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Conference paper

KEY FACTORS INFLUENCING STUDENTS' CHOICE OF UNIVERSITY FOR POSTGRADUATE STUDIES ABROAD: A MULTICRITERIA DECISION MODEL

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Abstract

The aim of the paper is to develop a multicriteria decision model for choosing a University for postgraduate studies abroad. The research has been conducted through a questionnaire distributed to the students from the fourth year of undergraduate studies at the Ss. Cyril and Methodius University in Skopje, Faculty of Economics – Skopje, in order to gain information on what is valuable for them, i.e. which factors are important for choosing a University for postgraduate studies abroad. Those factors that appear the most serve as inputs to the multicriteria decision model. Then, a group of 9 respondents made individual judgments for the importance of the criteria regarding the goal (choosing a University for postgraduate studies abroad), and by computing the geometric mean of the individual judgments, the group judgments are further acquired. The obtained results of the model are presented and discussed. This model will serve both students (for the purpose of choosing the most appropriate University for postgraduate studies abroad) and higher educational institutions (for the purpose of taking adequate next steps, i.e. making better decisions that will create value for students).

Key words: *university, postgraduate studies, students, AHP, group decision-making.*

JEL codes: *C44, I23, I25.*

1. INTRODUCTION

Everything is a choice. When making the simplest decision in life, there is as well a choice between at least two alternatives. Everyone wants a better future, but here is the question of whether we are ready to invest in ourselves daily, to expand the acquired knowledge, to acquire new knowledge and new skills, to be a better person. Such investments in oneself increase the net worth of an individual.

When a graduated student wants to "sell" themselves on the labor market, they have their own currency. On one side of that currency is their knowledge, while on the other are their personal characteristics. Over time, this currency needs to be gaining in value and allowing progress for their professional development, which will not only

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provide a benefit for the company they are an employee of, but also for the society as a whole. Students are the future drivers of the economy in every single country. Hence, the motive is to conduct research on students from the fourth academic year of undergraduate studies at the most prestigious institution in the field of economy and business in Macedonia, the Faculty of Economics - Skopje, within the Ss. Cyril and Methodius University in Skopje, in order to determine how many of them want to continue their education in the second cycle of studies, i.e. postgraduate studies, whether they will continue in Macedonia or abroad, and what are the key factors for them when choosing a University.

The emphasis in this paper is on the factors that are crucial for the respondents when choosing a University for postgraduate studies abroad. This paper presents the ability to use a multicriteria decision model based on group decision-making, which allows determining the weight of the key factors, i.e. the criteria in relation to the goal (choosing a University for postgraduate studies abroad) and the selection of the best University for each student. The alternative, which according to the model will be obtained as the best, should serve as a recommendation to the student in making the final decision, and the results of the weights of the criteria will be especially useful for higher educational institutions because they will find out which factors create value for students, thus enabling them to improve in that direction and to make a better promotion of postgraduate studies.

Multicriteria decision-making (MCDM) is one of the fastest growing and very important subfields of Operational Research/Management Science, and it is about making a decision in situations when there is a number of criteria which in most cases are conflicting. Details about the early history of MCDM up until now, can be found in Koksalan, Wallenius and Zionts (2011). A literature review for multicriteria decision-making techniques including their application is made by Mardani et al., (2015), so they cover a period from 2000 to 2014, analyzing 393 articles that have been published in international peer-review journals, extracted from the Web of Science database system, and they found that the first method in use (128 studies) is the Analytic Hierarchy Process (AHP) (Cvetkoska & Savic, 2017).

In the area of higher education, in the literature there exist various applications of the analytic hierarchy process (selection of dean (Gibney & Shang, 2007); selection of the most adequate academic staff with fuzzy AHP (FAHP) (Rouyendegh & Erkan, 2012); choosing the best University for collaboration by firms with fuzzy AHP (Salimi & Rezaei, 2015)), but there has not been found an article with an AHP application as is presented in this paper, thus leading to the conclusion that this is an original one.

Aside from the introduction, the objectives and research methodology are stated in Section 2. The description of the research instrument and response is given is Section 3. The results of the survey are presented and analyzed in Section 4. The analytic hierarchy process is described in Section 5, the developed AHP model is explained in 5.1, and the results of group decision-making are presented and analyzed in 5.2. The conclusion is given in Section 6.

