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An Approach for Performance Evaluation of Employee Using Fuzzy TOPSIS and Propossing Improvement Strategies in order to Performance Promotion in High Tech Organization: (Case study: An airline in Iran)

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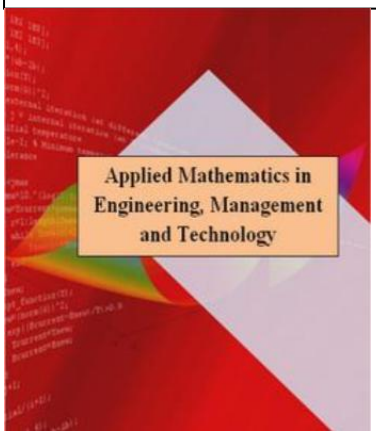

Abstract

Human resources are an important basis of each organization especially service organizations. Adaptation of manpower with organization's objectives improves performance and efficiency of the organization. In order to prevent wasting time and resources and organizing the manpower and supplying benefits of the organization and its staff, it is better to have some measures for assessing the staff's performance. Feasibility, accessibility and understandability of these measures help both the organization and the staff to organize their attempts in order to achieve the objectives. Creating awareness in each sector's staff reduces their job dissatisfaction. In the current study we try to identify and determine the measures for evaluating the staff's performance, and design an appropriate model for evaluating performance of the industry's staff by developed technology and using Fuzzy Multiple Attribute Decision Making approach, so that we get notified of their quality and performance, compare them and improve the staff's performance.

Literature Review

In today's competitive and complex environment of business, organizations' success depends on being aware of strong and weak points of oneself and continuous improvement in key indices. Thus, one of the main concerns of the managers is to achieve a comprehensive assessment method with which they can obtain an accurate image of their organization and its performance. One of the efficient methods which evaluates the organization with an strategic view is the Balanced Score Card (BSC) model, which evaluates the organization's performance in terms of customer, internal processes, growth and learning in addition to financial evaluation. Therefore, in this study we try to emphasize on BSC approach and use Fuzzy Topsis Ranking method to propose an efficient and functional method for evaluating the staff's performance in industry with developed technology.
Chang et.al. (2010) have evaluated the performance of mutual funds in the multiple attribute planning structure by using Treynor Ratio, Sharp Ratio, Jensen's alpha and information to performance evaluation ratio in an article titled: performance evaluation of internal open base mutual funds using developed technique for order performance by similarity to ideal solution (TOPSIS) by different distance approach, all of the above measures are also used for final ranking. In this survey 82 mutual funds in Taiwan in a 24 months period are evaluated.
Razmi et.al. (2013) have proposed an approach which is based on network analysis for evaluating the development unit of Kale corporate.
Hajian et.al. (2014) have proposed a model for evaluating the performance of non-industrial research centers. Ghasemi and Abbasian (2014) evaluated the performance of Gabin Fuladsazan's staff who were working in electricity, mechanic, security, foundry and warehouse units in 1392. Chen et.al. (2015) have proposed a model based on Dymtl hybrid model and fuzzy network analysis process which is used to evaluate the development of new products. Hue et.al. (2015) proposed a model using network analysis and Dymtl to evaluate the quality performance of those who supply materials for a factory which produces computer parts. Scring Olemdo et.al. (2015) presented a Fuzzy Topsis model for evaluating performance of clothing industry. Visa Lukechmi and Lukechmi (2015) suggested a hybrid method based on Dymtl and Topsis methods in Fuzzy environment for evaluating economic performance of environmental industry. Eugi (2015) evaluated the performance of international pathways in Taiwan and neighbor countries with strong and weak points of multiple attributes

decision making in fuzzy environment. Kasci et.al. (2015) proposed a model using Fuzzy hierarchical analysis method for evaluating the performance of ship officers.

TOPSIS Method

In Topsis method, in addition to considering the distance of A_i from the ideal point, its distance from negative ideal point is also considered. That is, the chosen option must have the minimum distance from the ideal solution and at the same time have the farthest distance from the negative ideal solution.
TOPSIS method is presented in the following (Connon et.al, 2014):
Step 1: Transforming the available decision making matrix into a non-dominated matrix using the following equation:

$$n_{ij} = \frac{r_{ij}}{\sqrt{\sum_{i=1}^{m} r_{ij}^2}}$$

Step 2: Creating a weighted non-dominated matrix assuming vector W is the input to the algorithm. That is:

$$W = \{w_1, w_2, ..., w_n\} \approx (\text{DM})$$

$$\text{weighted non-dominated matrix } = V = N_D.W_{n\times n} = \begin{vmatrix} V_{11} & \dots & V_{1j} & \dots & V_{1n} \\ : & : & : & : & : \\ : & : & : & : & : \\ V_{m1} & \dots & V_{mj} & \dots & V_{mn} \end{vmatrix}$$

