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EVALUATION OF NON-TYPE RATED PILOT SELECTION CRITERIA IN THE CIVIL AVIATION INDUSTRY WITH AHP AND TOPSIS METHODS

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ABSTRACT

Purpose- The purpose of the study is to show that multi-criteria decision-making methods can be used in the recruiting process of non-type rated pilots in the civil aviation sector.
Methodology-In this scope, the criteria taken into consideration by the HR departments in the recruitment process of non-type rated pilots to work in the civil aviation sector have been identified in the study. Then, with the AHP method, importance levels of the criteria have been determined by taking experts opinion. TOPSIS method has been used to select the right candidate for the business among the five candidates who applied as non-type rated pilots.
Findings- Finding of the study has proposed the most suitable candidate for the company.
Conclusion- The effective use of AHP and TOPSIS multi-criteria decision-making techniques in an integrated manner will facilitate HR managers and decision makers in the quantitative evaluation of subjective and objective criteria. The proposed method can also be used in selection processes in other areas of HRM.

Keywords: Human resource management, civil aviation, AHP, TOPSIS, non-type rated pilots
JEL Codes: M12, Y9, C35

1. INTRODUCTION

The selection function of human resources, which is vital for businesses to produce the goods and/or services they offer to satisfy the needs and desires of consumers, is a very important human resources management function when considering the ability of businesses to make profit and maintain their lives. The successful realization of this process, which can be briefly expressed as selecting the candidates with the right qualifications for the right job, will be very beneficial for the businesses, while the selection of unsuitable candidates for the business will lead to negative results. In order not to cause these negative results, it is necessary to prepare in advance for the recruiting process. The right candidate should be determined taking the requirements of the jobs and experience, skills of the candidates. (Ren et.al, 2018).

In this process, it is vital to identify the criteria for the requirements of the position, regardless of the fact that there are several alternative methods which will enable HR departments to recruit the right candidate. These criteria can be deduced from the previous job analyzes in the enterprise and the job descriptions and job requirements prepared in line with these analyzes (Tyson, 2014). In addition to the harmony between the knowledge, skills, experience and abilities of the candidates and the job requirements, the selection of people who are suitable and/or will adapt to the cultures and values of the enterprises will also provide more positive results. Thanks to the weighted criteria, much more accurate decisions can be achieved in the recruiting process (Langan, 2000).

Businesses resort to many traditional or modern methods when selecting personnel. While some businesses conduct interviews with candidates, some businesses try to find the right candidate with the help of multiple-choice tests. Another method that will contribute to recruiting process is multi-criteria decision-making methods. Several methods and applications on this subject exist in the literature. Since the personnel selection criteria are of a qualitative nature, methods such as

Analytical Hierarchy Process method is frequently used to transform these criteria into a quantitative structure and to develop a more objective perspective (Vaidya and Kumar, 2006)

In this study, personnel selection criteria were determined to realize the right recruitment process of non-type rated pilot in civil aviation enterprises. The relevant criteria were created by taking expert opinion together with the support of the literature. In order to determine the weights of the criteria and convert the qualitative expressions into a quantitative structure, AHP method has been utilized. The qualifications of the candidates who have completed the pilot training and applied to a civil aviation enterprise have been examined. Thanks to TOPSIS method, the right candidate has been determined. In this scope, the study is expected to contribute to civil aviation companies to recruit non-type rated pilots.

In the first part of the study after the introduction, recent studies on strategic human management and recruiting process in aviation has been analyzed. In the third part of the study, the method of the study, information about interview process, AHP and TOPSIS has been given. Part 4 demonstrates findings of the study. Last but not the least, conclusion of AHP and TOPSIS method has been explained and suggestions for further studies on the topic has been stressed.

2. LITERATURE REVIEW

Recent literature on strategic human resource management and recruitment process in aviation industry has been analyzed.

2.1. Strategic Human Resource Management

The main objectives of strategic management are to be successful in strategic management understanding of enterprises, to maintain the existence of the organization in the long term, to gain competitive advantage, to use its resources effectively and efficiently. Finding a place for strategic management in human resources management is possible with the management style that does not comply with the human resources management policies of the enterprise and the strategic management policies of the enterprise. Adopting the strategic human resources management approach in the business affects the increasing business performance, problem solving, change and innovation, and reducing the absenteeism of the employees (Collins, 2021).

