

The Determination of University Selection Based Upon Analytic Hierarchy Process

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Abstract: The most important factor in career planning of a person is to direct him depending upon his features. The best way of choosing career is to compare the wishes of a person with the requirements of that career so that he can decide the best one. Particularly, those who think to have a university education for their careers come across difficulties while deciding on their career path on account of the fact that the global world can offer various opportunities for education in a great many places. The student must choose by taking into account some criteria. As an example, several factors play a crucial role in this process such as the academic success of the university, the working opportunities provided, the distance of the university to the hometown of the student, the economic status of that city, the facilities of accommodation. Considering all these factors, the student should give an optimal decision. In this context, the common decision including both the personal different opinions and convincing for all is strongly needed. AHP (Analytic Hierarchy Process) has gained a very big momentum at these kind of situations.

Introduction

The key to help to a student in the process of career planning is to give him an encouragement that will have an impact in the future for the career planning activities (Laker & Laker, 2007, p.138). The fact to be known about career is that the person is responsible for the career development himself (Walker & Levesque, 2006, p.28). The reason is that in terms of career development and management in the literature, much has been emphasized personally gained and experienced career instead of organization based career development. (Kidd & Green, 2006, p.229). The person in the personal planning stage while choosing his career, he has been affected by a number of factors. The best career choice is, to reach the best by comparing what he wants and what he needs. The matter is to decide upon the best among the alternatives and upon the methods by which the decisions will be taken.

The selection of the department in high schools until the university exam, even the selection of the type of the high schools and the private courses for the preparation of the university exam is determined by the selections following the decisions. The selection of the university after high school is particularly significant for the students who are at the beginning of their careers. In this term, the students are a little bit confused due to the efforts to choose the best among a number of alternatives. In this case, the most important moment for decision is to choose the best alternative of the university.

The student is supposed to choose by taking into account some criteria such as the academic achievement of the university, the chance of the graduates in having jobs, the distance of the university to the homeland, the economic status and the opportunities for accommodation of the city. Considering all these factors, the student should give an optimal decision. By means of this, throughout undergraduate study, some of the regrets should be prevented and motivation and concentration should be used for the productivity and the efficiency of the education. In this case, a common decision is needed by means of which both the differences of personal opinions can be assessed and everyone can be persuaded at the same time.

From this perspective, AHP is a mathematical method which lays emphasis on the features of a person as well as group, and which assesses both the qualitative and quantitative variables together (Dağdeviren et al., 2004, p.132). At the same time, it provides opportunity for deciding effectively in the solution of decisional problems (Dündar & Ecer, 2008, p.198). AHP enables to modeling in a hierarchical way showing the relationship between

decision makers with complex problems, the ultimate goal of the problem, criteria, sub criteria, and the alternatives (Kuruüzüm & Atsan, 2001, p.84). Recently, this problem has captured attention a lot, and it is used in the solution of decision making problems in real life. Particularly, in the efficiency analysis, in the productivity analysis, and in the problems of performance assessment, the AHP is seen to be widely used.

The Determination of University Selection

There are many application processes all around the world in the higher education system. Recruitment structures and college admissions vary widely from country to country. For example, mostly, all British higher education institutions are members of the UCAS, therefore, nearly all those wishing to study for their first degrees in the UK have to apply through the UCAS. In the USA, students apply to one or more colleges or universities by submitting an application which each college evaluates according to its own criteria. For the graduate education, virtually all graduate programs require applicants to submit scores on standardized tests. In Turkey the Student Selection and Placement Center (ÖSYM) prepares the centralized University Entrance Examination (Yamamoto, 2006, p.59).

