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Identifying and Ranking the Factors Affecting on the Promotion of Tax Culture using Fuzzy AHP and Fuzzy TOPSIS

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Abstract If tax culture is a set of attitudes, insights and reactions of people against tax system, lack of positive response of tax payers for doing their legal duties and taxes are considered as a remark on tax culture weakness. The main purpose of this study was to rank the importance of effective factors in tax culture of Tax Office in West of Tehran using Fuzzy AHP (FAHP) and Fuzzy TOPSIS (FTOPSIS) techniques. 50 cases of tax experts to answer questionnaires were analyzed by paired comparisons. With a survey research, the components and sub-components affecting the tax culture has been identified. To rank the factors and tax departments, two questionnaires were used to collect the views of experts. The first questionnaire was related to paired comparison of factors affecting the tax culture techniques using FAHP and the second questionnaire was about the relative importance of criteria and alternatives using FTOPSIS technique. After ranking, using the Spearman correlation coefficient, the validity of responses was measured. The results in FAHP indicated that social factors and organizational factors are equally important and individual factors are less important than the others. The rank of tax departments with order included Shahriar, Shahre Qods, Robatkarim and Baharestan and the results of ranking fuzzy TOPSIS tax administration with order included Tax affairs office of Shahryar, Rabat Karim, Shahre Qods and Baharestan. Given the different results obtained by the two methods, by using the integrated method POSET showed that the tax affairs of the Robat Karim, Shahriar, Shahre Qods and Baharestan respectively are important.

Keywords: Tax, Tax Culture, Fuzzy TOPSIS, Fuzzy AHP.

1 Introduction

Culture includes all one acquires as a member of society that means all habits and actions that a person learns via experiences and custom together with all material things which are produced by group and what can be manifested in artistic works or scientific studies[1]. Tax culture creates a set of attitudes, insight, interpretation, ideals, social values, current regulations and people's awareness from tax [2].

Tax is one of the main sources of government revenue and collecting tax by government and paying tax by payers is merely common and rational cooperation to supply general costs

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and social requirements [3]. Nowadays tax is as governments' revenue which plays a significant role in economy of each country [4]. Nowadays the progressive governments have achieved the solution for many of the problems related to proposing and executing tax provisions along with progression of science, technology and in accordance with civilization of current era [5]. Regarding the importance of paying tax by people and manner of its costing by government, tax culture shall be considered as a whole in the society [3].

Propagation and growth of tax culture is one of the most basic necessities of any proper tax system in a society. Considering it is one of the most basic compliance problems which includes tax collection. This problem will be only solved via society's general culture and following it via tax culture [6].

Tax is one of the characteristics of social system; its acceptance by the nation and manner of its execution by the government, the sensitivity of experts and national governmental organizations to it depends on cultural characteristics [7]. On the other hand, the implanting incorrect tax policies weakens the different economic sectors and lead to lack of supplying financial resources of government and slowing the economic and social development [1]. Tax culture includes a set of behaviors and actions in a tax system between tax payers and tax organization [8].Tax programs are considered as one of the development tools in advanced and/or developing countries. In many countries, citizen equals to taxpayer. Nowadays, about all over the world, people accept that if they receive a service in their daily life, they shall pay its cost directly or indirectly [9]. Creating confidence and good spirits among members of a society requires conditions; the most important of which is fairness of received tax, sufficiency of tax department and rational governmental expenses [10]. If people know government as efficient serving, in other words, if they consider it fairly and humanistic, the people undertake to show more compliance for paying taxes and reduce tax avoidance and tax escape[11]. In advanced industrial countries, tax escape is a crime which will have social and economic consequences for the wrongdoer. Many politicians left the policy due to tax violations [12].

The main purpose of this research is identifying the importance of components, subcomponents and tax departments in the promotion of tax culture using FAHP and FTOPSIS methods. The auxiliary aims include identifying the importance and ranking the socializing factors and its subsets, identifying the importance and ranking of organizational factors and its subsets, identifying the importance and ranking of individual factors and its subsets, identifying the importance and ranking of tax departments in the promotion of tax culture using FAHP and FTOPSIS methods.

2 Review of Literature

Mohseni Tabrizi, Komeijani, Abbaszadeh [1] in their study on "studying the effective factors on tax culture among tax payers of employed ones" studied four main hypotheses including socializing factors, external organizational factors, internal organizational factors and individual factors related to tax culture together with totally 17 auxiliary hypotheses. Regarding the findings, the above four hypotheses are verified and has significant correlation in 99% confidence. This study was a survey one, the population of which was 85 ones of stationary businessmen at Alborz General Department of Tax Affairs, having used Cochran formula, the sample size was estimated at 265 ones and the sampling was done in two stages.

The method of information gathering in this research is using questionnaire by 5-point Likert including very high, high, medium, low and very low with 51 items for realizing the

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research hypothesis. All principal and auxiliary hypotheses were verified. The research findings show that social factors are effective in increasing tax culture. All external organizational and internal organizational factors are effective in increasing tax culture.

Mollazadeh [13] studied the effective factors on the promotion of tax culture among payers of value-added tax system of West Azerbaijan (gold merchants). The research methodology is considered as survey. Statistical society includes 1102 gold merchants in West Azerbaijan general department of tax affairs. The sample size was obtained at 285 ones using Cochran formula and sampling was done in two phases. At first, the share of each class (city) and number of samples were determined by class sampling and then the number of samples was chosen via random sampling. The method of gathering information in this research in 5-point Liker scale questionnaire which examined the research hypotheses with 51 items and Excel and SPSS was used for data analysis. The mentioned research has 4 main hypotheses and 17 auxiliary hypotheses. The main factors include socializing factors, external organizational, internal organizational and individual factors and the research findings show that all main and auxiliary factors are effective in this research.

Nerre [14] proposed that studying tax culture is unlimited for tax payers while there is need for using limited view and historical studying of tax and clarifying the diversity of tax culture for extending its comprehension and within globalization process, two different types of disorders are known for tax culture: tax culture shock and tax culture pause which are resulted from lack of knowledge or racism which are part of political criteria, though tax culture pauses required transformation or amendments during the time. The shock necessities hinder the proper execution of tax political criteria in international (national) level in tax culture.

Alm and Orgler [15] whose work based on the study by Teskium et.al studied the relationship between the dimensions of national culture and tax escape and used multiple criteria for obtaining more documents for tax escape in this regard. The mentioned study was expanded which was the developed model of primary tax escape of Teskium et.al which was about the relationship between national dimensions of culture and tax escape. For example, the effect of law, policy and foreign variable along with culture are the ground for tax escape in countries. In this regard, the data were obtained from 47 countries and then they were controlled for economic development via regressive results which shows higher level of uncertainty which is inevitable which is lower level of individualism, law enforcement, trust to government and religious bias which are higher level of tax escape in countries. These findings are the remaining issues for multiple scale of tax escape. The policy makers shall consider the findings of this study in probable assessment for tax escape in culture, law, policy, religious view and amendment policies of tax development for reducing tax escape.

