A 360 Degree Feedback Model for Performance Appraisal Based on Fuzzy AHP and TOPSIS

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ABSTRACT
Performance appraisal (PA) which is a process used by the firms to evaluate their employees’ efficiency and productivity, was initially carried out by the supervisors. Recently authors consider PA as an evaluation process based on the opinion of different assessors such as superiors, peers, subordinates and the employees themselves. As assessors have different knowledge about the evaluated employee, their different opinions could be a more exact judgment. In addition, as the subjective and uncertain PA processes require linguistic terms, this study proposes a fuzzy hybrid multiple criteria decision making approach with combination of different assessors’ opinions, applying fuzzy AHP method for determining the weights of criteria and using TOPSIS technique for ranking employees in order to establish the human resources policy. Implementing this approach in a real case (an Iranian company in the field of electric power and energy industry) verifies the applicability of the proposed framework.

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1. Introduction

Human resource management (HRM) has emerged as an important discipline that is used in many fields. It has become a strategic tool for most organizations in today's highly competitive environment and Performance appraisal (PA) is seen as one of the most critical HRM tools (Manoharan, Muralidharan, & Deshmukh, 2012).

PA is a formal organizational process carried out on systematic basis to provide a comparison between the individual or group performance based on objective or subjective elements (Giangreco, Carugati, Sebastiano, & Al Tamimi, 2012). It is an evaluative process by which managers rate employees and deliver feedback to them according to their performance. Theoretically, PA is put within the larger realm of performance management and thus it should focus on performance improvement. However in addition to performance improvement, PA may have many other goals and motives such as training, succession planning, pay for performance and etc. (Spence & Keeping, 2011). Unfortunately, the application of performance appraisal systems (PASs) is neither always smooth, nor necessarily productive. It is widely believed that PASs do not always demonstrate high levels of accuracy and they are not readily accepted by users (Giangreco et al., 2012). One of the important PA in accuracies is related to this fact that one person’s assessment of another individual cannot be free of biases. Thus it is necessary to get multiple assessments for a more objective evaluation. Multi-source feedback systems also known as 360 degree appraisal are a good way to overcome this problem. The opinions of different assessors such as superiors, peers, subordinates are more reliable than one person’s judgment (Meeakshi, 2012). Another difficulty of PA process is related to the subjective judgments of the assessors. In fact in many situations, individuals prefer to express their feelings using verbal expression. Fuzzy linguistic models permit translation of verbal expressions into numerical ones, thereby dealing quantitatively with the expression of the importance of each criterion and ranking employees based on them (Manoharan et al. 2012). This paper tries to eliminate the above limitations of traditional methods of PA by supposing a 360 degree feedback model based on the FAHP and TOPSIS methods. In this regard, first the criteria which are suitable for the purpose of PA in the case company are selected through a comprehensive survey of the relevant literature. The fuzzy AHP method is then applied to determine weights of these criteria based on the experts' opinions. Finally TOPSIS method is used in order to rank some of the employees which are work for the case study company as the alternatives. Ranking outcomes can be used for the purpose of sorting employees in order to establish the human resources policies such as promotion and incentives. The remainder of this paper is organized as follows. The next section deals with the literature review and is followed by the methodology for the proposed PA model, which applies Fuzzy AHP method for weighting the criteria and TOPSIS method for ranking the alternatives. Subsequently, a real case application of the previous methodologies is described. The results and conclusions are then presented.

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2. Literature Review

2.1. Performance Appraisal and Its Related Indicators

The performance evaluation process often involves decision making problems with a complex process in which multiple requirements and uncertain conditions have to be taken into consideration simultaneously. As these assessments are often required to deal with uncertainty, subjective nature and imprecise data, Multi-Criteria Decision Making (MCDM) methods are suitable for comparing all alternatives based on their related rankings (Kuo & Liang, 2012).

A wide range of studies have identified criteria which play an important role in implementing successful PA in organizations. Scheneier, Beatty and Baird (1986), considered PA as the assessment of three areas namely results, behaviors, and personal characteristics. Each dictates a specific type of appraisal format based on competency or job-related behavior. Giangreco, et al. (2012) implied to four factors namely Productivity, commitment, Behavior and personal characteristics as the main areas of PA. Min-peng, Xiao-hu and Xin a (2012) obtained a four layer system namely Personal Qualities, Team Spirit, Work Attitude and Work Performance as the mail factors of PA. Other studies have determined a wide range of factors as the main PA criteria according to their case studies (see e.g., Manoharan et al. 2012; Kabak, Burmaog’lu, & Kazançoğ’lu, 2012). The Main factors of this study were chosen through the related literature and by having discussions with the managers, supervisors and representatives of employees in the case study company. The main criteria and their related sub-criteria which are used in this study are shown in Table 1.