2. OBJECTIVES AND RESEARCH METHODOLOGY

The overall objective of the research is:

- to develop a multicriteria decision model (AHP) for decision-making about choosing a University for postgraduate studies abroad.

The specific objectives of the paper are:

- to present and analyze the results of a questionnaire given to the students from the fourth year of undergraduate studies from the Ss. Cyril and Methodius University in Skopje, Faculty of Economics – Skopje.
- To develop a structure of the AHP model for choosing a University for postgraduate studies abroad.
- To present and analyze the results of the AHP model based on group decision-making.

In the decision-making process for choosing a University for postgraduate studies abroad, the alternatives, i.e. Universities will be specified by each participant (student).

In order to determine what the key factors that influence the students' choice of University for postgraduate studies abroad are, a survey was conducted in the form of a questionnaire. Those factors that appear the most serve as input (criteria) in the multicriteria decision model (AHP). To estimate the weights of the criteria, group decision-making with AHP is used (explained in detail in 5.1 and 5.2).

3. RESEARCH INSTRUMENT DESCRIPTION AND RESPONSE

A questionnaire was created for the purpose of obtaining information on whether the students from the fourth year of undergraduate studies at the Ss. Cyril and Methodius University in Skopje, Faculty of Economics – Skopje, have clearly defined goals for their future, whether their education will consist only of undergraduate studies or they would like to continue their education in postgraduate studies, where they would continue their postgraduate studies (in the Republic of Macedonia or abroad), in which study program, and what the most important factors are according to them when choosing a University for postgraduate studies.

The questionnaire consisted of 16 questions, and in the focus of this paper are the answers to the last question, related to the factors that are of particular significance to the respondents when choosing a University for postgraduate studies abroad (it was necessary for them to indicate from 7 to 9 factors).

The questionnaire was distributed to the students from the seven departments of undergraduate studies at the Faculty of Economics (departments: E-Business, Economics, Marketing, Management, Foreign Trade, Accounting and Auditing, Financial Management) in the winter semester of the academic year 2017/2018, i.e. in December 2017, before the start of the lectures in the courses that the respondents have in this semester.

The questionnaire was completed by 225 respondents (56 from the Financial Management Department, 39 from the Department of Management, 38 from the Department of E-Business, 31 from the Department of Marketing, 22 from the

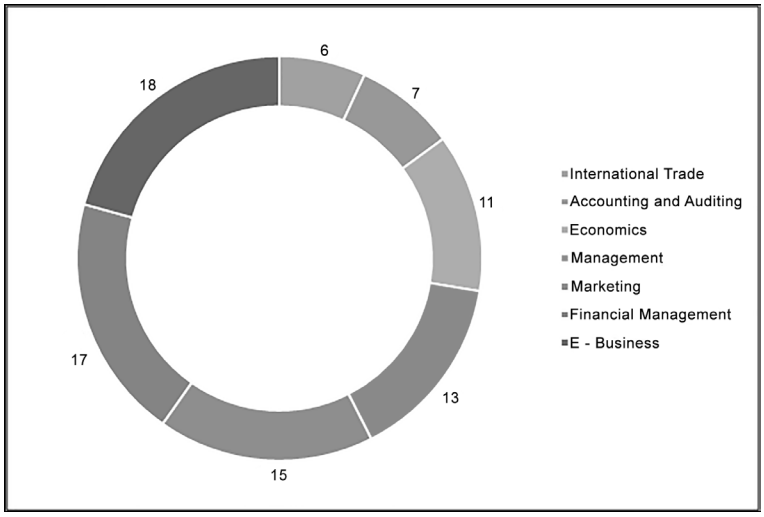
Department of Accounting and Auditing, 21 from the Department of Economics, and 18 from the Department of Foreign Trade).

Out of the 225 respondents, 53 answered that their education would include only undergraduate studies, hence these respondents did not answer the next questions in the questionnaire, while 172 respondents answered that their education will not consist only of undergraduate studies, meaning they will continue to postgraduate studies. Out of the 172 respondents who want to continue to postgraduate studies, 85 would like it to be in Macedonia, and 87 abroad. In this paper, the responses from these 87 respondents are analyzed.