The effective criteria on tax culture were extracted via available literature which are brought in table 1 as a general summing up after verifying and doing amendment of esteemed professors and also the experts employed at west tax affairs of Tehran province.

3 Research Methodology

One of the characteristics of scientific study which aims at finding truth is using a proper research method and choosing proper research method depends on aims, nature and subject of research and executive features and the goal of research is easy and accurate access to answers of research questions [16].

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Table 1 Effective Criteria on Tax culture

Main classification	Auxiliary indexes
Social factors	1. Multimedia advertisement
	2. Guild unions
	3. Paying taxes by other people
Individual factors (external organizational)	4. Experience of paying taxes
	5. Academic status
	6. Familiarity with law and regulations
	7. Constitutionalism
	8. Having legal lawyer
Organizational factors	9. Encouraging good dealer payers
	10. Manner of guiding tax officers
	11. Manner of tax collection
	12. E-tax

The current study is considered as applied research in terms of aim. In this research, the researcher seeks to study the effective factors on tax culture and present a model for prioritizing them, so this research is a descriptive survey.

At first stage, the assessment indexes and criteria in tax culture are identified via library study, searching in valid scientific sites and studying available scientific texts. At second stage, the fuzzy analytical hierarchy process is used for computing the indexes and choices weight (departments of tax affairs) and the priority of each of the choices are identified. Then, having using fuzzy TOPSIS technical, the choices are prioritized and finally these two methods will be compared with each other.

In the current study, two questionnaires were used for gathering the view of experts. The first questionnaire was related to couple comparing among the effective factors on tax culture by which the weight of each of the criteria and choices was determined by FAHP and second questionnaire measures the relative importance of criteria and choices to prioritize the available choices via using FTOPSIS technique. The statistical population in this research is the experts at West department of tax affairs in Tehran province and according to the investigations, there are totally 50 ones which are considered as statistical population. Since the statistical population in this research is the experts of west department of tax affairs in Tehran province which is 50 ones, the sampling was not done and all the population was studied. After preparing questionnaires, there were given to professors and tax experts, they were verified after solving the ambiguities. After collecting questionnaires, the consistency rate was computed for each of the questionnaires of which 4 questionnaires had more than 1% consistency rate which were returned to experts again to review their responses. After receiving them and computing the consistency rate, it became clear that they had less than 1% consistency rate which indicates reliability. Figure 1 indicates the schematic research stages.

In this research, multi-criteria decision-making techniques were used for data analysis which is as follow:

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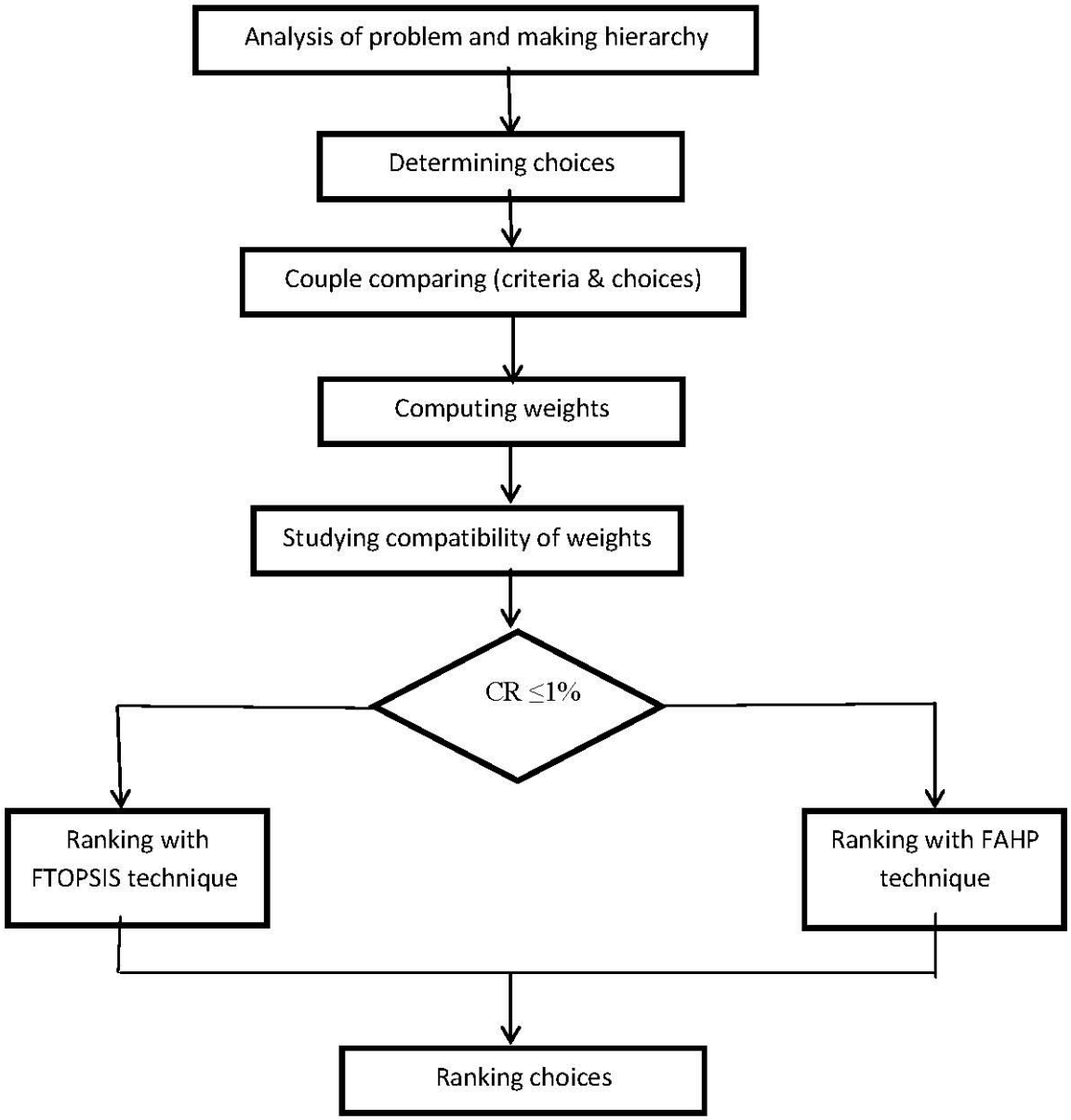

Fig. 1 Research Stages

3.1 Fuzzy Analytical Hierarchy Process (FAHP)

Although FAHP aims at achieving the opinions of experts and specialists, ordinary analytical hierarchy process does not reflect the human though accurately since in couple comparing, it uses the exact numbers. One of the other reasons which criticize the analytical hierarchy process is the availability of unbalanced scale in judges, uncertainty and inaccurate couple comparing. Decision makers mostly cannot announce their opinion explicitly about superiority since the couple comparing are basically fuzzy. Therefore they prefer presenting a range instead of a fixed number in their judgments. For overcoming this problem, fuzzy analytical hierarchy process is proposed. In fuzzy analytical hierarchy process, after preparing hierarchy graph, the decision-makers are asked to compare the elements of each level with each other and express the relative importance by fuzzy numbers. For example, table 2

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defines some of triangular fuzzy numbers and their membership functions are mentioned. Figure 2 shows fuzzy membership functions for language materials [17].