Such that N_D is a matrix in which attributes' scores are non-dominated and comparable, and W_{n*n} is a diagonal matrix in which only the diagonal elements are non-zero.
Step 3: defining the ideal solution and the negative ideal solution. For the ideal options (A^+) and the negative ideal options (A^-), we define:

$$A^+ = \{(\max V_{ij} \mid j \in J), (\min V_{ij} \mid j \in J') \mid i = 1, 2, ..., m\} = \{V_1^+, V_2^+, ..., V_n^+\}$$

$$A^- = \{(\min V_{ij} \mid j \in J), (\max V_{ij} \mid j \in J') \mid i = 1, 2, ..., m\} = \{V_1^-, V_2^-, ..., V_n^-\}$$

J = (js related to benefit|j=1, 2, .., n)
J' = (js related to benefit| j=1, 2, …, n)
Step 4: Calculating the distance
Distance between the i^{th} option using the Uclidean method is as follows:

$$d_{i+} = \{\sum_{j=1}^{n} (V_{ij} - V_j^+)^2\}^{0.5}; \; i = 1, 2, ..., m$$

$$d_{i-} = \{\sum_{j=1}^{n} (V_{ij} - V_j^-)^2\}^{0.5}; \; i = 1, 2, ..., m$$

Step 5: Calculating the relative closeness of A_i to the ideal solution. This relative closeness is defined as follows:

$$cl_{i+} = \frac{d_{i-}}{(d_{i+} + d_{i-})}; \; 0 \le cl_{i+} \le 1; \; i = 1, 2, ..., m$$

It can be seen that if $A_i=A^+$, then $d_{i+}=0$ and we have: $cl_{i+}=1$ and if $A_i=A^-$, then $d_{i-}=0$ and $cl_{i+}=0$. Therefore the closer is A_i to the ideal solution (A^+) value of cl_{i+} would be closer to unity.
Step 6: ranking options. Options available from the assumed problem are ranked based on descending cl_{i+}.

Problem Definition and Proposing the Evaluation Approach

In the following we use the introduced process for evaluating and ranking the attributed which are effective in evaluating the staff's performance. The proposed approach is as below:

Step 1: in this step, criteria effective in evaluating the staff of the studied organization are chosen. The criteria considered for this purpose are corresponding to balanced score cards.
Step 2: in this step, criteria (corresponding to balanced score cards) are weighted. Criteria weighing and attributes ranking are done as in the 7 steps below:
1) In this step, we assume that a group consisting k experts is available (D_1, D_2, …, D_k) and m evaluation attributes (A_1, A_2, …, A_m) will be compared using n critera (C_1, C_2, .., C_n). in fact, in this step we want to weight criteria using Table (1). Then we use the following formula for de-fuzzifying the triangular fuzzy numbers:

$$\frac{a+4b+c}{6} \quad (1)$$

In which a, b and c are the low, medium and high triangular numbers respectively. Therefore, W'_{jt} which denotes the j^{th} critetion's weight by the k^{th} expert is obtained. Then we use the following formula to obtain the final weight of each factor:

$$W_j = \frac{\sum_{t=1}^{k} W'_{jt}}{k} \quad (2)$$

Table (1): Linguistic words for the relative weight of criteria

Fuzzy Number	Linguistic Words
(0,0.2,0.4)	Very low
(0.2,0.4,0.5)	Low
(0.4,0.6,0.8)	Medium
(0.6,0.8,1)	High
(0.8,0.9,1)	Very high

2) In this step we use Table (2) and ask the experts to score each attribute for each criterion using linguistic words.

Then we average the experts' opinion using the following equation:

$$R_{ij} = (a_{ij}, b_{ij}, c_{ij}) = \frac{\sum_{t=1}^{k} (a_{ijt}, b_{ijt}, c_{ijt})}{k} \quad (3)$$

Therefore, Triangular Fuzzy Matrix R_{ij} is defined as below:

$$R_{ij} = \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1n} \\ r_{21} & r_{22} & \cdots & r_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ r_{m1} & r_{m2} & \cdots & r_{mn} \end{bmatrix} \quad (4)$$

Then R_{ij} is normalized as below:

$$r_{ij} = \left(\frac{a_{ij}}{c_j^*}, \frac{b_{ij}}{c_j^*}, \frac{c_{ij}}{c_j^*}\right), j \in B$$
$$c_j^* = \max c_{ij}, j \in B$$
$$r_{ij} = \left(\frac{a_j^-}{c_{ij}}, \frac{a_j^-}{b_{ij}}, \frac{a_j^-}{a_{ij}}\right), j \in C \quad (5)$$
$$a_j^- = \min a_{ij}, j \in C$$

B and C denote the negative and positive sets respectively.

