Multi-Criteria Approach to Personnel Selection: Fuzzy Topsis Applications

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Extensive Summary

Introduction

The most important competition tool in today's market, the effective use of resources in the organization of the resources they have. The first of these sources are from human resources. Human resources and the choice of one of the personnel providing the basic functions of management, there are people who have the qualities needed by the organization, defined as the selection and recruitment process. Well-chosen personnel, to carry out activities for the purpose of the organization is very important in terms of effective use of maintenance and other resources. Supply and people-oriented business sees the electoral process, objectively and in the planning and execution of a strategic perspective, it is important for both organizations to respond to the expectations and goals of both employees.

Personnel selection problems, decision-making and be more than the number of candidates and the terms of a number of criteria to be effective in the decision lies in the multi-criteria decision problems. Decisions based on personal jurisdiction includes the uncertainty. Therefore, one of the multiple-criteria decision analysis techniques in this study preferred method of fuzzy TOPSIS. In the process of recruiting a research assistant in a public university under study, which will be invited to the entrance examination of the applicant who, with proximity to the ranking made by calculating the coefficients for each candidate is determined based on objective criteria.

Methodology

In this study, fuzzy TOPSIS method is used in a higher education institution, one of the research assistants, multi-criteria decision-making methods for the determination of candidates to be the science exam in the process of employment in the public sector.

Research assistant hiring process consists of two stages. In the first stage, it is taken applications from candidates who meet the criteria specified in the written notice. Exam jury is to determine the candidate to ten times the 60 % and make a preliminary
assessment, taking into account 40% of foreign language score and who applied for the number of staff declared among the candidates of the applicant who ALES, declare the candidates to be the entrance examination. In the second stage by a jury, the entrance exam is a written test to measure the level of knowledge related to the area of declared candidates is done. Entrance exam results in the exam jury, 30% of the students who apply ALES, 10% of foreign language score of 30% of the graduation grades and entrance examination score, taking into account the 30% makes the final selection. Candidates who score below 65 is considered failing.

In the study, a research assistant personality given by the ad agency staff, a total of thirty-nine candidates with the general terms and conditions stated in the ad title was admitted. These candidates will be invited to ten of the examination. Have multiple decision makers in the selection process and due to the large number of fuzzy TOPSIS approach to evaluate candidates based on different criteria are preferred.

Applications of fuzzy TOPSIS method steps are as follows:

**Step 1.** Determination of the decision criteria that will be used in the evaluation of alternatives by decision making group.

**Step 2.** Using linguistic expressions (very low, low, medium low, medium, medium high, high, very high), by decision making group to evaluate the decision criteria importance weights.

**Step 3.** Using linguistic expressions (very poor, poor, medium poor, fair, medium good, good, very good), evaluation of alternatives according to decision criteria by decision making group.

**Step 4.** The linguistic expressions for decision criteria, to be converted into triangular fuzzy numbers and the creation of fuzzy weight vector.

**Step 5.** The linguistic expressions used in the evaluation of alternative decision criteria, to be converted into triangular fuzzy numbers and preparation of fuzzy decision matrix.

**Step 6.** Calculate the normalized decision matrix. It is applied the following formula:

\[
\hat{r}_{ij} = \left( \frac{a_{ij}^{+} - a_{ij}^{-}}{c_{ij}^{+} - c_{ij}^{-}}, \frac{a_{ij}^{+} - a_{ij}^{-}}{c_{ij}^{+} - c_{ij}^{-}} \right), \ j \in B;
\]

\[
\check{r}_{ij} = \left( \frac{a_{ij}^{-} - a_{ij}^{-}}{c_{ij}^{-} - c_{ij}^{-}}, \frac{a_{ij}^{+} - a_{ij}^{-}}{c_{ij}^{+} - c_{ij}^{-}} \right), \ j \in C;
\]

\[
c_{i} = \max_{j} c_{ij}, \ j \in B;
\]

\[
a_{i}^{+} = \min_{j} a_{ij}, \ j \in C;
\]

**Step 7.** Calculate the weighted normalized decision matrix. The weighted normalized decision matrix is calculated as

\[
\tilde{r}_{ij} = \hat{r}_{ij} \cdot w_{j}
\]
Step 8. Determine the positive ideal solution (PIS) and negative ideal solution (NIS).

\[ A^+ = (v_i^1, v_i^2, ..., v_i^n) \] ve

\[ A^- = (v_i^-1, v_i^-2, ..., v_i^-n) \]

Step 9. Calculate the separation measures for positive and negative ideal solution.

\[ d_i^+ = \sum_{j=1}^{n} d(v_{ij}, v_{ij}^*) \quad i = 1, 2, 3, ..., n \]

is the distance between PIS,

\[ d_i^- = \sum_{j=1}^{n} d(v_{ij}, v_{ij}^-) \quad i = 1, 2, 3, ..., n \]

is the distance between NIS.

Step 10. Calculate the relative closeness to the ideal solution and rank the preference order. The relative closeness to the ideal solution is calculated as

\[ CC_i = \frac{d_i^-}{d_i^+ + d_i^-} \quad i = 1, 2, 3, ..., n \]

Findings and Discussion

In this study, fuzzy TOPSIS method was applied in a higher education institution in the process of recruiting research assistants involved in the public sector in order to determine the candidates will be invited to the entrance examination. Decision criteria for determining priority by decision makers to evaluate the candidates and the right candidate is identified. Then, by applying fuzzy TOPSIS process step by step, positive ideal solution and negative ideal solution for determining the values of proximity coefficients were calculated for each candidate. The closeness coefficients are calculated for each candidate; it is observed that there are huge differences between the values obtained for the designated decision criteria. In such a case away from the subjective judgments of the decision makers, making it difficult to make the right decision. Fuzzy TOPSIS method by considering different decision criteria by the decision-makers of all candidates who apply, to be evaluated objectively and sequencing is provided. Based on the highest score in terms of closeness to the ideal solution to the ranking made towards the lowest points, the candidates will take the entrance exam, respectively, A38, A37, A36, A31, A30, A39, A24, A33, is designated as the A10 and A12.

Fuzzy TOPSIS method, where large numbers of decision-makers, and many have an effect on the decision of the criteria to be included in the staff selection problem, said to be a very useful method to solve problems in a fuzzy environment.

A method used in this study, based on the regulations applicable to the purchase is a research assistant for an alternative to public universities. Fuzzy TOPSIS method of evaluating candidates ALES and foreign language as well as a number of points to consider in terms of criteria, decision-makers at the level of accuracy in terms of
personnel selection and the reliability of the decision; In terms of candidates it may increase confidence in the justice perception and attention given to decision makers.