Table 2 some of fuzzy numbers

Fuzzy number	Definition	Triangular fuzzy scale	Range	Membership function
$\tilde{9}$	Absolute importance	(9،9،7)	7≤x≤9	$\frac{x-7}{9-7}$
$\tilde{7}$	Very strong importance	(9،7،5)	7≤x≤9 5≤x≤7	$\frac{9-x}{9-7}$ $\frac{x-5}{7-5}$
$\tilde{5}$	Strong importance	(3،7،5)	5≤x≤7 3≤x≤5	$\frac{7-x}{7-5}$ $\frac{x-3}{5-3}$
$\tilde{3}$	Weak importance	(5،3،1)	3≤x≤5 1≤x≤3	$\frac{5-x}{5-3}$ $\frac{x-1}{3-1}$
$\tilde{1}$	Moderate importance	(3،1،1)	1≤x≤3	$\frac{3-x}{3-1}$
1	Exactly equal	(1،1،1)	------	------

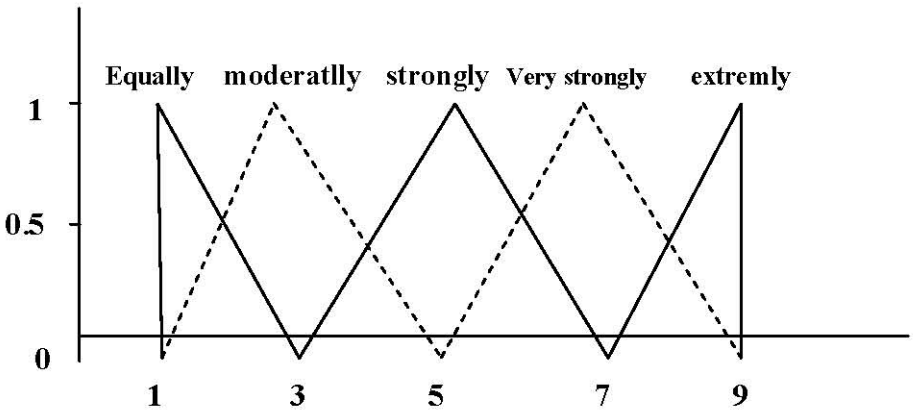

Fig. 2 fuzzy membership function

Stages of analytical hierarchy process as Chen method [18] is as follow:
Stage 1: drawing hierarchy graph
Stage 2: drawing fuzzy numbers for doing couple comparing
Stage 3: creating couple comparing matrix via using fuzzy numbers
Couple comparing matrix of $(\tilde{A})$ will be as follow:

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$$\tilde{A}=\begin{bmatrix} 1 & \tilde{a}_{12} & \cdots & \tilde{a}_{1n} \\ \tilde{a}_{21} & 1 & \cdots & \tilde{a}_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ \tilde{a}_{n1} & \tilde{a}_{n2} & \dots & 1 \end{bmatrix} \quad (1)$$

This matrix includes the following fuzzy numbers:

$$_{ij}=\begin{cases} 1 & i=j \\ \tilde{1},\tilde{3},\tilde{5},\tilde{7},\tilde{9} \text{ or } \tilde{1}^{-1},\tilde{3}^{-1},\tilde{5}^{-1},\tilde{7}^{-1},\tilde{9}^{-1} & i\neq j \end{cases} \quad (2)$$

If decision-making committee has several decision-makers, entries of comprehensive couple comparing matrix which are used in fuzzy analytical hierarch process is a triangular fuzzy number, the first component is minimum feedback, the second component is mean of feedback and third component is maximum feedback.

Stage 4: computing S_i for each of couple comparing matrix rows of S_i which is a triangular fuzzy number is computed by equation3:

$$S_i=\sum_{j=1}^{m} M_{gi}^{j} \otimes \left[\sum_{i=1}^{n}\sum_{j=1}^{m} M_{gi}^{j}\right]^{-1} \quad (3)$$

In this equation, *i* indicate row number and j indicates column number.

M_{gi}^{j} is the triangular fuzzy number if couple comparing matrix in this equation.

$\left[\sum_{i=1}^{n}\sum_{j=1}^{m} M_{gi}^{j}\right]^{-1}, \sum_{j=1}^{m} M_{gi}^{j}, \left[\sum_{i=1}^{n}\sum_{j=1}^{m} M_{gi}^{j}\right]^{-1}$ are computed via equations 4, 5, and 6 respectively.

$$\sum_{j=1}^{m} M_{gi}^{j}=\left(\sum_{j=1}^{m} l_j, \sum_{j=1}^{m} m_j, \sum_{j=1}^{m} u_i\right) \quad (4)$$

$$\sum_{i=1}^{n}\sum_{j=1}^{m} M_{gi}^{j}=\left(\sum_{i=1}^{m} l_i, \sum_{i=1}^{m} m_i, \sum_{i=1}^{m} u_i\right) \quad (5)$$

$$\left[\sum_{i=1}^{n}\sum_{j=1}^{m} M_{gi}^{j}\right]^{-1}=\left(\frac{1}{\sum_{i=1}^{n} u_i}, \frac{1}{\sum_{i=1}^{n} m_i}, \frac{1}{\sum_{i=1}^{n} l_i}\right) \quad (6)$$

In above equations, l_i, m_i, and u_i are first to three components of fuzzy numbers respectively.

Stage 5: Computing the bigness of Si compared to each other totally if $M_1=(l_1,m_1,u_1)$ and $M_2=(l_2,m_2,u_2)$ are two triangular fuzzy numbers, according to figure 3, the bigness of M_1 compared to M_2 is defined as equation 7.

