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TWO-STAGE MCDM APPROACH IN THE SELECTION OF MANAGER TRAINING TECHNIQUES

Gülsüm Alcioğlu^a, Aylin Adem^{a*}, Metin Dağdeviren^a

a: Industrial Engineering Department, Gazi University, Ankara,

e-posta : aylinadem@gazi.edu.tr

ORCID No : 0000-0003-4820-6684

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ABSTRACT

Convenient management of the qualities of the managers who play effective and strategic roles in business decisions is very crucial. To develop and improve in terms of their managerial sense is significantly related to the training for the personnel who are nominated to be managers by the Human Resources (HR) department. The manager training techniques in the literature are divided into two main groups: on-the-job and off-the-job techniques. In this study, on-the-job manager training techniques which is highly important for the business and used for managers' training were evaluated. A two-stage integrated methodology was used to solve the problem. Hesitant Fuzzy Analytical Hierarchy Process (HF-AHP) was used to obtain criteria' weights. The weights were included as an input to the MOORA method used to order training methods. The fact that the criteria affecting the choice of on-the-job training techniques cannot be distinguished from each other by certain lines and that it will be subjectively assessed has necessitated the inclusion of Hesitant Fuzzy LTS to the study. The criteria for the techniques were determined in the context of brainstorming conducted by HR experts and the authors.

Keywords:

Human Resource,
MCDM,
Manager Training Techniques,
Fuzzy Environment

INTRODUCTION

In Human Resources (HR) Management, as one of the functions of it, selection and training of the staffs are both important in terms of companies' success in the long run in the competitive environment. Improvement in the success of companies is related to the effective and strategic management of managers. In addition to the crisis, time, money and human resource management qualifications, managers should have knowledge and experience in matters such as task allocation and organizational structure. The ability of the companies to sustain their existence and adapt to the up-to-date developments and technologies in the environment of intense competition and chaos can be ensured by applying the qualifications of the manager. Therefore, after the hiring process, naturally, training problems arise in the stage of performing such occupational tasks. Acquisition of these qualifications/gains and leadership characteristics can be achieved through training. If it is desired that staff is

effective in terms of psychological, physiological and economical aspects, employed training techniques/activities should not be chosen in coincidentally an industry that especially benefitted from complex techniques (Efil, 2013). For these reasons, the selection of convenient Manager Training Techniques (MTT) is critical for businesses and organizations. The techniques used in the training of the manager in the related literature are divided into two main groups: on-the-job and off-the-job MTT. In this study, on-the-job MTT which is highly important for the business and used for managers' training were evaluated. When selecting a training technique, certain factors are taken into account. As a result of literature survey, it is possible to express the criteria which plays an important role on selecting MTTs, under several different headings. To illustrate these criteria, some of them are given in here: training cost, duration of training and knowledge, skills and experience of trainers etc. Because, there are a set of conflicting criteria and alternatives in this problem, this situation points out a traditional Multi-Criteria Decision Making (MCDM) problem. A two-stage integrated methodology was employed to figure out this important selection problem for companies. The first stage of this study, Hesitant Fuzzy-Analytic Hierarchy Process) HF-AHP method was utilized to gain selection criteria, on the other hand, in the second stage; Multi-Objective Optimization by Ratio Analysis (MOORA) method was employed to rank the MTTs.

The fact that the criteria affecting the choice of on-the-job training techniques cannot be distinguished from each other by certain lines and that it will be subjectively assessed has necessitated the inclusion of Hesitant Fuzzy Linguistic Term Set (HFLTS) to the study. Because the results obtained from MOORA method are reliable and its calculation time is shorter than other MCDM methods, the MOORA method was preferred to rank the alternatives.

In the literature, there are few studies about manager training techniques. In this part of the study, outstanding examples of these studies were given. Turabik et al. (2014) examined certain developed countries' school manager models and offered some beneficial suggestions for developing Turkey's school manager training model. Esteban-Lioret et al. (2014) aimed at to analyse the drivers and outcomes of managers training. At the end of their empirical study, they concluded that by training managers, organizational legitimacy improves as well as organizational performance. There are many studies that have tried to examine the relationship between training and organizational results empirically in a subjective measure. (Jerez-Gómez et al. 2004, Vlachos, 2008). Úbeda, (2005) examines the relationship between training policies and business performance. The result of that study is that training policy has a significant impact on firm performance. However, any studies about the selection of convenient training techniques were not found in the literature. This situation led authors of this study to evaluate manager training techniques with MCDM methods.

