Artvin Çoruh Üniversitesi
Orman Fakültesi Dergisi
ISSN:2146-1880, e-ISSN: 2146-698X
Yıl: 2018, Cilt: 19, Sayı:2, Sayfa:12--137

Artvin Coruh University
Journal of Forestry Faculty
ISSN:2146-1880, e-ISSN: 2146-698X
Year: 2018, Vol: 19, Issue: 2, Pages:129-137

ofd.artvin.edu.tr

Trainee evaluations and recruitment based on fuzzy AHP: an application in furniture sector

Bulanık AHP'ye dayalı staj değerlendirme ve işe alım: mobilya sektöründe bir uygulama

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Eser Bilgisi / *Article Info*
Araştırma makalesi / *Research article*
DOI: 10.17474/artvinofd.424696

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Geliş tarihi / *Received*
17.05.2018
Düzeltme tarihi / *Received in revised form*
16.08.2018
Elektronik erişim / *Online available*
04.09.2018

Keywords:
Multi-criteria decision making (MCDM)
Fuzzy logic
Personnel selection
Job evaluation

Anahtar kelimeler:
Çok kriterli karar verme (ÇKKV)
Bulanık mantık
Personel seçimi
İş değerlendirme

Abstract

The choice of a newly personnel to hire is a decision making problem that requires evaluation of many factors being not totally known in terms of enterprises. That the success of this process is as significant as may not be left for coincidences. Therefore, staff selection problems should be resolved with scientific methods. This study aims to carry out trainee recruitment by means of the Fuzzy Analytic Hierarchy Process (FAHP) method being from one of the multi criteria decision making methods in a furniture factory. For this purpose, it was guaranteed by the enterprise that a student shall be hired as a CNC operator before the internship and this was notified to trainees in advance. Three students having satisfied the preconditions of enterprise were started the internship. The students were subjected to the evaluation at the end of training course and the most successful trainee among them was accepted for the job. In evaluation process the intern's linguistic variables were used and the defuzzification of fuzzy weights was carried out based on the α-cutting and optimism index.

Özet

İşe alınacak yeni bir personelin seçimi, işletmeler açısından tamamen bilinmeyen birçok faktörün değerlendirilmesini gerektiren bir karar verme problemidir. Bu sürecin başarısı tesadüflere bırakılmayacak kadar önemlidir. Bu nedenle, personel seçim problemleri bilimsel yöntemlerle çözülmelidir. Bu çalışma bir mobilya fabrikasında, çok kriterli karar verme yöntemlerinden biri olan Bulanık Analitik Hiyerarşi Prosesi (FAHP) yöntemi ile stajyer seçiminin yapılması amaçlamıştır. Bu amaçla staj öncesinde CNC operatörü olarak bir öğrencinin işe alınacağı işletme tarafından garanti edilmiş ve stajyerlere önceden bildirilmiştir. İşletmenin ön koşullarını sağlayan üç öğrenci staja başlamıştır. Bu öğrenciler staj sonunda değerlendirilmeye tabi tutuldu ve aralarındaki en başarılı stajyer işe kabul edilmiştir. Stajyerlerin değerlendirilmesinde dilsel değişkenler kullanılmış ve bulanık ağırlıkların durulaştırılması α-kesme ve iyimserlik indeksine dayalı yapılmıştır.

INTRODUCTION

Staff selection is the process for identifying the people who are the best suitable to all the skills and requirements of the job among the suitable qualified candidates applying for the available vacancy position in the establishment. The selection based on the reliable foundations makes the trust to the establishment enhance to create a more efficient working environment (Sabuncuoğlu 2016).

In today's intense competitive environment, the quality workforce is required for enterprises to survive. The choice and proper management of the workforce are the important factors to increase the efficiency of the business (Deniz ve Bakkalbaşı 2010).

Large enterprises during the process of workforce choice manage more efficiency via the human resource units while in small businesses only one person decides by interviewing the candidates and makes the choice after the evaluation process where the neutrality is the most important issue. Therefore, the enterprises should know the criteria that are in the relation to the knowledge, skills and abilities of candidates on the job (Dağdeviren and Yüksel 2007).

It is well known that in our country, especially in recent years, there is a problem about finding qualified labor force in the production sector and the education system spends much more efforts to educate the workforce in the qualities demanded by the business world. In order to solve the problem, it is essential to make effectively the communication and cooperation between the workplaces and educational institutions. For this purpose, some organizations and educational institutions have made various agreements and successful studies so that the rates of students finding workplace for trainee student and finding a job increase considerably when they graduate. Largely, the choice of students to be employed among the trainee students results in the challenging process for the business engagement directors.