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$$V(M_2 \geq M_1) = hgt(M_1 \cap M_2) = \mu_{M_2}(d) = \begin{cases} 1 & if\ \ m_2 \geq m_1 \\ 0 & if\ \ l_1 \geq u_2 \\ \dfrac{l_1 - u_2}{(m_2 - u_2) - (m_1 - l_1)} & otherwise \end{cases} \quad (7)$$

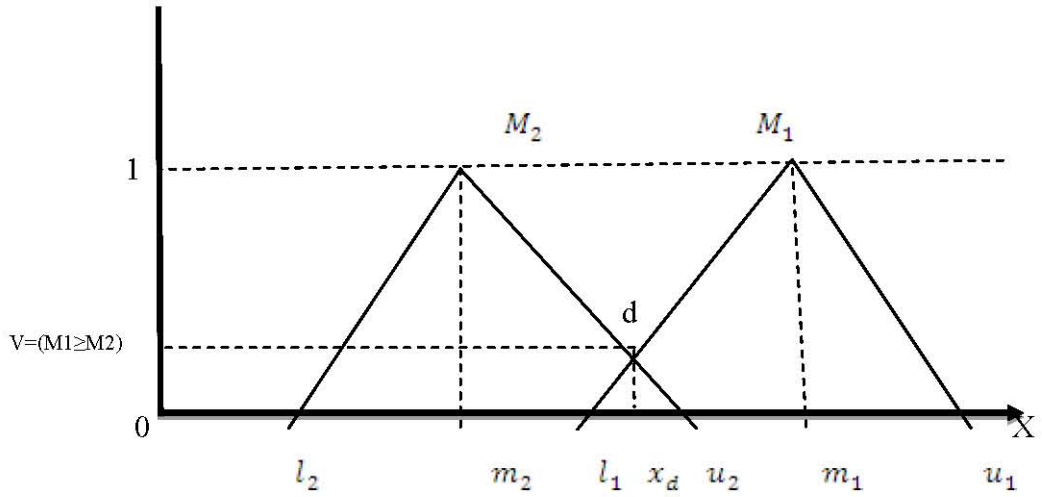

Fig. 3 bigness of M_1 compared to M_2

On the other hand, bigness of a triangular fuzzy number from K other triangular fuzzy number is obtained via equation 8:

$$V(M \geq M_1 \geq M_2, ..., M_k) = V\left[(M \geq M_1)\ and\ (M \geq M_2)\ and\ ...\ and\ (M \geq M_k)\right] \quad (8)$$
$$= MinV(M \geq M_i), \quad i = 1, 2, 3, ..., k$$

Stage 6: Computing weight of criteria and choices in couple comparing matrixes
Equation 9 is used in this regard:

$$d'(A_i) = MinV(S_i \geq S_k) \qquad k = 1, 2, ..., n \ \ , \ \ k \neq i \quad (9)$$

Non-normalized weight vector will be as equation 10:

$$W' = (d'(A_1), d'(A_2), ..., d'(A_n))^T \qquad A_i (i = 1, 2, ..., n) \quad (10)$$

Stage 7: Computing final weight vector
For computing final weight vector, the weight vector which was computed in previous stage is normalized, so:

$$W' = (d(A_1), d(A_2), ..., d(A_n))^T \quad (11)$$

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3.2 Fuzzy TOPSIS Technique

Fuzzy TOPSIS method which is proposed in this study is ranking the available choices regarding the criteria in fuzzy and inaccurate settings. In this research, the verbal variables for factors' importance of weight are as very high (VH), high (H), moderate high (MH), moderate (M), moderate low (ML), low (L), very low (VL) and also the verbal variables for rates of the criteria of each choice is as very good (VG), good (G), moderate good (MG), moderate (M), moderate poor (MP), Poor (P), and very poor (VP). For more explanation related to fuzzy TOPSIS in this part, Chen and Howang method [18] is described:

Stage 1: Establishing fuzzy decision matrix

Assume that we have 3 alternative, n criteria and k decision-maker. The fuzzy multi-criteria group decision-making can be expressed as follow in matrix:

$$\tilde{D} = \begin{array}{c} \\ A_1 \\ \vdots \\ A_i \\ \vdots \\ A_m \end{array} \begin{array}{c} \begin{array}{cccccc} C_1 & \cdots & C_j & \cdots & C_n \end{array} \\ \begin{bmatrix} \tilde{x}_{11} & \cdots & \tilde{x}_{1j} & \cdots & \tilde{x}_{1n} \\ \vdots & & \vdots & & \vdots \\ \tilde{x}_{i1} & \cdots & \tilde{x}_{ij} & \cdots & \tilde{x}_{in} \\ \vdots & & \vdots & & \vdots \\ \tilde{x}_{m1} & \cdots & \tilde{x}_{mj} & \cdots & \tilde{x}_{mn} \end{bmatrix} \end{array} \qquad i = 1,2,...,m;\ j=1,2,...,n \tag{12}$$

In which $A_1, A_2, \ldots, A_2$ are alternatives which should be chosen or prioritized. $C_1, C_2, \ldots, C_n$ are criteria with assessment features. $\tilde{x}_{ij}$ Shows alternative degree of Ai compared to criteria with Ci feature by K assessor. For integrating $\tilde{x}_{ij}$ fuzzy function point, K assessor from mean value is used:

$$\tilde{x}_{ij} = \frac{1}{k}(\tilde{x}_{ij}^1 + \tilde{x}_{ij}^2 + ... + \tilde{x}_{ij}^k) \tag{13}$$

In which $\tilde{x}_{ij}^k$ is Ai alternative degree compared to criteria with Ci feature by K assessor is shown.

$$\tilde{x}_{ij}^k = (a_{ij}^k, b_{ij}^k, c_{ij}^k) \tag{14}$$

Second step: normalizing fuzzy decision matrix

The obtained raw date should be normalized for eliminating deviation units and different measurement scales in multi-criteria decision-making. Linear normalizing is used in this method. If $\tilde{R}$ is matrix of normalized fuzzy decision, so:

$$\tilde{R} = [\tilde{r}_{ij}]_{m\times n}, \quad i=1,2,...,m;\ j=1,2,...,n \tag{15}$$

In which:

$$\tilde{r}_{ij} = (\frac{a_{ij}}{c_j^+}, \frac{b_{ij}}{c_j^+}, \frac{c_{ij}}{c_j^+}) \tag{16}$$

$$c_j^+ = \max_i(c_{ij}) \tag{17}$$

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Third step: establishing normalized weight fuzzy decision matrix
Having considered the different weight for each feature or criteria, normalized weight decision matrix can be computed by the multiplying the importance of criteria weight to normalized fuzzy decision matrix.

Normalized weight decision matrix $\tilde{V}$ is defined as equation 18:

$$\tilde{V} = [\tilde{v}_{ij}]_{m\times n}, \quad i=1,2,...,m;\ j=1,2,...,n \tag{18}$$

$$\tilde{v}_{ij} = \tilde{r}_{ij} \otimes \tilde{w}_j$$

In which $\tilde{w}_j$ shows weight of criteria *j*.

