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SUGGESTION OF A FUZZY AHP APPROACH FOR EVALUATION AND RANKING OF ORGANIZATIONS (CASE STUDY: INSURANCE INDUSTRY)

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ABSTRACT: The insurance industry as a service sector has compensation and protective role in the economy of any country; so that successful action in this industry will develop motivation for other industries. The aim of this study was to evaluate the performance and ranking of insurance companies using fuzzy AHP approach. To achieve this object, the affecting criteria of the insurance companies' performance should be specified in the insurance industry. Firstly, a comprehensive list of factors affecting the performance of insurance companies prepared using literature and experts for effective localization and completion criteria in the performance evaluation of insurance companies so that the criteria was in accordance with the conditions of country with the highest correlation and the necessary adaptation with the case study. Finally, in this study, to evaluate the performance of the insurance companies, the Fuzzy Analytical Hierarchy Process are used as one of the most versatile techniques of decision making and management for complex situations where there are multiple and different measures.

***Keywords*:** performance evaluation, effective criteria for performance evaluation, Fuzzy AHP, the insurance industry.

INTRODUCTION

Assessment of the efficiency of production, service and education units has always been an important issue for engineers and economists. This issue that how to set the unit to use their facilities and how it will function during the period is the questions that place within the scope of performance. Evaluation as a means of judging the effectiveness of predetermined programs requires the special use of tools and models. Several models have been proposed for evaluating the performance of organizations, which each have their own characteristics. Some of these models can be MADM models such as ANP, AHP, TOPSIS and etc. An appropriate and efficient means in this context is the analytic hierarchy process that is used as a multi Criteria Decision Making Method to calculate the ranking of options. Today, the application of analytic hierarchy process technique has been expanding rapidly and is used for the evaluation of different organizations and industries such as banking, posts, hospitals, training centers, power plants, refineries, etc. The basis of this method lies within paired comparisons method.

In this study the data related to the criteria was collected through questionnaire and experts viewpoints. In practice, we are always confronted with data that are derived from human judgments and are full of ambiguity and uncertainty. This makes decision process complicated and more difficult. So using traditional methods that use absolute values seems inappropriate. Therefore the form of fuzzy AHP is used. In other words, considering the uncertainties in the assessment process will take advantage of fuzzy logic. Finally, Fuzzy AHP will be used to evaluate the performance and ranking of insurance companies in the form of a case study.

Literature

Evaluation of the performance of the organization plays an important role in management decisions, policy and strategies. Strategic decision making was not possible without sufficient knowledge about the strengths and weaknesses of the organization and such knowledge into the organization is achieved through the implementation of a systematic performance evaluation. One of the most important and sensitive performance evaluation processes is the selection criteria for performance evaluation.

Evaluation of the performance of an organization is one of the key managerial activities. Cronin (1982) called this activity "systematic process for evaluating the effectiveness of the method, standard and predetermined purpose". In other words, performance evaluation is the comparison of actual performance with predetermined performance targets (Slizyte and Bakanauskiene, 2007). Neely (1995) defined performance evaluation as a process of quantifying the efficiency and effectiveness of the activities.

Efficiency is usually interpreted as the ratio of input to output while the effectiveness describes as the relationship between input and output. Also expert opinions vary to assess the performance. These include: assessing and judging the behavior, individual merit and competence in job appointments (Boyne, 2002), measurement of performance evaluation of employment process in organizations (ASHE-ERIC Higher Education Report, 1995), Systematic evaluation of individuals about the quality of their job duties performing and determination of the potential of their jobs for growth and improvement (Mirsepasi, 2005), the performance evaluation of a systematic description of the strengths and weaknesses of individual or group performance about the tasks (Cascio, 2003), etc. From the perspective of a rational-goal model, organizational effectiveness or performance can be defined as the confine in which the organizational goals are achieved (Price, 1972). So the organization performance can be measured with "a range in which organizational goals can be achieved". System resources model defines organizational effectiveness as "organization survival through active interaction with its environment in order to achieve valuable resources to ensure its functions" (Seashore and Yuchtman, 1967). Organization survival is a vital and critical indicator of organizational performance. The ability to access valuable resources is an important tool for achieving the organization's life.