4. THE RESULTS OF THE SURVEY

Out of the 87 respondents who want to continue their education to postgraduate studies abroad, most of them are from the Department of E-Business (18), followed by the Departments of: Financial Management (17), Marketing (15), Management (13), Economics (11), Accounting and Auditing (7), and Foreign Trade (6) (Figure 1).

Figure 1. Number of respondents from individual departments who want to continue to postgraduate studies abroad



Source: Author's calculation

The factors that are particularly significant to the respondents (87) when choosing a University for postgraduate studies abroad are shown in Table 1. From this table it can be seen that the total number of listed factors is 30, and they are the following: practice, study program, tuition fee, location, quality of education, scholarship, standard of living in the state, quality of academic staff, rank, greater opportunity for progress in work, language of instruction (language of the teaching), connection of courses with practice, conditions of enrollment, recognition of academic diploma, networking, acquiring new knowledge, using new learning materials, experience of students from previous generations, way of teaching, reknown for finance and banking, availability of

professors, proposals for jobs in institutions, duration of studies, attitude of academic staff, organization of teaching, access to databases, availability of computer programs for work, new courses, state University, and fair assessment. Most of the respondents have indicated the factor of practice (69) as being most important, followed by the study program (63), tuition fee (47), etc., while fair assessment is indicated by 2 respondents.

Table 1. Factors that are important to the respondents when choosing a University for postgraduate studies abroad

No.	Factor	No. of respondents who listed the factor
1.	Practice	69
2.	Study program	63
3.	Tuition fee	47
4.	Location	42
5.	Quality of education	39
6.	Scholarship	38
7.	Standard of living in the state	37
8.	Quality of academic staff	34
9.	Rank	33
10.	Greater opportunity for progress in work	32
11.	Language of instruction	31
12.	Connection of courses with practice	24
13.	Conditions of enrollment	17
14.	Recognition of academic diploma	16
15.	Networking	15
16.	Acquiring new knowledge	14
17.	Using new learning materials	14
18.	Experience of students from previous generations	10
19.	Way of teaching	10
20.	Reknown for finance and banking	9
21.	Availability of professors	8
22.	Proposals for jobs in institutions	8
23.	Duration of studies	8
24.	Attitude of academic staff	7
25.	Organization of teaching	6
26.	Access to databases	6
27.	Availability of computer programs for work	4
28.	New courses	3
29.	State University	3
30.	Fair assessment	2

Source: Author's calculation

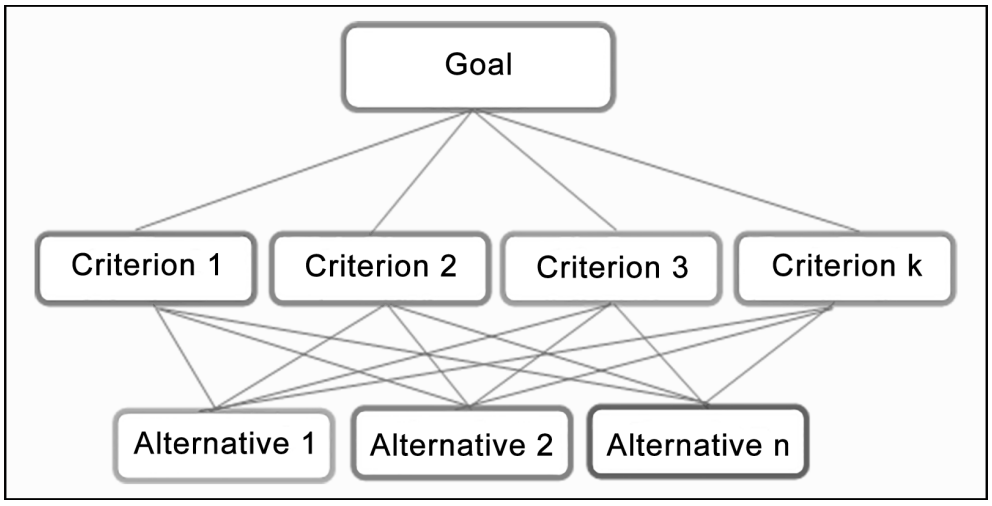
5. THE ANALYTIC HIERARCHY PROCESS (AHP)

The multicriteria decision-making method analytic hierarchy process was developed by Thomas L. Saaty in the late 70s of the previous century (Saaty, 1977). The analytic hierarchy process allows complex decision-making problems, which can be decomposed into these components: goal, criteria, subcriteria and alternatives, to be solved.