Forth step: determining ideal positive solution and ideal negative solution
Since positive fuzzy numbers ranges 1 to 0, fuzzy ideal solution and negative fuzzy ideal solution can be defined as equation 19:

$$A^+ = (\tilde{v}_1^+, \tilde{v}_2^+, ..., \tilde{v}_n^+) \tag{19}$$

$$A^- = (\tilde{v}_1^-, \tilde{v}_2^-, ..., \tilde{v}_n^-)$$

In which

Positive Ideal alternative

$$A^+ = \left\{(\max v_{ij} \mid j \in J), (\min v_{ij} \mid j \in J' \mid i = 1,2,...,m\right\} = \left\{v_1^+, v_2^+, ..., v_j^+, ..., v_n^+\right\} \tag{20}$$

$$A^- = \left\{(\min v_{ij} \mid j \in J), (\max v_{ij} \mid j \in J' \mid i = 1,2,...,m\right\} = \left\{v_1^-, v_2^-, ..., v_j^-, ..., v_n^-\right\} \tag{21}$$

Fifth step: Computing distance size
The distance of each alternative with positive ideal solution and fuzzy negative ideal solution is computed as equation 22 and 23:

$$d_i^+ = \sum_{j=1}^{n} d(\tilde{v}_{ij}, \tilde{v}_j^+), \quad i=1,2,...,m;\ j=1,2,...,n \tag{22}$$

$$d_i^- = \sum_{j=1}^{n} d(\tilde{v}_{ij}, \tilde{v}_j^-), \quad i=1,2,...,m;\ j=1,2,...,n \tag{23}$$

In which $d(\tilde{v}_a, \tilde{v}_b)$ shows the distance measurement between two fuzzy numbers and d_i^+ shows i alternative distance from ideal solution and d_i^- shows *i* alternative distance from negative ideal solution.
If two triangular fuzzy numbers are as follow:
$M(m_1, m_2, m_3), N(n_1, n_2, n_3)$
The fuzzy distance between these two numbers is computed as equation 24:

$$d(m,n) = \sqrt{\left[(m_1 - n_1)^2 + (m_2 - n_2)^2 + (m_3 - n_3)^2\right]} \tag{24}$$

Sixth step: computing proximity ratio and prioritizing alternatives
Having determined the proximity ratio, the ranking of all alternatives can be computed and decision-makers can choose the best alternative. The proximity ratio of each alternative is computed as equation 25:

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$$C_i = \frac{d_i^-}{d_i^+ + d_i^-}, \quad i=1,2,...,m \tag{25}$$

C_i index near to 1 shows the proximity of alternative to ideal solution and away from negative ideal solution. Therefore, the values more than C_i will show good function of A_i alternative.

4 Data Analysis

4.1 Computing Indices and Alternatives Weights by Fahp

In this part, having established hierarchy decision-making tree, the couple comparing matrix between indices and choices is established and finally the indices and choices weights is computed. For doing computations, Excel is used.

4.1.1 Establishing Decision-Making Hierarchy

Figure 4 shows the hierarchy of decision-making levels which is established according to doing interview and surveying with experts and library studies. Its first level includes aims, the second level includes main criteria of tax culture and its sub-criteria and third level is choices. It aims at determining weight of each of criteria and ranking choices.

Also Tax affairs offices include the tax affairs office of Shahryar (A_1), Rabat Karim (A_2), Baharestan (A_4) and Shahre Qods (A_4).

4.1.2 Doing Couple Comparing

Different stages of computing indices weight are as follow:
A: feedback from experts and creating couple comparing matrix

After determining effective criteria and sub-criteria on tax culture, the feedback form was prepared which includes all above criteria and were given to 50 experts. In this form, the experts were asked to express the importance of each of the parameters according to verbal variables of table 3 depending on their opinion.

Having gathered the opinions of experts, at first consistency rate of the judgments by each of the persons were studied. After determining the inconsistency rate of couple comparing by experts, it became clear that in 4 ones, consistency rate was more than 0.1. Therefore, the questionnaires were given again to experts to redo the couple comparing. After completing the questionnaires by experts, all the questionnaires have less than 0.1 consistency rate.

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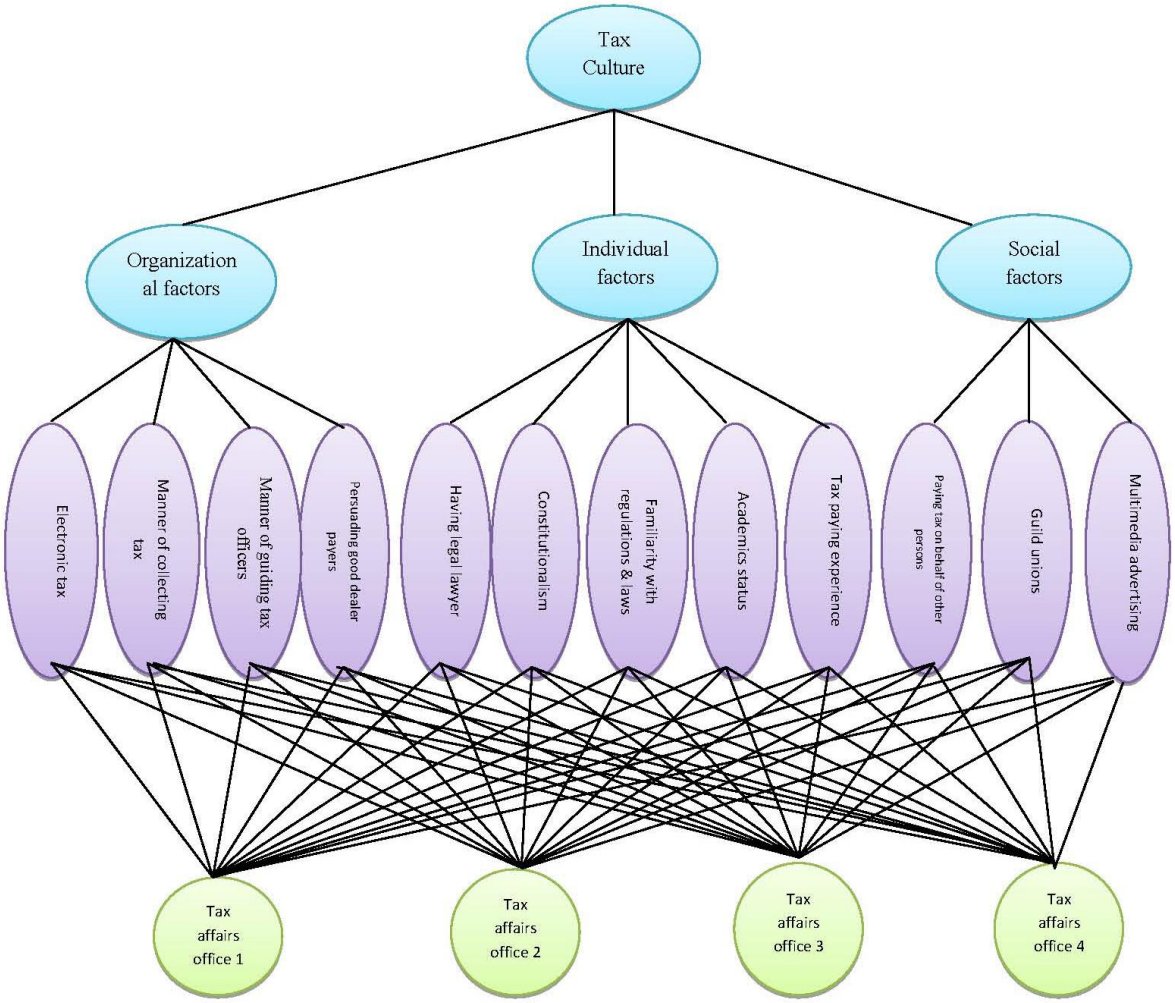

