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RESEARCH ARTICLE / ARAŞTIRMA MAKALESİ

Using The Analytic Hierarchy Process For Store Manager Selection: A Real Case Study*

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Abstract

In today's competitive work environment, it is important for managers to have personnel who can move the company forward and adapt to changes as quickly as possible. Selecting the most suitable personnel has a great influence on the development of the company as well as on the motivation of the personnel. For this reason, the frequently encountered problem of personnel evaluation is a significant one. In this problem, the performance of the personnel is compared and evaluated considering the criteria set. Therefore, the personnel evaluation problem is a multi-criteria, decision-making problem. In this study, the personnel performance evaluation problem within Lanse Company was solved using the Analytic Hierarchy Process (AHP), a multi-criteria decision-making method. The criteria that are effective in personnel selection were determined through a literature review and interviews with the owner of the company and the Human Resources Team (HRT). Considering these criteria, a hierarchical model was constructed, and pairwise comparisons were made to obtain judgments. As a result of the pairwise comparisons, the most suitable person for the position of store manager was identified among the six employees working at Lanse. The results were presented to the decision maker in the form of a report. The validity and applicability of the findings were confirmed by the decision maker.

Keywords

Analytic Hierarchy Process (AHP), Personnel Performance, Real-World Problem, Multi-Criteria Decision Making (MCDM), Personnel Selection

JEL Classification: C44, M51

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Introduction

The personnel performance evaluation problem (PPEP) has an important place in contemporary business life, especially in the ever-changing and evolving conditions of the world. Today's managers want to evaluate their personnel's success at work, both at the recruitment stage and stages such as promotion and reward because, companies want to increase productivity as well as retain or add personnel who will help the company to move forward.

In solving the problem of personnel performance evaluation, decision makers consider many criteria, both tangible and intangible, which may vary from company to company. The comparison of complex criteria and alternatives is very difficult for the decision maker. In such cases, multi-criteria decision making (MCDM) methods are the preferred methods.

This study discusses the personnel performance evaluation problem of Lanse Company, which is engaged in the leather and upholstery fabric industry, in the context of the selection process for a store manager. In other words, Lanse wishes to promote one of the personnel into a store manager position. In this context, the Analytical Hierarchy Process (AHP), an MCDM method, was used to solve the multi-criteria personnel performance evaluation problem at Lanse.

This study consists of four sections. In the first section, a brief introduction to the personnel performance evaluation problem and the multi-criteria structure of this problem are discussed. Section 2 contains an overview of AHP and its applications in dealing with the personnel performance evaluation problem. The real-world problem of Lanse's personnel performance evaluation is included in Section 3. The results and evaluation of the outcomes are presented in the last section.

The Analytic Hierarchy Process (AHP) and Its Applications

AHP, a multi-criteria decision making technique, was developed by Thomas L. Saaty (Saaty, 2000). Because of its advantages, the method is still used successfully in many fields. One of these advantages is that in the solution process of the AHP method, both tangible and intangible criteria can be dealt with together, which corresponds to the subjectivity of real problems (Erdoğmuş, Aras, & Koç, 2006). Another advantage of the method is that it presents problems involving more than one time period, decision maker, and criterion in a hierarchical structure. This type of hierarchical modeling not only facilitates the participation of decision makers in the solution process, but also allows them to reconsider their judgments according to the evolution of the decision process (Koç & Burhan, 2014). Therefore, in the case of group decisions, a consensus can be formed among many decision makers.

The AHP method consists of four basic steps. In the first step, the decision problem is defined and, accordingly, the main criteria, sub-criteria and alternatives are determined. In the next step, the decision problem is modeled using a hierarchical structure, taking into account the determined criteria and alternatives (Wind & Saaty, 1980). The hierarchical structure can be formed and represented in several ways. A general representation of the hierarchical structure consisting of the ultimate goal, criteria and alternatives is given in Figure 1.