The application of the AHP method can be explained in the following four steps:

1. For the decision problem, the hierarchy model is developed in such a way that the goal is settled on the top, the criteria and subcriteria (if any) on the lower levels, while the alternatives are at the bottom. The maximum number of elements that people can simultaneously deal with is 9 (Saaty, 1980, 1990), which also presents the maximum number of elements at every level of the hierarchy structure. The general AHP model is presented in Figure 2.
2. After the construction of the hierarchy, on each of its levels all elements in pairs that belong to the same node should be compared, starting from the top and continuing to the lowest level. In this procedure the fundamental scale for pairwise comparisons is used (Saaty, 2012, p.73) (Table 2). Then, the local importance (priorities of alternatives and weights for criteria) for all the elements of the constructed hierarchy are calculated. This calculation is based on the pairwise comparisons. An explanation of the second step by using the mathematical notation is given in Begicevic et al., (2007).
3. The results from the previous step are synthesized into overall priority for each alternative, which allows to rank the alternative and to determine which of them is the best one. Also, in this step the consistency ratio (CR), which is described in detail below, is calculated.
4. Finally, the sensitivity analysis is performed. This analysis enables to observe how the change of the importance of the criteria and subcriteria influences the priorities of alternatives.

Figure 2. General AHP model



Source: Author's illustration

Table 2. The fundamental scale for pairwise comparisons

Intensity of importance	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective
3	Moderate importance	Experience and judgment slightly favor one activity over another
5	Strong importance	Experience and judgment strongly favor one activity over another
7	Very strong or demonstrated importance	An activity is favored very strongly over another, its dominance demonstrated in practice
9	Extreme importance	The evidence favoring one activity over another is of the highest possible order of affirmation
2, 4, 6, 8	For compromise between the above values	Sometimes one needs to interpolate a compromise judgment numerically because there is no good word to describe it
Reciprocals of above	If activity *i* has one of the above non-zero numbers assigned to it when compared with activity *j*, then *j* has the reciprocal value when compared with *i*	A comparison mandated by choosing the smaller element as the unit to estimate the larger one as a multiple of that unit
Rationals	Ratios arising from the scale	If consistency were to be forced by obtaining *n* numerical values to span the matrix
1.1-1.9	For tied activities	When elements are close and nearly indistinguishable; moderate is 1.3 and extreme is 1.9

Source: Saaty, T.L. (2012) Decision making for leaders: The analytic hierarchy process for decisions in a complex world. 3rd ed. Pittsburgh: RWS Publications, p.73.

In order to investigate whether the decision maker was consistent or not when he/she was comparing in pairs the elements of the hierarchy structure, the consistency ratio needs to be calculated (CR=CI/RI, where CI is a consistency index (CI= $(\lambda_{\max} - n)/(n-1)$), $\lambda_{\max}$ is the biggest eigenvalue of the matrix of pairwise comparisons, while RI is a random index and its values are given in Cvetkoska and Iliev (2017, p.96)).

The advantages of using the AHP are (Saaty, 2012, p.25): for a wide range of problems that are unstructured it provides a model that is easily understood and flexible; in solving problems that are complex it integrates deductive and systems approaches; it can deal with interdependence of elements in a system and it doesn't insist on linear thinking; it reflects the natural tendency of our mind to sort elements of a system into different levels and to group like elements in each level; for measuring intangibles it provides a scale, and for establishing priorities it provides a method; it tracks the logical consistency of judgments used in determining priorities; it leads to an overall estimate of the desirability of each alternative; it considers the relative priorities of factors in a system, and the best alternative can be selected by people according to their goals; it doesn't insist on consensus, but it synthesizes a representative outcome from diverse judgments; and through a process of repetition it enables people to refine their definition of a problem and improve their judgment and understanding.