In addition to the differences of the applications depending upon the countries, there are also some differences in the selection of the university of a student. In occurrence of these differences, the impacts of the opportunities are effective. While some of the universities bring forth the the quality of their education, the others mention about the technological facilities. At the same time, some of the universities are boastful about the employed students, but the others are important for their social opportunities in the campus. The students on the verge of choosing the university will be affected from all these differences and will need to search the reality of these opportunities and they will focus on the criteria and the factors determined well in advance. These factors and the criteria become more clear after collecting informations from many sources about the universities (Veloutsou et al., 2005, p.281). The location of the the university, local social life and campus, the future career prospects and opportunities, financial considerations, the quality of education, the institutions' infrastructure, job prospects, personal motives have impacts on selection (Keskinen et al., 2008, p.639-640; Soutar & Tourner, 2002, p.40-41; Veloutsou et al., 2005, p.161-162)

The Analytic Hierarchy Process

The Analytic Hierarchy Process is decision-making process that breaks complex problems down into levels of decision criteria that can be managed more readily. The AHP synthesizes information and evaluates decision criteria in a way that enables the use of both real data and qualitative evaluations of factors in one model (Liu et al., 2008,p. 437). As Saaty mentions that it also organizes the basic rationality by breaking down a problem into its smaller constituent parts and then guides decision makers through a serious of pairwise comparison judgments to express relative strength or intensity of impact of the elements (Varma et al., 2008, p.346).

The AHP method can support managers in a broad range of decisions and complex problems including supplier-selection decisions, facility-location decisions, forecasting, risks and oppurtunities modeling, choice of technology, plan and product design, and so on. Further more the AHP approach also shows some interesting advantages (Costa & Evangelista, 2008, p.71):

- Effectiveness also in presence of descriptive and evaluative lacks;
- Effectiveness when there is a co-presence of qualitive and quantitative;
- It overcomes the difficulty of the evaluation of decisional factors;
- Control of the answers consistency and the final results coherence;
- Possibility to focus on every aspect of the problem always going down to a greater level of detail and stratifying the analysis; and
- Dynamism and adaptability of the method

The calculation procedure of AHP is presented below (Hsu and Chen, 2008, p. 46):

Establishment of pair-wise comparison matrix A. Let $C_1, C_2, C_3, \dots, C_n$ be the set of criteria, while a_{ij} represents a quantified judgement on a pair of criteria C_i, C_j . The relative importance of two criteria is rated using a scale with the digits 1, 3, 5, 7 and 9, where 1 denotes "equally important", 3 for "slightly more important", 5 for "strongly more important", 7 for "demonstrably more important" and 9 for "absolutely more important". The digits 2, 4, 6 and 8 are used to facilitate a compromise between slightly differing judgments. A n-by-n matrix A is derived as follows

$$A = \begin{bmatrix} a_{11} & a_{12} & \dots & a_j \\ a_{21} & a_{22} & \dots & a_j \\ \cdot & & & \cdot \\ \cdot & & & \cdot \\ \cdot & & & \cdot \\ a_{i1} & a_{i2} & \dots & a_{ij} \end{bmatrix} \quad (1)$$

Where $a_{ij} = 1$ and $a_{ji} = 1/a_{ij}$, $i, j = 1, 2, \dots, n$.

In matrix A, the problem involves assigning a set of numerical weights $W_1, W_2, W_3, \dots, W_n$ to the n criteria $C_1, C_2, C_3, \dots, C_n$ that “reflects the recorder judgments”. If A is a consistency matrix, the relations between weights W_i and judgments a_{ij} are simply given by $W_i / W_j = a_{ij}$ (for $i, j = 1, 2, 3, \dots, n$)

Eigenvalue and eigen vector. Saaty suggested that the largest eigenvalue λ_{max}

If A is a consistency matrix then eigen vector X can be calculated by the equation (2):

$$(A - \lambda_{max}I) X = 0 \quad (2)$$

Consistency test. Saaty proposed utilizing consistency index (CI) and consistency ratio (CR) to verify the consistency of the comparison matrix. Additionally, CI and CR are defined as follows:

$$CI = (\lambda_{max} - n) / (n - 1) \quad (3)$$

$$CR = CI / RI \quad (4)$$

Where RI denotes the average consistency index over numerous random entries of same order reciprocal matrices. If $CR \leq 0,1$ the estimate is accepted; otherwise, a new comparison matrix is solicited until $CR \leq 0,1$.