Organizations to identify and detect their current location and survive and thrive in today's competitive world should use methods and models in order to continually evaluate and continuously improve their own performance. Performance evaluation is the fundamental necessity of confronting and coping with change and activity improvement. Today in the insurance industry, because of the entrance of many companies in the private sector, special competitive conditions have prevailed so that firms just with high performance and competitiveness will be able to survive. Therefore, it is essential for these companies in addition of evaluation of their performance relative to other companies, identify their strengths and weaknesses to provide a field for continuous improvement (Mirzaee and Safari, 2009).

Insurance services play an important role in the national economy and have a profound impact on the behavior of different economic sectors. Today, with fundamental changes in the world economy, insurance companies are also tailored essential changes. Among the changes, increase insurance agencies and the more highlighted private sector in the field of economic activities (Golestani, 2007) can be named. Scientific methods to minimize errors caused by subjective judgment can also show the status of the insurance agencies and in the following, appropriate ways to strengthen the position of any organization. (Abavi , 2011). Most models for performance evaluation focuses are on the accounting and financial models for profitable organizations. These models include the return on capital, sales growth, and net profit margins and so on. These models provide a convenient tool for performance evaluation and comparison with other organizations. (Kaplan and Norton, 2004).AHP method that faced with deciding practice with multiple choice and decision criteria can be useful. Indicators can be quantitative or qualitative. This method lies on paired comparisons.

The process of ranking and prioritization of options in AHP method is as follows. The first step is the definition of the hierarchical structure and the decision making goals are drawn as a hierarchy of the constituent elements. AHP requires breaking the problem into a hierarchy of levels by several factors. For this purpose, the decision tree is used which consists of four levels: The first level is the overall objective of the decision. At the second level the general criteria are placed that decision making is performed based on them. On the third level sub-criteria are placed and the last level includes the options to be considered. The following figure shows the hierarchical structure of the indices prioritization in decision making problem (Ghodsipour, 2005).

Research Background

Using the evaluation system in the world officially returns to the nineteenth century. Generally the performance evaluation has been developed with management thought development. In Iran, both formally and nationally for the first time in 1970, it was decided that government agencies evaluated or to be evaluated for the management and

administration of the jobs. For this reason, the evaluation of government agencies in the premiership was formed. The results show that after more than thirty years, a specified pattern and model to assess the state and national level has not been designed and developed yet (Madrakian, 1998). Defining new measures and new look to the performance evaluation system begins in the 1980s. In this decade some changes and developments in the field of management studies is obvious. This development is mainly based on the evaluation of the criticism about the criteria that mainly was based on tax factor (Brem , 2008). However, most progress in evaluating the performance returns to the late 1980s and the 1990s. In this time the manager knowledge about the performance evaluation change to provide valuable information that can be used as a basis for decision-making in the organization. However, further studies in this field have shown that there is a practical gap between knowledge and its application (Garengo , 2005).

MATERIALS AND METHODS

It is required to determine the criteria and sub-criteria affecting the performance of insurance companies, according to the literature and experts in the field of insurance to assess insurance companies. After determination of the criteria and sub-criteria in the insurance industry, it was time to collect the data. Since many measures of performance are qualitative, the experts' opinions used to collect data. Therefore, to gather expert opinions, questionnaire was used as a research tool. This section deals with the production of research tools, validation tool and how to select experts to answer the questionnaire. The study used a questionnaire that is related to AHP questions. This questionnaire is designed based on paired comparisons. This questionnaire was used to extract the importance of functional criteria and sub-criteria and the final scores of items. To implement the method of fuzzy AHP, Excel software and IDE Splus was used. The present study aims have practical goal because the aim of practical research is the development of the practical knowledge in a particular area. Because of the multidimensional nature of the problem of prioritization, its fully understanding requires the proficiency in areas such as performance appraisals, insurance, etc., Experts, managers and generally practitioners and senior officials of the central insurance were selected. These individuals are familiar with a field assessment and prioritization, efficiency and scope of insurance, and the insurance industry situation in the country. In this study, the sampling method is not used.

