

**JOB SELECTION BASED ON FUZZY AHP: AN INVESTIGATION
INCLUDING THE STUDENTS OF ISTANBUL TECHNICAL
UNIVERSITY MANAGEMENT FACULTY**

Hüseyin Selçuk Kılıç

Marmara University, Industrial Engineering Department

Research Assistant

34722/ Kadıköy Istanbul, Turkey

E-mail: huseyin.kilic@marmara.edu.tr

Emre Çevikcan

İstanbul Technical University, Industrial Engineering Department

Research Assistant

34367/ Beşiktaş İstanbul, Turkey

E-mail: cevikcan@itu.edu.tr

—Abstract —

Job selection is one of the most important points of the life. In addition to the importance of the selected job, where you perform it is also important. During this multi-criteria decision making period, possible job alternatives are evaluated. In fact, alternatives and criteria differ among other in terms of score and weight, respectively. Fuzzy AHP, in which linguistic variables are represented by triangular fuzzy numbers, is an effective method for analyzing this kind of problem. The aim of this study is to analyze the factors which play a role in job selection. For this aim, an investigation is conducted within the university students who will graduate from Istanbul Technical University Management Faculty within the following year. All the analyses of the criteria and evaluation of alternatives are made via fuzzy AHP.

Keywords: Decision making, fuzzy AHP, job selection.

JEL Classification: J62, D81

1. INTRODUCTION

One of the most important decisions to be made in life is about job selection. Choosing the right job is very crucial at this point. During this decision making period, a lot of criteria are taken into account and evaluated with respect to the possible alternatives. It is obvious that not all of the criteria have the same weights and not all of the alternatives are same with each other with respect to the criteria. To find a solution to this problem, a real life application is made.

The aim of this study is to analyze the factors which play a role in the selection of job and evaluating the alternatives by using fuzzy AHP between the students in Istanbul Technical University Management Faculty. For this aim, an investigation is conducted within the university students who will graduate within the following year. All the analysis of the criteria and evaluation of alternatives are made with fuzzy AHP.

Fuzzy AHP is an effective method for analyzing this kind of problems. In fuzzy AHP, linguistic variables which are used in the comparison of the criteria with respect to each other and comparison of the alternatives with respect to each criterion are represented by triangular numbers and then the required operations are made.

The rest of the paper is organized as follows: Literature review is given in Section 2. Section 3 includes the proposed model and its application and finally, conclusions are provided in section 4.

2. LITERATURE REVIEW

The literature is extensive related with job selection criteria which the graduates think and regard their relative importance when searching their job after graduation (Lim and Soon, 2006). The opportunity for advancement has been listed as one of the most important job selection criteria according to the majority of the studies (Boswell et al., 2003; Moy and Lee, 2002; Wilkinson, 1996).

In another study, Chan and Simon (2000) found that while choosing the employer, the important criteria are training and examination assistance. Besides, it is also concluded that salary or wage is one of the most important job selection criteria. Bai (1998) found that good income is the most important criterion in job selection among the students of the Chinese universities. However, Lau and Pang (1995) state that salary has been considered as if it was a sign and approval of one's ability. Ayca and Pasa (2003) also tried to find the effect of culture and cultural

change influence on career choices and job selection criteria of Turkish university students.

Besides the importance of opportunity for advancement and salary criteria, the rank of criteria changes from study to study. For instance, the job security is found to be the second important criterion by Karl and Sutton (1998) and Phillips et al. (1994). However, in the studies of Moy and Lee (2002), it is found to be the third most important criterion.

Another important criterion is the location of the work stated by Boswell et. al (2003) and Wilkinson (1996). The effect of applicability of degree obtained is also regarded as important by Counsell (1996) and Ahmadi et al. (1995).

The relative importance of the job selection criteria is also affected by the gender (Chan and Simon, 2000). In the studies of Aytaç and Bayram (2001), although the rank of the criteria doesn't change according to gender, the importance degree of the criteria regarded by the male and female students in job selection differs.

As fuzzy AHP provides the opportunity to take into consideration the vague thoughts of the decision makers, it is used in this study. There are several approaches to fuzzy AHP in the literature. While determining the weights of the criteria and alternatives, the fuzzy AHP methodology proposed by Chang (1992) will be used.