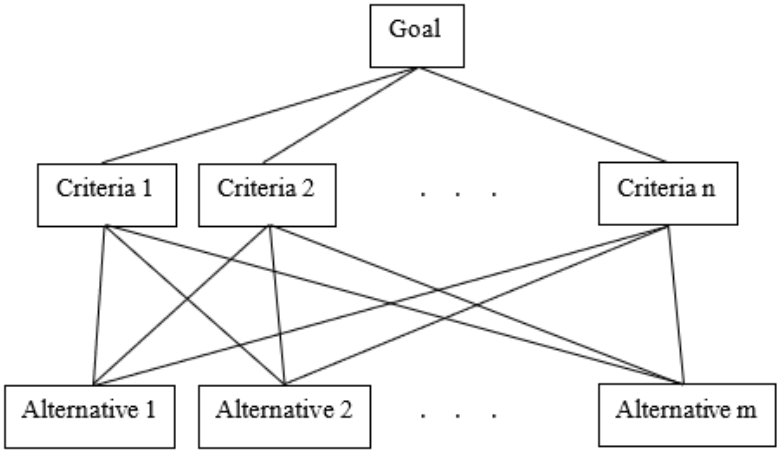

Figure 1: General Structure of the Hierarchy (Saaty, 2000)

In the third step, the judgments of the decision maker are obtained by making pairwise comparisons. In other words, this step collects the data that will be used in order to determine the importance levels of the criteria and alternatives. For this reason, criteria are compared with each other and the alternatives are compared with each other considering each criterion. For these comparisons, the scale of relative importance developed by Saaty is used, which includes scores from 1 to 9 (Saaty, 2000). This scale is shown in Table 1.

Table 1

Fundamental Scale Used in AHP (Saaty, 2000)

Intensity of Importance	Definition	Explanation
1	Equal Importance	Two activities contribute equally to the objective
2	Weak	--
3	Moderate Importance	Experience and judgment slightly favour one activity over other
4	Moderate Plus	--
5	Strong Importance	Experience and judgment strongly favour one activity over other
6	Strong Plus	--
7	Very strong	An activity is favoured very strongly over another
8	Very, very strong	--
9	Extreme Importance	The evidence favouring one activity over another is of highest possible order of affirmation

As can be seen from Table 1, pairwise comparisons use a value of 1 for equal importance, 3 for moderate importance, 5 for strong importance, 7 for very strong importance, and 9 for extreme importance. Intermediate values (2, 4, 6, and 8) are used when decision makers cannot decide between two values. From these comparisons, pairwise comparison matrices are obtained. For each matrix obtained, inconsistency ratios are calculated. The inconsistency ratios are important to detect possible misjudgments in comparisons. Although the literature indicates that the acceptable limit of this ratio is 0.10, some researchers have found that a limit of 0.20 is also acceptable (Scala, Needy, & Rajgopal, 2010; Soma, 2003). After obtaining all pairwise comparison matrices, if the inconsistency ratios are at an acceptable level in all matrices, the next step is taken. Otherwise, the pairwise comparisons for matrices found to be inconsistent should be performed again until consistent matrices are obtained. In the third step of the process, the relative importance levels of the alternatives and criteria are determined based on the judgments obtained from the decision maker(s) (Korpela, Tuominen, & Valoaho, 1998). In the fourth step, the best alternative is determined as a result of the analysis, therefore, the solution of the decision problem is obtained.

AHP is used to solve complex decision problems in different areas, such as planning, resource evaluation, location selection, resource allocation, performance evaluation, selection of the best strategy after searching a set of alternatives, and priority setting. The areas of application under consideration can be seen in various studies that have been prepared as a literature review (Boer, Labro, & Morlacchi, 2001; Ho, 2008; Subramanian & Ramanathan, 2012; Vargas, 1990). Table 2 shows studies that include AHP and its applications to real-world problem.