Model analysis

AHP

AHP approach to pricing and ranking of preferences uses the matrix of pairwise comparisons that the input data is crisp number and i cases where the input data are faced with uncertainty, this matrix can not be used to achieve the desired results. Leung and Cao (2000) argue among the reasons for the low accuracy of this type of business ideas obtaining is that the person is asked to allocate a compared paired number based on his understanding of the phenomena despite the fact that perceptions of phenomena are not expressible in terms of Crisp numbers but the range of numbers may reflect a better understanding of the exact number of phenomena importance in relation to other phenomena. The Fuzzy AHP causes better decision-making process of simulating the human mind compared to traditional AHP. Therefore, In the collection of expert opinion, Tangible expression of the common items in the questionnaire of AHP fuzzy pairwise comparisons is used rather than the conventional deterministic traditional AHP. The used scale to measure each phase is 1-9 scale suggested by Tesfamariam and Sadiq based on the time scale. The use of 1-9 scale in each pair gives more freedom to the experts when making comparisons. After collecting the experts' responses, it is necessary to convert 1-9 scale to those with the ability to analyze because it is impossible to perform mathematical operations on variables in terms of quality. Therefore, the variables in the expression must be converted to a fuzzy measure.

Table 1. Conversion variable expression to triangular fuzzy numbers (Wei & Yu 2007)

Expression variable	Triangular fuzzy number
Same	(1,1,1)
Slightly more important	(2,3,4)
More important	(4,5,6)
Very important	(6,7,8)
More strictly important	(8,9,9)
Intermediate values between the two levels	$(X+1, X, X-1)$
Mutual triangular numbers	$(1/(X-1), 1/X, 1/(X+1))$
	(1/9,1/9,1/8)

Fuzzy analytic hierarchy process is composed of several key steps .These steps include:

Preparation of paired comparisons matrix

In the hierarchical analysis of the decision in each part due to their importance in controlling the test criteria are compared in paired method and also each part is compared with regard to their impact on the target areas. Decision makers in the form of a series of paired comparisons is asked which impact two elements or two parts have together in their upstream criteria(Asgharpour, 2004).

In addition, if there is a relationship between the elements, the effects of the elements must be shown using paired comparisons and obtaining eigenvectors of each element .The relative importance is calculated using a relative scale. For example, you can use a scale of 1 to 9 while a score of 1 indicates equal importance to both and the score of 9 represents the most important of an element (row matrix) compared with others (Mehregan, 2004). In a paired comparison matrix, the value of opposite side is opposite. In the network analysis method like the method of hierarchical analysis, paired comparisons is performed in the form of a matrix and local priority vector is obtained by estimating the relative importance of the elements which is obtained by solving the following equation:

$$\lambda_{\max} W = AW$$

Where A is paired comparison matrix, W is eigenvectors and the maximum value of the eigenvalues is the matrix A (Saaty, 2005).

In this study, three sets of paired comparison matrix are provided in the following. The preparation reason of each set of paired comparisons matrix is given in Table 1. Paired comparison matrix for the criteria to each other in relation to objective, paired comparison matrix for the sub criteria to each other in relation to the relevant criteria, paired comparison matrix for comparing options (insurance companies) to each other in connection with the sub-criteria.

Defuzzification of Expert Answers

Using network analysis phase although increases the capability of decision making method in reflection of the understanding of experts about the importance of phenomena, but the investigation of the adaptation of fuzzy responses of experts is more difficult from compatibility assessment the crisp number matrix because in this method it is necessary to examine the compatibility between the range of numbers. Since it is necessary to ensure from consistency of responses, it is necessary to convert fuzzy response to crisp ones And then using the definition of traditional hierarchical analysis that is generally accepted assess the accuracy and consistency of responses.