Besides the advantages, the disadvantages of the analytic hierarchy process are (Cvetkoska, 2013, p.55): to compare the elements in pairs, for certain problems in the process of decision-making, the fundamental scale for pairwise comparisons is not

comprehensive enough; for many problems there needs to be made a high number of comparisons of elements in pairs; it is difficult to obtain a consistency ratio that is acceptable; there cannot be considered incomparable alternatives. Saaty (2006, p.225) explains how the last disadvantage can be overcome.

5.1 AHP MODEL FOR CHOOSING A UNIVERSITY FOR POSTGRADUATE STUDIES ABROAD

The problem of choosing a University for postgraduate studies abroad can be considered an MCDM problem and can be decomposed into: goal, criteria, subcriteria and alternatives.

The most commonly used MCDM method for selecting the best alternative from given alternatives that are evaluated relative to criteria that are important for achieving the goal is AHP. This method allows factors of a quantitative and qualitative nature to be included, and despite the individual decision-making, it supports group decision-making. Hence, in this paper the AHP method has been chosen as the most suitable for solving the problem of choosing a University for postgraduate studies abroad.

At each level of the hierarchical structure, there should be 7 ± 2 elements, and details can be found in (Miller, 1956).

The elements of the multictiteria decision model (AHP) are:

- Goal – choosing a University for postgraduate studies abroad.
- Criteria – after processing the responses received from the questionnaire filled in by 87 respondents (students from the fourth year of undergraduate studies at the Faculty of Economics - Skopje), 9 criteria are chosen, as the most frequently listed, and they are: practice, study program, tuition fee, location, quality of education, scholarship, standard of living in the state, quality of academic staff, and rank. These 9 criteria constitute the first level of the hierarchical structure.
- Alternatives – the Universities that will be listed by each student. The alternatives constitute the second level of the hierarchical structure.
  The AHP model for choosing a University for postgraduate studies abroad is presented in Figure 3.

In order to calculate the weight of the elements of the first level, i.e. the criteria, a new questionnaire was created. In this questionnaire the 9 criteria (which were most often given from the respondents in the first questionnaire) were listed, 36 comparisons in pairs of criteria were given (n is the number of elements at each level, in this case n=9, and to estimate how many comparisons need to be made, the following formula is used: $n(n-1)/2$, i.e. 9(9-1)/2 = 36), and how to assign the intensity of importance from the fundamental scale for pairwise comparisons was explained (this scale was also included as part of the questionnaire).

The respondents chosen to fill in the questionnaire were 9 students from all those who want to continue their education to postgraduate studies in a University abroad. During the students' selection, what was taken into account was that a student from each department was to be included, having achieved high average success in their studies. Two students each were selected from the E-Business and Financial

Management departments because out of these two departments, most of the respondents (18 from E-Business and 17 from Financial Management) answered that they wanted to continue their postgraduate studies abroad.

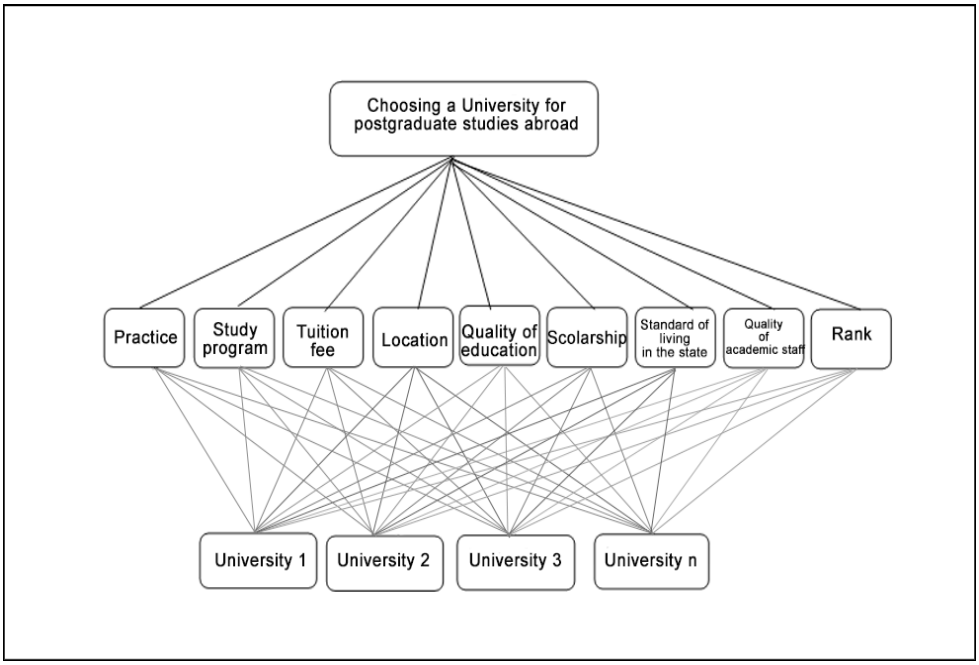
In making the comparison of two criteria about their importance regarding the goal, each of the respondents brings in their own judgment and assigns a numerical value from the given scale.

