

Prioritizing critical success factors of knowledge management using FAHP: A case study in Refah Bank branches of Iran

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Abstract

Nowadays, knowledge management is the most important guidelines for the optimal use of information, moving toward a learning organization and achieving long-term organizational goals; but given the high cost of implementing knowledge management systems, success in its implementing is a major concern of organization's managers and researchers in this field. Therefore, this research has explained the critical success factors of knowledge management, for this purpose following previous research and literature review, research prototype was developed. In the next stage, the prototype was given to experts and after implementing amendments based on a consensus of experts opinion the components and model parameters of Li Huang's model (2012) was the basis of the research. He has introduced the critical success factors in six categories, including cultural factors, environmental factors, organizational characteristics, individual characteristics, information technology infrastructures and knowledge management features. On the other hand, due to the influence of various factors on the process of knowledge management implementing, the multi-criteria decision making techniques were used and based on this the decision making issue was structured in three hierarchical levels. And linguistic words with their meanings were replaced in the form of triangular fuzzy numbers by gaining the knowledge and information of decision makers in the form of linguistic words through related paired comparisons questionnaire. Then the obtained data was arranged in matrix form in Excel and finally prioritization was done based on fuzzy hierarchy analysis using code writing in Excel and with the help of Super decision software. Results of this research

could be used as a guide of way and a supplement for implementation of knowledge management so that the organization devote its resources such as financial and time resources to achieve and improve critical success factors of knowledge management according to the priorities of the key success factor of knowledge management.

Keywords: Critical Success Factors, Knowledge Management, Fuzzy Logic, Analytic Hierarchy Process

Introduction

Knowledge is the main instrument of competition in many organizations. Business communities and scientific communities believe that an organization can maintain its competitive advantages by knowledge leverage. Organizations' managers should address knowledge management in order to guide knowledge toward organizational goals and gaining a sustainable competitive advantage. Inso-much, knowledge management is used to describe the application of any new technology, with the aim of trying to organize the intellectual capital of an organization; it may be incorrectly defined as an equivalent to data processing or data management, or even may be considered exclusively as a technical and creative process. Thus, knowledge management is not a set of technological approaches to a problem, but is a social and human process which may be facilitated through technological approaches. Benefits of knowledge management can be manifested at the individual or organizational level. At the individual level, knowledge management enables people to develop their skills by sharing knowledge with other people and using their experiences. At the

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organizational level, improvement of staffs' performance increases the efficiency of the organization (Seba and Rowley, 2010).

The most important pillar of knowledge management is its implementation and effectiveness. Because other related topics are all considered as an introduction to sub-structuring and are used for practical realization of knowledge management. Undoubtedly, the implementation of knowledge management and designing its software without regard to infrastructure issues and organizational factors which have a direct effect on it, will just lead to information mass gathering; on the other hand, a large part of the total expenses of organizations is spent by strategic and long-term requirements that are dependent on effective management of knowledge source in the field of initiatives or actions related to knowledge management (Lee & Sukoco, 2007).

This is where the necessity of investigating critical success factors for organizations that aim to benefit from this great knowledge is felt more than ever. With respect to this important issue, in an organization such as bank; the importance of knowledge management as a vital source to gain competitive advantage for the organization is doubled due to the rapid development of new technology and digital communications, professional activity, and the average tenure of more than 9 years, during which the labor force accumulates extensive knowledge from bank and its performance and there is a growing awareness that if appropriate measures and actions are not taken, the bulk of this critical knowledge and expertise will be simply taken out of the organization. (Ndlela, L.T, 2010). Thus, presenting a model to identify and determine the critical success factors for implementing knowledge management in the banking industry seems necessary.

In order to identify the critical factors of knowledge management first this process should be well illuminated. Critical success factors are defined as a limited number of levels that convince the organization results for successful competitive implementation. Lack of these factors is considered as one of the major obstacles in achieving the goals of the organization. CSFs method is an accepted top-down methodology for integrated strategic planning, which can specify and highlight key information needed by senior managers (Bullen and Rockart, 1986).

CSFs concept can be generalized to other levels of management within the organization. Others like (Chen, 1999) stated that if the critical success factors are identified, management can take certain

steps to implement new models such as knowledge management more effectively. In knowledge management, activities that are required and necessary to ensure its successful implementation can be considered as the key success factors. These activities must be created and nurtured if they do not exist and if they exist, they should be developed.

Success factors of knowledge management in organizations have been discussed and investigated from different aspects in various researches and various case studies have been done in organizations and companies around the world to survey these factors. For example, the typology method of Gold and colleagues (2001), that consider information technology (IT), organizational culture and organizational structure as a key component of an organization's capabilities of the basic structure of knowledge is used in a research.

Martha and Martinez (2012) in an article introduced strategic, cultural and technological factors in implementing knowledge management as using structural equation modeling technique as success factors.

Dawn Sharp evaluates communication within the organization, senior management commitment to knowledge management, collaboration and systematic work, employees' commitment to the concept and implementation of knowledge management, innovative collaborative culture and application of appropriate technology as success criteria of knowledge management (Sharpe, 2003).