The conversion of the paired comparisons from fuzzy matrix to crisp scale is called the defuzzification of the paired comparison matrices. Several methods have been proposed for the defuzzification of the paired comparison matrices. So in this step the procedure of CFCS consists of five steps is used for defuxxified calculation results of decisions. The goal of the first step is the formation of matrix Z, which is called the matrix of direct links. These calculations have not great influence on the accuracy of the results in terms of transforming ideas into crisp numbers. Suppose $z_{ij} = (l_{ij}, m_{ij}, r_{ij})$ is triangular Fuzzy element of the $\tilde{Z}$matrix which reflects the fuzzy assessment of the about the significance of i criterion to jth criterion. For defuzification of the aggregated opinions of experts according to CFCS, 4 steps should be performed: a) forming normalized matrix of a direct relationship matrix (matrix $\tilde{X}$), b) Calculation of left sid normal values left (ls) and right side normal values (rs), c) calculation of the final crisp normal value, d) Calculation of the crisp values

Rate adaptation calculation

After the conversion of the paired comparisons from fuzzy matrix to crisp scale, it turns to the assessment of adaptation experts' responses. The following equations are used to calculate the rate of incompatibility.

This index indicates the degree of compatibility of crisp decision matrix. As can be seen, this index is dependent to n (the number of rows or columns of the paired comparisons matrix $\tilde{A}$). To normalize the index, it is divided to another indicator of the random index, RI. This index is obtained from the average of consistency decision index randomly generated. Table 2 shows the values of RI in various quantities. New index is called CR (Saaty, 1998).

$$CR = CI / RI$$

If $CR \leq 0.1$ for a paired comparison matrix, then the rate of adaptation is acceptable, otherwise the paired comparisons matrix should be modified to reduce the incompatibility.

Table 2. Random index values

n	3	4	5	6	7	8	9	10	11	12	13	14	15
RI	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49	1.51	1.48	1.56	1.57	1.59

Local weights calculation

After defuzzification of the paired comparison matrix, the local weight of final matrix is defuzzified and obtained by the following equation (Yang , 2008).

$$W_i = \frac{\left(\prod_{j=1}^{n} a_{ij}\right)^{1/n}}{\sum_{i=1}^{n}\left(\prod_{j=1}^{n} a_{ij}\right)^{1/n}} \quad , i, j = 1,2, \ldots., n$$

Calculation of the final weights (final score options)

For the final weight calculation, it is sufficient to multiply the local weight obtained at each level of analytic hierarchy process to another matrix.

RESULTS AND DISCUSSION

After the data collection through questionnaires, it turns to fuzzy analytic hierarchy process to be implemented. In this regard, the paired comparisons matrix should be calculated for the main criteria, sub-criteria and options using table 1. At this stage, it is necessary to calculate the rate adjustment for single-phase matrix of paired comparisons. After confirming the compatibility of paired comparisons, matrix phase can be integrated using the geometric mean. For example, in the following matrix, the matrix of fuzzy paired comparisons is aggregated based on the opinions of 13 experts from the Central Insurance about the main criteria.

Table 3. The matrix of fuzzy paired comparisons aggregation of 13 expert opinions about the main criteria

		C1			C2			C3	
C1	1.00	1.00	1.00	0.50	0.68	0.94	0.14	0.17	0.20
C2	1.06	1.47	2.00	1.00	1.00	1.00	0.48	0.54	0.62
C3	4.98	5.99	7.01	1.61	1.86	2.09	1.00	1.00	1.00
C4	3.44	4.11	4.76	1.00	1.16	1.36	0.36	0.40	0.45
		C4							
C1	0.21	0.24	0.29						
C2	0.74	0.86	1.00						
C3	2.22	2.50	2.75						
C4	1.00	1.00	1.00						

The final 12 × 7 matrix is defuzzified using the above equations.
The results of these relations i.e. the normalized values, normal left side values (ls) and normal right side values (rs), the final normal crisp value and crisp value are given in the tables below.

