 1: Decision tree to prioritizing the dimensions of the quality of E-banking services



Fuzzy AHP technique

Hierarchical Analytic Process (AHP) is a research technique to support logical decision making of a qualitative multi-factor type. This technique is a very prominent managerial tool for complex multi-criteria decision-making issues and can be generalized as a way to provide flexible solutions for quantitative and qualitative issues. The concept of "being phase" in the ordinary AHP method has been considered indirectly and without the use of Fuzzy sets. In fact, in this method, using the verbal expressions in Table 2, the fuzzy concept is involved in determining the pairing comparison matrices. Therefore, by generalizing the above-mentioned method, methods are presented in which fuzzy numbers are used to express the preference of the elements. In the meantime, we can point out the methods provided by Chang.

A large study of these techniques can also be found in the works of Karaman and his colleagues. In this study, by Chang Development Analysis Method, Fuzzy AHP was used.

Table 2. Membership function of linguistic variables determining the weight of criteria.

Preference of column to row			Preference of row to column				
Equivalent fuzzy number	Linguistic variable	Equivalent fuzzy number	Linguistic variable	Equivalent fuzzy number	Linguistic variable	Equivalent fuzzy number	
1 1 1	The same importance	1 1 1	The same importance				
.37	.5	.075	Same to relatively more important	1.33	2	2.67	Same to relatively more important
0.27	0.33	0.43	relatively more important	2.33	3	3.67	Relatively more important
0.21	0.25	.300	relatively to much more important	3.33	4	4.67	Relatively to much more important
0.18	0.20	0.23	much more important	4.33	5	5.67	Much more important

Since Chang's method is used in this research, therefore, in the following paragraphs, we will explain the steps of the problem-solving algorithm in this method.

In the developmental analysis method for each of the rows of the paired comparison matrix, the value of S_k , which itself is a triangular fuzzy number, is calculated as follows:

If $X = \{x_1, x_2, x_3, \dots, x_n\}$ is the set of goals and $U = \{u_1, u_2, \dots, u_n\}$ is the set of ideas, then according to this method and by considering each objective, the analysis of development for each of the ideals (g_i) can be performed. Therefore, there could be m number of development analysis value for each goal:

$$M_{g_i}^1, M_{g_i}^2, \dots, M_{g_i}^m \quad \text{so that } i=1,2,3,\dots,n$$

$$\begin{bmatrix} M_{g_1}^1 & M_{g_1}^2 & \dots & M_{g_1}^m \\ M_{g_2}^1 & M_{g_2}^2 & \dots & M_{g_2}^m \\ \vdots & \vdots & \dots & \vdots \\ M_{g_n}^1 & M_{g_n}^2 & \dots & M_{g_n}^m \end{bmatrix}$$

All of them $M_{g_i}^j$ are triangular fuzzy numbers that are expressed as (l, m, u) . The stages of Chang's development analysis are as follows:

Step 1. Obtaining a fuzzy compound expansion for each target.

If $M_{g_i}^1, M_{g_i}^2, \dots, M_{g_i}^m$ be the values of the development analysis for the sixth goal are for m ideals, then the fuzzy compound expansion of m ideals for the sixth goal is defined as follows:

If $M_{g_i}^1 = (l_{ij}, m_{ij}, u_{ij})$, then $\sum_{j=1}^m M_{g_i}^j$ by the fuzzy plus operator on the development analysis of m ideal is defined as follows:

$$\sum_{j=1}^m M_{g_i}^j = (l_{i1}, m_{i1}, u_{i1}) + (l_{i2}, m_{i2}, u_{i2}) + \dots + (l_{im}, m_{im}, u_{im})$$

$$= (\sum_{j=1}^m l_{ij}, \sum_{j=1}^m m_{ij}, \sum_{j=1}^m u_{ij}) = (l'_i, m'_i, u'_i)$$