In the literature on the choice of personnel, the studies produced with multi-criteria decision making methods attract attention. Rouyendegh and Erkan (2013) made an academic staff selection using the Fuzzy ELECTRE (Elemination and Choice Translating Reality English) method. Koutra et. al. (2017) applied a model for personnel choice in the maritime industry, settled on the AHP (Analytical Hierarchy Process). Ji et. al. (2018) operated a numerical model of the personnel selection to express the practice of the projection-based TODIM (Iterative Multi Criteria Decision Making). Sang et al. (2015) indicated Karnik–Mendel algorithm-based fuzzy TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) in personnel choice exercise. Efe and Kurt (2018) showed the possibility degree based TOPSIS method with IT2F numbers as an extension of the TOPSIS method. Jasemi and Ahmadi investigated a novel fuzzy ELECTRE approach which is categorized as a multiple criteria decision making (MCDM) technique. Çelikbilek (2017) was applied Grey-AHP approach to project director choice for a software project.

In the previous studies on personnel selection, the multi-criteria decision making methods were often used. In addition, the methods were practiced and in fact combined with each other or/and with fuzzy logic as the multidisciplinary studies today. (Doğan and Önder 2014; Cheng and Li 2001; Gibney and Shang 2007; Özbek 2014; Dağdeviren, 2007a; Güngör et. al. 2009; Kelemenis and Askounis, 2010; Değirmenci and Ayvaz 2016; Dursun and Karsak 2010; Köse et. al. 2013, Zhang and Lui 2011; Balezentis et. al. 2012; Aksakal and Dağdeviren 2010; Mojahed et. al. 2013; Bali 2013; Bedir and Eren (2015). Furthermore, if we further thought the subject, these studies have proved the superiority of the multi-criteria decision-making method in the selection of personnel with positive results from the past to the present. In this context, the aim of this study is to perform the selection of the best candidate as a CNC operator among trainees in a furniture factory throughout the fuzzy AHP method.

MATERIAL AND METHOD

Analytic Hierarchy Proses (AHP)

AHP was designed by L. Thomas in 1965 to reflect the human thinking in the decision making problems to provide the sharing resources and the needs of military, and used in the planning problems of the U.S. Department of Defense in the year of 1971 for the first time (Saaty 1980; Dağdeviren 2007a; Göksu and Güngör 2008).

AHP is a method that is frequently used to implement easily in the decision making problems (Dağdeviren and Eren, 2001). In the first step of AHP, factors and sub-factors that will be suitable for the purpose of the study are determined and the hierarchical structure is created and pairwise comparison (n x n) matrixes (A) are formed as shown in the Eq.1. At this stage, data can be collected with survey work or expert opinions can be obtained. Pairwise comparison matrices are created using the 1-9 importance scale (Table 1) so that alternatives can be evaluated by the factors (Eg.1) (Saaty 1980).

Table 1 Importance scale and its definition

Importance	Definition
1	Equal importance both element
3	Weak importance one element over another
5	Essential or strong importance one element over another
7	Very strong importance one element over another
9	Absolute importance one element over another
2,4,6,8	Intermediate values between two adjacent judgments

$$A=(a_{ij})_{nxn}=\begin{pmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots & \cdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{pmatrix} \qquad 1$$

The weight vector is calculated using Eq. 2 at the next stage (Göksu and Güngör, 2008). The calculation will be accomplished from the Satty's eigenvector technique.

$$w_i = \frac{\sum_{j=1}^{n} a_{ij}}{n} \quad (2)$$

Then, consistency ratio (*C.R.*) is computed using consistency index (*C.I*) as given in Eq. 3. It is obvious that the comparison matrix is logical if the random number index (*R.I.*) defined by the consistency ratio (*C.R.*) is less than 0.10 (Dağdeviren and Yuksel, 2007).

$$CR = \frac{CI}{RI} \quad (3)$$

On the other hand, if the consistency rate great than the constant of 0.1, the experts should rapidly revise their pairwise comparison decisions. The consistency index can also be obtained from Eq. 4.

$$CI = \frac{\lambda_{\max} - n}{n-1} \quad (4)$$

Finally, the priority value of alternatives is calculated by multiplying the importance weights of the factors and alternatives. The greatest value achieved points out the optimal option for the decision problem. (Dağdeviren 2007a).