Table 4. Normalized values

		C1			C2			C3	
C1	0.125	0.125	0.125	0.052	0.079	0.116	0.000	0.004	0.009
C2	0.134	0.194	0.271	0.125	0.125	0.125	0.049	0.058	0.070
C3	0.705	0.852	1.000	0.214	0.250	0.284	0.125	0.125	0.125
C4	0.480	0.578	0.672	0.125	0.148	0.178	0.032	0.038	0.045
		C4							
C1	0.010	0.015	0.022						
C2	0.087	0.105	0.125						
C3	0.303	0.344	0.380						
C4	0.125	0.125	0.125						

Table 5. the normal left side and right side value

	C1		C2		C3	
	xls_{ij}	xrs_{ij}	xls_{ij}	xrs_{ij}	xls_{ij}	xrs_{ij}
C1	0.125	0.125	0.077	0.112	0.004	0.009
C2	0.183	0.251	0.125	0.125	0.058	0.069
C3	0.742	0.871	0.242	0.275	0.125	0.125
C4	0.527	0.614	0.145	0.173	0.038	0.045

	C4	
	xls_{ij}	xrs_{ij}
C1	0.014	0.022
C2	0.103	0.123
C3	0.330	0.367
C4	0.125	0.125

Table 6. The final normalized crisp value

	C1	C2	C3	C4
C1	0.125	0.080	0.004	0.015
C2	0.199	0.125	0.058	0.105
C3	0.841	0.250	0.125	0.343
C4	0.576	0.150	0.038	0.125

Table 7. The crisp values (the direct relation matrix or Z matrix)

	C1	C2	C3	C4
C1	1	0.693	0.170	0.241
C2	1.506	1	0.542	0.864
C3	5.921	1.860	1	2.496
C4	4.098	1.168	0.401	1

Local weights of criteria and sub-criteria

After aggregation of the opinion of experts and the formation of the matrix of paired comparisons, the defuzzification is performed. This process is performed based on Aprykvych Tzng method (2003) that is described in the relationship 2 to 8 (Tables 4 to 7). Defuzzified paired comparison matrix that are the same crisp values presented in table 7 are again presented in the table below. Local weights are extracted from the matrix using equation (11). Local weights obtained for the main criteria have been reported in the last column of the table below. It should be noted that prior to the measurement and aggregation of expert opinion after using the geometric mean, the compatibility of the aggregated responses has to be evaluated. The calculation of the compatibility of matrix is reported in the table below that represents the matrix is compatible. As previously mentioned, the reliability of questionnaire is investigated via the adjustment index. If the consistent index is $CR \le 0.1$, questionnaire validation will be acceptable. Given the consistency index of criteria and sub-criteria reported in the table (8) to (13), it can be concluded that the designed questionnaire has the acceptable validity.

Table 8. Defuzzified paired comparisons matrix of the main criteria, local weights, and adjustment rate

	C1	C2	C3	C4	Local weight
C1	1	0.693	0.170	0.241	0.086
C2	1.506	1	0.542	0.864	0.191
C3	5.921	1.860	1	2.496	0.478
C5	4.098	1.168	0.401	1	0.246
			CR=0.095≤0.1		

Similarly the above calculation procedure can be performed for each set of sub-criteria to calculate their local weight. The following tables show defuzzified comparison matrix, local weights and adjustment rate for each group of sub-criteria.

Table 9. defuzzified paired comparisons matrix of the sub-criteria, local weights, and adjustment rate

	C21	C22	C23	C24	Local weight
C21	1	0.110	0.110	0.110	0.029
C22	8.917	1	0.694	0.170	0.156
C23	8.917	1.441	1	0.210	0.197
C24	8.917	5.965	4.859	1	0.617
		CR=0.014≤0.1		Compatible Matrix	

Table 10. defuzzified paired comparisons matrix of the learning sub-criteria, local weights, and adjustment rate

	C31	C32	C33	C34	Local weight
C31	1	0.110	0.110	0.110	0.031
C32	8.917	1	0.644	0.191	0.166
C33	8.917	1.593	1	0.311	0.236
C34	8.917	5.132	3.221	1	0.567
		CR=0.052≤0.1		Compatible Matrix	