3. INVESTIGATION IN ISTANBUL TECHNICAL UNIVERSITY MANAGEMENT FACULTY

While choosing a job, a lot of criteria are taken into account. Analyzing the factors which play a role in the selection of job and evaluating the alternatives become very important. While determining the alternatives and criteria, it is benefited from the study of Aytaç and Bayram (2001). In this study an investigation is conducted within the university students who are to graduate soon in Istanbul Technical University Management Faculty. 6 criteria and 3 alternatives are taken into account. The criteria and alternatives are analyzed and evaluated with Fuzzy AHP according to the answers of the questionnaires.

3.1 Criteria

In this study, 6 criteria are chosen. There could be more criteria but this is mostly because of the increasing effect of the criteria in the number of questions in the questionnaire. On the condition that the number of criteria increases, more questions in the questionnaire appear and application of the questionnaire within

the students becomes more difficult. Therefore, an optimum number of criteria is chosen. The chosen criteria are also satisfying in the job selection problem. The weights are all compared in the questionnaires within the pair wise comparison matrices. The determined criteria are as follows.

Criteria

- The revenue of the job; Loving the job; Social position of the job; Social assurance of the job; Business environment of the job; Physical conditions of the job

3.2 Alternatives

There can be three main ways in the job selection process. These can be working in government such as the municipalities, institutions of the government. Second alternative can be working in private sector and the last one can be having your own job. Then the alternatives are as follows

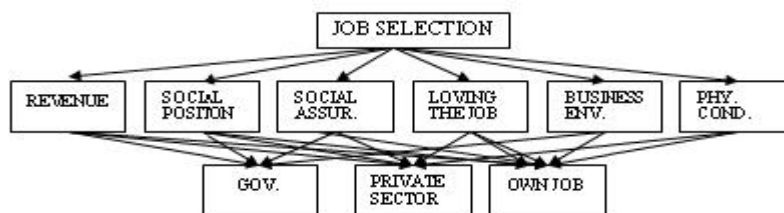
Alternatives

- Working in government, working in private sector, having own job

3.3 Hierarchy of the problem

The hierarchy of the problem is given in Figure-1. In the first level, there is the aim of the problem. In the second level, there are the criteria and in the last there are the alternatives.

Figure-1: The hierarchy of the problem



3.4 Participants

The application is made in Istanbul Technical University Management Faculty. 52 students participated in the questionnaire. All of the students are chosen from the last classes. 27 students are from the industrial engineering department and 25 students are from the management engineering department. 30 students are male and 22 students are female.

There are two departments in Istanbul Technical University Management Faculty. These are Industrial Engineering Department and the Management Engineering Department. For the representation of the whole faculty, nearly equal numbers of students are chosen from the two departments.

3.5 Questionnaire

Since Fuzzy AHP is used in the study, pair wise comparisons are made. Firstly, each of the criteria is compared with each other. Then with respect to each criterion, the alternatives are compared with each other. These are all made by the means of the questions in the questionnaire. There are 33 questions in the questionnaire. The first fifteen questions are for the comparison of the criteria with each other. Furthermore, the last 18 questions are evaluating the alternatives with respect to each criterion.

In the questionnaire, the comparisons are represented by five degrees. These linguistic comparison variables and their triangular lower, medium and upper bounds are as follows:

Equal (1,1,1), weakly strong (0.5, 1, 1.5), strong (1, 1.5, 2), very strong (1.5, 2, 2.5), absolute (2, 2.5, 3)

3.6 Calculations

The steps of the fuzzy AHP are applied for three cases. These are the whole faculty, only male students and only female students. The mean of the answers to the questionnaires are taken and required operations are done.

3.6.1 Calculations for the whole faculty

In the first case, all of the answers of the applicants are taken into consideration. There are 52 students that filled in the questionnaire.

The mean of the answers to the pair wise comparison of the criteria are as in the table 1.