The emerging concept of “strategic human resources management” is another name for the role of human resources in the new era. Strategic human resources management is an approach based on the compatibility of organizational strategies with human resources and the addition of human resources to strategic management. The basic idea in strategic human resources management is to have highly motivated employees who have the basic behaviors and skills that the organization needs to achieve the goals of the business and to provide competitive advantage, and to ensure that they have a greater say in their relations with the management by making efforts to increase the performance of the employees to a high level. With this thought, a high performance is achieved by creating an integrative atmosphere (Iqbal, 2019).

One of the important features of strategic human resources management is the formation of the link between human resources strategy practices and the general strategic goals of the enterprise. Strategic human resource management is a market-oriented approach to how the business will affect its competitive advantage by using human resources more actively. According to this approach, human resources management is a conceptual approach on how to provide human resources with other resources, how to meet and manage employment (Verma et al., 2022).

There are five basic features in strategic human resource management activities. These features are (Da Silva et al., 2022);

- Long-term planning: It is necessary to make strategic long-term plans regarding the use of human resources.
- Developing new links between human resource management and strategic planning: Human resource management provides support both in determining and implementing business strategies.
- Enabling interaction between human resources and organizational performance: The important role of human resources management in passing the organization's strategic goals creates a positive effect on organizational performance.

- The development of mutual relations between human resources management and command-and-command management: The strategic importance of human resources management in the enterprise strengthens its relations with command-command management.
- Human resources management gaining a strategic quality: It ensures that the tasks undertaken by human resources management are more effective in the planning and implementation stages.

Having these features of strategic human resources management makes the system preferable by coming to the forefront in contrast to conventional human resources management. As a result, strategic human resources management is a preferred dimension in in-house management approach.

2.2. Recruitment Process in Aviation

It is seen as a necessity for the new employee to have the qualifications and abilities required by the job for the goals such as sustaining the existence of the enterprises, being efficient and effective. The fact that the recruitment processes are carried out with scientific methods is the determining factor on the success of the individuals recruited. For this reason, the recruitment process aims to harmonize the skills and qualifications required by the job with the talents and qualifications of the candidate to be recruited (Lubis and Amalia, 2021).

Employee recruitment is the process of finding candidates who are qualified to be needed by the business and the organization. Before starting to do this, job analyzes must be made and job descriptions must be specified. Jobs are analyzed one by one with job analysis and job descriptions are determined. With the help of these definitions, what the job consists of, the process of doing the job, the working environment, the number of people to do the job, job risk etc. topics are determined. Next comes the selection of the most suitable candidate among a group of qualified candidates. There are two aspects that the business must consider before deciding on the resources it can use. First, it is necessary to know well which position to recruit, what is expected of the employee for this job, and the requirements of the job. This is only possible with business analysis. After the job analysis is done, the second step is to determine the qualifications of the employee who will do this job. If this process is not followed in this way, the result will be negative for both the business and the employee (Moradi et al., 2020).

Companies operating in aviation industry carry out their operations in competition with several airlines and non-aviation enterprises as well. For this reason, civil aviation companies need to pay great attention to safety, high quality, and reliability. In this scope, human factor, namely personnel working in this sector play an essential role. In today's word together with globalization which has resulted in new markets, international and multinational enterprises, it has become a necessity to use human resources in a strategic way. (Harvey and Turnbull, 2020).

Recruiting qualified personnel has been one of the main objectives of HR department in companies operating in civil aviation industry to survive in the competition (Van, 2013). Even though there may be differences in the steps of recruiting process depending on the structure of the enterprises and type of the work, 8 steps can be mentioned; 1- Preliminary interview, 2- Completing the application form, 3- Recruitment tests/exams, 4- Recruitment interviews, 5- Reference review, 6- Conditional job offer, 7- Health check, 8- Permanent job offer (Chapman and Mayers, 2015).

Considering the employee selection process, it can be said that the test/exam application and recruitment interviews are the most effective stages in making the selection decision.Since the interviewer and and the candidate share exchange information, recruitment interview is defined as purposeful. (Lengnick-Hall et al., 2011). Final stage of recruiting process is to decide whom to hire. The candidate with highest score can be hired if there is only one position to be filled. However, when many people need to be hired for the same position, the decision-making process can turn into clarifying the boundary of who is eligible to be hired and who doesn't (Alfes et al., 2013).