Table (2): Linguistic Words and Scoring Fuzzy Attributs

Fuzzy Number	Linguistic Words
(0,0,1)	Very low
(0,1,3)	Low
(1,3,5)	Medium low
(3,5,7)	Medium
(5,7,9)	Medium high
(7,9,10)	High
(9,10,10)	Very high

3) In this step, normalized decision making matrix is weighted. The matrix created in the previous step (normalized decision making matrix) is multiplied by the criteria's weight such that the weighted normalized decision making matrix is obtained as follows:

$$v_{ij} = r_{ij} W_j \quad , \begin{matrix} i = 1,2,...,m \\ j = 1,2,...,n \end{matrix} \tag{6}$$

4) In this step, ideal solution (A^+) and negative ideal solution (A^-) are determined.
Ideal solution is a solution which has the maximum value for positive attributes and the minimum value for negative attributes.
Negative ideal option is an option which has the minimum value for positive attributes and the maximum value for negative attributes.

$$\begin{aligned} &(A^*) = (v_1^*, v_2^*, ..., v_n^*) \\ &(A^-) = (v_1^-, v_2^-, ..., v_n^-) \\ &v_j^* = \max\{v_{ij}\} \\ &v_j^- = \min\{v_{ij}\} \end{aligned} \tag{7}$$

5) In this step the distance between the ideal solution and the negative ideal solution is calculated:

$$\begin{aligned} &d_i^* = \sum_{j=1}^{n} d_v(v_{ij}, v_j^*) \quad , i = 1,2,...,m \\ &d_i^- = \sum_{j=1}^{n} d_v(v_{ij}, v_j^-) \quad , i = 1,2,...,m \end{aligned} \tag{8}$$

In which the triangular fuzzy numbers' distance is defined as:

$$d(A,B) = \sqrt{\frac{1}{3}[(a-a_1)^2 + (b-b_1)^2 + (c-c_1)^2]} \tag{9}$$

6) In this step, closeness coefficient is obtained using the following formula:

$$cc_i = \frac{d_i^-}{d_i^- + d_i^*} \quad , i = 1,2,...,m \tag{10}$$

7) In this step, any of the attributes with higher cc_i is chosen as the highest attribute. Therefore attributes can be ranked based on their cc_i.
8) Evaluating staff's performance
9) Proposing enhancement approaches

Case Study

In this section we implement the proposed approach based on experts' experiences in one of Iran's Airlines. In the following, we rank the organizational excellence criteria using the approaches proposed in partnership with 5 experts. In the following steps the implementation process in described:
Step 1: as described in step 1, in this step we extract criteria and attributes to prioritize the considered attributes. Due to the reasons stated in step 1, 4 balanced score cards are considered as ranking criteria. Therefore, prioritizing criteria in this survey are as follows:

- Customers' perspective
- Financial perspective
- Internal Process perspective
- Growth and Learning Perspective

After defining the criteria, attributes which are effective in evaluating staff's performance are extracted from literature and experts' knowledge. For this purpose, after studying the literature a number of attributes are extracted and these attributes were given to the organization's experts to screen them and to add an attribute if it is not yet considered. In Table (3) selected attributes and sub-attributes are given.

Table (3): selected attributes and sub-attributes for evaluating staff's performance

Indicator	**Sub-indicator**	
Quality / quantity of work	Task accomplishment	Q1
	Assignment of importance to goals	Q2
	Multi-tasking	Q3
Planning / organization	Clear goals	P1
	Identification of sources	P2
	Searching instruction guide	P3
Initiative and commitment	Obligations registered as responsive staff	I1
	Minimal supervision	I2
	Expectations	I3
Teamwork and cooperation	Coordinated and harmonized work	T1
	Adaptation to changes	T2
	Sharing information resources	T3
Communications	Information and idea transfer	C1
	Incompatibility of solutions	C2
	Searching the clarities	C3
External factors	Cooperation and assistance with the company or organization	E1
	Customer satisfaction	E2
	Promotion of company or organization	E3

Step 2: In this step we use the following 7 steps to weight criteria and prioritize selected attributes of the previous step.
1) In this step, using the linguistic words of Table (1), experts are asked to prioritize each criterion (corresponding to balanced score cards) in evaluating the staff's performance in human resource unit of an Airline. The obtained results are summarized in Table (4).