All of the S_i values are calculated for each of the criteria.

$$S_{\text{revenue}} = (4.93, 6.26, 8.14) \otimes (1/47.45, 1/36.6, 1/28.46) = (0.10, 0.17, 0.28)$$

$$S_{\text{socialstatus}} = (4.82, 6.23, 8.23) \otimes (1/47.45, 1/36.6, 1/28.46) = (0.10, 0.17, 0.28)$$

$$S_{\text{socialassurance}} = (4.52, 5.84, 7.71) \otimes (1/47.45, 1/36.6, 1/28.46) = (0.09, 0.16, 0.27)$$

$$S_{\text{lovingthejob}} = (5.49, 7.31, 9.36) \otimes (1/47.45, 1/36.6, 1/28.46) = (0.12, 0.20, 0.32)$$

$$S_{\text{businessenv.}} = (4.7, 6.03, 7.91) \otimes (1/47.45, 1/36.6, 1/28.46) = (0.10, 0.17, 0.28)$$

$$S_{\text{physicalcmd.}} = (4, 4.93, 6.3) \otimes (1/47.45, 1/36.6, 1/28.46) = (0.08, 0.14, 0.22)$$

Table 1: The mean of the answers to the pair wise comparison of the criteria

	Revenue	Social Status	Social assurance	Loving the job	Business environment	Physical conditions
Revenue	(1,1,1)	(0.80, 1.05, 1.39)	(0.83, 1.09, 1.49)	(0.69, 0.93, 1.25)	(0.67, 0.92, 1.31)	(0.94, 1.27, 1.70)
Social Status	(0.72, 0.95, 1.25)	(1,1,1)	(0.86, 1.19, 1.64)	(0.63, 0.85, 1.24)	(0.75, 1.04, 1.45)	(0.86, 1.20, 1.65)
Social assurance	(0.67, 0.92, 1.20)	(0.61, 0.84, 1.16)	(1,1,1)	(0.67, 0.93, 1.38)	(0.76, 1.04, 1.49)	(0.81, 1.11, 1.48)
Loving The job	(0.8, 1.08, 1.45)	(0.8, 1.18, 1.59)	(0.72, 1.08, 1.49)	(1,1,1)	(1.04, 1.43, 1.85)	(1.13, 1.54, 1.98)
Business Environment	(0.76, 1.09, 1.49)	(0.69, 0.96, 1.33)	(0.67, 0.96, 1.31)	(0.54, 0.70, 0.96)	(1,1,1)	(1.04, 1.32, 1.62)
Physical Conditions	(0.59, 0.79, 1.06)	(0.61, 0.83, 1.16)	(0.68, 0.90, 1.24)	(0.51, 0.65, 0.88)	(0.61, 0.76, 0.96)	(1,1,1)

All of the S_i values of the criteria are compared with each other to find the weights.

The comparison of the S_{revenue} with other S_i 's, $V(S_{\text{revenue}} \geq S_{\text{socialstatus}}) = 1$ since $0,17 \geq 0,17$

$V(S_{\text{revenue}} \geq S_{\text{socialassurance}}) = 1$ since $0,17 \geq 0,16$

$V(S_{\text{revenue}} \geq S_{\text{lovingthejob}}) = 0,84$ m_2 is not greater than m_1 and l_1 is not greater than u_2 then $(0,12-0,28) / ((0,17-0,28)-(0,2-0,12)) = 0,84^*$

$V(S_{\text{revenue}} \geq S_{\text{businessenv}}) = 1$ since $0,17 \geq 0,17$, $V(S_{\text{revenue}} \geq S_{\text{physicalcmd}}) = 1$ since $0,17 \geq 0,14$

Then $S_{\text{revenue}} = 0,84$

Similar calculations are made for all the criteria and S_i values below are obtained.

$S_{\text{revenue}} = 0,84$; $S_{\text{socialstatus}} = 0,84$; $S_{\text{socialassurance}} = 0,79$; $S_{\text{lovingthejob}} = 1$; $S_{\text{businessenv.}} = 0,84$;
 $S_{\text{physicalcmd.}} = 0,62$

These values are normalized and the weights of the criteria are found. The weights are as follows.

$$S_{\text{revenue}} = 0,84 / (4,93) = 0,17; S_{\text{socialstatus}} = 0,84 / (4,93) = 0,17; S_{\text{socialassurance}} = 0,79 / (4,93) = 0,16$$

$$S_{\text{lovingthejob}} = 1 / (4,93) = 0,20; S_{\text{businessenv.}} = 0,84 / (4,93) = 0,17; S_{\text{physicalcomd.}} = 0,62 / (4,93) = 0,13$$

After finding the weights of the criteria then the weights of the alternatives with respect to each criterion are calculated.