### Table 1. Performance appraisal criteria

<table>
<thead>
<tr>
<th>Main Criteria</th>
<th>Sub-criteria</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>personal characteristics</td>
<td>Knowledge</td>
<td>Min-peng, et al. (2012); Giangreco, et al. (2012); Moon, Lee and Man-peng, et al. (2012)</td>
</tr>
<tr>
<td></td>
<td>Ability to Learn</td>
<td>Abraham, Karns, Shaw and Mena (2001); Kabak, et al. (2012); Dursun and Karsak (2010)</td>
</tr>
<tr>
<td></td>
<td>Innovation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Problem-solving</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Adaptability</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Decision making ability</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Emotional stability</td>
<td></td>
</tr>
<tr>
<td>Inter-personal relations</td>
<td>Cooperation</td>
<td>Moon, et al. (2010); Giangreco, et al. (2012); Taormina and Gao (2009); Abraham et al. (2001); Min-peng, et al. (2012); Manoharan, et al. (2012); Chilton and Hardgrave (2004)</td>
</tr>
<tr>
<td></td>
<td>Team work</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Team Loyalty</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Communication</td>
<td></td>
</tr>
<tr>
<td>Work attitudes</td>
<td>Being responsible</td>
<td>Giangreco, et al. (2012); Taormina and Gao (2009); Min-peng, et al. (2012)</td>
</tr>
<tr>
<td></td>
<td>Motivation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discipline</td>
<td></td>
</tr>
<tr>
<td></td>
<td>commitment</td>
<td></td>
</tr>
<tr>
<td>Work results</td>
<td>Accuracy</td>
<td>Moon, et al. (2010); Giangreco, et al. (2012); Taormina and Gao (2009); Min-peng, et al. (2012);</td>
</tr>
<tr>
<td></td>
<td>Efficiency</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rapidity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Completeness of assignments</td>
<td></td>
</tr>
</tbody>
</table>

2.2. The 360 Degree Performance Appraisal

Typically, performance appraisals have been limited to a feedback process between employees and their superiors. With the increased focus on teamwork, employee development and customer service, the emphasis has shifted to employee feedback from the full circle of sources (Meenakshi, 2012). This multi-source feedback system which is called 360 degree feedback can include supervisors, collaborators, colleagues, subordinates, employee themselves and outsiders like customers. The 360 degree appraisal system (see Figure 1) presents some advantages with in comparison with the traditional systems. According to Andrés, García-Lapresta and González-Pachón (2010), some of the 360 degree appraisal system's advantages are as below:

- More extensive due to integral evaluation which collects information from different points of view
- Reducing the bias and prejudice because of the information collecting from several people, not just one
- Encouraging the Human Resources Department to establish policies of internal selection more clearly based on the results of the evaluation process
- Defining training and development plans for employees based on individual and group performance appraisal results
- Allowing companies to identify successful people more easily with the aim of reinforcing, recognizing and encouraging their results

In order to overcome the critiques associated with the traditional PA process and to adopt the advantages of the integral evaluation, we propose a 360-degree appraisal model where different sets of assessors have to evaluate employees according to different criteria.

3. Research Methodology

3.1. Research Framework

The purpose of this paper is developing a performance appraisal framework where there are different sets of assessors taking part in the evaluation process. In this framework which is based on the fuzzy multiple criteria decision making approach, the PA criteria are being weighted through fuzzy AHP method and the employees are ranked based on this weighted criteria through TOPSIS method. The overall four-step framework of the study is shown in Figure 2.
3.2. Fuzzy Sets and Fuzzy Numbers

Fuzzy set theory, which was introduced by Zadeh (1965) to deal with problems in which a source of vagueness is involved, has been utilized for incorporating imprecise data into the decision framework. A fuzzy set $A$ can be defined mathematically by a membership function $\mu_A(x)$, which assigns each element $x$ in the universe of discourse $X$ a real number in the interval $[0,1]$. A triangular fuzzy number $\tilde{A}$ can be defined by a triplet $(a, b, c)$ as illustrated in Figure 3.