Table (4): Fuzzy priority of each criterion based on experts' opinion

	Expert 1	**Expert 2**	**Expert 3**	**Expert 4**	**Expert 5**
Customers' perspective	(0.8,0.9,1)	(0.6,0.8,1)	(0.4,0.6,0.8)	(0.4,0.6,0.8)	(0.6,0.8,1)
Financial perspective	(0.8,0.9,1)	(0.8,0.9,1)	(0.8,0.9,1)	(0.6,0.8,1)	(0.4,0.6,0.8)
Internal Process perspective	(0.2,0.4,0.5)	(0.6,0.8,1)	(0.4,0.6,0.8)	(0.2,0.4,0.5)	(0.2,0.4,0.5)
Growth and Learning Perspective	(0.6,0.8,1)	(0.4,0.6,0.8)	(0.2,0.4,0.5)	(0.6,0.8,1)	(0.2,0.4,0.5)

Now we use equation (1) for defuzzyfying fuzzy triangular numbers of Table (3). Transformation results are given in Table (5).

Table (5): Importance of Defuzzyfying each criterion based on each expert's opinion

	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5
Customer erspective	0.9	0.8	0.6	0.6	0.8
Financial perspective	0.9	0.9	0.9	0.8	0.6
Internal business processes	0.38	0.8	0.6	0.38	0.38
Learning and growth perspective	0.8	0.6	0.38	0.8	0.38

Then we normalize the average value obtained from Table (5) such that sum of weights is equal to 1. Results are given in Table (6).

Table (6): Average of Experts' Opinion and Final Weight of Criteira

	Average of Experts' Opinion	Normal weight
Customer erspective	0.74	0.278
Financial perspective	0.82	0.308
Internal business processes	0.508	0.191
Learning and growth perspective	0.592	0.223

Final weight of criteria is calculated.
2) In this step we use Table (6) and ask the experts to score each attribute for each criterion.
Accordingly, only two questionnaire were filled by the experts and the obtained results are given in Tables (7) and (8). Average of experts' opinions for each attribute per each criterion is given in Table (9).

Table (7): Opinion of Experts' Team 1 in prioritizing attributes

	Customer erspective	Financial perspective	Internal business processes	Learning and growth perspective
Q1	(1,3,5)	(5,7,9)	(7,9,10)	(1,3,5)
Q2	(1,3,5)	(1,3,5)	(9,9,10)	(7,9,10)
Q3	(5,7,9)	(0,1,3)	(1,3,5)	(9,9,10)
P1	(5,7,9)	(7,9,10)	(7,9,10)	(7,9,10)
P2	(9,9,10)	(3,5,7)	(9,9,10)	(5,7,9)
P3	(3,5,7)	(3,5,7)	(0,1,3)	(7,9,10)
I1	(7,9,10)	(7,9,10)	(0,1,3)	(7,9,10)
I2	(0,1,3)	(1,3,5)	(0,1,3)	(1,3,5)
I3	(1,3,5)	(1,3,5)	(7,9,10)	(5,7,9)
T1	(1,3,5)	(7,9,10)	(3,5,7)	(1,3,5)
T2	(0,1,3)	(1,3,5)	(9,9,10)	(1,3,5)
T3	(1,3,5)	(1,3,5)	(0,1,3)	(5,7,9)
C1	(0,1,3)	(7,9,10)	(1,3,5)	(5,7,9)
C2	(1,3,5)	(7,9,10)	(5,7,9)	(7,9,10)
C3	(9,9,10)	(1,3,5)	(5,7,9)	(9,9,10)
E1	(3,5,7)	(5,7,9)	(5,7,9)	(1,3,5)
E2	(1,3,5)	(1,3,5)	(3,5,7)	(1,3,5)
E3	(1,3,5)	(7,9,10)	(5,7,9)	(1,3,5)

Table (8): Opinion of Experts' Team 2 in prioritizing attributes

	Customer erspective	Financial perspective	Internal business processes	Learning and growth perspective
Q1	(3,5,7)	(3,5,7)	(7,9,10)	(3,5,7)
Q2	(3,5,7)	(3,5,7)	(7,9,10)	(5,7,9)
Q3	(5,7,9)	(1,3,5)	(1,3,5)	(3,5,7)
P1	(5,7,9)	(5,7,9)	(7,9,10)	(7,9,10)
P2	(7,9,10)	(3,5,7)	(7,9,10)	(3,5,7)
P3	(5,7,9)	(3,5,7)	(1,3,5)	(7,9,10)
I1	(9,9,10)	(7,9,10)	(5,7,9)	(3,5,7)
I2	(5,7,9)	(5,7,9)	(0,1,3)	(0,1,3)
I3	(7,9,10)	(5,7,9)	(1,3,5)	(1,3,5)
T1	(5,7,9)	(7,9,10)	(3,5,7)	(1,3,5)
T2	(1,3,5)	(1,3,5)	(3,5,7)	(3,5,7)
T3	(3,5,7)	(3,5,7)	(1,3,5)	(3,5,7)
C1	(3,5,7)	(7,9,10)	(0,1,3)	(3,5,7)
C2	(1,3,5)	(7,9,10)	(5,7,9)	(7,9,10)
C3	(7,9,10)	(3,5,7)	(5,7,9)	(5,7,9)
E1	(5,7,9)	(5,7,9)	(0,1,3)	(0,1,3)
E2	(7,9,10)	(5,7,9)	(1,3,5)	(1,3,5)
E3	(3,5,7)	(5,7,9)	(7,9,10)	(0,1,3)