Fig. 4 graph of hierarchy structure of decision-making model

Table 3 used fuzzy spectrum in AHP (Habibi, Izadyar, Sarafrazi, 2014)

Verbal criteria	Corresponding triangular fuzzy numbers
equal	(1, 1, 1)
intermediate	(1, 2, 3)
A little more important	(2, 3, 4)
intermediate	(3, 4, 5)
More important	(4, 5, 6)
intermediate	(5, 6, 7)
Very more important	(6, 7, 8)
Intermediate	(7, 8, 9)
Absolutely more important	(9, 9, 9)

B: couple comparing among main criteria

For making the paper brief, expressing the couple comparing matrix by all experts is avoided and group couple comparing matrix is shown. For clarifying the discussion in these parts, the couple comparing matrix of two experts is shown as sample in table 4 and 5.

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Table 4 couple comparing matrix of main indices (first expert)

	Social factors			Individual factors			Organizational factors		
Social factors	1	1	1	0.25	0.33	0.50	0.17	0.20	0.25
Individual factors	2.00	3.00	4.00	1	1	1	1.00	1.00	1.00
Organizational factors	4.00	5.00	6.00	1.00	1.00	1.00	1	1	1

Table 5 couple comparing matrix of main indices (second expert)

	Social factors			Individual factors			Organizational factors		
Social factors	1	1	1	6.00	7.00	8.00	2.00	3.00	4.00
Individual factors	0.13	0.14	0.17	1	1	1	0.13	0.14	0.17
Organizational factors	0.25	0.33	0.50	6.00	7.00	8.00	1	1	1

For computing group couple comparing matrix, geometrical mean is used which combines corresponding inputs in all couple comparing matrices. Meanwhile, for computing relative weight of each of the couple comparing matrices, Chen development analytical method [18] is used. (Table 6).

Table 6 group couple comparing matrix of main indices

	Social factors			Individual factors			Organizational factors			Relative weight
Social factors	1	1	1	1.00	1.18	1.43	0.26	0.35	0.47	0.34
Individual factors	0.70	0.84	1.00	1	1	1	0.49	0.57	0.70	0.31
Organizational factors	2.12	2.85	3.87	1.43	1.75	2.05	1	1	1	0.34

After forming couple comparing matrices, weight vectors are determined by fuzzy hierarchy method as equations 4, 5, 6 which are as table 7.

Table 7 Computing $\sum_{j=1}^{m} M_{gi}^{j}$

	Social factors			Individual factors			Organizational factors			$\sum_{j=1}^{m} M_{gi}^{j}$		
Social factors	1	1	1	1.00	1.18	1.43	0.26	0.35	0.47	2.26	2.53	2.9
Individual factors	0.70	0.84	1.00	1	1	1	0.49	0.57	0.70	2.19	2.41	2.7
Organizational factors	2.12	2.85	3.87	1.43	1.75	2.05	1	1	1	4.55	5.6	6.92
			$\sum_{i=1}^{n}\sum_{j=1}^{m} M_{gi}^{j}$							9	10.54	12.52
			$\left[\sum_{i=1}^{n}\sum_{j=1}^{m} M_{gi}^{j}\right]^{-1}$							0.07	0.09	0.11

S_i is obtained as equations 3 according to table 8 for each of couple comparing matrices.

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Table 8 computing S_i for criteria

	$\sum_{j=1}^{m} M_{gi}^{j}$				$\left[\sum_{i=1}^{n}\sum_{j=1}^{m} M_{gi}^{j}\right]^{-1}$					S_i
S_1	2.26	2.53	2.9	$\otimes$	0.07	0.09	0.11	0.16	0.23	0.32
S_2	2.19	2.41	2.7	$\otimes$	0.07	0.09	0.11	0.15	0.22	0.30
S_3	4.55	5.6	6.92	$\otimes$	0.07	0.09	0.11	0.31	0.50	0.76

The bigness of each of S_i to each other will be as equations 7 and 8:

$$V(S_1 \geq S_2) = 1 \qquad V(S_1 \geq S_3) = 0.07$$
$$V(S_2 \geq S_1) = 1.68 \qquad V(S_2 \geq S_3) = 0.06$$
$$V(S_3 \geq S_1) = 1 \qquad V(S_3 \geq S_2) = 0.07$$

Then, relative weight of each of criteria (normalized weight and non-normalized weight) is obtained according to equation 9 and 10 as table 9. Computing relative weight of each of sub-indices is done in the same way.

Table 9 computing the relative weight of criteria

	Non-normalized weight	Normalized weight
Social factors	0.070	0.34
Individual factors	0.066	0.31
Organizational factors	0.070	0.34

D: Computing relative and final weight of Alternatives

In continuing the final weight of each of the alternatives is computed according to equation 11, the results of which are shown in table 10.

Table 10 final weight of choices

index	Weight of main indices	Sub-index	Relative weight	Tax office of shahryar	Tax office of Robat Karim	Tax office of Baharestan	Tax office of Qods
Social factors	0.340	Multimedia advertisement	0.340	0.260	0.260	0.210	0.260
		Guilt unions	0.320	0.250	0.250	0.250	0.250
		Paying taxes on behalf of other	0.340	0.790	0.010	0.100	0.100
		Paying tax experience	0.220	0.400	0.400	0.140	0.070
Individual factors	0.310	Academic level	0.050	0.330	0.330	0.330	0.010
		Familiarity with regulations and laws	0.340	0.310	0.120	0.270	0.310
		constitutionalism	0.270	0.410	0.150	0.040	0.410
Organizational	0.340	Having legal lawyer	0.110	0.250	0.250	0.250	0.250
		Persuading good dealer payers	0.020	0.350	0.270	0.250	0.120

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index	Weight of main indices	Sub-index	Relative weight	Tax office of shahryar	Tax office of Robat Karim	Tax office of Baharestan	Tax office of Qods
factors		Manner of guiding tax officers	0.310	0.370	0.320	0.170	0.170
		Manner of collecting taxes	0.020	0.490	0.010	0.490	0.010
		Electronic taxes	0.650	0.270	0.270	0.200	0.270
		Sum of points		**0.361**	**0.220**	**0.185**	**0.228**

Weight of each of the alternatives according to the computations is brought in table 11.

Table 11 ranking choices by FAHP method

Tax offices	weight	Final rank
Tax office of shahryar	0.361	1
Tax office of Robat karim	0.220	3
Tax office of Baharestan	0.185	4
Tax office of Qods	0.228	2

The results indicates that tax office of Shahryar is in rank one due to tax culture and after it, tax offices of Qods, Robat Karim and Baharestan are in next ranks.