The Study

Imagine that any high school graduate student determined some of the criteria about the university planned by means of the decision either collectively or individually. These criteria are such as the image and the prestige of the university, the knowledge in education and the technological opportunities, the career opportunities, the possibility of employment of the university graduates, the atmosphere of the campus and the social life, the opportunities for accommodation, and transportation, yet still, let’s consider that the student gives more paramount importance to the five of them more than the others. Let’s say these are the criteria like “the image and the prestige of the university”, “the knowledge in education and the technological opportunities”, “the career opportunities in the university”, “the possibility of employment of the university graduates”, “the atmosphere of the campus and the social life”. The university alternatives and the results of these alternative universities out of 100 point in terms of the criteria are shown below in Table 1:

	1. UNIV.	2. UNIV.	3. UNIV.	4. UNIV.	5. UNIV.
IMAGE-PRESTIGE	80	100	70	60	90
KNOWLEDGE-TECH.	90	70	80	100	80
CAREER	50	80	90	60	70
EMPLOYMENT	70	70	60	60	80
CAMPUS	60	60	100	90	90

Table 1

In this stage of the application, initially, the comparison of the criteria was done in accordance with the method of AHP and indicated in Table 2. In the process of the determination of the level of importance, the opinion of the student and the environment left impacts, and comparisons were made depending upon these opinions.

	I-P	K-T	CAR	EMP	CAM
I-P	1	1/2	3	1/3	5
K-T	2	1	2	1/4	4
CAR	1/3	1/2	1	1/5	3
EMP	3	4	5	1	7
CAM	1/5	1/4	1/3	1/7	1

Table 2

$$A = \begin{bmatrix} 1 & 1/2 & 3 & 1/3 & 5 \\ 2 & 1 & 2 & 1/4 & 4 \\ 1/3 & 1/2 & 1 & 1/5 & 3 \\ 3 & 4 & 5 & 1 & 7 \\ 1/5 & 1/4 & 1/3 & 1/7 & 1 \end{bmatrix} \quad W = \begin{bmatrix} 0.184 \\ 0.195 \\ 0.094 \\ 0.481 \\ 0.044 \end{bmatrix}$$

The Consistency Ratio of Matris A = 0.0545

The calculated vector in the column W shows values of numerical importance. In the framework of these results, the most important criteria with the percentage of 48 % is “employment” whereas the least criteria is “the atmosphere of campus” with the percentage of 5 %. In the Table 3 below, the criteria’s values of importance in percentage are given sequently.

The Sequence of Importance	The Assessment Criterium	Approximate Values of Importance in Percentage
1	Employment	% 48
2	Knowledge-Technology	% 20
3	Image-Prestige	% 18
4	Career	% 9
5	Campus	% 5

Table 3

The formula used while finding W is, at the same time, used to compare and contrast the criteria of all the candidates with one another. In this context, the stages of finding out matris C such as C1, C2, C3, C4, and C5 in the results of all the contrasts in every criterium is in the following:

	1. UNIV.	2. UNIV.	3. UNIV.	4. UNIV.	5. UNIV.
1. UNIV.	1	1/5	3	5	1/3
2. UNIV.	5	1	7	9	3
3. UNIV.	1/3	1/7	1	3	1/5
4. UNIV.	1/5	1/9	1/3	1	1/7
5. UNIV.	3	1/3	5	7	1

$$V1 = \begin{bmatrix} 1 & 1/5 & 3 & 5 & 1/3 \\ 5 & 1 & 7 & 9 & 3 \\ 1/3 & 1/7 & 1 & 3 & 1/5 \\ 1/5 & 1/9 & 1/3 & 1 & 1/7 \\ 3 & 1/3 & 5 & 7 & 1 \end{bmatrix} \quad C1 = \begin{bmatrix} 0.134 \\ 0.502 \\ 0.067 \\ 0.034 \\ 0.260 \end{bmatrix}$$

The Consistency Ratio of Matris C1= 0.0541

The Comparison of the University in terms of “Image and Prestige”

Assessing from the perspective of “Image and Prestige”, it can be stated that the university in the second order is much more preferable with the percentage of 50.2 %.