Fuzzy Logic

Lotfi Zadeh was used for the concept of fuzzy logic in 1965 for the first time. The fuzzy logic enabled the researchers to resolve many problems that had not been fully assured before. The method has transformed all the variables such as yes or no and true or false into a new shape such as low, medium and high (Dağdeviren 2007b). Fuzzy clusters are defined by the membership functions, in which the fuzzy set of *M* is represented by $\mu_{A(x)}$, and a factor's cluster membership is determined by a number between 0 and 1. The fuzzy cluster representation is expressed by drawing the top of the symbol. *A* fuzzy triangular number is shown with *l/m-m/u* or *l-m-u* (Figure 1). *l-m-u* statements respectively represent the lowest probability, net value, and highest probability in a fuzzy event (Akman and Alkan 2006).

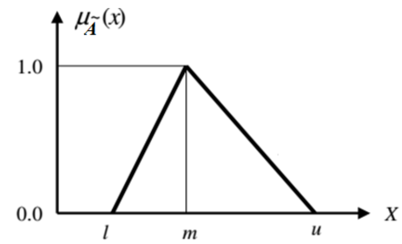

Figure 1 Representation of a triangular fuzzy number

The linear representation of a triangular fuzzy number according to the right and left membership degree values is as follows: (Zimmermann 1990; Akman and Alkan 2006; Dağdeviren 2007a).

$$\mu_{\tilde{A}}(x) = \begin{cases} 0, & x < l \\ \dfrac{x-l}{m-l}, & l \le x \le m \\ \dfrac{u-x}{u-m}, & m \le x \le u \\ 0 & x > u \end{cases} \quad (5)$$

When ã (l_a, m_a, u_a) and b̃ (l_b, m_b, u_b) are thought of as two triangular fuzzy numbers, the basic mathematical operations of the fuzzy numbers are indicated as follows (Zimmermann, 1990; Dağdeviren 2007a).

$$\tilde{a} \oplus \tilde{b} = (l_a + l_b, m_a + m_b, u_a + u_b) \quad (6)$$

$$\tilde{a} - \tilde{b} = (l_a - u_b, m_a - m_b, u_a - l_b) \quad (7)$$

$$\tilde{a} \otimes \tilde{b} = (l_a l_b, m_a m_b, u_a u_b) \quad (8)$$

$$\tilde{a} \div \tilde{b} = (l_a \div u_b, m_a \div m_b, u_a \div l_b) \quad (9)$$

$$\tilde{a}^{-1} = (1/u_a, 1/m_a, 1/l_a) \quad (10)$$

α-cutting is used to obtain a set of closed values for different alpha values from the fuzzy *A=(l_α, m_α, u_α)* number. *A* fuzzy set of α-cutting is displayed as follows:

$$A_\alpha = \left\{\alpha \in [0,1] \mid \mu_{M(x)} \ge \alpha\right\} \quad (11)$$

here α is defined as the degree of optimism [0,1] of the decision-makers. If the values of α are close to 1, the decision makers are optimistic, and otherwise they are pessimistic (Deng 1999; Dağdeviren, 2007a).

Fuzzy Analytical Hierarchy Process (FAHP)

The FAHP was formed by combining the fuzzy logic with the AHP. The fundamental goal is to make rather easier decisions in situations that are clearly unsure of certainty. The BAHP planned for the present study was to require a 7-step study (Dağdeviren 2007a; Güngör et. al. 2009).

Step 1: The team has been created.

Step 2: Team members determined the factors and sub-factors with respect to a common decision, and the hierarchy is created.

Step 3: Pairwise comparison matrices are prepared using fuzzy triangle numbers (Table 2). Later, the fuzzy weights of the factor and sub-factors are calculated with the fuzzy geometric mean method (Dağdeviren 2007a).