4.2 Ranking Tax Affairs Offices By Fuzzy TOPSIS Technique

Computing the fuzzy TOPSIS algorithm is as follow:

Step 1: **Establishing fuzzy decision matrix**
After gathering data by questionnaire and combining the opinions of experts, decision matrix is established according to equation 12, 13, and 14 as table 12.

Table 12 fuzzy TOPSIS decision-making matrix

	Tax office of shahryar			Tax office of Robat Karim			Tax office of Baharestan			Tax office of Qods		
Multimedia advertisement	2.00	4.00	6.00	1.33	3.00	5.00	1.17	2.83	4.67	1.00	2.50	4.33
Guilt unions	4.17	5.83	7.33	3.83	5.50	7.17	2.67	4.00	5.67	2.67	4.17	6.00
Paying taxes on behalf of other	3.00	2.83	4.67	3.17	4.83	6.50	3.33	4.83	6.33	3.50	5.17	6.67
Paying tax experience	5.67	7.33	8.50	5.33	7.17	8.50	4.33	6.00	7.33	5.00	6.67	8.00
Academic level	5.00	6.83	8.33	4.33	6.33	8.00	3.67	5.67	7.50	4.00	6.00	7.83
Familiarity with regulations and laws	7.00	8.67	9.50	5.33	7.17	8.67	1.67	3.17	4.83	2.33	3.83	5.50
Constitutional ism	5.00	6.83	8.33	3.33	5.17	6.83	2.33	3.83	5.50	2.33	3.83	5.50

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	Tax office of shahryar			Tax office of Robat Karim			Tax office of Baharestan			Tax office of Qods		
Having legal lawyer	4.83	6.33	7.67	3.33	4.67	6.17	2.17	3.33	4.83	2.50	3.67	5.17
Persuading good dealer payers	2.83	4.67	6.67	2.50	4.33	6.33	2.00	3.67	5.67	2.33	4.00	6.00
Manner of guiding tax officers	5.33	7.17	8.83	5.33	7.17	8.83	6.33	8.00	9.17	5.00	6.83	8.50
Manner of collecting taxes	3.33	5.33	7.33	3.00	5.00	7.00	2.00	4.00	6.00	2.00	4.00	6.00
Electronic taxes	4.17	6.00	7.67	3.17	5.00	7.00	1.83	3.67	5.67	1.83	3.67	5.67

Step 2: normalizing fuzzy decision matrix

According to equations 15, 16, 17, the normalized decision-making matrix is obtained as table 13.

Table 13 normalized decision-making matrix

	Tax office of Shahryar			Tax office of Robat Karim			Tax office of Baharestan			Tax office of Qods		
Multimedia advertisement	0.33	0.67	1.00	0.22	0.50	0.83	0.19	0.47	0.78	0.17	0.42	0.72
Guilt unions	0.57	0.80	1.00	0.52	0.75	0.98	0.36	0.55	0.77	0.36	0.57	0.82
Paying taxes on behalf of other	0.45	0.68	0.93	0.48	0.73	0.98	0.50	0.73	0.95	0.53	0.78	1.00
Paying tax experience	0.67	0.86	1.00	0.63	0.84	1.00	0.51	0.71	0.86	0.59	0.78	0.94
Academic level	0.60	0.82	1.00	0.52	0.76	0.96	0.44	0.68	0.90	0.48	0.72	0.94
Familiarity with regulations and laws	0.74	0.91	1.00	0.56	0.75	0.91	0.18	0.33	0.51	0.25	0.40	0.58
Constitutionalism	0.60	0.82	1.00	0.40	0.62	0.82	0.28	0.46	0.66	0.28	0.46	0.66
Having legal lawyer	0.63	0.83	1.00	0.43	0.61	0.80	0.28	0.43	0.63	0.33	0.48	0.67
Persuading good dealer payers	0.43	0.70	1.00	0.38	0.65	0.95	0.30	0.55	0.85	0.35	0.60	0.90
Manner of guiding tax officers	0.58	0.78	0.96	0.58	0.78	0.96	0.69	0.87	1.00	0.55	0.75	0.93
Manner of collecting taxes	0.45	0.73	1.00	0.41	0.68	0.95	0.27	0.55	0.82	0.27	0.55	0.82
Electronic taxes	0.54	0.78	1.00	0.41	0.65	0.91	0.24	0.48	0.74	0.24	0.48	0.74

Step 3: Establishing weight normalized fuzzy decision matrix

After computing the fuzzy weight of criteria as table 14, the harmonic decision-making matrix was obtained as equation 18 (table 15).

Table 14 fuzzy weights of criteria

Index	Fuzzy weight		
Multimedia advertisement	7.33	8.83	9.50
Guilt unions	7.00	8.50	9.33
Paying taxes on behalf of other	3.00	4.50	6.17
Paying tax experience	5.67	9.33	10.00
Academic level	4.67	7.67	9.33
Familiarity with regulations and laws	6.00	7.67	8.67
Constitutionalism	5.50	7.17	8.33
Having legal lawyer	2.83	4.67	6.67

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Index	Fuzzy weight		
Persuading good dealer payers	3.33	5.33	7.33
Manner of guiding tax officers	5.33	7.17	8.67
Manner of collecting taxes	4.00	5.50	7.00
Electronic taxes	6.00	7.67	8.83

Table 15 harmonic normal decision-making matrix

	Tax office of shahryar			Tax office of Robat Karim			Tax office of Baharestan			Tax office of Qods		
Multimedia advertisement	2.44	5.89	9.50	1.63	15.50	0.28	1.43	14.64	0.26	1.22	12.92	0.25
Guilt unions	3.98	6.76	9.33	3.66	6.38	9.12	2.55	4.64	7.21	2.55	4.83	7.64
Paying taxes on behalf of other	1.35	3.04	5.70	1.43	3.26	6.01	1.50	3.26	5.86	1.58	3.49	6.17
Paying tax experience	3.78	8.05	10.00	3.56	7.87	10.00	2.89	6.59	8.63	3.33	7.32	9.41
Academic level	2.80	6.29	9.33	2.43	5.83	8.96	2.49	5.21	8.40	2.72	5.52	8.77
Familiarity with regulations and laws	4.42	6.99	8.67	3.37	5.78	7.91	1.05	2.56	4.41	1.47	3.09	5.02
Constitutionalism	3.30	5.88	8.33	2.20	4.44	6.83	1.54	3.30	5.50	1.54	3.30	5.50
Having legal lawyer	1.79	3.86	6.67	1.23	2.84	5.36	0.80	2.03	4.20	0.92	2.23	4.49
Persuading good dealer payers	1.42	3.73	7.33	1.25	3.47	6.97	1.00	2.93	6.23	1.17	3.20	6.60
Manner of guiding tax officers	3.10	5.60	8.35	3.10	5.60	8.35	3.68	6.25	8.67	2.91	5.34	8.04
Manner of collecting taxes	1.82	4.00	7.00	1.64	3.75	6.68	1.09	3.00	5.73	1.09	3.00	5.73
Electronic taxes	3.26	6.00	8.83	2.48	5.00	8.07	1.43	3.67	6.53	1.43	3.67	6.53