Table (9): Average of Experts' Opinion in prioritizing attributes

	Customer erspective	Financial perspective	Internal business processes	Learning and growth perspective
Q1	(2,4,6)	(4,6,8)	(7,9,10)	(2,4,6)
Q2	(2,4,6)	(2,4,6)	(8,9,10)	(6,8,9.5)
Q3	(5,7,9)	(0.5,2,4)	(1,3,5)	(6,7,8.5)
P1	(5,7,9)	(6,8,9.5)	(7,9,10)	(7,9,10)
P2	(8,9,10)	(3,5,7)	(8,9,10)	(2,4,6)
P3	(4,6,8)	(3,5,7)	(0.5,2,4)	(7,9,10)
I1	(8,9,10)	(7,9,10)	(2.5,4,6)	(5,7,8.5)
I2	(2.5,4,6)	(3,5,7)	(0,1,3)	(0.5,2,4)
I3	(4,6,7.5)	(3,5,7)	(4,6,7.5)	(3,5,7)
T1	(3,5,7)	(7,9,10)	(3,5,7)	(1,3,5)
T2	(0.5,2,4)	(1,3,5)	(6,7,8.5)	(2,4,6)
T3	(2,4,6)	(2,4,6)	(0.5,2,4)	(4,6,8)
C1	(1.5,3,5)	(7,9,10)	(0.5,2,4)	(4,6,8)
C2	(1,3,5)	(7,9,10)	(5,7,9)	(7,9,10)
C3	(8,9,10)	(2,4,6)	(5,7,9)	(7,8,9.5)
E1	(4,6,8)	(5,7,9)	(2.5,4,6)	(0.5,2,4)
E2	(4,6,7.5)	(3,5,7)	(2,4,6)	(1,3,5)
E3	(2,4,6)	(6,8,9.5)	(6,8,9.5)	(0.5,2,4)

Then we use equation (5) presented, to normalize the matrix denoted in Table (9). The results obtained from normalizing are reported in Table (10).

Table (10): Average of Experts' Opinion Normalized in Prioritizing Attributes

	Customer erspective	Financial perspective	Internal business processes	Learning and growth perspective
Q1	(0.2,0.4,0.6)	(0.4,0.6,0.8)	(0.7,0.9,1)	(0.2,0.4,0.6)
Q2	(0.2,0.4,0.6)	(0.2,0.4,0.6)	(0.8,0.9,1)	(0.6,0.8,0.95)
Q3	(0.5,0.7,0.9)	(0.05,0.2,0.4)	(0.1,0.3,0.5)	(0.6,0.7,0.85)
P1	(0.5,0.7,0.9)	(0.6,0.8,0.95)	(0.7,0.9,1)	(0.7,0.9,1)
P2	(0.8,0.9,1)	(0.3,0.5,0.7)	(0.8,0.9,1)	(0.2,0.4,0.6)
P3	(0.4,0.6,0.8)	(0.3,0.5,0.7)	(0.05,0.2,0.4)	(0.7,0.9,1)
I1	(0.8,0.9,1)	(0.7,0.9,1)	(0.25,0.4,0.6)	(0.5,0.7,0.85)
I2	(0.25,0.4,0.6)	(0.3,0.5,0.7)	(0,0.1,0.3)	(0.05,0.2,0.4)
I3	(0.4,0.6,0.75)	(0.3,0.5,0.7)	(0.4,0.6,0.75)	(0.3,0.5,0.7)
T1	(0.3,0.5,0.7)	(0.7,0.9,1)	(0.3,0.5,0.7)	(0.1,0.3,0.5)
T2	(0.05,0.2,0.4)	(0.1,0.3,0.5)	(0.6,0.7,0.85)	(0.2,0.4,0.6)
T3	(0.2,0.4,0.6)	(0.2,0.4,0.6)	(0.05,0.2,0.4)	(0.4,0.6,0.8)
C1	(0.15,0.3,0.5)	(0.7,0.9,1)	(0.05,0.2,0.4)	(0.4,0.6,0.8)
C2	(0.1,0.3,0.5)	(0.7,0.9,1)	(0.5,0.7,0.9)	(0.7,0.9,1)
C3	(0.8,0.9,1)	(0.2,0.4,0.6)	(0.5,0.7,0.9)	(0.7,0.8,0.95)
E1	(0.4,0.6,0.8)	(0.5,0.7,0.9)	(0.25,0.4,0.6)	(0.05,0.2,0.4)
E2	(0.4,0.6,0.75)	(0.3,0.5,0.7)	(0.2,0.4,0.6)	(0.1,0.3,0.5)
E3	(0.2,0.4,0.6)	(0.6,0.8,0.95)	(0.6,0.8,0.95)	(0.05,0.2,0.4)