Table 2

AHP-based Applications to Real-World Problems

Application Areas	**References**
Macroeconomic forecasting	Blair, Mandelker, Saaty, & Whitaker, 2010; Blair, Nachtmann, Saaty, & Whitaker, 2006; Eyüboğlu, 2016
Evaluation of resources	Asadi & Venkata Sravan Kumar Reddy, 2018; Jaber & Mohsen, 2001;
Evaluation of production cycles	Weck, Klocke, Schell, & Rüenauver, 1997
Software selection	Al Jafa, 2020; Hanine, Boutkhoum, Tikniouine, &Agouti, 2016; Lai, Wong, & Cheung, 2002
Evaluation of electric power plants	Akash, Mamlook, & Mohsen, 1999
Location selection	Alossta, Elmansouri, & Badi, 2021; Aras, Erdoğmuş, & Koç, 2004; Atthirawong & MacCarthy, 2002; Kengpol, 2002; Kim, Lee, & Lee, 1999; Koç & Burhan, 2015; Kuo, Chi & Kao, 2002; Tzeng, Teng, Chen, &Opricovic, 2002.
Evaluation of fuel systems	Erdoğmuş, Aras, & Koç, 2006; Junior, Cortes, Barbosa, Lourenço, & Santana, 2019; Poh & Ang, 1999
Bank selection	Ismail, 2019; Özbek, 2015; Ta & Har, 2000
Supplier selection	Ecer, 2020; Koç & Burhan, 2014; Mohanty & Deshmukh, 1993
Policy development in the energy market	Chedid, 2002
Evaluation of agricultural activities	Alphonce, 1997; Barati, Azadi, Pour, Lebailly, & Qafori, 2019
Setting priorities for objectives	Kwak & Lee, 1998; Kwak & Lee, 2002; Lee & Kwak, 1999; Mahendran & Mahadevan, 2014; Radash & Kwak, 1998; Ramanathan, 1997; Wu, Lin, Shih, & Chen, 2013
Performance evaluation	Aytekin, 2017; Fashoto, Amaonwu, Aderenle, & Afolorunsho, 2018; Islam & Rasad, 2006; Rangriz & Pashootanizadeh, 2014; Singh & Aggarwal, 2014

As can be seen from Table 2, personnel performance evaluation problems are an area where the AHP is frequently used. Consistent with the focus of this study as a real-world problem, Table 3 provides a compilation of some studies in which AHP and integrated AHP have been applied to real-world personnel performance evaluation problems.

Table 3

AHP-based Applications to Real-World Personnel Performance Evaluation Problems

Industries	**Applications**
Education	Aytekin, 2017; Fashoto, Amaonwu, Aderenle, & Afolorunsho, 2018; Gibney & Shang, 2007; Yousif & Shaout, 2018
Military	Korkmaz, Gökçen, & Çetinyokuş, 2008
Telecommunication	Kalinowska & Trzaskalik, 2014; Kusumawardani & Agintiara, 2015
Banking	Azadeh, Ghaderi, Mirjalili, & Moghaddam, 2011; Rangriz & Pashootanizadeh, 2014
Maintenance and cleaning	Islam & Rasad, 2006
Engineering R&D	Min-peng, Xiao-hu, & Xin a, 2012
Manufacturing	Kurniawan, Yulianti, & Puspitasari, 2021

It is clearly seen in Table 3 that AHP has been widely used by many researchers in solving personnel performance evaluation problems in many fields such as education, telecommunications, and banking. In this study, AHP was used to solve the problem

of selecting a store manager for Lanse Company, which is in the leather and optical industry.

Store Manager Selection for Lanse Company Using AHP

The main motivation behind this study is to solve the real-world problem of Lanse Company to select a store manager. The company was established in 1980 and has a significant market share in leather and optics. Lanse Company manufactures all the products that are key components in shoe manufacturing and also supplies raw materials to shoe and bag manufacturers, promotional products manufacturers and the auto upholstery industry. Lanse has a total of four stores, one leather store and three optical stores. The company wants to select a store manager for its leather and footwear store. This problem has a complex structure as it involves many tangible and intangible criteria. For this reason, the AHP method was used to make an objective and correct decision in order to solve this multi-criteria decision making problem at Lanse and to make the solution simple and clear. Before AHP was implemented, a meeting was held with the owner of the company. At this meeting, the owner of the company was informed about the AHP method, and it was explained to him how the process of solving the problem was going to work. The process that was to be followed in solving the problem is shown in the Table 4 below.