Step 4: Determining Positive ideal solution and negative ideal solution

According to equations 19, 20, 21, the positive and negative ideal of twelve indices was obtained, for instance, the positive and negative ideal of two first indices are as follow:

$$V_2^+ = \left(\max(9.33, 9.12, 7.21, 7.64), \max(9.33, 9.12, 7.21, 7.64), \max(9.33, 9.12, 7.21, 7.64)\right)$$

$$= (9.33, 9.33, 9.33)$$

$$V_1^+ = \left(\max(9.5, 0.28, 0.26, 0.25), \max(9.5, 0.28, 0.26, 0.25), \max(9.5, 0.28, 0.26, 0.25)\right)$$

$$= (9.5, 9.5, 9.5)$$

$$V_1^- = \left(\min(2.44, 1.63, 1.43, 1.22), \min(2.44, 1.63, 1.43, 1.22), \min(2.44, 1.63, 1.43, 1.22)\right)$$

$$= (1.22, 1.22, 1.22)$$

$$V_2^- = \left(\min(3.98, 3.66, 2.55, 2.55), \min(3.98, 3.66, 2.55, 2.55), \min(3.98, 3.66, 2.55, 2.55)\right)$$

$$= (2.55, 2.55, 2.55)$$

Step 5: computing distance

Distance of each alternative from positive ideal solution and fuzzy negative ideal solution of choices one to three is obtained as equations 22, 23, 24:

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$$d(1,1)=\sqrt{\frac{1}{3}[(2.44-9.5)^2+(5.89-9.5)^2+(9.5-9.5)^2]}=4.58$$

$$d(1,2)=\sqrt{\frac{1}{3}[(3.98-9.33)^2+(6.76-9.33)^2+(9.33-9.33)^2]}=3.43$$

$$d(1,3)=\sqrt{\frac{1}{3}[(1.35-6.17)^2+(3.04-6.17)^2+(5.7-6.17)^2]}=3.33$$

The same is done for indices 4 to 12 and the same process is repeated for other choices.

Step 6: computing the proximity ratio and prioritizing alternatives

Proximity ratio of each alternative is obtained according to equation 25 as table 16. The values more than C_i will show good function of A_i alternative.

Table 16 Distances of Positive and Negative Ideal Solutions and the proximity ratio of Alternatives

Tax offices	Sigma Di -	Sigma Di+	CCI	Final rank
Tax office of shahryar	22.0433	6.4797	0.7728	1
Tax office of Robat Karim	16.9190	11.7210	0.5907	2
Tax office of Baharestan	6.0526	21.9957	0.2158	4
Tax office of Qods	6.7412	20.5574	0.2469	3

The results indicate that tax office of Shahryar has higher tax culture and tax office of Robat Karim, Qods and Bahestan are in next ranks.

4.3 Comparing Results Obtained From FAHP and FTOPSIS Technique

The results obtained from two fuzzy AHP method and fuzzy TOPSIS are compared in table 17.

Table 17 comparing resulted of FAHP and FTOPSIS

choices	Rank	
	FAHP	FTOPSIS
Tax office of shahryar	1	1
Tax office of Robat Karim	3	2
Tax office of Baharestan	4	4
Tax office of Qods	2	3

Having ranked the tax affairs offices by FAHP and FTOPSIS, Spearman correlation coefficient measures the validity of responses and SPSS is used for this regard, the results of which are as table 18.

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Table 18 computing correlation coefficient by FAHP and FTOPSIS

		FAHP	FTOPSIS
FAHP	Correlation coefficient	1.000	.800
	Bilateral significance	*.0.000*	.020
	Quantity	4	4
FTOPSIS	Correlation coefficient	.800	1.000
	Bilateral significance	.020	*.0.000*
	Quantity	4	4

According to table 18, there is high correlation among the ranks resulted from two mentioned methods, so responses are valid.

4.4 Integrating Ranking Techniques

The results of averaging and integrating are shown in table 19.

Table 19 Results of Mean, kopland and Integration

Alternatives	Mean	Borda	Kopland	integration
Tax office of shahryar	1	1	1	1
Tax office of Robat Karim	2.5	2	2	2.16
Tax office of Baharestan	4	3	3	3.33
Tax office of Qods	2.5	2	2	2.16

Total ranking is as follow:

Tax office of Sharyar > tax office of Robat Karim and Tax office of Qods> Tax office of Baharestan.

5 Conclusions

One of the minor aims is determining the effect of social factors, organizational factors and individual factor on the promotion off tax culture and regarding the results from FAHP method, social factors and organizational factors has same importance in the promotion of tax culture and individual factors has less importance compared to the other two components in the promotion of tax culture.

This research aims at determining the importance of the components in the promotion of tax culture and regarding the results from FAHP and related to social factors, paying tax on behalf of others and multimedia advertisement has equal importance in the promotion of tax culture and guild unions has less importance in the promotion of tax culture. About individual factors, familiarity with regulations and laws has higher importance in the promotion of tax culture compared to other components. Constitutionalism, paying tax experience, having legal lawyer and academic status has less importance respectively. Regarding organizational factors, electronic tax has high importance in tax culture and manner of guiding tax officer, manner of collecting taxes, persuading good dealer payers has less importance in the promotion of tax culture respectively. Regarding the rank of tax affairs offices, the tax affairs office of sharyar, Qods, Robat Karim and Baharestan has rank one to four by FAHP method.

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The tax affairs offices were ranked by FTOPSIS and tax affairs offices of Shahryar, Robat Karim, Qods and Baharestan are put in rank one to four. Due to difference in obtained ranks from two mentioned method, the offices ranking was done by integration method and in this regard the tax affairs offices of Sharyar, Qods and Robat Karim and Baharestan are put in priority one to four.

In this research a new process which is the same as FAHP and FTOPSIS is proposed for ranking effective factors on the promotion of tax culture in west general department of tax affairs in Tehran province which is considered as a kind of innovation in similar researches. In current study, the benefits of two methods of FAHP and FTOPSIS were combined for ranking components, subcomponents and west departments of tax affairs in Tehran province and since the results from two method were not similar, POSET method was used for ranking tax affairs offices and results show the priority of tax affairs offices of Shahryar, Robat karim, and Qods are in next priorities and tax office of Baharestan is the latest priority.

So it can be concluded that the factors which have more importance compared to other factors have potential talent for increasing tax culture, so directors and decision makers shall consider the mentioned factors to lead the increasing of tax culture. Regarding the tax affairs offices, the offices of bBaharestan, Qods and Robat Karim, Shahryar shall be taken action on the promotion of tax culture respectively. That means tax affairs office of Shahryar has better tax culture compared to tax office of Baharestan. So, tax office of Baharestan has more priority for doing related affairs on the promotion of tax culture compared to Shahryar.

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