As can be seen, in most previous researches internal factors of an organization that affect the management have been studied and external factors influencing the success of knowledge management have not been studied. This paper attempts to study a comprehensive and hierarchical set of factors affecting knowledge management. In this context, the factors are prioritized based on criteria of Li Hung's (2012) model who introduced the critical success factors in six categories, including cultural factors, environmental factors, organizational characteristics, individual characteristics, information technology infrastructures and knowledge management features.

On one hand, given the influence ability of knowledge management implementation from multiple criteria, sub-criteria and indicators, prioritization of these factors is a complex process; that multi-criteria decision-making methods such as AHP method is the best way to deal with this complexity; However, Since experts apply natural language variables (so much, more important, ...)

instead of numerical values in their assessments, classical AHP results may not be satisfactory. This research suggests fuzzy AHP framework for measuring the weight of indexes. Given the fact that no accurate study has been conducted in this area, therefore, the present study can be very important. And this research is expected theoretically to:

- Add to the knowledge and literature of knowledge management concept.
- Introduce critical success factors for knowledge management in Iranian banking industry so that director of the banks can decide on activities and indices to invest on and pay attention by explaining and prioritizing these indices (cultural factors, environmental factors, organizational characteristics, individual characteristics, IT infrastructure and management features); and thereby help them in implementation of knowledge management as a competitive and strategic tool.
- Be a background for further researches.

And in methodology and practical section, it is expected to:

- Present a comprehensive model based on fuzzy hierarchical analysis to prioritize success factors of knowledge management in banking industry.

Methodology

The purpose of this research is practical, because it is an attempt to solve scientific problems and difficulties that exist in the real world of Refah bank. The method is exploratory and descriptive and has an integrated approach. It is descriptive, because describes the current situation of Refah bank branches administration in Khuzestan without interference and studies the variables without manipulation. Researcher has defined the real and exact situation and condition and has tried to report the situation without interference and deduction and achieve subjective conclusions. And it is somehow exploratory, because tries to prioritize factors in a certain area. It has a mixed approach, because uses the method of analytic hierarchy process with fuzzy approach to analyze data.

According to the extent of administration of Refah bank branches of Khuzestan province all around the province and also branches located in township, the research population includes all those who take a managerial responsibility in the branches of the bank. Since data gathering in this study is based on expertise and specialization in the field of knowledge management, the purposive sampling

has been used. Purposive sampling is the best way to call the opinions of people who are skilled in certain areas. Thus, 10 experts and specialists in the field of knowledge management implementation in the banking domain were detected.

Data collection in this study has been done using two library and field methods. Library, journals, conference papers and various academic reputable sites have been used to write research literature (theoretical principles and research background) and select research criteria and indicators. The study's main data have been obtained by fieldwork and through distributing questionnaire among experts in order to investigate research questions. Specialized questions of questionnaire are based on Li Hung (2012) in the form of six main indexes. However, due to the spatial domain of research that is Refah bank branches of Khuzestan, the items of Li's standard questionnaire (2012) were adjusted and localized. The questionnaire of this research is composed of two parts:

Part 1: Paired comparisons (determining importance) of main criteria in relation to goal

Part 2: Paired comparisons of main criteria with each other.

The Delphi technique is used to assess the content validity of the questionnaire and after implementation of this method content validity was confirmed by experts. Content validity means that the set questions measure the variable to which it is made to measure. Its evaluation method is often based on specialized judgments and professional people's experiences. Using data obtained from these questionnaires and with the help of Spss statistical software, reliability coefficient by the method of Cronbach's alpha is equal to 0/8597 which is reliable.

Given the influence ability of knowledge management implementation process from numerous and diverse criteria and vague and probable ideas of respondents, the method of data analyzing in this research is based on FAHP which is one of the most widely used techniques of MADM. The classical AHP method has been criticized due to its inability to notice uncertainty and ambiguity of information of some of the decision makers (Deng, 1999), and the use of fuzzy AHP and triangular numbers is recommended in several studies.

This decision making method begins by providing a hierarchical tree. Decision hierarchy tree is a multi-level tree in which the first level is goal and subsequent levels are main criteria, sub-criteria and finally options.

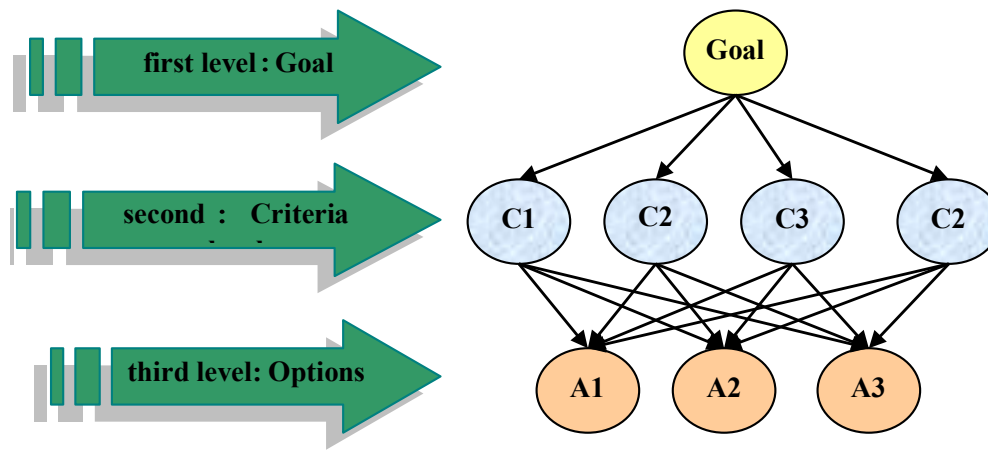


Figure 1. AHP method

Analytic hierarchy process is one of the most comprehensive systems designed for decision making with multiple criteria, because this technique makes it possible to formulate the problem into a hierarchy form and also to consider various quantitative and qualitative criteria in the problem. This process has involved various options in decision-making and is able to analyze sensitivity on the criteria and sub-criteria, in addition to this it facilitates judgments and calculations based on established paired comparisons. It also illustrates the compatibility or incompatibility of the decision which is distinct advantages of this technique in multi-criteria decision making.