The questionnaire was sent to the respondents in May 2018, and all of them filled it in and sent it back by mail within a week in the same month.

In order to combine the numerical values of individual judgments in group judgment, there are two ways to approach this: a consensus vote and a geometric mean (Begicevic et al., 2011, p.448). In this paper the geometric mean is used.

The results of the AHP model based on group decision-making, about the importance of the key factors influencing the choice of University for postgraduate studies abroad, are presented and analyzed in the next section.

Figure 3. The AHP model for choosing a University for postgraduate studies abroad



Source: Author's own developed model

5.2 RESULTS OF GROUP DECISION MAKING

Table 3 presents the pairwise comparison matrix of the criteria with respect to the goal (choosing a University for postgraduate studies abroad). Each criterion compared with itself gets a value of 1. By comparing the first criterion (C1) with the fourth (C4), a value 2 is entered in the (1,4) position (first row, fourth column). This value represents group judgment and is obtained by calculating the geometric mean of individual judgments. When comparing the fourth with the first criterion, it receives a reciprocal value, in this case ½ which is entered in the (4,1) position (fourth row, first column). The remaining values are obtained and entered in an analogous manner. Aczel and Saaty (1983) have proved that when reciprocal judgments are used, the geometric mean presents the only way to combine the judgments from different individuals.

Table 3. Pairwise comparison matrix of the criteria with respect to the goal

	C1	C2	C3	C4	C5	C6	C7	C8	C9
C1	1	1	1	2	1/2	1/2	1	1/3	2
C2	1	1	2	2	1/2	1/2	2	1/2	1
C3	1	1/2	1	2	1/3	1/3	1	1	1
C4	1/2	1/2	1/2	1	1/3	1/3	1	1/4	1
C5	2	2	3	3	1	1	3	2	2
C6	2	2	3	3	1	1	3	1	3
C7	1	1/2	1	1	1/3	1/3	1	1/3	2
C8	3	2	1	4	1/2	1	3	1	3
C9	1/2	1	1	1	1/2	1/3	1/2	1/3	1

Source: Author's calculation

When each element of each column of the pairwise comparison matrix is divided by the sum of the elements of the column in which it belongs, a new, normalized matrix is obtained (Table 4).

Table 4. Normalized matrix

	C1	C2	C3	C4	C5	C6	C7	C8	C9
C1	0.0833	0.0952	0.0741	0.1053	0.1000	0.0938	0.0645	0.0494	0.1250
C2	0.0833	0.0952	0.1481	0.1053	0.1000	0.0938	0.1290	0.0741	0.0625
C3	0.0833	0.0476	0.0741	0.1053	0.0667	0.0625	0.0645	0.1481	0.0625
C4	0.0417	0.0476	0.0370	0.0526	0.0667	0.0625	0.0645	0.0370	0.0625
C5	0.1667	0.1905	0.2222	0.1579	0.2000	0.1875	0.1935	0.2963	0.1250
C6	0.1667	0.1905	0.2222	0.1579	0.2000	0.1875	0.1935	0.1481	0.1875
C7	0.0833	0.0476	0.0741	0.0526	0.0667	0.0625	0.0645	0.0494	0.1250
C8	0.2500	0.1905	0.0741	0.2105	0.1000	0.1875	0.1935	0.1481	0.1875
C9	0.0417	0.0952	0.0741	0.0526	0.1000	0.0625	0.0323	0.0494	0.0625