Businesses make use of various selection criteria when choosing the human resources to work within them. Among the most common criteria are education and experience, personal characteristics, skills and abilities (Swanson, 2022). The selection process consisting of selection criteria should carry some general standards such as reliability, validity, generalizability, usefulness, and legality. Human resource management specialists or business managers struggle to the information of the candidates thus, make the right decision in recruiting the right candidate (Yalım and Mızrak, 2021). In order to make the decision-making process easier, several methods have been developed. Some of the most common methods include the use of statistical analysis of the test results, matching the applications forms with requirements of the jobs, etc. (Bernardin and Russell, 2006).

Considering the fact that aviation is one of the fastest growing businesses, one cannot deny the necessity of keeping the knowledge and skills of the personnel fresh at all times. Especially, since the personnel such as pilots and technicians play an essential role in fulfilling the goals of civil aviation activities, the provision of safety, reliability and high-quality factors in aviation is directly affected by the personnel trainings (Shanker, 2020).

In recent years, the selection of non-type rated pilots in civil aviation has been made more gradually, especially with the increase in the share of the human factor in accidents. First of all, candidates are expected to prove their English level with exams such as IELTS, TOEFL, ITEP or with the English exam conducted by the institution. Candidates who pass this stage are invited to interviews called CRM, where their situational awareness levels are measured, and various psychological tests are included. Afterwards, the candidates are taken to the simulator applied exams where their flight skills are tested. Candidates who are successful in all these steps are finally taken to the board interview, which is attended by the members of the human resources department of the institution and the captains (Adanov and Macintyre, 2020).

The decisions made in the process of selecting new employees are the decisions made about people. The fact that it is not possible to determine the full potential of people and it is almost impossible to predict the performance of the people to be recruited with absolute certainty, causes the recruiting process to take the form of predicting the best results with the available information. For this reason, it is very important to determine the criteria to be used. Correctly determined and correctly weighted criteria will enable much more accurate decisions (Wang et al., 2022).

3. DATA AND METHODOLOGY

In this study, criteria have been determined for the realization of the right non- type rated pilot recruiting process in civil aviation companies. While determining the criteria, a recent literature has been reviewed and interviews have been conducted with the human resources managers of the airline companies operating in Turkey. Detailed information about the recruitment processes has been obtained from the managers, and they have been asked about the criteria they attach importance to in this process. As a result of the interviews, 5 main criteria that companies take into account in the recruiting process of non-typed rated pilots have been determined. To determine the importance levels of the criteria obtained, the relevant criteria have been scored by the three sector representatives interviewed.

The significance levels of the criteria have been obtained using the AHP method. This method was developed by Saaty in the 1970s, which allows the researcher to make a hierarchical modeling. Then, ranking among the candidates has been made with TOPSIS method by scoring over the application information of the five candidates who applied to X aviating company. Detailed information about the methods is given below.

3.1. The Analytic Hierarchy Process (AHP)

When decision maker is struggling between multiple goals, choosing between alternatives becomes challenging. The Analytic Hierarchy Process developed by Thomas Saaty in the 1970s is a tool to assist decision makers in multi-objective problems. AHP is the hierarchy of decision components used in the decision-making process. This technique is flexible for evaluating strategies under alternative environmental scenarios. It offers a modeling and measurement approach. It also provides judgment and data use procedure for resolving and evaluating disputes. AHP makes it clear that risk and uncertainty require careful judgment. It takes the advice and opinions of all concerned individuals on the subject into consideration, evaluates alternatives and gives detailed results (Rajabpour et al., 2022).

AHP is frequently used to analyze complex decisions. It helps the decision maker by using pairwise comparisons to rank and identify the most suitable alternative.

AHP is a selection process consisting of the following steps (Saaty, 1990);

1. Defining the problem and determining the information to be used in the process.

2. Establishment of decision hierarchy.

The skeleton in the AHP method is hierarchy. With the help of hierarch, the influence possessed by the function amongst elements, and their impact on the entire system can be determined. The complexity of the problem being analyzed becomes decisive on the number of the hierarchies. Too many elements in a hierarchy should be avoided. The number of hierarchies depends on the complexity of the problem analyzed: there should not be too many elements in a hierarchy.