Also for obtaining $[\sum_{i=1}^n \sum_{j=1}^m \sum_{g_i}^j]^{-1}$, by applying a fuzzy operator, we will have:

$$\sum \sum M_{g_i}^j = \sum_{i=1}^n \left(\sum_{j=1}^m l_{ij}, \sum_{j=1}^m m_{ij}, \sum_{j=1}^m u_{ij} \right) = \left(\sum_{i=1}^n l'_i, \sum_{i=1}^n m'_i, \sum_{i=1}^n u'_i \right)$$

$$\left(\sum_{i=1}^n \sum_{j=1}^m M_{g_i}^j \right)^{-1} = \left(\frac{1}{\sum_{i=1}^n u'_i}, \frac{1}{\sum_{i=1}^n m'_i}, \frac{1}{\sum_{i=1}^n l'_i} \right)$$

$$S_i = \sum_{j=1}^m M_{g_i}^j * \left[\sum_{i=1}^n \sum_{j=1}^m M_{g_i}^j \right]^{-1}$$

Therefore:

$$(l'_i, m'_i, u'_i) * \left(\frac{1}{\sum_{i=1}^n u'_i}, \frac{1}{\sum_{i=1}^n m'_i}, \frac{1}{\sum_{i=1}^n l'_i} \right) = \left(\frac{l'_i}{\sum_{i=1}^n u'_i}, \frac{m'_i}{\sum_{i=1}^n m'_i}, \frac{u'_i}{\sum_{i=1}^n l'_i} \right) = (l_i, m_i, u_i)$$

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

Where k denotes the row number, and i and j respectively represent options and indices.

Second step: In this method, after calculating S_k , we must obtain their degree of magnitude in relation to each other. In general, M_1 and M_2 are two triangular fuzzy numbers, the degree of M_1 and M_2 magnitude are defined as follows:

And we have if

$$V(M_i \geq M_k) = 1 \quad m_i \geq m_k$$

$$V(M_i < M_k) = \text{hgt}(M_i \cap M_k)$$

Otherwise:

$$\text{hgt} = (M_i \cap M_k) = \frac{u_i - l_k}{(u_i - l_k) + (m_k - m_i)}$$

Step 3: The magnitude of a triangular fuzzy number of k , another triangular fuzzy number also is obtained from the following equation:

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

Also, to calculate the weight of the indices in the matrix of paired comparison, we act as follows:

$$w'(x_i) = \min \{V(S_i \geq S_k)\} \quad k = 1, 2, 3, \dots, n, k \neq i$$

Step 4: So the weight vector of the indexes would be as follows:

$$w'(x_i) = [w'(x_1), w'(x_2), \dots, w'(x_n)]^t$$

Which is the same as the vector of non-regular coefficients?

To obtain a normal vector we perform as follows:

$$w(x_k) = \frac{w'(x_k)}{\sum_{k=1}^n w'(x_k)}$$

Implementation of the hierarchical analysis process

Before implementing the fuzzy hierarchy process with the developed approach of Chang, it is necessary to recall that the process of group decision-making has been used in this research, and the decision tables included in this section are all derived from the geometric mean of 30 questionnaires completed by experts, managers and the supervisors of the branches of the Tejarat bank of Shiraz.

In order to determine the weight of each criterion specified in the previous step, the fuzzy hierarchy analysis method consistent with Chang extension analysis method was applied. In order to collect comments on the paired comparison of criteria, the membership function of linguistic variables has been used (Asgharpour, 2004). It should be noted that since the same weight have been assigned for all chosen variables, the geometric mean formula is stated as above.

In this section, we are going to prioritize the eight sub-indices related to the quality of banking services namely efficiency, performance, availability, confidentiality, the beauty of beauty, accountability, compensation, and communication. For this purpose, first, the combined table of fuzzy group decision making for the paired comparisons of the eight aforementioned sub-indices is presented. Then, to calculate the incompatibility rate of this matrix, fuzzy numbers must be converted to definite numbers and the incompatibility of decision matrix is calculated. In the table below, the paired comparison matrix of Fuzzy AHP is

calculated from the geometric mean of experts' opinions about prioritizing these factors. In this table, the inversion values obtained for the upper strata of the main diameter has been used for low values of the main diameter. All steps for obtaining the weight of each of the sub-indices are as follows.