Table 2 Fuzzy numbers and equivalent for factor comparison

1-9 Scale Value	Fuzzy Number Equivalent	1-9 Scale Value	Fuzzy Number Equivalent
1	(1, 1, 1)	1/1	(1/1, 1/1, 1/1)
2	(1, 2, 4)	1/2	(1/4, 1/2, 1/2)
3	(1, 3, 5)	1/3	(1/5, 1/3, 1/1)
5	(3, 5, 7)	1/5	(1/7, 1/5, 1/3)
7	(5, 7, 9)	1/7	(1/9, 1/7, 1/5)
9	(7, 9, 11)	1/9	(1/11, 1/9, 1/7)

Step 4: Global fuzzy weights are calculated by the multiplication of the sub-factor belonging to the factor whose fuzzy weights and the sub-factor's own fuzzy weight

Step 5: Evaluation of trainees is done and the fuzzy priority values are calculated. Linguistic variables and fuzzy numbers are used in the evaluation of trainees (Chan et al. 2000; Dağdeviren 2007a) (Table 3). The sub-factor fuzzy weights are gathered for the total fuzzy priority values of the trainees (Dağdeviren 2007a).

Step 6: The total fuzzy priority values are exposed to the defuzzification (Dağdeviren 2007a). For this process, the lower and upper bound fuzzy priority values are computed with Eqs.11 and 12, by using the α-interrupt operation for different values *(α_l, l=1,2,..,L)* to the fuzzy priority value. Then, the unified sub (W_{sub}) and upper boundary priority (W_{upper}) values for the trainees are deduced using Eqs. 13 and 14. The value of defuzzification priority (W_d) is determined by Eq.16.

$$\text{Sub-boundary } (SB) = \alpha * (m - l) + l \quad 12$$

$$\text{Upper-boundary } (SB) = \text{r} - \alpha * (r - m) + l \quad 13$$

$$W_{sub} = \sum_{l=1}^{L} {}_l (SB)_l \div \sum_{l=1}^{L} \alpha_l \quad 14$$

$$W_{upper} = \sum_{l=1}^{L} {}_l (UB)_l \div \sum_{l=1}^{L} \alpha_l \quad 15$$

$$W_d = \lambda W_{upper} + (1-\lambda) W_{sub} \qquad \lambda \in [0,1] \quad 16$$

Table 3 Fuzzy logic evaluation scale

Linguistic variable	Triangular fuzzy number
Very excellent	(3, 5, 5)
Excellent	(1, 3, 5)
Middle	(1,1,1)
Poor	(1/5, 1/3, 1)
Very poor	(1/5, 1/5, 1/3)

Step 7: Finally, normalization is exerted with the priority value, and it is decided to hire the trainee gathering the biggest number of points.

RESULT AND DISCUSSION

The selection of personnel to be recruited was carried out by applying the fundamental steps with the FAHP method in the furniture factory.

Step 1. The team including 3 senior engineers with more than 5 years of experience in the factory was created to manage the recruitment process and make the best choice.

Step 2. The team defines the trainee recruitment problem based on the factors for hierarchical structure and all evaluation factors as shown in Fig. 2.