Many researchers believe that due to the existence of some uncertainty in experts' responses, when conducting paired comparison and assigning to it, this kind of decision-making is inaccurate and non-reliable (Leung and Cao, 2002); therefore, fuzzy expressive and common items have been used in paired comparisons' questionnaire in the stage of collecting experts' opinion.

The simplest consideration for definition of fuzzy logic is that "Fuzzy logic has developed answer of a question to a range of answers in between, instead of splitting the answer of the question into two correct or incorrect parts". Its typical example is the existence of gray between the color ranges of black and white. Lotfi Zadeh (1965) has used Fuzzy, defined as uncertainty and unknown in the dictionary, as the name of vague or multi-valued sets; sets that their components belong to them with different degrees. Like those who express their satisfaction from working complex with varying degrees of very satisfied, satisfied, and indifferent (Zaranezhad and Ahmdifard, 2012).

To express vagueness in the form of a number, fuzzy logic introduces a function to membership in a set, which gives each element a real number between 0 and 1; this number represents the membership degree of the element in relation to the set. Membership of 0 elements indicates that the element is totally out of the set. While, membership of number one indicates that the element is totally in the set (Rinu, 2010). The simplest and most commonly used membership function is triangular type. A triangular fuzzy number which is shown by $\tilde{A} = (l, m, u)$ has the following membership function.

$$\mu_{\tilde{A}}(x) = \begin{cases} 0, & x < l \\ \frac{x-l}{m-l}, & l \leq x \leq m \\ \frac{u-x}{u-m}, & m \leq x \leq u \\ 0, & x > u \end{cases}$$

In the triangular fuzzy numbers two indices are used: confidence index and optimism index. Confidence index represents the level of decision maker's confidence in his judgment and prioritization. With the definition of (α) triangular fuzzy number is defined as follows :

Generally, the prioritization of model's element using the fuzzy AHP has three basic steps including hierarchical structure determination, prioritization of main criteria based on goal, and comparisons and prioritization of sub-criteria.

First step: determining the hierarchical structure identifying final criteria and sub-criteria

In the first step the criteria and sub-criteria of the study were identified and selected in accordance with Table 1. The criteria and sub-criteria of research were named by numerical index so that to be easily tracked and studied in the research process.

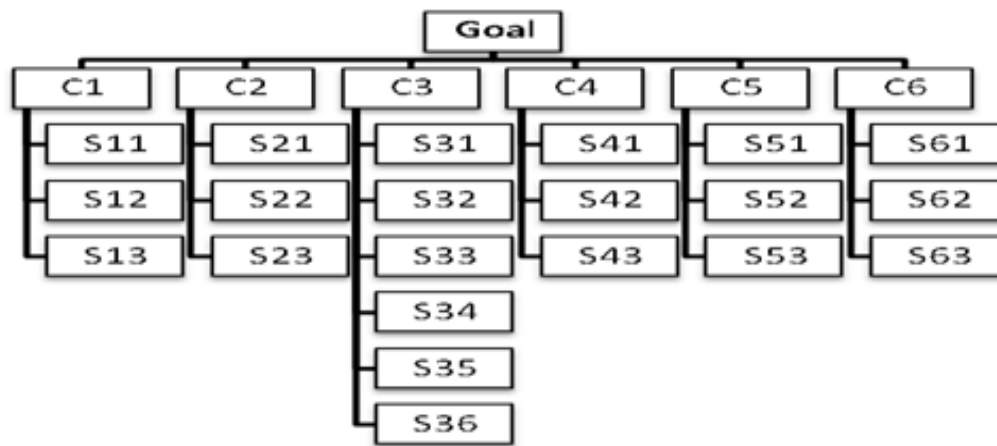


Figure 2. Hierarchical pattern of final criteria and sub-criteria of research

Table 1. The criteria and sub-criteria affecting Knowledge Management implementation process

Symbol	Criterion	Sub-criterion	Symbol
C1	Environmental Factors	Rules and regulations on the banking industry	S11
		Industrial Competitiveness	S12
		IT development and use of local and global networks such as the intranets and the Internet	S13
C2	Individual Factors	Employees' creativity	S21
		Employees' attitudes toward their work	S22
		Type of personality (introverted and extroverted))	S23
C3	Organizational Factors	The number of bank employees	S31
		Structure Flexibility	S32
		Strategy and Policy	S33
		Views of senior executives	S34
		Educational Programs	S35
		Individual's career path development based on new knowledge acquisition	S36
C4	Information Technology Infrastructures	Staffs ability to take advantage of the bank's needed technologies	S41
		Existence of Information technology infrastructures (content, new technologies, etc.) in accordance with needs and goals of the bank (adaptation)	S42
		Possibility of registering, recording and updating available information and knowledge through IT tools	S43
C5	Cultural Factors	Teamwork Culture	S51
		Encourage to cooperation	S52
		Interaction with others	S53
C6	Knowledge management Characteristics	Rewarding to gain new knowledge	S61
		Conceptual, administrative and practical consistency of knowledge (knowledge type) with goals of the bank	S62
		Conditions to distribute and publish knowledge in banks with the aim of its availability to the public (knowledge transfer channels)	S63