Table 9. defuzzified paired comparisons matrix of the financial sub-criteria, local weights, and adjustment rate

	C31	C32	C33	C34	Local weight
C31	1	0.140	0.150	0.170	0.048
C32	6.851	1	0.514	1.252	0.284
C33	6.501	1.950	1	1.252	0.391
C34	5.939	0.828	0.828	1	0.278
	CR=0.033≤0.1		Compatible Matrix		

Table 9. defuzzified paired comparisons matrix of the customer sub-criteria, local weights, and adjustment rate

	C41	C42	C43	C44	Local weight
C41	1	3.428	5.234	5.698	0.558
C42	0.293	1	3.022	6.580	0.273
C43	0.190	0.336	1	3.022	0.116
C44	0.170	0.150	0.336	1	0.053
	CR=0.060≤0.1		Compatible Matrix		

Local weight of options (insurance companies)

Similarly the above calculation procedure can be performed for fuzzy paired comparisons matrix with respect to each sub criteria and local weight of each item can be calculated in relation to the sub criteria. The following table shows the local weights and adjustment rates resulting from paired comparisons matrix of options (insurance companies) in relation to sub-criteria.

Table 13. Local Weights adjustment rate of paired comparison matrix of options in relation to sub-criteria

	Local weights							
	C11	C12	C13	C14	C21	C22	C23	C24
A1	0.112	0.192	0.126	0.027	0.200	0.054	0.117	0.200
A2	0.310	0.227	0.448	0.254	0.207	0.362	0.333	0.200
A3	0.122	0.184	0.145	0.279	0.200	0.338	0.323	0.200
A4	0.102	0.173	0.136	0.236	0.193	0.128	0.113	0.200
A5	0.356	0.224	0.145	0.204	0.200	0.118	0.113	0.200
CR	0.052	0.098	0.070	0.075	0.092	0.043	0.092	0.022
	C31	C32	C33	C34	C41	C42	C43	C44
A1	0.127	0.117	0.055	0.200	0.200	0.140	0.230	0.233
A2	0.347	0.333	0.343	0.200	0.200	0.448	0.230	0.244
A3	0.342	0.113	0.343	0.207	0.200	0.140	0.230	0.244
A4	0.054	0.323	0.130	0.193	0.200	0.145	0.230	0.242
A5	0.129	0.113	0.130	0.200	0.200	0.126	0.078	0.037
CR	0.046	0.042	0.067	0.062	0.090	0.095	0.024	0.10

The final weight Options

As previously mentioned, in the AHP method to calculate the final score options, local weight of each AHP level are multiplied as a matrix together. After the final weight calculation of options (insurance companies), they are reported in the following figure.

Table 14. Results of the implementation of fuzzy analytic hierarchy process for evaluation of the performance of insurance companies

Insurance company	Final weight	Ranking
Asia insurance co.	0.106	5
Iran insurance co.	0.232	1
Karafarin insurance co.	0.197	2
Dana insurance co	0.158	3
Dey insurance co	0.130	4

As can be seen in table (14), the Asia and Karafarin insurance co. have achieved the highest final score higher than other companies. Therefore, the company ranked first and second in terms of performance among other companies.

On the other hand, Asia Insurance earned the lowest score that shows that it has the minimum performance in comparison with the other five companies. These results are depicted graphically in the following figures.