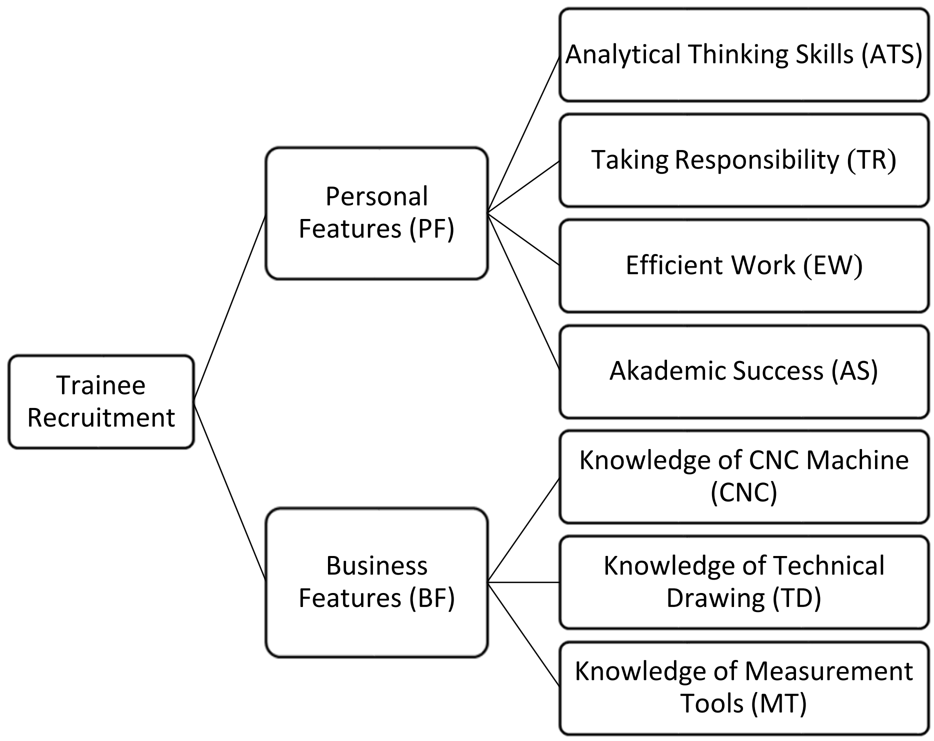

Figure 2 Hieratical structure of trainee recruitment problem

Rouyendegh and Erkan (2013) evaluated the 3 factors and 10 sub-factors to choose academic staff. In a different study, it was reported that the proposed approach was applied to evaluate six candidate engineers with 25 sub-criteria under five criteria (Çelikbilek 2017). Dağdeviren (2007a) showed that staff selection can be made with 2 factors and 8 sub-factors. In the present study, 2 factors and 7 sub-factors were used. In this respect, the study is compatible with the literature.

Step 3. The team members made comparisons between the factors (Table 4) and sub-factors. Matrices belonging to factor and sub-factor were calculated by the fuzzy weights using fuzzy geometric mean method. We showed how these calculations were made with a detailed description as follows. The sub-factor fuzzy weights were also calculated in the same way.

Table 4 Pairwise comparison matrix and fuzzy weights for factors

Factors	BF	PF	Fuzzy weight
Business Features (BF)	(1, 1, 1)	(1, 3, 5)	(0.31, 0.75, 1.55)
Personal Features (PF)	(1/5, 1/3, 1)	(1, 1, 1)	(0.14, 0.25, 0.69)

Geometric average of the first row = $\{(1x1)^{1/2}+(1x3)^{1/2}+(1x5)^{1/2}\}=(1, 1.73, 2.24)$

Geometric average of the second row = $\{(1/5x1)^{1/2}+(1/3x1)^{1/2}+(1x1)^{1/2}\}=(0.45, 0.58, 1)$

Sum of fuzzy geometric averages = (1.45, 2.31, 3.24)

The fuzzy weight of the BF factor = $\{(1/3.24)^{2}+(1.73/2.31)+(2.24/1.45)\}=(0.31, 0.75, 1.55)$

The fuzzy weight of the PF factor = $\{(0.45/3.24)^{2}+(0.58/2.31)+(1/1.45)\}=(0.14, 0.25, 0.69)$

Table 5 showed the pairwise comparison for sub-factors of BF when Table 6 indicated the pairwise comparison for sub-factors of PF.

Table 5 The pairwise comparison matrix for sub-factor of BF factor

Sub-factor of BF factor	CNC	TD	MT	Fuzzy weight
CNC	(1, 1, 1)	(1, 2, 4)	(1, 2, 4)	(0.18, 0.53, 1.38)
TD	(1/4, 1/2, 1)	(1, 1, 1)	(1/4, 1/2, 1)	(0.12, 0.33, 0.87)
MT	(1/4, 1/2, 1)	(1, 2, 4)	(1, 1, 1)	(0.06, 0.14, 0.51)

Table 6 The pairwise comparison matrix for sub-factor of PF factor

Sub-factors of PF factor	ATS	TR	EW	AS	Fuzzy weight
ATS	(1, 1, 1)	(1, 2, 4)	(1, 2, 4)	(1, 2, 4)	(0.18, 0.37, 0.74)
TR	(1/4, 1/2, 1)	(1, 1, 1)	(1/4, 1/2, 1)	(1, 1, 1)	(0.10, 0.18, 0.32)
EW	(1/4, 1/2, 1)	(1, 2, 4)	(1, 1, 1)	(1, 1, 1)	(0.13, 0.24, 0.43)
AS	(1/4, 1/2, 1)	(1, 1, 1)	(1, 1, 1)	(1, 1, 1)	(0.13, 0.21, 0.32)

Koutra et. al. (2017) results show that criteria such as trustworthiness, responsibility, capabilities in decision making, team spirit and communication skills are among the most important features that the companies look for. Likewise, the criteria as personal qualifications, personal skills, qualifications for work, experience and test-after criteria were used in the personnel selection problem in Bedir and Eren (2015). The results of the present study are thus in accordance with the results from the literature.