The second step: Prioritizing the main criteria based on goal

In order to perform the hierarchy analysis, first main criteria have been pored compared

based on goal. For this purpose, the opinion of some of the experts has been used. Experts view has been quantitative in Table 2 using fuzzy scale.

Table 2. Scale of linguistic variables with fuzzy triangular numbers, (Lee et al, 2008, p.101)

Value	Comparison Status of i to j	Fuzzy numbers			Inverse of Fuzzy numbers		
		l	m	u	l	m	u
1	Equally Preferred	1	1	1	1	1	1
2	middle	1	2	3	0.333	0.5	1
3	Moderately Preferred	2	3	4	0.25	0.333	0.5
4	middle	3	4	5	0.2	0.25	0.333
5	Strongly Preferred	4	5	6	0.166	0.2	0.25
6	Middle	5	6	7	0.142	0.16	0.2
7	very strongly Preferred	6	7	8	0.125	0.142	0.166
8	Middle	7	8	9	0.111	0.125	0.142
9	Extremely Preferred	9	9	9	0.111	0.111	0.111

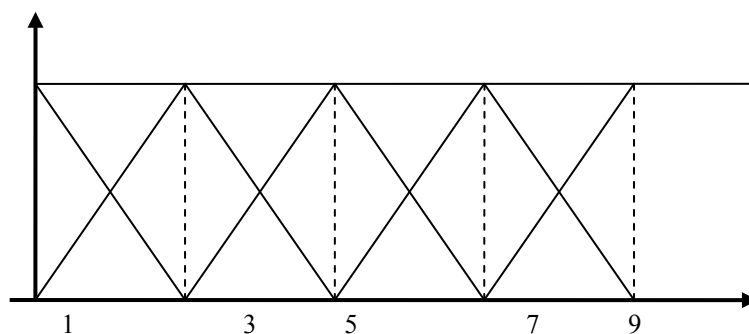


Figure 3. Scale of linguistic variables with fuzzy triangular numbers

In this study, the group hierarchical analysis method has been used. So, after gathering the views of experts with nine degree clockwise spectrum and fuzzing them, experts' opinion has been aggregated using fuzzy average. To calculate the average of n re-

spondents' opinion, fuzzy average will be calculated as follows: (Bujadzif, 2009, p.115)

$$F_i = (l_i, m_i, u_i)$$

The matrix of paired comparison is presented in Table 3, using fuzzy average of 10 experts.

$$fuzzy\ average = \left[\frac{l_1 + l_2 + \dots + l_n}{n}, \frac{m_1 + m_2 + \dots + m_n}{n}, \frac{u_1 + u_2 + \dots + u_n}{n} \right]$$

Table 3. Fuzzy average of research main criteria priority

	C1	C2	C3	C4	C5	C6
C1	(1, 1, 1)	(1.08, 1.14, 1.27)	(0.36, 0.51, 0.7)	(1.17, 1.69, 2.22)	(0.25, 0.28, 0.33)	(0.61, 0.78, 1.05)
C2	(0.79, 0.88, 0.93)	(1, 1, 1)	(1.5, 1.91, 2.35)	(3.33, 4.03, 4.74)	(1.84, 2.35, 2.88)	(1.63, 2.23, 2.84)
C3	(1.43, 1.98, 2.76)	(0.43, 0.52, 0.67)	(1, 1, 1)	(4, 4.9, 5.8)	(1.75, 2.36, 2.98)	(1.65, 2.16, 2.67)
C4	(0.45, 0.59, 0.85)	(0.21, 0.25, 0.3)	(0.17, 0.2, 0.25)	(1, 1, 1)	(1.77, 1.93, 2.18)	(1, 1.18, 1.48)
C5	(3.01, 3.6, 4.05)	(0.35, 0.42, 0.54)	(0.34, 0.42, 0.57)	(0.46, 0.52, 0.57)	(1, 1, 1)	(1.63, 2.14, 2.65)
C6	(0.95, 1.29, 1.65)	(0.35, 0.45, 0.61)	(0.37, 0.46, 0.61)	(0.68, 0.85, 1)	(0.38, 0.47, 0.61)	(1, 1, 1)

After forming the paired comparisons matrix, eigenvector is calculated based on the fol-

lowing steps. A) First, the fuzzy sum of each row is calculated.

$$\sum_{j=1}^9 M_{g_1}^j = (1,1,1) \oplus (1.08, 1.14, 1.27) \oplus (0.36, 0.51, 0.7) \oplus (1.17, 1.69, 2.22) \oplus (0.25, 0.28, 0.33) \oplus (0.61, 0.78, 1.05) = (4.47, 5.38, 6.57)$$