3.Construction of the pairwise comparisons matrix (square matrix).

When there are n criteria, a matrix of nxn size is formed. In order to create this matrix, decision makers make n(n-1)/2 pairwise comparisons with the help of a questionnaire. The values in Table 1 are used in these comparisons.

Table 1: Pair-Wise Comparison Scale for AHP Preferences

Numerical Rating	Verbal Judgements of Preferences
9	Extremely preferred
8	Very strongly to extremely
7	Very strongly preferred
6	Strongly to very strongly
5	Strongly preferred
4	Moderately to strongly
3	Moderately preferred
2	Equally to moderately
1	Equally preferred

Source: Saaty, T. L. (1990). An exposition of the AHP in reply to the paper "remarks on the analytic hierarchy process". Management science, 36(3), 259-268.

According to the table above (Table 1), a pairwise comparison matrix is created by comparing the importance levels of all criteria with each other. With these values, the relative importance matrices of the criteria are created. In other words, the process of dividing each criterion by the total criterion value takes place. However, an important process in this process is consistency rates. The consistency ratio suggested by Saaty is used to measure the consistency ratio. The randomness indicator is used when calculating the consistency ratios.

Table 2: Average Random Consistency

Size of Matrix	1	2	3	4	5	6	7	8	9	10
Random consistency	0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.49

Source: Saaty, T. L. (1990). An exposition of the AHP in reply to the paper "remarks on the analytic hierarchy process". Management science, 36(3), 259-268.

In order to validate the results of the AHP, the consistency ratio (CR) is calculated using the formula, CR = CI/RI in which the consistency index (CI) is, in turn, measured through the following formula:

$$CI = \frac{\lambda_{\max} - n}{n-1} \quad (1)$$

CI : consistency index; N: number of variables; λ_{max}: maximum eigen value of matrix A

The value of RI is related to the dimension of the matrix and will be extracted from Table 2. It should be noted that consistency ratio lower than 0.10 verifies that the results of comparison are acceptable.

3.2. TOPSIS Method

TOPSIS method, which is one of the multi-criteria decision-making methods, was developed by Hwang and Yoon in 1981. The main purpose of the method is to determine the relative closeness values of the candidates to the ideal solution. In this process, first of all, the decision matrix is being created. In the Aij matrix, m gives the number of decisions, n the number of criteria (Pavić and Novoselac, 2013).

$$A_{ij} = \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ . & & & . \\ . & & & . \\ . & & & . \\ a_{m1} & a_{m2} & \dots & a_{mn} \end{bmatrix} \quad (2)$$

If all weights w is mutually equal, in which case w = 1 / n, the numbers r can be applied in the matrix j j i_j

A as the numbers a_{ij}.

Step 1: Construction of the Normalized Decision Matrix

With this process, various attribute dimensions are transformed into non-dimensional attributes. It allows comparison across the attributes. One way is to take the outcome of each criterion divided by the norm of the total outcome vector of the criterion at hand (Hwang et al., 1981). An element of r_{ij} of the normalized decision matrix R can be calculated as in the below equation;

$$r_{ij} = \frac{a_{ij}}{\sqrt{\sum_{k=1}^{m} a_{kj}^2}} \quad (3)$$

Thus, the normalized decision matrix R is shown in below matrix (Hwang et al., 1981);

$$R = \begin{bmatrix} r_{11} & r_{12} & . & . & . & r_{1n} \\ r_{21} & r_{22} & . & . & . & r_{2n} \\ . & . & . & . & . & . \\ . & . & . & . & . & . \\ . & . & . & . & . & . \\ r_{m1} & r_{m2} & . & . & . & r_{mn} \end{bmatrix} \quad (4)$$

m represents the number of alternatives whereas n is the number of criteria. R_{ij} symbolizes normalized preference measure of the i^{th} alternatives in terms of the j_{tj} criterion (Hwang et al., 1981).