With respect to the revenue criterion, the mean of the answers in the questionnaires are as in the table 2.

Table 2: The mean of the answers with respect to the revenue criterion.

Revenue	Government	Private sector	Own job
Government	(1,1,1)	(0.5, 0.68, 1)	(0.51, 0.69, 1.04)
Private sector	(1, 1.47, 2)	(1,1,1)	(0.66, 0.88, 1.29)
Own job	(0.96, 1.45, 1.96)	(0.78, 1.14, 1.52)	(1,1,1)

$$S_{\text{government}} = (2.01, 2.37, 3.04) \otimes (1/11.81, 1/9.31, 1/7.41) = (0.17, 0.26, 0.41)$$

$$S_{\text{privatesector}} = (2.66, 3.35, 4.29) \otimes (1/11.81, 1/9.31, 1/7.41) = (0.22, 0.35, 0.57)$$

$$S_{\text{ownjob}} = (2.74, 3.59, 4.48) \otimes (1/11.81, 1/9.31, 1/7.41) = (0.23, 0.40, 0.60)$$

All of the S_i values of the alternatives are compared with each other to find the weights.

The comparison of the $S_{\text{government}}$ with other S_i 's

$$V(S_{\text{government}} \geq S_{\text{privatesector}}) = 0,65, \quad V(S_{\text{government}} \geq S_{\text{ownjob}}) = \mathbf{0,56^*}$$

$$\text{Then } S_{\text{government}} = 0,56$$

The comparison of the $S_{\text{privatesector}}$ with other S_i 's

$$V(S_{\text{privatesector}} \geq S_{\text{government}}) = 1, \quad V(S_{\text{privatesector}} \geq S_{\text{ownjob}}) = \mathbf{0,89^*}$$

$$\text{Then } S_{\text{privatesector}} = 0,89$$

The comparison of the S_{ownjob} with other S_i 's

$$V(S_{\text{ownjob}} \geq S_{\text{government}}) = \mathbf{1^*}, \quad V(S_{\text{ownjob}} \geq S_{\text{privatesector}}) = 1$$

$$\text{Then } S_{\text{ownjob}} = 1$$

Then the S_i values of all the alternatives with respect to the revenue criterion are as follows:

$$S_{\text{government}} = 0,56; S_{\text{privatesector}} = 0,89; S_{\text{ownjob}} = 1$$

These values are normalized and the weights of the alternatives with respect to the revenue criterion are found as below.

$$S_{\text{government}} = 0,56 / (2,45) = 0,23, S_{\text{privatesector}} = 0,89 / (2,45) = 0,36, S_{\text{ownjob}} = 1 / (2,45) = 0,41$$

Similar calculations are made for the other alternatives and the final matrix showing the weights of the criteria and alternatives for the whole faculty are obtained as in the table 3 below.

Table 3: Final matrix showing the weights of the criteria and alternatives for the whole faculty.

	Revenue	Soc. Sta.	Soc. Assurance	Loving the job	Business Environment	Physical Conditions	Weighted points
Government	0,23	0,3	0,42	0,21	0,28	0,27	0,28
Private sector	0,36	0,33	0,33	0,28	0,3	0,35	0,32
Own job	0,41	0,37	0,25	0,51	0,42	0,38	0,40
Weights	17,03%	17,03%	16,02%	20,28%	17,03%	12,57%	1

When the similar steps are done for only the male and female students, the final matrixes are obtained as in the table 4 and table 5.

Table 4: Final matrix showing the weights of the criteria and alternatives for the male students.

	Revenue	Soc Sta.	Soc. Assurance	Loving the job	Business Environment	Physical Conditions	Weighted points
Government	0,2	0,26	0,42	0,16	0,26	0,28	0,26
Private sector	0,37	0,29	0,33	0,3	0,28	0,34	0,32
Own job	0,43	0,45	0,25	0,54	0,46	0,38	0,43
Weights	18,31%	17,48%	16,04%	20,57%	16,04%	11,52%	1

Table 5: Final matrix showing the weights of the criteria and alternatives for the female students.