3) In this step, we weight the normalized decision making matrix. In other words, we apply the criteria's weight to the normalized matrix of Table (10). The results obtained from applying the weights to the matrix are demonstrated in Table (11).

Table (11): Weighted Normalized Average Matrix of Experts' Opinion in Prioritizing Attributes

	Customer erspective	Financial perspective	Internal business processes	Learning and growth perspective
Q1	(0.0556,0.1112,0.1668)	(0.1232,0.1848,0.2464)	(0.1337,0.1719,0.191)	(0.0446,0.0892,0.1338)
Q2	(0.0556,0.1112,0.1668)	(0.0616,0.1232,0.1848)	(0.1528,0.1719,0.191)	(0.1338,0.1784,0.2118)
Q3	(0.139,0.1946,0.2502)	(0.0154,0.0616,0.1232)	(0.0191,0.0573,0.0955)	(0.1338,0.1561,0.1895)
P1	(0.139,0.1946,0.2502)	(0.1848,0.2464,0.2926)	(0.1337,0.1719,0.191)	(0.1561,0.2007,0.223)
P2	(0.2224,0.2502,0.278)	(0.0924,0.154,0.2156)	(0.1528,0.1719,0.191)	(0.0446,0.0892,0.1338)
P3	(0.1112,0.1668,0.2224)	(0.0924,0.154,0.2156)	(0.0096,0.0382,0.0764)	(0.1561,0.2007,0.223)
I1	(0.2224,0.2502,0.278)	(0.2156,0.2772,0.308)	(0.0477,0.0764,0.1146)	(0.1115,0.1561,0.1895)
I2	(0.0695,0.1112,0.1668)	(0.0924,0.154,0.2156)	(0,0.0191,0.0573)	(0.0111,0.0446,0.0892)
I3	(0.1112,0.1668,0.2085)	(0.0924,0.154,0.2156)	(0.0764,0.1146,0.1432)	(0.0692,0.1115,0.1561)
T1	(0.0843,0.139,0.1946)	(0.2156,0.2772,0.308)	(0.0573,0.0955,0.1337)	(0.0223,0.0692,0.1115)
T2	(0.0139,0.0556,0.1112)	(0.0308,0.0924,0.154)	(0.1146,0.1337,0.1623)	(0.0446,0.0892,0.1338)
T3	(0.0556,0.1112,0.1668)	(0.0616,0.1232,0.1848)	(0.0096,0.0382,0.0764)	(0.0892,0.1338,0.1784)
C1	(0.0417,0.0843,0.139)	(0.2156,0.2772,0.308)	(0.0096,0.0382,0.0764)	(0.0892,0.1338,0.1784)
C2	(0.0278,0.0843,0.139)	(0.2156,0.2772,0.308)	(0.0955,0.1337,0.1719)	(0.1561,0.2007,0.223)
C3	(0.2224,0.2502,0.278)	(0.0616,0.1232,0.1848)	(0.0955,0.1337,0.1719)	(0.1561,0.1784,0.2118)
E1	(0.1112,0.1668,0.2224)	(0.154,0.2156,0.2772)	(0.0477,0.0764,0.1146)	(0.0111,0.0446,0.0892)
E2	(0.1112,0.1668,0.2085)	(0.0924,0.154,0.2156)	(0.0382,0.0764,0.1146)	(0.0223,0.0692,0.1115)
E3	(0.0556,0.1112,0.1668)	(0.1848,0.2464,0.2926)	(0.1146,0.1528,0.1814)	(0.0111,0.0446,0.0892)

4) In this step ideal solution (A^+) and negative ideal solution (A^-) are determined.
According to equation (7) in step 4, ideal and negative ideal solutions are as shown in Table (10).

Table (12): Ideal and Negative Ideal Solutions

	Ideal Solutions	Negative Ideal Solutions
Customers' perspective	(0.278,0.278,0.278)	(0.0139,0.0139,0.0139)
Financial perspective	(0.308,0.308,0.308)	(0.0154,0.0154,0.0154)
Internal Process perspective	(0.191,0.191,0.191)	(0,0,0)
Growth and Learning Perspective	(0.223,0.223,0.223)	(0.0111,0.0111,0.0111)

5) In this step we calculate ideal and negative ideal solutions.