The remainder of this paper is given as follows. In Section 2, used methods in this study are explained in detail. Section 3 gives the application part of the study, i.e. decision problem solutions etc. Section 4 shows results of the study and gives discussion about gained results.

METHODS

HF-AHP Method

AHP is a well-known MCDM method which was developed by Saaty in 1970s. AHP is based on pairwise comparisons of criteria's and matrix operations.

Fuzzy logic was introduced by Zadeh, in 1961, however; different fuzzy scale and application form have been developed different researchers over time (Dagdeviren et al. 2008; Zhang, 2018; Whang and Wan, 2018). One

of the developed fuzzy scales is Hesitant Fuzzy Linguistic Term Set. HFLTS, as a new fuzzy scale in the related literature, wants to make it easier for decision makers to transfer their thoughts to decision-making processes (Yavuz et al, 2015). HF numbers are seen as a means by which decision makers can transfer their thoughts on decision making process more easily than other fuzzy sets (Rodríguez et al,2012). Numerical equivalents of the linguistic expressions used are shown in the Table 1. HFLTS is a fairly recent issue in fuzzy logic (Herrera, Martinez, and Rodríguez, 2011). In the literature, there are studies that integrates HFLTS and MCDM methods (Li, 2014, Wei and Zhang, 2014, Chen and Xu, 2015, Zhang and Xu, 2017, Wang, Peng, and Wang, 2018).

Table 1. The scale for linguistic expressions

ni	vli	li	mi	hi	vhi	ai
0	1	2	3	4	5	6

$$P = \left(\begin{array}{l} I = \langle \text{primary term} \rangle | \langle \text{composite term} \rangle, \\ \langle \text{composite term} \rangle ::= \\ \langle \text{unary relation} \rangle \langle \text{primary term} \rangle \langle \text{binary relation} \rangle \\ \langle \text{primary term} \rangle \langle \text{conjunction} \rangle \langle \text{primary term} \rangle, \\ \text{primary term} ::= S_0 | S_1 | \dots | S_g, \langle \text{unary relation} \rangle ::= \\ \text{lower than} | \text{greater than} | \text{at least} | \text{at most}, \\ \langle \text{binary relation} \rangle ::= \text{between}, \langle \text{conjunction} \rangle ::= \text{and} \end{array} \right)$$

Figure 1. Production rules (Yavuz et al., 2015)

Production rules provide us the production of logical linguistic expressions. In the HF-AHP method, followed steps are given in briefly: after taken linguistic expressions from experts, reciprocal equivalent is written in the evaluation table. Then, linguistic intervals are gained by arithmetic of each row. After these calculations, midpoints of intervals are defined. Finally, normalization of column gives criteria’s weights. For more information about detail of the calculation steps of HF-AHP method, please see Yavuz et al.’ study (2015).

MOORA Method

MOORA (Multi Objective Optimization on basis of Ratio Analysis) method was developed by W.R.M Brauers and E.K. Zavadskas in 2006. After the first form of this method many different approaches were developed in literature: MOORA-Ratio, MOORA-Reference Point, MultiMOORA etc. (Stanujkic, 2014, Karande, Zavadskas and Chakraborty, 2016, Majumder and Maity, 2018, Wang, Liu and Qin, 2018). In this study, MOORA-reference point approach was employed to rank on-the-job MTTs. In this method, reference points were determined according to the criteria’ goal (maximization or minimization).

Its application steps are given as follows:

- Step 1: Create decision matrix
- Step 2: Obtain weighted decision matrix
- Step 3: Determine reference points
- Step 4: Order the alternatives according to Eq. (2)

Mathematical equations of MOORA methods are given in below (Yıldırım and Önder, 2015):

$$x_{ij}^* = \frac{x_{ij}}{\sqrt{\sum_{i=1}^m x_{ij}^2}} \quad (i = 1, \dots, m, j = 1, \dots, n) \quad (1)$$

$$\min_i \{ \max_j (|r_j - x_{ij}|) \} \quad (2)$$

APPLICATION

In this part of the study, five training techniques was evaluated under six criteria. List of the alternative are given below.