	Revenue	Soc Sta.	Soc. Assurance	Loving the job	Business Environment	Physical Conditions	Weighted points
Government	0,26	0,26	0,42	0,24	0,3	0,26	0,29
Private sector	0,38	0,38	0,33	0,25	0,32	0,35	0,33
Own job	0,36	0,36	0,25	0,51	0,38	0,39	0,38
Weights	16,20%	17,20%	15,40%	20,00%	17,20%	14,00%	1

4. CONCLUSION

In this study, and, an investigation is conducted so as to analyze the factors and to evaluate the alternatives which play a role in the selection of job and fuzzy AHP is used as a tool in the study. Investigation is made in Istanbul Technical University Management Faculty by applying questionnaires to the students who will graduate within the current year.

By using fuzzy AHP, the study is made for three cases. These are for the whole management faculty, only male students and only female students. The weights of the criteria and alternatives differ in all of the three cases. But the order of the alternatives does not differ in all of the three cases. According to the results which are shown in more detail in the calculation part represent that the students prefer having their own job, working in private sector and working in government, respectively.

For further studies, the number of the criteria and alternatives can be increased and the problem can be solved under these criteria and alternatives. What is more, the number of the participants can also be increased for more accurate data and other decision making techniques can be used.

BIBLIOGRAPHY

Ahmadi, Mohammad, Marilyn M. Helms and Patricia Nodoushani (1995), "A factor-Analytic approach profiling job selection differences of male and female accountants", *Managerial Auditing Journal*, Vol. 10, Iss. 7, pp. 17-24.

Aycan, Zeynep and Selda Fikret Paşa (2003), "Career choices, job selection criteria, and leadership preferences in a transitional nation: The case of Turkey", *Journal of Career Development*, Vol. 30, Iss. 2, pp. 129-144.

Aytaç, Serpil and Nuran Bayram (2001), "Üniversite gençliğinin iş ve eş seçimindeki etkin kriterlerinin analitik hiyerarşi süresi (AHP) ile analizi", *Öneri Dergisi, Marmara Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, Sayı 16, Yıl.7, Cilt 1.

Bai, Limin (1998), "Monetary reward versus the national ideological agenda: Career choice among Chinese university students", *Journal of Moral Education*, Vol. 27, Iss. 4, pp. 525-540.

Boswell, Wendy R., Mark W. Roehling, Marcie A. LePine and Lisa M. Moynihan (2003), "Individual job-choice decisions and the impact of job attributes and recruitment practices: A longitudinal field study", *Human Resource Management*, Vol. 42, Iss. 1, pp. 23-37.

Chan, Siu Y. and Ho Simon S.M. (2000), "Desired attributes of public accounting firms in the job selection process: An empirical examination of accounting graduates' perceptions", *Accounting Education*, Vol. 9, Iss.4, pp. 315-327.

Chang, Da-Yong (1992), "Extent analysis and synthetic decision, optimization techniques and applications", *World Scientific*, Vol. 1, pp. 352.

Counsell, Doug (1996), "Graduate careers in the UK: An examination of undergraduates' perceptions", *Career Development International*, Vol. 1, Iss. 7, pp. 44-51.

Karl, Katherine A. and Cynthia L. Sutton (1998), "Job values in today's workforce: A Comparison of public and private sector employees.", *Public Personnel Management*, Vol. 27, Iss.4, pp. 515-527.

Lau, Agnes and Mary Pang (1995), "Undergraduates' career perceptions and first job needs in Hong Kong.", *The International Journal of Career Management*, Vol. 7, Iss. 3, pp. 14-24.

Lim, Hock-Eam and Jan-Jan Soon (2006), "Job Selection Criteria and Job Sector Preference of Economics Student: An Ordered Logit Model Analysis", *International Journal of Business and Society*, Vol. 7, Iss. 1, p. 53.

Moy, Jane W. and Sze M. Lee (2002), "The career choice of business graduates: SMEs or MNCs?", *Career Development International*, Vol.7, Iss. 6, pp. 339-347.

Phillips, Carl R., Antoinette S. Phillips and Samuel D. Cappel (1994), "Research note: How management students select prospective employers", *International Journal of Manpower*, Vol. 15, Iss. 1, pp. 55-59.

Wilkinson, Suzanne (1996), "The factors affecting the career choice of male and female civil engineering students in the UK.", *Career Development International*, Vol. 1, Iss. 5, pp. 45-50.