Table 4

Solution Process of Store Manager Selection Problem for Lanse Company

Definition of the problem
Determination of the criteria and the sub-criteria
Determination of the alternatives
Establishing the model
Creation of hierarchical structure
Data collection
Design of the questionnaire
Obtaining data by pairwise comparisons
Construction of pairwise comparison matrices
Calculating and checking the inconsistency ratio
Analysis
Calculation of the weights of the criteria
Calculation of the importance values of the alternatives
Selection of the store manager
Implementation of the results

As shown in Table 4, the first step of the solution process was to define the problem and establish the criteria, sub-criteria, and alternatives. In all steps of the process, we collaborated with the Lanse Human Resources Team (HRT). As a result of the interviews with the owner of the company and HRT, six people named K1, K2, K3, K4, K5 and K6 working in the company were selected as candidates for the store manager position. The names of the candidates were kept confidential in accordance with company policy. According to the HRT, each candidate had strong and weak qualities that should be used in the selection of the store manager. For this reason,

20 criteria were established by considering both the literature and the opinions of the HRT and the owner of the company. As a result of the interview, four main criteria (Personal Qualities, Communication and Leadership Skills, Experience, and Consistency with the Company's Vision) and sub-criteria under each main criterion were identified and listed in the table below.

Table 5
Criteria Considered in This Study

Personal Qualities	**Communication and Leadership Skills**	**Experience**	**Consistency with the Company's Vision**
Education level	Communication with customers	Length of service with company	Adherence to working hours
Marital status	Communication with colleagues	Product knowledge	Effective use of working hours
Practical math skills	Communication with managers	Courses in sales	Adherence to company dress code
Ease of access to work	Leadership skills	Courses in marketing	Loyalty to company
Foreign language skills			
Computer use			

Once the criteria were established, the second step was to create the hierarchical model shown in Figure 2.

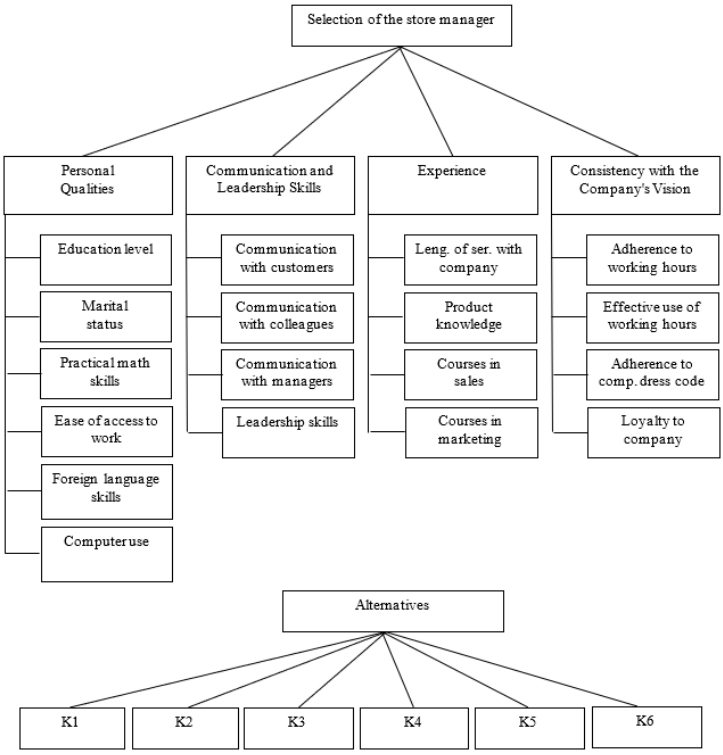

Figure 2: Hierarchical Model of the Problem of Selecting the Lanse Store Manager

After modeling the decision problem as shown in Figure 2, the judgments of the decision makers were determined by making pairwise comparisons. Saaty's scale (1-9) was used to determine the judgments, which are shown in Table 1. All pairwise comparisons were performed and the pairwise comparison matrices were constructed based on this scale. In this study, not all of the obtained pairwise comparison matrices are shown. As an example of these matrices, the pairwise comparison matrix for the main criteria is shown in Table 6.

Table 6

Pairwise Comparison Matrix for the Main Criteria

	Personal Qualities	**Communication and Leadership Skills**	**Experience**	**Consistency with the Company's Vision**
Personal Qualities	1	5	1/3	1/5
Communication and Leadership Skills	-	1	1/5	1/9
Experience	-	-	1	1/3
Consistency with the Company's Vision	-	-	-	1

As can be seen from Table 6, personal qualities criterion has a "strong" level of importance compared to communication and leadership skills. While the experience criterion has a "moderate" importance according to the personal qualities, the consistency with the company' vision has a "strong" importance according to the personal qualities. After all the pairwise comparison matrices were obtained, the inconsistency ratios of each matrix were checked. It was found that the inconsistency ratio was less than 0.10 for all matrices. Thus, it was determined that the pairwise comparison matrices obtained in this study were not inconsistent.