On-the-job training techniques:

- Alternative 1. Training under surveillance of supervisor (A1)
- Alternative 2. Training via help to manager (A2)
- Alternative 3. Training via job rotation (A3)
- Alternative 4. Training via having a special project prepared (A4)
- Alternative 5. Training via devolution of authority (A5)

More information about on the job MTT are given to have knowledge and understanding about HR experts' evaluations in detail (Efil, 2013). A1 is based on learning by practicing philosophy. According to this method, managers should be trained by their supervisors since they have information about their manager's superior and weak characteristics. In this method, one of the most important points is supervisors' experience, knowledge and desire. In A2 method, manager is assistant of supervisor. Manager helps to supervisors on their research, examination and communication tasks. Looking at A3 method, it can be said that manager is not directly under surveillance by supervisor. Manager works several departments to gain different information and experience about functions of organization. In A4 method, managers prepare and present special project to improve themselves in terms of leadership attributes and see their weaknesses. A5 method is utilized to improve manager's management and organizational skills and give broad authority and responsibility to managers.

Criteria:

- Training cost (C1)
- Training duration (C2)
- Knowledge, skills and attitudes provided by education (C3)
- Operability and conformity to both business and candidate (C4)
- Ease of application (C5)
- Trainer's knowledge and experience (C6)

When any method is desired to choose, the first considered criteria are cost and duration of related method. At the same time, the knowledge, skills and attitudes provided by education is also a criterion when the selection of MTTs in terms of scope of the training techniques. These criteria and other selected criteria were defined meticulously by the authors of the paper and HR experts.

Table 2. Linguistic evaluations taken from HR experts

	C1	C2	C3	C4	C5	C6
C1	-	At least mi	Between li and mi	Mi	Between mi and hi	Hi
C2		-	Li	Between li and mi	Between ni and li	At most mi
C3			-	Between vhi and ai	Between mi and vhi	Mi
C4				-	Mi	Between li and hi
C5					-	Between vli and li
C6						-

As seen in Table 2, linguistic evaluations of the criteria were conducted using linguistic scales which are obtained by production rules (Fig.1). According to the Table 2, C1 criteria’ importance with respect to the C2 criteria is “at least medium importance”, which means C1 criteria’ importance can take the {medium, high, very high, absolute importance} values.

Table 3. Enveloped Matrix

	C1	C2	C3	C4	C5	C6
C1	-	[3,6]	[2,3]	[3,3]	[3,4]	[4,4]
C2	[0,3]	-	[2,2]	[2,3]	[0,2]	[0,3]
C3	[3,4]	[4,4]	-	[5,6]	[3,5]	[3,3]
C4	[3,3]	[3,4]	[0,1]	-	[3,3]	[2,4]
C5	[2,3]	[4,6]	[1,3]	[3,3]	-	[1,2]
C6	[2,2]	[3,6]	[3,3]	[2,4]	[4,5]	-

After the obtained linguistic evaluations, Table 2 was converted to enveloped matrix (Table 3).

Table 4. Criteria’s weights obtained from HF-AHP

Criteria	Linguistic intervals	Interval utilities	Midpoints	Weights
C1	[(m,0.00);(h,0.00)]	[3,4]	3,5	0.194
C2	[(li,-0.20);(mi,-0.40)]	[0.8;2.6]	1,70	0.094
C3	[(hi,-0.40);(hi,+0.40)]	[3.6;4,4]	4	0.222
C4	[(vli,+0.20);(m, +0.00)]	[2.2;3]	2,6	0.144
C5	[(vli,+0.20);(mi,+0.40)]	[2.2;3.4]	2,8	0.155
C6	[(hi,-0.20);(hi,+0.00)]	[2.8;4]	3,4	0.188

Data in Table 3 were expressed as form of linguistic intervals by arithmetic mean operator. In order to gain criteria’s weights, midpoints were determined. By normalizing midpoints weights of criteria’ were obtained. After the first stage of the study, the criteria’s weights that is used as an input to the MOORA method were obtained.

In the second stage of the current study, MOORA reference point approach was employed to order the alternatives. This method can be preferred, because the results obtained from MOORA method are reliable and its calculation time is shorter than other MCDM methods (Yıldırım and Önder, 2015).