	1. UNIV.	2. UNIV.	3. UNIV.	4. UNIV.	5. UNIV.
1. UNIV.	1	5	3	1/3	3
2. UNIV.	1/5	1	1/3	1/7	1/3
3. UNIV.	1/3	3	1	1/5	1
4. UNIV.	3	7	5	1	5
5. UNIV.	1/3	3	1	1/5	1

$$V2 = \begin{bmatrix} 1 & 5 & 3 & 1/3 & 3 \\ 1/5 & 1 & 1/3 & 1/7 & 1/3 \\ 1/3 & 3 & 1 & 1/5 & 4 \\ 3 & 7 & 5 & 1 & 5 \\ 1/3 & 3 & 1 & 1/5 & 1 \end{bmatrix} \quad C2 = \begin{bmatrix} 0.245 \\ 0.046 \\ 0.105 \\ 0.497 \\ 0.105 \end{bmatrix}$$

The Consistency Ratio of Matris C2= 0.0284

The Comparison of the University in terms of “Knowledge and Technological Opportunities”

As for the criteria of “Knowledge and Technological Opportunities”, the university in fourth order is leading the others with the percentage of 49.7 %.

The Comparison of the University in terms of “The Opportunites of Career in the University”

	1. UNI.	2. UNI.	3. UNI.	4. UNI.	5. UNI.
1. UNI.	1	1/7	1/9	1/3	1/5
2. UNI.	7	1	1/3	5	3
3. UNI.	9	3	1	7	5
4. UNI.	3	1/5	1/7	1	1/3
5. UNI.	5	1/3	1/5	3	1

$$V3 = \begin{bmatrix} 1 & 1/7 & 1/9 & 1/3 & 1/5 \\ 7 & 1 & 1/3 & 5 & 3 \\ 9 & 3 & 1 & 7 & 5 \\ 3 & 1/5 & 1/7 & 1 & 1/3 \\ 5 & 1/3 & 1/5 & 3 & 1 \end{bmatrix} \quad C3 = \begin{bmatrix} 0.034 \\ 0.260 \\ 0.502 \\ 0.067 \\ 0.134 \end{bmatrix}$$

The Consistency Ratio of Matris C3= 0.0541

According to the criterium of “The Career Opportunities in the University” the university in the third order is in a better state with the percentage of 50.2 %.

The Comparison of the University in terms of “The Possibility of the Graduate Employment”

	1. UNI.	2. UNI.	3. UNI.	4. UNI.	5. UNI.
1. UNI.	1	1	3	3	1/3
2. UNI.	1	1	3	3	1/3
3. UNI.	1/3	1/3	1	1	1/5
4. UNI.	1/3	1/3	1	1	1/5
5. UNI.	3	3	5	5	1

$$V4 = \begin{bmatrix} 1 & 1 & 3 & 3 & 1/3 \\ 1 & 1 & 3 & 3 & 1/3 \\ 1/3 & 1/3 & 1 & 1 & 1/5 \\ 1/3 & 1/3 & 1 & 1 & 1/5 \\ 3 & 3 & 5 & 5 & 1 \end{bmatrix} \quad C4 = \begin{bmatrix} 0.195 \\ 0.195 \\ 0.073 \\ 0.073 \\ 0.462 \end{bmatrix}$$

The Consistency Ratio of Matris C4= 0.012

The university in the fifth order is much more successful in the criterium of “The Possibility of Graduate Employment” with the percentage of 46.2 %.