The membership function $\mu_{\tilde{A}}(X)$ is defined as

$$\mu_{\tilde{A}}(X) = \begin{cases} \frac{x-a}{b-a} & a \leq x \leq b \\ \frac{x-c}{b-c} & b \leq x \leq c \\ 0 & otherwise \end{cases}$$

(1)
Basic arithmetic operations on triangular fuzzy numbers $A_1 = (a_1,b_1,c_1)$, where $a_1 \leq b_1 \leq c_1$, and $A_2 = (a_2,b_2,c_2)$, where $a_2 \leq b_2 \leq c_2$, can be shown as follows:

Addition: $A_1 \oplus A_2 = (a_1 + a_2,b_1 + b_2,c_1 + c_2)$

(2)

Subtraction: $A_1 \ominus A_2 = (a_1 - b_2,b_1 - c_2 - a_3)$

(3)

Multiplication: if $k$ is a scalar

$k \otimes A_1 = \begin{cases} (ka_1, kb_1, kc_1), & k > 0 \\ (kc_1, kb_1, ka_1), & k < 0 \end{cases}$

$A_1 \otimes A_2 = (a_1 a_2, b_1 b_2, c_1 c_2)$, if $a_1 \geq 0, a_2 \geq 0$

(4)

Division: $A_1 \oslash A_2 = \left(\frac{a_1}{c_2} - \frac{b_2}{a_2}, a_2\right)$

if $a_1 \geq a_2, a_2 \geq 0$

(5)

Although multiplication and division operations on triangular fuzzy numbers do not necessarily yield a triangular fuzzy number, triangular fuzzy number approximations can be used for many practical applications (Kaufmann et al. 1988). Triangular fuzzy numbers are appropriate for quantifying the vague information about most decision problems including personnel selection (e.g. rating for creativity, personality, leadership). The primary reason for using triangular fuzzy numbers can be stated as their intuitive and computational-efficient representation (Karsak, 2002). A linguistic variable is defined as a variable whose values are not numbers, but words or sentences in natural or artificial language. The concept of a linguistic variable appears as a useful means for providing approximate characterization of phenomena that are too complex or ill-defined to be described in conventional quantitative terms (Zadeh, 1975).

3.3. Fuzzy Analytic Hierarchy Process

First proposed by Thomas L. Saaty (1980), the analytic hierarchy process (AHP) is a widely used multiple criteria decision-making tool. The analytic hierarchy process, since its invention, has been a tool at the hands of decision makers and researchers, becoming one of the most widely used multiple criteria decision-making tools (Vaidya et al. 2006). Although the purpose of AHP is to capture the expert’s knowledge, the traditional AHP still cannot really reflect the human thinking style (Kahraman et al. 2003). The traditional AHP method is problematic in that it uses an exact value to express the decision maker’s opinion in a comparison of alternatives (Wang et al. 2007). And AHP method is often criticized, due to its use of unbalanced scale of judgments and its inability to adequately handle the inherent uncertainty and imprecision in the pairwise comparison process (Deng, 1999). To overcome all these shortcomings, fuzzy analytical hierarchy process was developed for solving the hierarchical problems. Decision-makers usually find that it is more accurate to give interval judgments than fixed value judgments. This is because usually he/she is unable to make his/her preference explicitly about the fuzzy nature of the comparison process (Kahraman et al. 2003). The first study of fuzzy AHP is proposed by Van Laarhoven and Pedrycz (1983), which compared fuzzy ratios described by triangular fuzzy numbers. Buckley (1985) initiated trapezoidal fuzzy numbers to express the decision maker’s evaluation on alternatives with respect to each criterion Chang (1996) introduced a new approach for handling fuzzy AHP, with the use of triangular fuzzy numbers for pair-wise comparison scale of fuzzy AHP, and the use of the extent analysis method for the synthetic extent values of the pair-wise comparisons. Fuzzy AHP method is a popular approach for multiple criteria decision-making. In this study the extent fuzzy AHP is utilized, which was originally introduced by Chang (1996). Let $X = \{x_1, x_2, x_3, \ldots, x_n\}$ an object set, and $G = g_1, g_2, g_3, \ldots, g_m$ be a goal set. Then, each object is taken and extent analysis for each goal is performed, respectively. Therefore, m extent analysis values for each object can be obtained, with the following signs:

$\tilde{M}^1_{g_1}, \tilde{M}^2_{g_2}, \ldots, \tilde{M}^m_{g_m}$, \quad i = 1, 2, \ldots, n

Where $\tilde{M}^j_{g_i}$ (j=1, 2, 3, ..., m) are all triangular fuzzy numbers. The steps of the Chang’s (1996) extent analysis can be summarized as follows:

Step 1: The value of fuzzy synthetic extent with respect to the ith object is defined as:

$S_i = \sum_{j=1}^{m} \tilde{M}^j_{g_i} \otimes \left[\sum_{j=1}^{m} \tilde{M}^j_{g_i}\right]^{-1}$

(6)

Where $\otimes$ denotes the extended multiplication of two fuzzy numbers. In order to obtain $\sum_{j=1}^{m} \tilde{M}^j_{g_i}$, we perform the addition of m extent analysis values for a particular matrix such that,

$\sum_{j=1}^{m} \tilde{M}^j_{g_i} = \left(\sum_{j=1}^{m} l^j, \sum_{j=1}^{m} m^j, \sum_{j=1}^{m} u^j\right)$

(7)
And to obtain \( \left[ \sum_{i=1}^{n} \sum_{j=1}^{m} \tilde{M}^j_{s_i} \right]^{-1} \), we perform the fuzzy addition operation of \( \tilde{M}^j_{s_i} \) \( (j=1,2,\ldots,m) \) values such that,

\[
\sum_{i=1}^{n} \sum_{j=1}^{m} \tilde{M}^j_{s_i} = \left( \sum_{i=1}^{n} l_i, \sum_{i=1}^{n} m_i, \sum_{i=1}^{n} u_i \right)
\]

Then, the inverse of the vector is computed as,

\[
\left[ \sum_{i=1}^{n} \sum_{j=1}^{m} \tilde{M}^j_{s_i} \right]^{-1} = \left( \frac{1}{\sum_{i=1}^{n} u_i}, \frac{1}{\sum_{i=1}^{n} m_i}, \frac{1}{\sum_{i=1}^{n} l_i} \right)
\]

Where \( u_i, m_i, l_i > 0 \)

Finally, to obtain the \( S_j \), we perform the following multiplication:

\[
S_j = \sum_{j=1}^{m} \tilde{M}^j_{s_i} \otimes \left[ \sum_{i=1}^{n} \sum_{j=1}^{m} \tilde{M}^j_{s_i} \right]^{-1} = \left( \sum_{i=1}^{n} l_j \otimes \sum_{i=1}^{n} u_i, \sum_{i=1}^{n} m_j \otimes \sum_{i=1}^{n} m_i, \sum_{i=1}^{n} u_j \otimes \sum_{i=1}^{n} u_i \right)
\]

Step 2: The degree of possibility of \( \tilde{M}_2 = (l_2, m_2, u_2) \geq \tilde{M}_1 = (l_1, m_1, u_1) \) is defined as

\[
V(\tilde{M}_2 \geq \tilde{M}_1) = \sup \{ \min \{ \tilde{M}_1(x), \tilde{M}_2(y) \} \}
\]

This can be equivalently expressed as,

\[
V(\tilde{M}_2 \geq \tilde{M}_1) = hgt(\tilde{M}_1 \cap \tilde{M}_2) = \tilde{M}_2(d) = \begin{cases} 
1 & \text{if } m_2 \geq m_1 \\
0 & \text{if } l_2 \geq u_1 \\
\frac{l_2 - u_2}{m_2 - u_2 - (m_1 - l_1)} & \text{otherwise}
\end{cases}
\]

Figure 4 illustrates \( V(\tilde{M}_2 \geq \tilde{M}_1) \) for the case \( m_1 < l_2 < u_2 < m_2 \), where \( d \) is the abscissa value corresponding to the highest crossover point \( D \) between \( \tilde{M}_1 \) and \( \tilde{M}_2 \). To compare \( \tilde{M}_1 \) and \( \tilde{M}_2 \), we need both of the values \( V(\tilde{M}_1 \geq \tilde{M}_2) \) and \( V(\tilde{M}_2 \geq \tilde{M}_1) \).