Step 4. The global fuzzy weight of each group was computed by the mathematical operations and all the data obtained were shown in Table 7 clearly.

Step 5. In this step, the trainees brought transcripts from the schools for evaluating the academic success sub-factor. Note averages in the transcripts were used by converting into linguistic variables and thus the academic achievements were also contributed to the recruitment process. The team discussed the evaluation results among themselves, and concluded to a single assessment using fuzzy mathematical operation for each trainee as shown in Tables 8-10.

Table 7 Intra-group global fuzzy weights of sub-factors

Factors and fuzzy weights	Intra-group fuzzy weights	Global fuzzy weights
BF (0.31, 0.75, 1.55)	CNC (0.18, 0.53, 1.38)	(0.06, 0.40, 2.13)
	TD (0.12, 0.33, 0.87)	(0.04, 0.25, 1.34)
	MT (0.06, 0.14, 0.51)	(0.02, 0.10, 0.78)
PF (0.14, 0.25, 0.69)	ATS (0.18, 0.37, 0.74)	(0.02, 0.09, 0.51)
	TR (0.10, 0.18, 0.32)	(0.01, 0.05, 0.22)
	EW (0.13, 0.24, 0.43)	(0.02, 0.06, 0.30)
	AS (0.13, 0.21, 0.32)	(0.02, 0.05, 0.22)

Table 8 Evaluation of the first trainee

Global fuzzy weights of sub-factors	First trainee reviews (Numeric counterpart)	Weight	Total fuzzy priority
CNC (0.06, 0.40, 2.13)	Excellent (1, 3, 5)	(0.06, 1.19, 10.63)	
TD (0.04, 0.25, 1.34)	Excellent (1, 3, 5)	(0.04, 0.75, 6.70)	
MT (0.02, 0.10, 0.78)	Poor (1/5, 1/3, 1)	(0.00, 0.03, 0.78)	
ATS (0.02, 0.09, 0.51)	Middle (1, 1, 1)	(0.02, 0.09, 0.51)	(0.17, 2.33, 20.27)
TR (0.01, 0.05, 0.22)	Middle (1, 1, 1)	(0.01, 0.05, 0.22)	
EW (0.02, 0.06, 0.30)	Middle (1, 1, 1)	(0.02, 0.06, 0.30)	
AS (0.02, 0.05, 0.22)	Excellent (1, 3, 5)	(0.02, 0.16, 1.12)	

Table 9 Evaluation of the second trainee

Global fuzzy weights of sub-factors	Second trainee reviews (Numeric counterpart)	Weight	Total fuzzy priority
CNC (0.06, 0.40, 2.13)	Middle (1, 1, 1)	(0.06, 0.40, 2.13)	
TD (0.04, 0.25, 1.34)	Very excellent (3, 5, 5)	(0.11, 1.25, 6.70)	
MT (0.02, 0.10, 0.78)	Excellent (1, 3, 5)	(0.02, 0.31, 3.92)	
ATS (0.02, 0.09, 0.51)	Excellent (1, 3, 5)	(0.02, 0.27, 2.57)	(0.23, 2.31, 15.91)
TR (0.01, 0.05, 0.22)	Very Poor (1/5, 1/5, 1/3)	(0.00, 0.01, 0.07)	
EW (0.02, 0.06, 0.30)	Poor (1/5, 1/3, 1)	(0.00, 0.02, 0.30)	
AS (0.02, 0.05, 0.22)	Middle (1, 1, 1)	(0.02, 0.05, 0.22)	

Table 10 Evaluation of the third trainee

Global fuzzy weights of sub-factors	Third trainee reviews (Numeric counterpart)	Weight	Total fuzzy priority
CNC (0.06, 0.40, 2.13)	Middle (1, 1, 1)	(0.06, 0.40, 2.13)	
TD (0.04, 0.25, 1.34)	Excellent (1, 3, 5)	(0.04, 0.75, 6.70)	
MT (0.02, 0.10, 0.78)	Excellent (1, 3, 5)	(0.02, 0.31, 3.92)	
ATS (0.02, 0.09, 0.51)	Excellent (1, 3, 5)	(0.02, 0.27, 2.57)	(0.26, 2.43, 19.02)
TR (0.01, 0.05, 0.22)	Excellent (1, 3, 5)	(0.01, 0.14, 1.12)	
EW (0.02, 0.06, 0.30)	Very excellent (3, 5, 5)	(0.06, 0.30, 1.48)	
AS (0.02, 0.05, 0.22)	Very excellent (3, 5, 5)	(0.06, 0.26, 1.12)	

Step 6. Throughout the process of defuzzification the total fuzzy priorities of the trainees were operated and displayed numerically in Table 11-13. The α-cutting operation was conducted for all the 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9 values at the value of λ = 0.5 so that the solution presents a moderate decision-making profile for the optimism index in the process.