Fuzzy development of preferences of each main criterion will be as follows:

$$\sum_{j=1}^9 M_{g_1}^j = (4.47, 5.38, 6.57)$$

$$\sum_{j=2}^9 M_{g_2}^j = (10.08, 12.42, 14.73)$$

$$\sum_{j=3}^9 M_{g_3}^j = (10.25, 12.92, 15.87)$$

$$\sum_{j=4}^9 M_{g_4}^j = (4.6, 5.15, 6.06)$$

$$\sum_{j=5}^9 M_{g_5}^j = (6.79, 8.11, 9.38)$$

$$\sum_{j=6}^9 M_{g_6}^j = (3.74, 4.51, 5.48)$$

B) Then, the fuzzy sum of the total elements of preferences column is calculated:

$$\sum_{i=1}^n \sum_{j=1}^n M_{g}^j$$

The sum of elements of preferences column of main criteria will be as follows:

$$\sum_{i=1}^9 \sum_{j=1}^9 M_{g}^j = (39.93, 48.49, 58.09)$$

D) Preferences Normalization: In order to normalize the preferences of each criterion, the sum of the criterion's values should be divided by the sum of the preferences (elements of column). Since the values are fuzzy therefore, fuzzy sum of each row is multiplied in the inverse of the sum. The inverse of sum should be calculated.

$$F1^{-1} = (1/u1, 1/m1, 1/l1)$$

$$(\sum_{i=1}^n \sum_{j=1}^n M_{g}^j)^{-1} = (0.017, 0.021, 0.025)$$

$$S_k = \sum_{i=1}^n M * (\sum_{i=1}^n \sum_{j=1}^n M_{g}^j)^{-1}$$

Thus, the results of the normalization of obtained values would be as follows:

$$C1 = (0.077, 0.111, 0.164)$$

$$C2 = (0.174, 0.256, 0.369)$$

$$C3 = (0.177, 0.266, 0.398)$$

$$C4 = (0.079, 0.106, 0.152)$$

$$C5 = (0.117, 0.167, 0.235)$$

$$C6 = (0.064, 0.093, 0.137)$$

Each of the obtained fuzzy weight and normalized values are related to the main criteria. There are various methods to defuzz obtained values. In this study, considering applicability of results and ease of comprehension, Crisp (absolute) number method is used for defuzzing values. It should be noted that in this study the calculation of possibility degree is used to assess the Crisp (absolute) number. Defuzzing using crisp number is as follows:

$$x_{max}^1 = \frac{l + m + u}{3} \quad x_{max}^2 = \frac{l + 2m + u}{4}$$

$$x_{max}^3 = \frac{l + 4m + u}{6}$$

$$\text{Crisp number} = Z^* = \max \{ x_{max}^1, x_{max}^2, x_{max}^3 \}$$

(Bujadzif, 2009: 146)

Calculations done to prioritize the main criteria are as follows:

Table 4. Normal distribution the main criteria

The main criteria	X1max	X2max	X3max	Defuzzy	Normal
Environmental factors	0.117	0.116	0.114	0.117	0.112
Individual factors	0.266	0.264	0.261	0.266	0.254
Organizational factors	0.280	0.277	0.273	0.280	0.267
Information Technology	0.112	0.111	0.109	0.112	0.107
Cultural factors	0.173	0.172	0.170	0.173	0.165
Knowledge management characteristics	0.098	0.097	0.096	0.098	0.094

According to Table 4, eigenvector of priority of the main criteria would be as W1.

$$W1 = \begin{pmatrix} 0.112 \\ 0.254 \\ 0.267 \\ 0.107 \\ 0.165 \\ 0.094 \end{pmatrix}$$

Based on the obtained eigenvector:
The criterion of organizational factors with 0/267

normal-weight has the highest priority.

The criterion of individual factors with 0/254 normal-weight is the second priority.

The criterion of cultural factors with 0/165 normal-weight is the third priority.

The criteria of environmental factors and IT with weighing approximately the same as 0/112, 0/107 have a low priority.

The criterion of knowledge management characteristics with normal weight of 0/094 is the lowest priority.

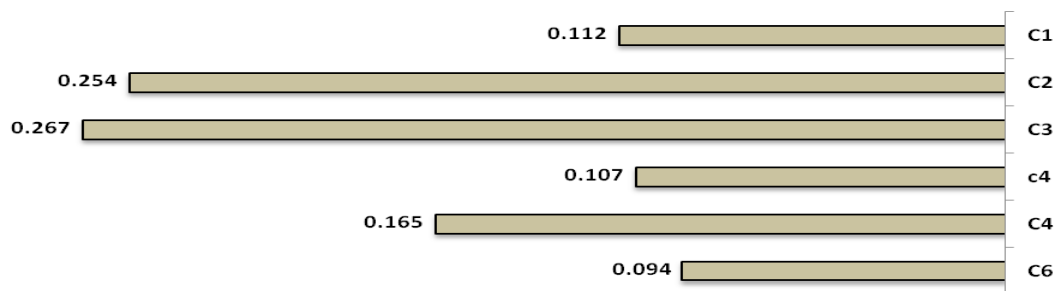


Figure 4. Graphical display of priority of the main criteria

Inconsistency rate of comparisons done is 0/07 which is smaller than 0/1 and therefore comparisons can be trusted.