Step 2: Weighted Normalized Decision Matrix

S_e if weights from the decision maker is applied in the matrix. This matrix is calculated by multiplying each column of the matrix r with the weights of w_j. For this reason, the weighted normalized matrix V is equal to;

$$V=\begin{bmatrix} v_{11} & v_{12} & . & . & . & v_{1n} \\ v_{21} & v_{22} & . & . & . & v_{2n} \\ . & . & . & . & . & . \\ . & . & . & . & . & . \\ . & . & . & . & . & . \\ v_{m1} & v_{m2} & . & . & . & v_{mn} \end{bmatrix} = RW = \begin{bmatrix} w_1.r_{11} & w_2.r_{12} & . & . & . & w_n.r_{1n} \\ w_1.r_{21} & w_2.r_{22} & . & . & . & w_n.r_{2n} \\ . & . & . & . & . & . \\ . & . & . & . & . & . \\ . & . & . & . & . & . \\ w_1.r_{m1} & w_2.r_{m2} & . & . & . & w_n.r_{mn} \end{bmatrix}$$

where W is;

$$W=\begin{bmatrix} w_1 & 0 & 0 & . & . & . & 0 \\ 0 & w_2 & 0 & . & . & . & 0 \\ 0 & 0 & w_3 & . & . & . & 0 \\ . & . & . & . & . & . & . \\ . & . & . & . & . & . & . \\ . & . & . & . & . & . & . \\ 0 & 0 & 0 & . & . & . & w_n \end{bmatrix}, \text{ and } \sum_{j=1}^{n} w_j = 1 .$$

(5)

Step 3: Ideal and Negative Ideal Solutions

To create the ideal solution set, the largest of the weighted evaluation factors, that is, column values, in the V matrix (the smallest if the relevant evaluation factor is minimization-oriented) is selected. Finding the ideal solution set is shown in the formula below (Hwang et al., 1981);

$$A^{*}=\left\{\left(\max_{i} v_{ij} \middle| j \in J\right),\left(\min_{i} v_{ij} \middle| j \in J^{'}\right)\right\} \quad (6)$$

Then, the following formula is used to create ideal and negative ideal solution sets.

$$A^{-}=\left\{\left(\min_{i} v_{ij} \middle| j \in J\right),\left(\max_{i} v_{ij} \middle| j \in J^{'}\right)\right\} \quad (7)$$

The value expressed with J indicates the benefit (maximization), and the value expressed with J' indicates the loss (minimization) value (Hwang et al., 1981).

Step 4: Calculation of Separation Measure

With the n-dimensional Euclidean distance method, separation distances each alternative from the ideal solution and negative ideal one can be obtained. Equation 7 suggests the ideal and negative ideal separation formula (Hwang et al., 1981).

$$S_i^* = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^*)^2}$$

$$S_i^- = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^-)^2} \quad (8)$$

Step 5: Relative Closeness to Ideal Solution

In the last step of the method, the relative closeness (C_i^*) of each decision point to the ideal solution is calculated. By using the ideal and negative ideal separation measures, the relative closeness to the ideal solution is obtained. The formula for this process is given below (Hwang et al., 1981).

$$C_i^* = \frac{S_i^-}{S_i^- + S_i^*} \quad (9)$$

If the value of C_i^* is close to 1, it indicates its absolute closeness to the ideal solution, and if it is close to 0, it indicates its absolute closeness to the negative ideal solution (Pavić amd Novoselac, 2013).

Step 6: Ranking of the Preference Order

A preference of order can be done based on the order of C_i^*. The best alternative is the one which has shortest distance to ideal solution and the worst is the one with the longest distance to ideal solution (Hwang et al., 1981).

4. FINDINGS AND DISCUSSIONS

4.1. Determination of Criteria

As a result of the literature research and interviews, 5 criteria on the requirement of non-rated type pilot have been obtained. Criteria set has been given in Table 3.

Table 3: Criteria Set on the Recruitment of Non-Rated Type Pilots

Criteria no#	Criteria
1	Knowledge of English Language
2	Education
3	Age
4	Flight Competence
5	Crew Resource Management

4.2. Evaluation of Logistics Personnel Selection Criteria with AHP Method

After the 5 criteria have been determined, a pairwise comparison matrix has been created to apply the AHP method. While creating the matrix, the criteria have been scored with expert opinion by using Saaty's importance scale (1-9). After the importance levels of the criteria and sub-criteria have been obtained, the consistency levels have been measured by using randomness indicators. The table containing the importance levels, consistency levels of the criteria of the study and the final ranking of the criteria is given below.