![Figure 4. The intersection between M1 and M2 (Chang 1996)](image)

Step 3: The degree of possibility for a convex fuzzy number to be greater than \( k \) convex fuzzy numbers \( \tilde{M}_i (i=1,2,\ldots,k) \) is defined as

\[
V(\tilde{M} \geq \tilde{M}_1, \tilde{M}_2, \ldots, \tilde{M}_k) = \min \{ V(\tilde{M} \geq \tilde{M}_1), \ldots, V(\tilde{M} \geq \tilde{M}_k) \}
\]

Step 4: Finally, \( W=(\min V(s_1 \geq s_k), \min V(s_2 \geq s_k), \ldots, \min V(s_n \geq s_k))^T \) is the weight vector for \( k = 1, \ldots, n \).
3.4. TOPSIS Method

The TOPSIS method is proposed in Chen and Hwang (1992), with reference to Hwang and Yoon (1981). The basic principle is that the chosen alternative should have the shortest distance from the ideal solution that maximizes the benefit and also minimizes the total cost, and the farthest distance from the negative-ideal solution that minimizes the benefit and also maximizes the total cost (Opricovic and Tzeng, 2003).

The TOPSIS method consists of the following steps:

Step 1: Calculate the normalized decision matrix. The normalized value \( r_{ij} \) is calculated as

\[
r_{ij} = \frac{X_{ij}}{\sum_{i=1}^{n} X_{ij}^2}, \quad \forall i, j
\]

Step 2: Calculate the weighted normalized decision matrix. The weighted normalized value \( v_{ij} \) is calculated as

\[
v_{ij} = w_j r_{ij}, \quad \forall i, j
\]

Where \( w_j \) is the weight of the \( j^{th} \) criterion, and

\[
\sum_{j=1}^{m} w_j = 1
\]

Step 3: Determine the ideal and negative-ideal solution.

\[
A^* = \{v_{i1}^*, ..., v_{im}^*\} = \{(\max_i v_{ij} \mid j \in C_b), (\min_i v_{ij} \mid j \in C_c)\}
\]

(15)

\[
A^- = \{v_{i1}^-, ..., v_{im}^-\} = \{(\min_i v_{ij} \mid j \in C_b), (\max_i v_{ij} \mid j \in C_c)\}
\]

(16)

where \( C_b \) is associated with benefit criteria and \( C_c \) is associated with cost criteria.

Step 4: Calculate the separation measures, using the \( m \)-dimensional Euclidean distance. The separation of each alternative from the ideal solution is given as

\[
S_i^+ = \sqrt{\sum_{j=1}^{m} (v_{ij} - v_{ij}^+)^2}, \quad \forall i
\]

(17)

Similarly, the separation from the negative-ideal solution is given as

\[
S_i^- = \sqrt{\sum_{j=1}^{m} (v_{ij} - v_{ij}^-)^2}, \quad \forall i
\]

(18)

Step 5: Calculate the relative closeness to the ideal solution. The relative closeness of the alternative \( A_i \) with respect to \( A^* \) is defined as

\[
RC_i^* = \frac{S_i^-}{S_i^- + S_i^+}, \quad \forall i
\]

(19)

Step 6: Rank the preference order.

The index values of \( RC_i^* \) lie between 0 and 1. The larger index value means the closer to ideal solution for alternatives.

4. Empirical Analysis

The case of this study is an Iranian company which is active in the field of electric power and energy. Its mission is managing the assets of the company in the electric power industry, leading activities for the purpose of supplying reliable and economical electricity for all sectors of consumption, management and supervision on installation and operation of facilities and entering into transactions of electricity.

The case study company intends to carry out its performance appraisal process by means of the previously proposed model. The company need to efficiently qualify employees to determine the level of efficiency of each employee in order to develop Human Resources policies and to achieve an effective personnel management. For this purpose, the company is carrying out a 360-degree assessment over their employees of the project planning department which involves evaluations from supervisors, colleagues, subordinates and employees themselves. There are five employees working in this department as project planning experts. These five employees are being evaluated based on the criteria shown in Table 1. Thus we have five employees (as alternatives) which are going to evaluate based on four groups of criteria by four assessors. In this paper, the weights of criteria are calculated using Fuzzy AHP, and these calculated weight values are used as TOPSIS inputs. Then, after TOPSIS calculations, evaluation of the alternatives and selection of best person is realized.
**Fuzzy AHP**

In Fuzzy AHP method, we determine the weights of each factor by utilizing pair-wise comparison matrixes. We compare each factor with respect to other factors. You can see the pair-wise comparison matrix for ranking of these factors in Table 2.