The third Step: Compare and prioritize sub-criteria

In the third step of the AHP method, sub-criteria of each criterion are pair compared. At this

point, the calculations have been carried out for fuzzy average of experts' view in order to prioritize sub-criteria of environmental factors and results of this operation have been presented in Table 5. Since this criterion is comprised of 3 indices, therefore, just three paired comparisons have been conducted.

Table 5. Prioritizing sub-criteria of environmental factors

	C1	C2	C3
C1	(1, 1, 1)	(1.47, 1.72, 2.02)	(1.92, 2.53, 3.13)
C2	(0.5, 0.58, 0.68)	(1, 1, 1)	(2.91, 3.71, 4.51)
C3	(0.32, 0.4, 0.52)	(0.22, 0.27, 0.34)	(1, 1, 1)
C4	(1, 1, 1)	(1.47, 1.72, 2.02)	(1.92, 2.53, 3.13)
C5	(0.5, 0.58, 0.68)	(1, 1, 1)	(2.91, 3.71, 4.51)
C6	(0.32, 0.4, 0.52)	(0.22, 0.27, 0.34)	(1, 1, 1)

CR = 0.013

Therefore, fuzzy development of preferences and the sum of elements of column of each sub-criterion and the results of normalization would be as follows:

The calculations of Crisp number have been used to defuzz the values. The results of Crisp number calculations' defuzzing are as follows:

$$\sum_{j=1}^9 M_{E_1}^j = (4.40, 5.25, 6.15)$$

$$\sum_{j=2}^9 M_{E_1}^j = (4.41, 5.29, 6.19)$$

$$\sum_{j=3}^9 M_{E_1}^j = (1.54, 1.67, 1.86)$$

$$\sum_{i=1}^p \sum_{j=1}^p M_{ij}^j = (10.35, 12.21, 14.2)$$

$$(\sum_{i=1}^p \sum_{j=1}^p M_{ij}^j)^{-1} = (0.07, 0.082, 0.097)$$

$$S11 = (0.31, 0.43, 0.594)$$

$$S12 = (0.31, 0.433, 0.598)$$

$$S13 = (0.109, 0.136, 0.18)$$

Table 6. Disruption of and calculating normal weight of the environmental factors

Sub-criteria of environmental factors	X1max	X2max	X3max	Deffuzy	Normal
Rules and regulations on the banking industry	0.455	0.441	0.437	0.445	0.430
Industrial Competitiveness	0.447	0.444	0.440	0.447	0.433
IT development and use of local and global networks such as the intranets and the Internet	0.142	0.140	0.139	0.142	0.137

According to Table 6, eigenvector of priority of the main criteria would be as W_{C1} .

$$W_{C1} = \begin{pmatrix} 0.430 \\ 0.433 \\ 0.137 \\ 0.254 \\ 0.267 \end{pmatrix}$$

Based on the obtained eigenvector:

The criterion of industrial competitiveness with normal weight of 0/433 has the highest priority.

The criterion of rules and regulations on the banking industry with the similar weight of 0/430 is the central priority.

The criterion of IT development and use of local and global networks such as the intranets and the Internet with normal weight of 0/137 has the lowest priority.

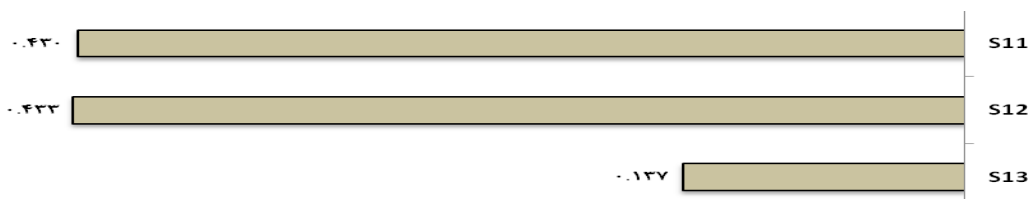


Figure 5. Graphical display of priority of indicators related to environmental factors criterion

Considering the prolong time of fuzzy computations and similarity of steps for prioritizing each sub-criterion of this study, their repetition have been

ignored in this section. In the following part, the priority of sub-criteria of each cluster is shown in diagram form.

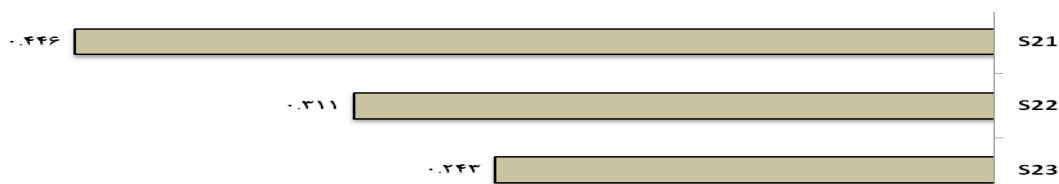


Figure 6. Graphical display of priority of indicators related to individual factors criterion