Table 11 The first trainee's total fuzzy priorities are defuzzification

Alpha Value	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9
SB	0,386	0,602	0,818	1,034	1,25	1,466	1,682	1,898	2,114
UB	18,476	16,682	14,888	13,094	11,3	9,506	7,712	5,918	4,124

The combined sub-boundary priority value: (W_{1S}) = 1,538, The combined upper-boundary priority value: (W_{1U}) = 8,908, Defuzzification value (W_{1D}) = 5,223

Table 12 The second trainee's total fuzzy priorities are defuzzification

Alpha Value	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9
SB	0,438	0,646	0,854	1,062	1,27	1,478	1,686	1,894	2,102
UB	14,55	13,19	11,83	10,47	9,11	7,75	6,39	5,03	3,67

The combined sub-boundary priority value: (W2S) = 1,547, The combined upper-boundary priority value: (W2U) = 7,297, Defuzzification value (W2D) = 4.422

Table 13 The third trainee's total fuzzy priorities are defuzzification

Alpha Value	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9
SB	0,477	0,694	0,911	1,128	1,345	1,562	1,779	1,996	2,213
UB	17,361	15,702	14,043	12,384	10,725	9,066	7,407	5,748	4,089

The combined sub-boundary priority value: (W3S) = 1,634, The combined upper-boundary priority value: (W3U) = 8,513, Defuzzification value (W3D) = 5,074

Step 7. Finally, the defuzzification values were sorted by normalization (Table 14).

Table 14 Normalized trainee priorities

Trainees	Defuzzification values	Normalized weights	Order of precedence
1	5.223	0.355	1
2	4.422	0.300	3
3	5.074	0.345	2

According to Table 14, the trainee to be recruited is found to be the first candidate due to slighter higher normalization value of 0.355, followed by a third candidate with a value of 0.345 against to a second candidate with a value of 0.300. In this context, as a result of the application, the first candidate was decided to hire.

In the literature, the method for staff selection was proposed as Fuzzy AHP (Dağdeviren 2007a, Dağdeviren 2007b, Dağdeviren and Yüksel 2007). But other studies proposed many different methods such as AHP (Koutra et. al.), Fuzzy ELECTRE (Rouyendegh and Erkan 2013), TODIM (Ji et. al. 2018), fuzzy TOPSIS (Sang et al. 2015, Değirmenci and Ayvaz 2016, Fathi et al. 2011), an extension TOPSIS method (Efe and Kurt 2018), Grey-AHP (Çelikbilek 2017), AHP-PROMETHEE (Bedir and Eren 2015) AHP-TOPSIS (Doğan and Önder 2014), ELECTRE-AHP (Mojaheed et al. 2013). The fuzzy AHP method (alone or combined with more complex structure) used in the study was one of the most commonly used methods in literature.

CONCLUSION

Many decision problems were solved by fuzzy cluster theory. The major reason for the use of fuzzy cluster theory in the problems was to overcome the difficulties of making a clear assessment related to the decision making process. In the present work, the choice procedure of trainees included many uncertain factors so that the fuzzy numbers and linguistic variables were used throughout the assessment process and the problem was solved with FAHP. Accordingly;

1. The internship program should provide opportunities for students to develop more skills in all industry areas.

2. The objective evaluation of this program is crucial for the students' careers.

3. The increase effectiveness of the internship program will be expected to play an important role in the enhancement of the skilled workforce.

4. The results of the research revealed that this method can perfectly be preferred to hire a candidate in factory.

5. The method used in the current work enables the employers to hire personnel objectively and precisely with much more accuracy in the trial period. Besides it is believed that the method is planned to become a leader for all furniture companies during the hiring process.

6. In addition, different multi-criteria decision making methods can be utilized for next researches and the results attained are comparable.

7. To sum up, the methods helped the decision-makers to determine the best trainee for a quick and accurate decision comparable with each other.

8. Finally, this study was performed with relatively small trainee groups. Further research can be conducted on larger trainee groups so that the widespread impact can be enhanced.

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