The Comparison of the University according to the criteria of “The Atmosphere of Campus and Social Life”

	1. UNIV.	2. UNIV.	3. UNIV.	4. UNIV.	5. UNIV.
1. UNIV.	1	1	1/9	1/7	1/7
2. UNIV.	1	1	1/9	1/7	1/7
3. UNIV.	9	9	1	3	3
4. UNIV.	7	7	1/3	1	1
5. UNIV.	7	7	1/3	1	1

$$V5 = \begin{bmatrix} 1 & 1 & 1/9 & 1/7 & 1/7 \\ 1 & 1 & 1/9 & 1/7 & 1/7 \\ 9 & 9 & 1 & 3 & 3 \\ 7 & 7 & 1/3 & 1 & 1 \\ 7 & 7 & 1/3 & 1 & 1 \end{bmatrix} \quad C5 = \begin{bmatrix} 0.038 \\ 0.038 \\ 0.476 \\ 0.222 \\ 0.222 \end{bmatrix}$$

The Consistency Ratio of Matris C5= 0.025

The results of the last criterium of “Campus Life and Social Life” are as in the Matris of C5. In this criterium, the university in the third order is more likely to be preferred with the 47.6 % percentage.

After this point, to calculate the sequence is of great significance. Depending upon the values, it can be mentioned that the decision about the university selection will be optimal. In this way, the decisions of the students would be rational, not regretful.

The decision matris is seen in the last part of this application through this Formula [Cij]_{m×n} × [Wi]_{n×1}.

$$\begin{bmatrix} 0.134 & 0.245 & 0.034 & 0.195 & 0.038 \\ 0.502 & 0.046 & 0.260 & 0.195 & 0.038 \\ 0.067 & 0.105 & 0.502 & 0.073 & 0.476 \\ 0.034 & 0.497 & 0.067 & 0.073 & 0.222 \\ 0.260 & 0.105 & 0.134 & 0.462 & 0.222 \end{bmatrix} \times \begin{bmatrix} 0.184 \\ 0.195 \\ 0.094 \\ 0.481 \\ 0.044 \end{bmatrix} \rightarrow \mathbf{D} = \begin{bmatrix} 0.171 \\ 0.221 \\ 0.136 \\ 0.154 \\ 0.312 \end{bmatrix}$$

When the values in the Matris D are assessed regarding the Table 4, 5th university is in the first sequence with the percentage of 32%. And this choice is the best and optimal one for the student.

The Sequence of Importance	Universities	Approximate Values of Importance in Percentage
1	5 th UNIVERSITY	31%
2	2 nd UNIVERSITY	22%
3	1 st UNIVERSITY	17%
4	4 th UNIVERSITY	16%
5	3 rd UNIVERSITY	14%

Table 4

Conclusion and Suggestions

All of us wants to have a very prestigious job at the end of our education for which we spend a great amount of time on account of the fact that a job that makes us happy enables our life meaningful and productive. The efficiencies of a certain job, perhaps, are presented to a great number of students in many universities. However, the universities have some ups and downs in terms of the opportunities. Even this is the case for the same faculties of the same university. To say in another way, the university that can offer opportunities should be preferred, not an ordinary one. From this perspective, the decision of university selection which is the most critical stage of the education should be given rationally. AHP is the method of mathematical decision by means of which the qualitative and the quantitative cases can be assessed together.

As in the example of here, the university candidate ascertains some certain criteria both with group and individual decisions. These criteria are “the image and the prestige of the university”, “the knowledge in education and the technological opportunities”, “the career opportunities in the university”, “the possibility of employment of the university graduates”, “the atmosphere of the campus and the social life”. The candidate student decides the university of 5th university among the five university alternatives through the AHP method. It can be demonstrated that this result is the most optimal and rational one. This method enables the student to reach the most liked occupational efficiencies in the best and useful atmosphere.

AHP can be used not only in the university selection, but also in all of the management and the organizational activities as the solution to the decisional problems. By means of this, the interested people, the workers, and the managers can find the opportunity to reach the most suitable decision in a shortest way and thanks to the consistency of the decisions, the unnecessary repetitions of the same procedures will be prevented.

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