6) In this step, closeness coefficient of each option is calculated based on equation (10) which is presented. Closeness coefficient of each option is calculated in Table (13).

Table (13): Closeness Coefficient of Sub-attributes

Sub-criteria	Closeness Coefficient
Task accomplishment	0.598648
Assignment of importance to goals	0.558564
Multi-tasking	0.463026
Clear goals	0.753998
Identification of sources	0.640516
Searching instruction guide	0.532456
Obligations registered as responsive staff	0.717078
Minimal supervision	0.335901
Expectations	0.518822
Coordinated and harmonized work	0.545879
Adaptation to changes	0.371383
Sharing information resources	0.397283
Information and idea transfer	0.508877
Incompatibility of solutions	0.645721
Searching the clarities	0.662397
Cooperation and assistance with the company or organization	0.490886
Customer satisfaction	0.449032
Promotion of company or organization	0.52873

7) In this final step we use closeness coefficient to rank options. The sub-attribute with highest closeness coefficient is the most preferred sub-attribute and the sub-attribute with lowest closeness coefficient is the least preferred sub-attribute. Priority of the sub-attributes is listed in Table (14).

Table (14): Closeness coefficient of the sub-attributes

Sub-criteria	**Closeness coefficient**	**rank**
Task accomplishment	0.598648	6
Assignment of importance to goals	0.558564	7
Multi-tasking	0.463026	14
Clear goals	0.753998	1
Identification of sources	0.640516	5
Searching instruction guide	0.532456	9
Obligations registered as responsive staff	0.717078	2
Minimal supervision	0.335901	18
Expectations	0.518822	11
Coordinated and harmonized work	0.545879	8
Adaptation to changes	0.371383	17
Sharing information resources	0.397283	16
Information and idea transfer	0.508877	12
Incompatibility of solutions	0.645721	4
Searching the clarities	0.662397	3
Cooperation and assistance with the company or organization	0.490886	13
Customer satisfaction	0.449032	15
Promotion of company or organization	0.52873	10

Based on the obtained prioritization, the organization would be able to increase the manpower's performance significantly by focusing on some of these sub-attributes. Parto rule also shows that by concentrating on 20% of these sub-attributes, organization's performance can be increased by 80%. Therefore by concentrating on 4 of the attributes with highest priority in this organization, performance of human resources can be increased significantly. These 4 sub-attributes include: obvious objectives, commitments proved as responsive personnel, searching the obvious and non-compatibility of the solutions.
For evaluating the staff's performance, weight of each sub-attribute must be obtained. In this section we normalize the closeness coefficient for obtaining weight of each sub-criterion. Weight of each sub-criterion is as follows:

8) Evaluating Staff's Performance

In this step we evaluate performance of each staff. We choose 10 staff and ask the experts to use numbers between 0 to 100 to score each staff's performance. Score of sub-criterion for other experts is also collected the same way.

Now we obtain each staff's score based on sum of the weight of sub-criterion multiplied by the evaluated values.

Thus, the score of evaluating the performance of each staff is obtained. In the following we propose an approach for improving each staff. This approach suggests that performance of each staff can be improved by focusing on each sub-criterion.
9) Evaluating Staff's Performance
These approaches are based on the priority (weight) of the sub-criterions. In general, more attention must be paid to sub-criterions with higher priority and lower performance evaluation average.
Thus a graph like Figure (1) is designed to determine each criterion is located in which class and how much attention must be paid to it.