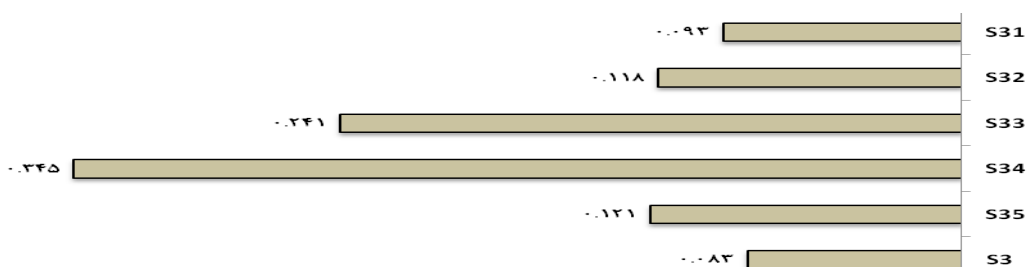


Figure 7. Graphical display of priority of indicators 7 related to organizational factors criterion

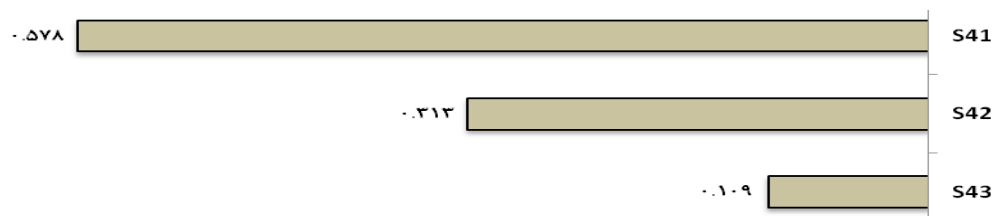


Figure 8. Graphical display of priority of indicators related to IT criterion

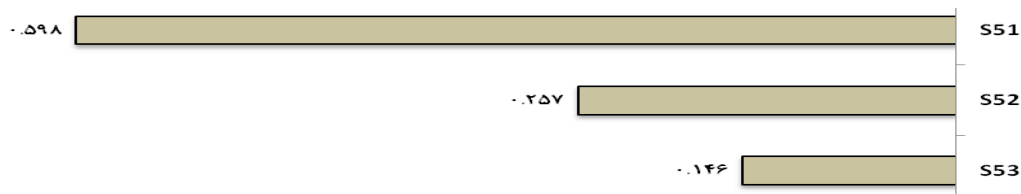


Figure 9 . Graphical display of priority of indicators related to cultural factors criterion



Figure 10. Graphical display of priority of indicators related to knowledge management Characteristics criterion

The fourth step: Ultimate priority of indices with AHP technique

In this step, the ultimate priorities of research criteria are calculated. The results of research sub-criteria comparisons and their weights form the W2matrix. In order to ultimate prioritizing of indices with AHP technique, you should just multiply indices' weight based on each criterion (W2) in main criteria's weight (W1). With the weight of each main criteria (W1) and sub-criteria (W2) in hand, the weight of each index is calculated. Super decision software has been used to conduct related calculations. The results of performed computations and weights related to indices are given in Table 7.

Results

According to the conducted calculations, the ultimate weight of each model index has been calculated by FAHP technique. Accordingly employees' creativity index with ultimate weight 0/113 has the highest priority. Index of teamwork culture weighing 0/099 is the second priority. Index of views of senior executives with a weight of 0/092 is the third priority. Employees' attitude toward their work, weighing

0/079 is the next priority. Indices of personality type (introverted and extroverted), strategy and policy, and Staffs ability to take advantage of the bank's needed technologies have middle grades of importance. On the other hand, IT development and use of local and global networks such as the intranets and the Internet, and possibility of registering, recording and updating available information and knowledge through IT tools are less important compared to other criteria.

Discussion

The most important role that can be attributed to knowledge management is to consider it as a change methodology. Knowledge management can be the most important factor of change in an organization by absorbing new knowledge into system and effectively managing this knowledge. Because of the proximity of knowledge to organizational decisions and actions, it can improve the performance and thus improve the quality of organizations' services in general and banks in particular much more than data and information. That is why most organizations are looking to deploy a knowledge management system to further benefit from their knowledge in policy-making and to achieve cre-

ation and maintenance of competitive advantage in internal and international environment. According to this fact, this research has investigated the identification and determination of importance of factors affecting knowledge management deployment in banking area. So according to the calculations in Table 7, ultimate weight of each model index is calculated by FAHP technique. Accordingly, employees' creativity index with ultimate weight 0/113 has the highest priority. Index of teamwork culture weighing 0/099 is the second priority. Index of views of senior executives with a weight of 0/092 is the third priority. Employees' attitude toward their work, weighing 0/079 is the next priority. Indices of personality type (introverted and extroverted), strategy and policy, and Staffs ability to take advantage of the bank's needed technologies have middle grades of importance. On the other hand, IT development and use of local and

global networks such as the intranets and the Internet, and possibility of registering, recording and updating available information and knowledge through IT tools are less important compared to other criteria. Some of the researchers believe that many organizations invest more on IT seeking to take advantage of knowledge management benefits in the organization, unaware that in the absence of adequate human and cultural context in the organization, investment in information technology is barren. Although the use of information technology in organizations is achieved quickly, developing social infrastructure in the organization is very difficult (Park, 2004). The results indicate that human activities affect the success of knowledge management more than technological activities. The results of the research are in accordance with the results of Hsieh (2007), park (2004), and Mohaqer (2012).