Source: Author's calculation

The weight of each criterion (w_i) is obtained as an average of the elements which are part of every row of the normalized matrix. For example, the weight for the first criterion, i.e. practice, is: w_1 = (0.0833 + 0.0952 + 0.0741 + 0.1053 + 0.1000 + 0.0938 + 0.0645 + 0.0494 + 0.1250) / 9 = 0.0878. The weight for the other criteria is obtained in an analogous manner (Table 5). From Table 5 it can be seen that the highest importance when choosing a University for postgraduate studies abroad is shown in criterion 5, i.e. the quality of education (w_5=0.1933), followed by: scholarship (w_6 = 0.1838), quality of academic staff (w_8 = 0.1713), study program (w_2 = 0.0990), practice (w_1 = 0.0878), tuition fee (w_3 = 0.0794), standard of living in the state (w_7 = 0.0695), rank (w_9 = 0.0634), and location (w_4 = 0.0525). The sum of the elements at each level of the AHP model should be 1, which is also confirmed in this case. The consistency ratio is 0.0296, which means that the degree of consistency is satisfactory.

Table 5. Weights of criteria, rank, and consistency ratio

No.	Criterion	Weights	Rank
1.	Practice	0.0878	5
2.	Study program	0.0990	4
3.	Tuition fee	0.0794	6
4.	Location	0.0525	9
5.	Quality of education	0.1933	1
6.	Scholarship	0.1838	2
7.	Standard of living in the state	0.0695	7
8.	Quality of academic staff	0.1713	3
9.	Rank	0.0634	8
Sum		**1.0000**	
CR = CI/RI =0.0430/1.45		**0.0296**	

Source: Author's calculation

At the second level of the developed AHP model are the alternatives, i.e. Universities that each student will list. For example, if the student chooses 5 Universities, he/she should compare the Universities in pairs for each of the criteria (there need to be made 10 comparisons in pairs for each criterion (5(5-1)/2=10)), assign an appropriate value from the fundamental scale for pairwise comparisons, and form the pairwise comparison matrix. When comparing the alternatives with respect to each criterion, the question arises as to which alternative of those that are compared in pairs is preferred more regarding the criterion? Then, a normalized matrix is formed, and the local priorities for the alternatives regarding each criterion are obtained in an analogous manner as the weights of criteria. To calculate the overall priorities of the alternatives, see (Saaty, 2012). According to the obtained overall priorities, the alternatives can be ranked (the one with the highest overall priority has the highest rank) and the best one will be chosen.

To solve an AHP model, the softwares Expert Choice, Super Decisions and Decision Lens can be used, and details can be found in (Cvetkoska, 2013). From these softwares, Expert Choice has the most options for a sensitive analysis, which needs to be performed in the final step of the application of AHP.

6. CONCLUSION

This paper proposes a multicriteria decision model (AHP) for choosing a University for postgraduate studies abroad. This model is built through the eyes of 87 students of undergraduate studies at Ss. Cyril and Methodius University in Skopje, Faculty of Economics - Skopje. The obtained responses from the first questionnaire about the factors that are of crucial importance for the students when choosing a University for postgraduate studies enable to select the key factors that serve as an input in MCDM modeling. The weights of the included key factors (criteria) in the AHP model are obtained by AHP-based group decision-making. Through the second questionnaire, distributed to a group of 9 participants, some of the disadvantages of group decision-making are eliminated: conflicts have been avoided and it prevents imposing an opinion on a particular member of the group.

According to the obtained results, the quality of education is the most important factor regarding the goal, followed by: scholarship, quality of academic staff, study program, practice, tuition fee, standard of living in the state, rank and location. The selected key factors and their importance should serve the management of higher educational institutions as an indication for institutional improvement, quality development and better promotion of their postgraduate studies. Additionally, by applying these model students can make a better decision when choosing a University for postgraduate studies abroad.

The participants in this research include only students from one higher educational institution in Macedonia, and in our further research we plan to expand the sample of participants, i.e. to include students from other faculties in Macedonia and abroad in order to develop a general multicriteria decision model.

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