Table 4: Significance, Consistency, and Final Ranking of Criteria

Criteria	Weights
Knowledge of English Language	0,4795
Education	0,1551

Age	0,1027
Flight Competence	0,1314
Crew Resource Management	0,1314

4.3. Personnel Selection with TOPSIS Method

After the personnel selection criteria have been evaluated with the AHP method, the information of the five candidates who applied for the relevant position has been evaluated and analyzed with the TOPSIS method. The scores of the candidates regarding the criteria are given below.

Table 4: Decision Matrix

	Knowledge of English Language	Education	Age	Flight Competence	Crew Resource Management
Candidate 1	2	2	26	5	3
Candidate 2	5	4	29	4	2
Candidate 3	3	4	34	4	3
Candidate 4	4	5	35	4	4
Candidate 5	3	3	42	5	4

After the decision matrix is created, each value in the column is divided by their sums and the values are normalized. The normalized matrix is obtained by multiplying the normalized criteria values with the criteria weights. The values for the matrix are given below.

Table 6: Weight Normalized Matrix

	Knowledge of English Language	Education	Age	Flight Competence	Crew Resource Management
Candidate 1	0,11842887	0,03585686	0,03455321	0,06565992	0,05307228
Candidate 2	0,29607217	0,07171372	0,03854012	0,05252793	0,03538152
Candidate 3	0,1776433	0,07171372	0,04518497	0,05252793	0,05307228
Candidate 4	0,23685774	0,08964215	0,04651394	0,05252793	0,07076304
Candidate 5	0,1776433	0,05378529	0,05581673	0,06565992	0,07076304

A positive and negative ideal solution set was obtained, the relevant information is given in the table below.

Table 7: Positive and Negative Ideal Solution Set

V+	0,29607217	0,08964215	0,03455321	0,06565992	0,07076304
V-	0,11842887	0,03585686	0,05581673	0,05252793	0,03538152

6. By using the values in the table above, the relative closeness of the criteria values of the candidates to the ideal solution has been found and the final ranking among the candidates has been done. Relevant values are given in the table below.

Table 8: Distance to Positive-Negative Solution, Relative Closeness to Ideal Solution, and Final Ranking

	Si+	Si-	P score	Rank
Candidate 1	0,18644828	0,03061942	0,14105931	5
Candidate 2	0,04197171	0,18204763	0,81264245	1
Candidate 3	0,12225086	0,0700364	0,364228	4
Candidate 4	0,06182117	0,13511716	0,68608869	2
Candidate 5	0,12555177	0,07247123	0,36597378	3

As seen in the table, among the 5 pilot candidates, candidate 2 has the highest value in terms of its closeness to ideal solution. Then, candidate 4, candidate 5, candidate 3 and candidate 1 come respectively.

5. CONCLUSION AND IMPLICATIONS

Employee procurement and selection is an important decision for businesses. There may be many different and conflicting criteria regarding the characteristics of candidates. While the candidates are better than others in some criteria, they may be

behind others in some criteria. This makes it difficult for decision makers. Quantifying all relevant quantitative and qualitative criteria is an objective method for evaluating candidates. In this study, it is shown on an experimental example that AHP and TOPSIS multi-criteria decision-making techniques can be used together effectively in the selection of non-type rated first officers in the civil aviation sector.

In the study, as a result of the AHP analysis, the most important criterion in the "selection of non-type rated pilots in the civil aviation sector" has been determined as "English language knowledge" (0.4795), followed by "Education" (0.1551), "Age" (0.1027), ''Flight Competence'' (0.1314), ''Crew Resource Management'' (0.1314). After determining the importance of non-type rated pilot characteristics in the civil aviation sector in line with the opinions of the participants, the analytical hierarchy model and TOPSIS methods have been used together, and 5 experimental candidates have been ranked according to the criteria. These 5 experimental candidates have also been ranked with equal emphasis on all criteria. The rankings resulting from these two different applications also differed from each other. From this point of view, it can be said that in the recruiting process of the enterprises, selection path in line with the criteria determined by their importance and weight can lead to more positive results for the enterprises.

The effective use of AHP and TOPSIS multi-criteria decision-making techniques in an integrated manner will facilitate HR managers and decision makers in the quantitative evaluation of subjective and objective criteria. The proposed method can also be used in selection processes in other areas of HRM. In future studies, the relations between criteria can be analyzed in a more complex way with the Analytical Network Process (AAP) method or the results can be compared using different multi-criteria techniques.

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