Table 7. Ultimate priority of research criteria with AHP technique

Criterion	Weight	Sub-criteria	The initial weight	The ultimate weight
Environmental factors	0.112	Rules and regulations on the banking industry	0.430	0.048
		Industrial Competitiveness	0.433	0.049
		IT development and use of local and global networks such as the intranets and the Internet	0.137	0.015
Individual factors	0.254	Employees' creativity	0.446	0.113
		Employees' attitudes toward their work	0.311	0.079
		Type of personality (introverted and extroverted))	0.243	0.062
Organizational factors	0.267	The number of bank employees	0.093	0.025
		Structure Flexibility	0.118	0.032
		Strategy and Policy	0.241	0.064
		Views of senior executives	0.345	0.092
		Educational Programs	0.121	0.032
		Individual's career path development based on new knowledge acquisition	0.083	0.022
IT infrastructures	0.107	Staffs ability to take advantage of the bank's needed technologies	0.578	0.062
		Existence of Information technology infrastructures (content, new technologies, etc.) in accordance with needs and goals of the bank (adaptation)	0.313	0.034
		Possibility of registering, recording and updating available information and knowledge through IT tools	0.109	0.012
Cultural factors	0.165	Teamwork Culture	0.598	0.099
		Encourage to cooperation	0.257	0.042
		Interaction with others	0.146	0.024
Knowledge management characteristics	0.094	Rewarding to gain new knowledge	0.483	0.045
		Conceptual, administrative and practical consistency of knowledge (knowledge type) with goals of the bank	0.241	0.023
		Conditions to distribute and publish knowledge in banks with the aim of its availability to the public (knowledge transfer channels)	0.267	0.026

Conclusions

Results of this research can be used as:

1) a guide of way and a supplement for implementation of knowledge management so that the organization devote its resources such as financial and time resources to achieve and improve critical success factors of knowledge management according to the priorities of the key success factor of knowledge management.

2) In this research, it has been tried to take advantage of multi-criteria methods and techniques, to apply proven models of engineering in the field of management sciences to facilitate the important management and organizational decisions. Therefore, it provides an incentive for further researches with more sophisticated methods such as network analysis and DEMATEL.

3) In this study, triangular fuzzy approach is used at all stages, however this can be done with the help of the trapezoidal fuzzy numbers. In order to determine the weight of indices the average fuzzy method has been used, and in addition to the methods used in this study, other methods such as simple additive weighting, ELECTRE, LINMAP or permutation can be used in future researches.

References

- Bullen & Rockart, J.R. (1986). *A primer on critical success factors .The rise of managerial computing: The best of the center for information systems research*, Sloan School of Management, MIT, Cambridge .pp. 383–423.
- Chen, T. (1999). Critical success factors for various strategies in the banking industry, *International Journal of Bank Marketing*, 17(2), 83–91.
- Deter (2002). *Multi-criteria Analysis: A Manual*, Department of Environment, Transport and Regions, London.
- Gold, A.H., Malhotra, A. & Segars, A.H. (2001). Knowledge management: an capabilities perspective, *Journal of Management Information Systems*, 18(1), 185-214
- Hsieh, H. J. (2007). *Organizational characteristics, knowledge management strategy, enablers, and process capability: Knowledge management performance in U.S. software companies*. PhD Dissertation, Lynn.
- Lee, A. H. I., Chen, W.-C., & Chang, C.-J. (2008). A fuzzy AHP and BSC approach for evaluating performance of IT department in the manufacturing industry in Taiwan. *Expert Systems with Applications*, 34(1), 96–107.
- Lee, L.T. & Sukoco, B.M. (2007). The effects of entrepreneurial orientation and knowledge management capability on organizational effectiveness in Taiwan: the moderating role of social capital, *International Journal of Management*, 24(3), 549-73.
- Li-Su H., & Cheng-Po L. (2012). An investigation on critical success factors for knowledge management using structural equation modeling. *Social and Behavioral Sciences*, 40, 24- 30.
- Marta M.M. & Carme Martínez Costa (2012). Exploring critical success factors of knowledge management projects in the consulting sector. *Total Quality Management & Business Excellence*, 23, 11-12.
- Ndlela, M.N. (2010). Knowledge Management in the Public Sector: Communication Issues and Challenges at Local Government Level, *European Conference on Knowledge Management Portugal*, pp.711-716.
- Park, H. (2005). Knowledge management technology and organizational culture in the creating the discipline of knowledge management.
- Peniwati, K. (2005). *Criteria for evaluating group decision-making methods*, Springer, New York, NY.
- Renu, V., & Chandra, A. (2010). Predicting stock returns nifty index: An Application of artificial neural network. *International Research Journal of Finance and Economics*.
- Seba, I. & Rowley, J. (2010). Knowledge management in UK police forces. *Journal of Knowledge Management*, 14(4), 611-626.
- Sharp, D. (2003). Knowledge management today: Challenges and opportunities. *Information Processing and Management*, 20(2), 32-37.
- Williams, J.J. & Ramaprasad, A. (1996). A taxonomy of critical success factors, *European Journal of Information Systems*, 5(4), 250–26.
- Zadeh, L.A. (1965). Fuzzy sets. *Information Control*, 8, 338–35
- Zaranezhad M., & Ahmadifard, M. (2012). Providing a mixed model based on Neuro-fuzzy interference system for prediction of stock return. *Proceedings of the ninth International Conference on Industrial Engineering, Artificial Intelligence*, Tehran.