Table 3: Paired comparison matrix of electronic banking dimensions

	C1	C2	C3	C4
C1	(1,1,1)	(1.4461, 1.7241, 2.0178)	(1.7766, 2.2089, 2.6643)	(1.1424, 1.4102, 1.6974)
C2	(0.4955, 0.5799, 0.6914)	(1,1,1)	(1.3191, 1.6485, 2.0003)	(1.0852, 1.3005, 1.5162)
C3	(0.3753, 0.4527, 0.5628)	(0.4999, 0.6065, 0.7580)	(1,1,1)	(0.4944, 0.5905, 0.7213)
C4	(0.5891, 0.709, 0.8753)	(0.6595, 0.7689, 0.9214)	(1.3863, 1.6932, 2.0223)	(1,1,1)
C5	(0.6214, 0.7424, 0.898)	(1.0067, 1.2312, 1.4848)	(1.8560, 2.2658, 2.6980)	(1.232, 1.467, 1.7414)
C6	(0.5592, 0.6561, 0.7868)	(0.6326, 0.7491, 0.9045)	(1.0584, 1.2866, 1.5711)	(0.5093, 0.6047, 0.7366)
C7	(0.7784, 0.9363, 1.1182)	(0.7854, 0.9504, 1.1510)	(1.0199, 1.2343, 1.4801)	(0.9269, 1.1619, 1.4436)
C8	(1.1491, 1.3922, 1.6799)	(1.1670, 1.4522, 1.776)	(1.3394, 1.6031, 1.9054)	(1.2935, 1.5722, 1.8905)
C5	C6	C7	C8	
C1	(1.1134, 1.3468, 1.609)	(1.2708, 1.5241, 1.7881)	(0.8942, 1.0679, 1.2846)	(0.5952, 0.7182, 0.8701)
C2	(0.6734, 0.8121, 0.9933)	(1.1054, 1.3349, 1.5806)	(0.8687, 1.0521, 1.2731)	(0.563, 0.6885, 0.8568)
C3	(0.3706, 0.4413, 0.5387)	(0.6364, 0.7772, 0.9447)	(0.6755, 0.8101, 0.9804)	(0.5248, 0.6237, 0.7465)
C4	(0.5742, 0.6816, 0.8116)	(1.3575, 1.6535, 1.9634)	(0.6927, 0.8606, 1.0787)	(0.5289, 0.636, 0.773)
C5	(1,1,1)	(1.5534, 1.8544, 2.1832)	(1.2512, 1.522, 1.837)	(0.8356, 1.0477, 1.2922)
C6	(0.458, 0.5392, 0.6437)	(1,1,1)	(0.5458, 0.6629, 0.8051)	(0.5185, 0.6087, 0.7283)
C7	(0.5441, 0.6569, 0.7992)	(1.242, 1.5082, 1.8321)	(1,1,1)	(0.6697, 0.8125, 0.9999)
C8	(0.7738, 0.9544, 1.1967)	(1.3729, 1.6426, 1.9283)	(1.0000, 1.2307, 1.4929)	(1,1,1)

Then, according to the EA method, for each of the rows of the above -paired comparison matrix, the SK value which itself is a triangular fuzzy number, has been calculated.

$$\sum_{j=1}^8 M_{E1}^j = (1,1,1) + (1.4461, 1.7241, 2.0178) + (1.7766, 2.2089, 2.6643) + (1.1424, 1.4102, 1.6974) + (1.1134, 1.3468, 1.6090) + (1.2708, 1.5241, 1.7881) + (0.8942, 1.0679, 1.2846) + (0.5952, 0.7182, 0.8701) = (9.2390, 11.0006, 12.9318)$$

$$\sum_{j=1}^8 M_{E2}^j = (7.11, 8.4169, 9.912)$$

$$\sum_{j=1}^8 M_{E3}^j = (4.5772, 5.3023, 6.2528)$$

$$\sum_{j=1}^8 M_{E4}^j = (6.788, 8.0030, 9.446)$$

$$\sum_{j=1}^8 M_{E5}^j = (9.356, 11.130, 13.135)$$

$$\sum_{j=1}^8 M_{E6}^j = (5.282, 6.107, 7.176)$$

$$\sum_{j=1}^8 M_{E7}^j = (6.966, 8.260, 9.824)$$

$$\sum_{j=1}^8 M_{E8}^j = (9.096, 10.8479, 12.869)$$

$$\sum_{i=1}^8 \sum_{j=1}^8 M_{g_i}^j = (58.417, 69.07, 81.549)$$

$$\left(\sum_{i=1}^8 \sum_{j=1}^8 M_{g_i}^j \right)^{-1} = (0.0122, 0.0144, 0.0171)$$

- S1=(0.113294, 0.159267, 0.22137)
- S2=(0.087197, 0.12186, 0.16967)
- S3=(0.056128, 0.076767, 0.107038)
- S4=(0.083243, 0.115869, 0.1617)
- S5=(0.114736, 0.161152, 0.224862)
- S6=(0.064771, 0.088427, 0.122849)
- S7=(0.08543, 0.119602, 0.168178)
- S8=(0.11154, 0.157056, 0.220311)

Then the magnitude of each of the SK obtained values is calculated in relation to the others. In the following parts, the obtained magnitude values, , for each of the SKs have been presented.