<table>
<thead>
<tr>
<th></th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>C4</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>(1.00,1.00,1.00)</td>
<td>(1.00,2.00,3.00)</td>
<td>(0.33,0.50,1.00)</td>
<td>(2.00,3.00,4.00)</td>
</tr>
<tr>
<td>C2</td>
<td>(0.33,0.50,1.00)</td>
<td>(1.00,1.00,1.00)</td>
<td>(2.00,3.00,4.00)</td>
<td>(1.00,2.00,3.00)</td>
</tr>
<tr>
<td>C3</td>
<td>(1.00,2.00,3.00)</td>
<td>(0.25,0.33,0.50)</td>
<td>(1.00,1.00,1.00)</td>
<td>(0.33,0.50,1.00)</td>
</tr>
<tr>
<td>C4</td>
<td>(0.25,0.33,0.50)</td>
<td>(0.33,0.50,1.00)</td>
<td>(1.00,2.00,3.00)</td>
<td>(1.00,1.00,1.00)</td>
</tr>
</tbody>
</table>

After forming fuzzy pair-wise comparison matrix, we calculate the weight of criteria. The weight calculation details are given below. The value of fuzzy synthetic extent with respect to the ith object (i = 1,2,3,4) is calculated as

\[
S_i = (4.33, 6.50, 9.00) \otimes (0.03, 0.05, 0.07) = (0.15, 0.31, 0.65)
\]

Then the V values calculated using these vectors are shown in Table 3.

<table>
<thead>
<tr>
<th></th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>S2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>S3</td>
<td>0.657918</td>
<td>0.657918</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>S4</td>
<td>0.657918</td>
<td>0.657918</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Thus, the weight vector from Table 3 is calculated and normalized as

\[
W = (0.301583, 0.301583, 0.198417, 0.198417)
\]

**TOPSIS**

The weights of criteria are calculated by fuzzy AHP up to now, and then these values can be used in TOPSIS. According to TOPSIS methodology, we obtained weighted normalized decision matrix that can be seen in Table 4.

<table>
<thead>
<tr>
<th></th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>C4</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>0.24</td>
<td>0.24</td>
<td>0.11</td>
<td>0.15</td>
</tr>
<tr>
<td>A2</td>
<td>0.16</td>
<td>0.16</td>
<td>0.12</td>
<td>0.04</td>
</tr>
<tr>
<td>A3</td>
<td>0.08</td>
<td>0.05</td>
<td>0.10</td>
<td>0.03</td>
</tr>
<tr>
<td>A4</td>
<td>0.05</td>
<td>0.06</td>
<td>0.02</td>
<td>0.10</td>
</tr>
<tr>
<td>W</td>
<td>0.301583</td>
<td>0.301583</td>
<td>0.198417</td>
<td>0.198417</td>
</tr>
</tbody>
</table>

By following TOPSIS procedure steps and calculations, the ranking of persons are gained. The results and final ranking are shown in Table 5.

<table>
<thead>
<tr>
<th>Persons</th>
<th>S^+</th>
<th>S^-</th>
<th>RC^+</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>0.01</td>
<td>0.35</td>
<td>0.98</td>
</tr>
<tr>
<td>A2</td>
<td>0.16</td>
<td>0.22</td>
<td>0.58</td>
</tr>
<tr>
<td>A3</td>
<td>0.34</td>
<td>0.02</td>
<td>0.04</td>
</tr>
<tr>
<td>A4</td>
<td>0.28</td>
<td>0.11</td>
<td>0.28</td>
</tr>
<tr>
<td>A5</td>
<td>0.28</td>
<td>0.09</td>
<td>0.25</td>
</tr>
</tbody>
</table>

According to Table 5, A1 is the best person among other persons and other persons ranked as follow: A1 > A2 > A4 > A3 > A5.
5. Conclusions

Human resource management has emerged as an important discipline that is used in many fields. It has become a strategic tool for most organizations in today’s highly competitive environment and Performance appraisal is seen as one of the most critical HRM tools. The purpose of this paper is developing a framework based on the fuzzy multiple criteria decision making approach to identify the best person. First the criteria are recognized. Second the fuzzy AHP is applied to determine weights of criteria. Finally TOPSIS method is used in order to rank the persons. According to result, A_i is the best person among other persons.

References