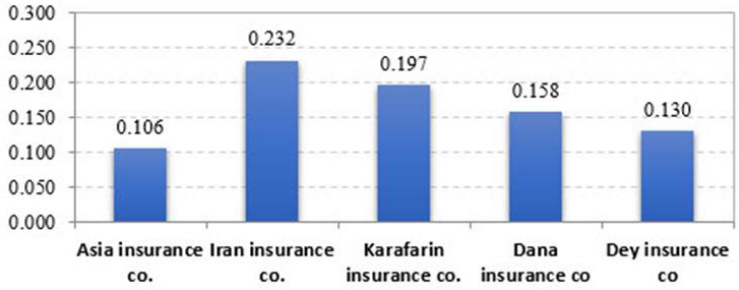

Figure 1. the final weight (score) of insurance companies

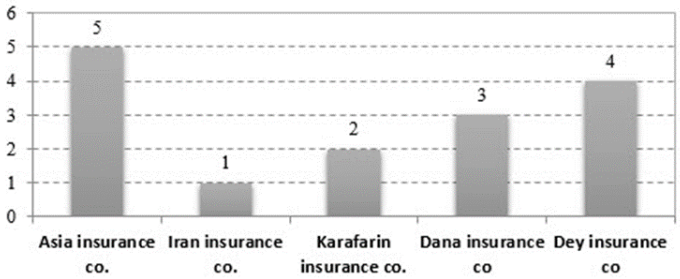

Figure 2. the performance ranking of insurance companies.

CONCLUSION

First, the identification of the functional criteria and sub-criteria of the insurance company was performed. For this purpose, by taking advantage of the literature and experts opinions, a comprehensive list of criteria and sub-criteria of the insurance companies was extracted based on the balanced score card and in the four perspectives of financial, customer, internal processes and learning and growth. Then these criteria and sub-criteria were localized with input from experts in the insurance industry and finally, the following criteria and sub-criteria were used for evaluation of the performance of insurance companies:

Table 15. Functional Criteria and sub-criteria used in this study

	The main criteria	The sub-criteria
1	Internal processes (C1)	Average settlement for damages (C11)
		Timely reminder of the insured to renew their insurance contracts (C12)
		Premium issued to personnel (C13)
		Efficiency of equipment and facilities (C14)
2	Growth and learning (C2)	Investment in education to the client (C21)
		Hours spent on research and development (C22)
		Number of trained staff to manage the units and departments (C23)
		The annual cost of training per person (C24)
3	Financial (C3)	The premium (C31)
		Loss ratio (C32)
		The average cost of the previous year (C33)
		Income from investments (C34)
4	Customer (C4)	Growth in the number of representatives (C41)
		Portfolio company market share of the total portfolio (C42)
		Attraction of new customers, in addition to previous customers (C43)
		Customer satisfaction (C44)

After identification of the criteria and sub-criteria in the insurance industry, five active insurance companies with the largest market share among other companies in the country, have been selected for the assessment. These

insurance companies include: Asia insurance co., Iran insurance co., Karafarin insurance co., Dana insurance co, and Dey insurance co.

In order to evaluate and prioritize the insurance companies, the analytic hierarchy process was used. Moreover, in order to determine the criteria and sub-criteria importance, this method is used. In this way, using the paired comparisons between criteria and sub-criteria, their importance is determined in relation to each other. This task is was performed using questionnaires and experts' opinions.

Also, due to the uncertainty and confusion in experts' opinions about the questions of fuzzy analytic hierarchy process, Fuzzy concepts and relationships were utilized to model the uncertainties and ambiguities. From the usual methods used for solving multi-criteria decision making in the context of uncertainty, fuzzy AHP method can be mentioned.

Results of implementation of this method of data collection showed that Iran and Karafarin insurance companies have the best performance among the insurance companies. Dana, Dey and Asia are next in order of priority. The figure below shows the priority ranking of insurance companies studied in this paper in terms of their performance.

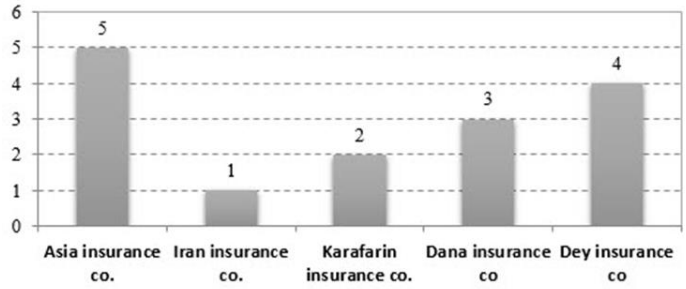

Figure 3. Prioritization of insurance companies in terms of their performance

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