$V(S_1 \geq S_2, \dots, S_8) = \text{Min}(V(S_1 \geq S_2), \dots, V(S_1 \geq S_8)) =$ 0.9175
$V(S_3 \geq S_1, \dots, S_8) = \text{Min}(V(S_3 \geq S_1), \dots, V(S_3 \geq S_8)) =$ 1.011659
$V(S_5 \geq S_1, \dots, S_8) = \text{Min}(V(S_5 \geq S_1), \dots, V(S_5 \geq S_8)) =$ 0.915615
$V(S_7 \geq S_1, \dots, S_8) = \text{Min}(V(S_7 \geq S_1), \dots, V(S_7 \geq S_8)) =$ 0.957165
$V(S_2 \geq S_1, \dots, S_8) = \text{Min}(V(S_2 \geq S_1), \dots, V(S_2 \geq S_8)) =$ 0.9549
$V(S_4 \geq S_1, \dots, S_8) = \text{Min}(V(S_4 \geq S_1), \dots, V(S_4 \geq S_8)) =$ 0.96089
$V(S_6 \geq S_1, \dots, S_8) = \text{Min}(V(S_6 \geq S_1), \dots, V(S_6 \geq S_8)) =$ 0.988341
$V(S_8 \geq S_1, \dots, S_7) = \text{Min}(V(S_8 \geq S_1), \dots, V(S_8 \geq S_7)) =$ 0.919712

	C ₁	C ₂	C ₃	C ₄	C ₅	C ₆	C ₇	C ₈
C ₁	1.00	2.11	2.80	1.78	1.68	1.87	1.34	0.91
C ₂	0.71	1.00	2.11	1.58	1.03	1.65	1.33	0.89
C ₃	0.58	0.79	1.00	0.75	0.56	0.99	1.02	0.77
C ₄	0.91	0.95	2.12	1.00	0.84	2.06	1.13	0.80
C ₅	0.93	1.55	2.83	1.81	1.00	2.28	1.92	1.36
C ₆	0.81	0.94	1.64	0.76	0.67	1.00	0.84	0.75
C ₇	1.17	1.20	1.55	1.52	0.83	1.92	1.00	1.04
C ₈	1.76	1.87	1.99	1.98	1.25	2.01	1.56	1.00
CI=0.0456								

$W' = (0.9175, 0.954, 1.0117, 0.9609, 0.9156, 0.9883, 0.9572, 0.9197)$
$W_N = (0.1203, 0.1252, 0.1327, 0.126, 0.1201, 0.1296, 0.1255, 0.1206)$

Therefore, the results from the use of fuzzy AHP indicate that the precedence of each of the above factors is as described in Table 4:

Table 4: Final ranking of e-banking quality dimensions

Rating in terms of degree of importance	Degree of importance obtained from fuzzy AHP	Dimensions of E-banking
7	0.1203	compensation
5	0.1252	performance
1	0.1327	availability
3	0.126	confidentiality
8	0.1201	Beauty of design
2	0.1296	efficiency
4	0.1255	responsiveness
6	0.1206	connectivity
	0.0456	Rate of compatibility

In order to obtain the compatibility rate, first; the Fuzzy matrix must be converted to a phase or definite matrix, that is, with the formula specified in the previous chapter, each fuzzy number must be converted to definite numbers. Table 4 shows the phase numbers of sub-indices related to the dimensions of electronic banking.

Table 5: Diphased numbers of Indices related to the dimensions of electronic banking

As shown in the table above, the compatibility rate related to electronic banking dimensions is 0456/0, which is a numeric value less than 1/0. Therefore, it can be concluded that the answers have acceptable adaptability.

Discussion and Conclusion

The services quality of all branches of electronic banking plays a central role in improving business performance, and the proper implementation and precise planning of these factors guide us in resource coordination, competitive advantage over other competitors in achieving success (which is the greater profitability).