Table 5. Decision matrix selection problem

	<i>C1</i> <i>min</i>	<i>C2</i> <i>min</i>	<i>C3</i> <i>max</i>	<i>C4</i> <i>max</i>	<i>C5</i> <i>max</i>	<i>C6</i> <i>max</i>
<i>A1</i>	60	4	6	9	8	9
<i>A2</i>	50	5	8	7	8	8
<i>A3</i>	95	12	9	5	3	4
<i>A4</i>	85	9	5	8	6	2
<i>A5</i>	90	8	10	2	5	7
<i>Weights</i>	0,194	0,094	0,222	0,144	0,155	0,188

As seen in Table 5, for C1 criterion, training cost, was taken approximate values. C2 criterion refers to training duration in terms of week. For from C3 to C6 criteria, 1-10 scale was utilized.

Table 6. Weighted normalize matrix and reference points

	<i>C1</i> <i>min</i>	<i>C2</i> <i>min</i>	<i>C3</i> <i>max</i>	<i>C4</i> <i>max</i>	<i>C5</i> <i>max</i>	<i>C6</i> <i>max</i>
<i>A1</i>	0,067	0,021	0,076	0,087	0,088	0,116
<i>A2</i>	0,056	0,026	0,102	0,068	0,088	0,103
<i>A3</i>	0,106	0,062	0,114	0,048	0,033	0,051
<i>A4</i>	0,094	0,047	0,063	0,077	0,066	0,026
<i>A5</i>	0,100	0,041	0,127	0,019	0,055	0,090
<i>Rereference points</i>	0,056	0,021	0,127	0,087	0,088	0,116

Weighted normalized matrix was obtained by using Eq (1). Reference points for maximization criteria were determined by choosing the maximum value, and for minimization criteria by choosing vice-versa (Table 6).

Table 7. Ranking of Alternatives (Reference point approach)

	<i>C1</i>	<i>C2</i>	<i>C3</i>	<i>C4</i>	<i>C5</i>	<i>C6</i>	<i>Max. Values*</i>	<i>Ranking</i>
<i>A1</i>	0,011	0	0,051	0	0	0	0,051	2
<i>A2</i>	0,000	0,005	0,025	0,019	0	0,013	0,025	1
<i>A3</i>	0,050	0,041	0,013	0,039	0,055	0,064	0,064	3
<i>A4</i>	0,039	0,026	0,063	0,010	0,022	0,090	0,090	5
<i>A5</i>	0,044	0,021	0	0,068	0,033	0,026	0,068	4

After the determination of reference points, maximum values were obtained using Eq. (2). The ranking of the alternatives was carried out according to descending order of maximum values. As seen in the Table 7, A2 (*Training via help to manager*) is in the first order with having minimum values of the among the “maximum values” *. According to the results of our study, the ranking of the MTTs is *Training via help to manager* - *Training under surveillance of supervisor* - *Training via job rotation* - *Training via devolution of authority* - *Training via having a special project prepared*.

RESULTS AND DISCUSSION

In this study, two stage integrated MCDM approach was proposed to select MTTs. Within the scope of the study, a scientific approach to selection process of convenient MTTs was presented. In the current study, the criteria were determined in the context of brain storming conducted by HR experts and the authors. At the end of the first stage of the proposed approach, criteria' weights were obtained HF-AHP method. When the criteria weights are examined, it is seen that C3 criteria, *knowledge, skills and attitudes provided by education*, has the largest weight: 0,222 and C2 criteria, *training duration*, was the smallest weight: 0,094. Obtained criteria's weights were included as an input the MOORA method, second stage of the proposed approach, to order on the job MTTs. Looking at the ranking of alternatives, it is seen that A2, *training via help to manager*, is in the first order and A4, *training via having a special project prepared*, is in the last order.

By ranking according to criteria affecting on the job training techniques, HR has made it possible to present this strategic decision with a scientific approach. For future research the ease-of-use of the proposed method will enable HR experts to easily apply it to the different HR decisions they will be made later. At the same time, both these decisions and different organizational decisions can be solved by other MCDM methods and their fuzzy extensions. In the present study, it was focus on only on-the-job training techniques, as mentioned before there are two main groups in the MTTs: on-the-job and off-the-job techniques. Thus, the latter of these techniques also can be taken into account in the future research.

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