The analysis step of the process associated with the AHP method includes the calculation of the relative weights for the main criteria, sub-criteria and alternatives, and the selection of the store manager. The Expert Choice program was used to calculate the relative weights and the weights obtained are shown in Table 7.

Table 7

Relative Weights for Main Criteria and Sub-criteria

Criteria	**Relative Weights**
Consistency with the Company's Vision	0.57074
Loyalty to company	0.54850
Effective use of working hours	0.29658
Adherence to working hours	0.10176
Adherence to comp. dress code	0.05316
Experience	0.25336
Length of service with company	0.56501
Product knowledge	0.26220
Courses in sales	0.11750
Courses in marketing	0.05529
Personal Qualities	0.13176
Education level	0.39152
Practical math skills	0.30907
Computer use	0.11939
Foreign language skills	0.07675
Marital status	0.07085
Ease of access to work	0.03251
Communication and Leadership Skills	0.04414
Leadership skills	0.48193
Communication with customers	0.27496
Communication with colleagues	0.15643
Communication with managers	0.08669

According to Table 7, the criterion of consistency with the company's vision is the most important main criterion in the selection of Lanse's store manager. This criterion is followed by experience, personal qualities and communication and leadership skills. Moreover, the table shows that the most important sub-criterion under the criterion of consistency with the company's vision, which is the most important main criterion, is loyalty to company. Accordingly, the most important sub-criterion for the main criterion of experience is the Length of service with company working time in the company, the most important sub-criterion for the main criterion of personal qualities is education level, and the most important criterion for the main criterion of communication and leadership skills is leadership qualities. Before the selection of the most suitable candidate for the store manager, the validity of these results in practice was checked and approved by management and HRT. Similarly, the importance values of the alternatives were calculated and given in Table 8.

Table 8: Importance Values of the Alternatives

Alternatives	Importance Values	Rank
K1	0.256987	1
K4	0.235163	2
K3	0.184737	3
K2	0.135022	4
K5	0.111944	5
K6	0.076146	6

Table 8 shows that the best candidate for Lanse's store manager position is K1. The final step of the process is the implementation of the results. The results obtained in this step were presented to and approved by the management of Lanse.

Discussions and Conclusions

In today's market environment where competition is intense, solving the problem of personnel performance evaluation is of great importance for companies. In this problem, it is possible to say that each criterion considered has different effects, and sometimes there are even conflicts between these effects. Therefore, these problems have a complex structure, as they contain many tangible/intangible and conflicting criteria. Therefore, AHP is an appropriate method to solve such problems. In this study, the problem of selecting a store manager for Lanse is discussed. First of all, the problem was defined, the main criteria/sub-criteria and alternatives were determined. Then, the problem was modeled as shown in Figure 2 and paired comparison matrices were obtained by making pairwise comparisons. Inconsistency rates were calculated for the matrices and all matrices were found to be consistent. Thus, the relative weights of the criteria were calculated. According to the relative importance weights of the main and sub-criteria given in Table 7, the main criterion of consistency with the Company's vision was identified as the most important main criterion. Among the sub-criteria of this main criterion, it can be seen that the criterion of loyalty to the company is the most important sub-criterion. Finally, the relative importance values of the alternatives were calculated and according to these values, which are shown in Table 8, the decision was made to select the K1 as the store manager. The results were presented to the Lanse management in a report and these results were considered as applicable by the management.

In this study, the solution of the personnel performance evaluation problem of a company operating in the leather and optics sector is discussed. Therefore, the main and sub-criteria were determined in accordance with this sector. However, the hierarchical model established in this study in accordance with the structure of the AHP method can guide decision makers and researchers in solving personnel performance evaluation problems in different sectors. Moreover, the fact that the study addresses a real-world problem and offers a viable solution to the problem at hand is an important contribution in presenting a roadmap to companies facing similar problems.

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