Based on the above-mentioned results, availability, efficiency, confidentiality, accountability, performance, communication, service compensation, and beauty of design were ranked according to the quality of service provided to customers. Each organization, according to its major policies, focuses on identifying the specific values of each part of the market and customers and by communicating with them, try to achieve customers' satisfaction and loyalty and attract new customers and optimize customers' service channels and step-by-step processes.

Increasing customers' access points to ATMs, as well as considering the fact that the banks receive payments from the issuing bank for successful accelerated transactions that the cards of other banks have placed on their ATMs, and if the transactions fail, they will not pay any fines, is a positive factor in increasing the use of ATMs, and this increase can be a source of revenue for banks.

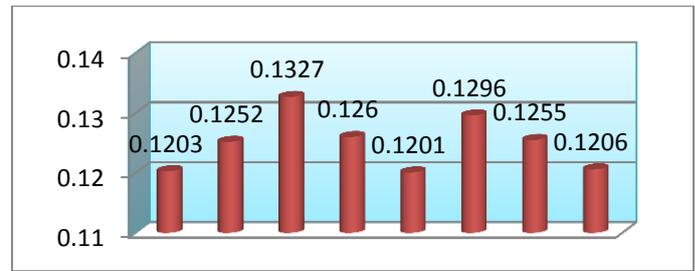
On the other hand, the lack of telecommunication coverage in all parts, slowdown in the development of the infrastructure network, the failure to provide 24-hour support services, the failure to provide telecommunication services in line with the quality required for banking operations, and the high average of repair failure time due to the sensitivity of banking systems, the lack of accurate conformity with SLAs by the telecom company and the low reliability of existing network connectivity and non-exclusiveness of the network are among the barriers and challenges of Internet-banking for banks. While the current world, and the increasing advancements in technology and

high speed require a 24-hour banking, it is desirable to widely expand internet banking with the planning and formulation of marketing strategies and the possibility to conduct online banking for customers. Furthermore, to achieve a steady profit; it is necessary to take steps to create a long-term relationship with customers.

Financial services, in particular banks, compete in a market with the same products.

Banks that have excellent services and continually use e-banking, by providing services with high quality can experience a premium marketing era with high earnings, customer retention, and market share development and are considered as customer-oriented organizations. Financial institutions and banks by widespread providing of high-quality E-banking system, create customers' satisfaction, especially for valued customers, which ultimately increases bank revenues and contributes significantly to the profitability of a bank. Use of advanced information and communication systems, which have high flexibility not only ensure the smooth and reliable flow of information in relation to problems but also allow compliance with changing conditions. In this regard, measures such as the use of appropriate standards in the exchange of inter-organizational information, the deployment of modern systems and communicational and information technology for establishing appropriate and inter-bank communication, the integration of dispersed components including customers, suppliers, and partners in virtual organizations can be taken; which in turn lead to creative and innovative environments, creating a mechanism for close communication with customers, continuous gathering of their views and creating the necessary hardware support. The quality which is an important dimension of agility plays an important role in the agility of a bank. Agility requires preserving a certain range of organizational flexibility and resources and also an agile bank controls the way in which new measures are implemented, which allows the leadership to know where more resources may be needed to ensure the success of the programs. The most agile organizations place a high value on the customer's service, organizational transformation and leadership capabilities as factors of speed, flexibility, and accountability. In sum, it can be said that each organization, based on its main goals and objectives, can rely on important dimensions of agility and strive to strengthen it. Once we will achieve a favorable situation in the field of centralized electronic banking that a comprehensive banking system with the characteristics of full coverage of branches, products and banking services, focus, integrity with future developmental capabilities from both quantitative and qualitative dimensions, responsive, flexible to legal requirements and new expectations of customer, service delivery with a new structure without time and space limitations, 24 hours without stop and efficient get established. These proceedings ultimately lead to satisfaction, loyalty, and profitability of the bank.

Figure 2: The measures of sub-indices related to the factors affecting electronic banking



- The use of appropriate standards in the exchange of inter-organizational information
- The use of modern systems and information and communication technology to establish appropriate and timely inter-bank communication
- Integration of dispersed components involving customers, suppliers, and partners in virtual organizations to create creative and innovative environments
- Establishing a mechanism for a close relationship with customers, continuous compiling of their views, and creating the necessary hardware structure with the aim of support
- Adapting E-banking tools and methods to people's culture, spirit, and knowledge.