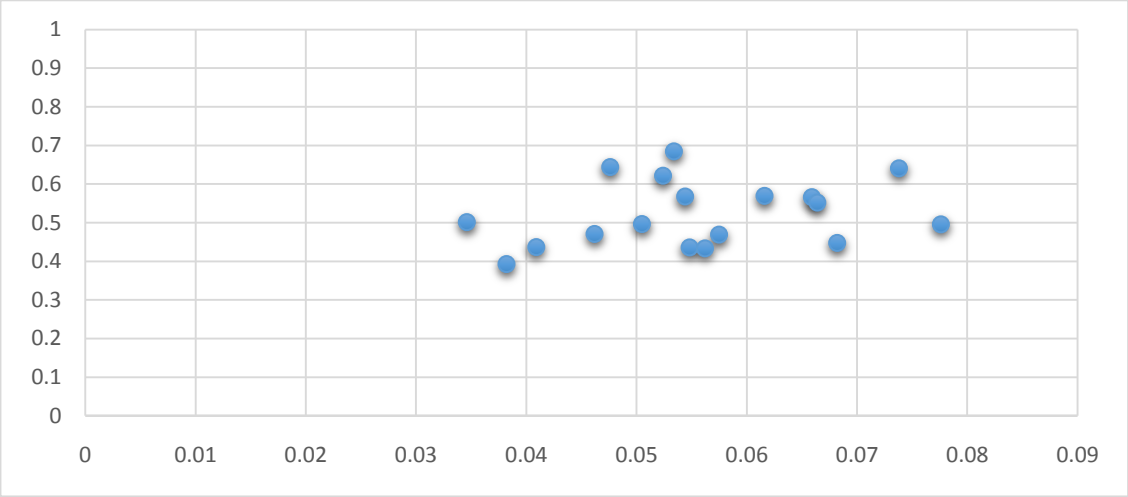

Figure (1): Chart of amount assessed under criteria based on their weight for the first employee

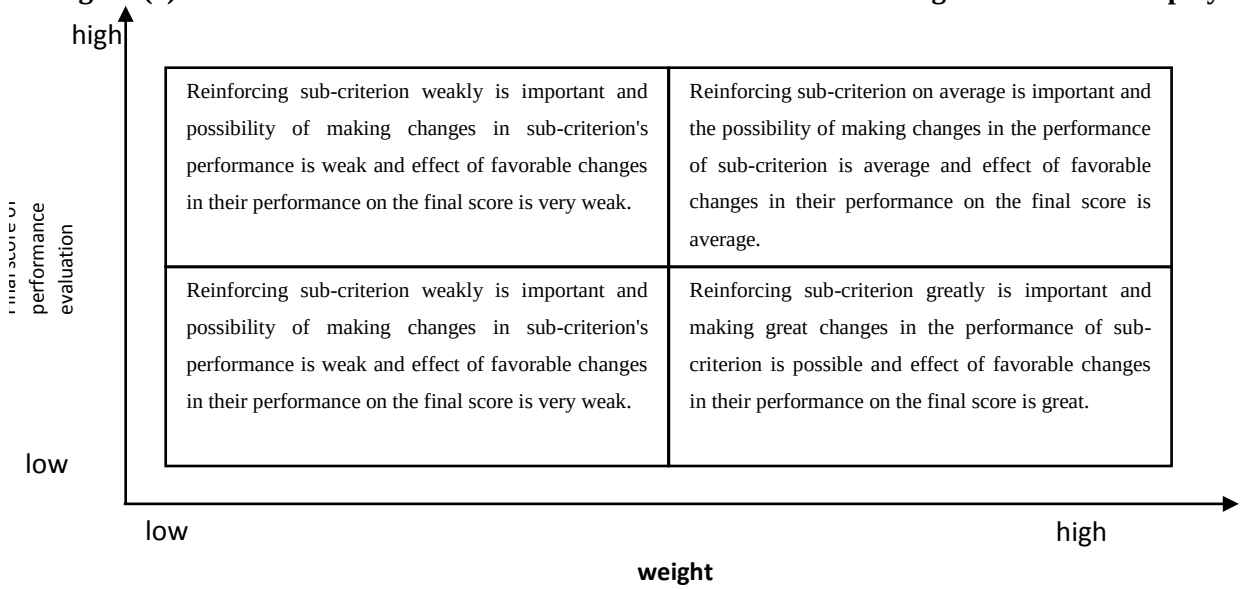

Figure (2): Classification of Sub-criterions based on weight and average score of their performance evaluation

Figure (2) does not mean that only 4 classes are considered for classification, but based on the location of each sub-criterion the importance will vary. For example consider the south-east rectangle of Figure (2), the more it is directed towards the high weight and low performance evaluation average score, its reinforcing sensitivity is decreased. To make it clear, we plot the sub-criterions of the case study based on their weight and performance for the first staff.

Conclusion

Performance evaluation system is one the most important and basic human resources systems. It is obvious that evaluating staffs' performance is a very important process and one of the most sensitive problems that challenges the organizations' managers. In this article, an approach for weighing criteria and sub-criterions is presented and the numerical results obtained from applying the proposed approach to one of Iran's Airlines are presented.

Some suggestions are also offered for future studies:

✓ In this study using an approach based on TOPSIS method, human resources' attributes of an Airline was evaluated and we suggest using this approach in similar organizations or other units of the same organization for future studies.

✓ Combining the proposed approach with mathematical planning models for evaluating and weighing will cover the weak points of each model.
✓ Comparing the proposed approach with other evaluation approaches based on heuristic and meta-heuristic methods
✓ Analyzing sensitivity of the proposed approach than effect of experts' tastes in determining weights

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