References

[1]. Karatepe, O., Yavas, U., & Babakus, E. (2005). Measuring Service Quality of Banks: Scale Development and Validation. *Journal of Retailing and Consumer Services*, 12(5), 373-83.

[2]. Guo, X., Duff, A., & Hair, M. (2008). Service Quality Measurement in the Chinese Corporate Banking Market. *International Journal of Bank Marketing*, 26(5), 305-327.

[3]. Shahi, B. & Rajabzadeh, A., (2005). Investigating the dimensions of organizational agility assessment in governmental organizations with the approach of information technology. *Second International Conference on Information and Communication Technology Management*, March, Iran.

[4]. Madu, C., & Madu, A. (2002). Dimensions of e- quality. *International journal of Quality and Reliability Management*, vol.19, NO.3, 246-258.

Mishkin, F. (2010). *The Economics of Money, Banking and Financial Markets*. 6th Edition, MA: Addison-Wesley, Reading.

[5]. Lundahl, N., Veghom, F., & Silver, L. (2009). Technical and Functional Determinants of Customer Satisfaction in the Bank-SME Relationship. *Managing Service Quality*, 19(5), 581-594.

[6]. Angur, M., Natarajan, R., & Jaheera, J. (2011). Service Quality in the Banking Industry: An Assessment in a Developing Economy. *International Journal of Bank Marketing*, 13(3), 116-23.

[7]. Arasli, H., Mehtap-Smadi, S., & Turan , K. (2015). Customer Service Quality in the Greek Cypriot Banking Industry. *Managing Service Quality*, 15(1), 41-56.

[8].Mishkin, F. (2010). *The Economics of Money, Banking and Financial Markets*. 6th Edition, MA: Addison-Wesley, Reading.

[9].Kolodinsky Jane M, Jeanne M. Hogarth, Marianne A. Hilgert, *The adoption of electronic banking technologies by US consumers*. *International Journal Of Bank Marketing* 2014; 22(5): 291-24.

[10]. Haghghinasab, Manijeh., Khosravi, Somayeh (2011). *Assessing the maturity level of organizational interactivity of the Institute of Information and Communication Technology Research*. *Technology Management Journal; Etelaat* 2011; (3) 6, 20-1.

[11].Sohail M., Sadiq Shanmugham, Balachandran. *E-banking and customer preferences in malaysia: An empirical investigation*. *Information Science* 2009; 140: 202-212.

[12].Caceres R. C., Paparoidamis N. G. *Service quality, relationship satisfaction, trust, commitment and business-to-business loyalty*. *European Journal of Marketing* 2012; 51(2): 196-162.

[13].Zahedi, Shams Sadat (1390). *Research on the websites of five major Iranian universities and presenting a suitable model*. *Journal of Information Technology Management* 2011 (3) 6, 21-44.

[14].Abedi Jafari, Hassan., Jamparazmi, Mona., Biriya, Hari Hassadat. (2010). *The Challenge of Human Resource Management in Virtual Organizations: Investigating the Relationship between the Degree of Virtualization of an Organization and Organizational Commitment*. *The Journal of Information Technology Management*, 2010(2) 5; 90-73.

[15]. Hesami, H., Geranmaei, P., & Ardestani, S. (2012). *Ranking the importance of the dimensions of the quality of E-banking services in line with the agility of the banking system*. *First International Conference on Quality Engineering*.

[16].Sharifi, S., Sharifi, S., & Salehpour, S. (2012). *Identification of factors affecting the quality of services of Trade Bank Branches of Tabriz*. *First International Conference on Quality Engineering*.

[17]. Lotfi, A (2006). *Assessment the compliance level of the quality of marketing services provided by the business development organization with the expectations of the exporters*. Thesis of Postgraduate Degree, University of Tehran, Faculty of Management, Department of Business Administration.

[18]. Alanezi, M. A., Ahmad Kamil, M., & Basri, S. (2011). *Conceptual model for measuring e-government service quality*. *Conference on open system (ICOS2011)*.

[19]. Pather, S., & Usabuwera, S. (2010). *Implications of e-Service Quality Dimensions for the Information Systems Function*.

[20]. Healthc, A. E. (2011). *Investigating the Relationship between Service Quality and Customer Satisfaction*. international conference on business, Engineering and industrial Applications (ICBEIA).