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Selection of Scholarship Students in Higher Education with VIKOR Method

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Abstract: Selection of students who will benefit from scholarships given in the university are usually done by formed commission. Due to limited number of scholarships offered, commission are obliged to choose the most appropriate students. In this selection process, it is important to make objective evaluation. The commission should mostly interview the applicants face to face. This situation causes time and labour loss and a stressful environment for both members of the commission and the students. An objective scoring system could solve the problems discussed above. In this study, 200 students who applied for the scholarship at Akdeniz University Faculty of Economics and Administrative Sciences to the scholarship were ranked. In this study, firstly the selection criteria of students for the scholarship was determined with the help of researchers and social aid service experts. Then, the weights of the criteria were calculated by the SWING method. These weights were used to rank the students who were eligible for the scholarship by using the VIKOR method. This method will make an objective evaluation and will accelerate the selection process.

1. INTRODUCTION

Defined as unrequited assistance to successful and needy students, the scholarship supports students in meeting their physiological and cultural expenses such as accommodation, nutrition, transportation and education. Institutions and organizations select students for scholarship by using various evaluation criteria. Applications are generally evaluated by the commission which formed by these institutions and organizations and the students to be awarded scholarships are determined. Limited number of scholarships makes hard the selection of appropriate student for the commission. Selecting students to be awarded a scholarship from candidate students is a complex decision-making process that requires multiple selection criteria to be considered simultaneously. In this respect, it would be appropriate to approach the scholarship selection process as a multi-criteria decision-making problem.

Many problems may have more than one qualitative or quantitative, contradictory criterion and purpose. One alternative may be best for one criterion, while it may be worse for another criterion. Multi-criteria decision making (MCDM) is a part of operations research that supports

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the decision maker to resolve problems when multiple conflicting criteria are involved and need to be evaluated (Sitorus, Cilliers, & Brito-Parada, 2019). It assists the decision-maker in finding a best choice to these situations.

Multi-criteria decision-making problems are grouped under three headings: Selection, Sorting, and Classification problems. In selection problems, the aim is to determine the best alternative. In the ranking problems, it is aimed that the alternatives will be defined correctly or measurably from good to bad. In classification problems, alternatives are classified according to a preference or criterion. (Yıldırım & Önder, 2015). This study is a ranking problem applied on to scholarship student selection.

There are various studies using MCDM methods on to student selection problems. For example, Yeh (2003) formulated the scholarship student selection as Multiattribute decision making and used comparative methods including Total Sum Method, Simple Additive Weighting (SAW), the Weighted Product (WP) and TOPSIS. Altunok, Özpeynirci, Kazançoğlu and Yılmaz (2010) discussed three MCDM methods namely Analytic Hierarchy Process (AHP), Weighted Product (WP) and TOPSIS method for postgraduate student selection. Mavrotas and Rozakis (2012) proposed PROMETHEE V2 method for selection of students for a postgraduate program. Taşkın, Üstün, and Deliktaş (2013) ranked candidate students for Erasmus Student Mobility by Fuzzy AHP method. Mahmud, Pazil, Mazlan, Jamaluddin, and Hasan (2017) applied Fuzzy AHP to selection of eligible students in receiving the scholarship while Irvanizam (2018) applied Fuzzy TOPSIS method. Deliktaş and Üstün (2017) handled the student selection process in the Erasmus program. They proposed an integrated approach of fuzzy Multimoora and Multichoice Conic Goal Programming. De Farias Aires, Ferreira, Araujo, and Borenstein (2017) developed a hybrid algorithm called ELECTRE-TOPSIS for rank students in Brazilian University. Mardhiyyah, Sejati, and Ratnasari (2019) used MOORA method as decision support system selection process for scholarship selection.

Besides the above studies there are various studies about scholarship selection by using MCDM in Turkey. For example, Erdem Hacıköylü (2006) used AHP to determine the students who will receive nutrition and shelter assistance from Anadolu University. Criteria are grouped into the income status of the family, student's success, student accommodation and the number of children, the presence of parents and siblings' education. By the AHP method, the students who were eligible for help were compared. Abalı, Kutlu, and Tamer (2012) handled the problem of selecting a student for a scholarship at Kırıkkale University Faculty of Engineering. The criteria are the number of children depend on the family, the total monthly income of the family, the status of the parents, the total number of properties owned by the family and the employment status of the student. As a result of the AHP, it was determined that the most important criterion was the total monthly income of the family. By TOPSIS method the most appropriate student for the scholarship was chosen among the five students. Çakır (2016) handled the problem of determining the students at Adnan Menderes University Nazilli Faculty of Economics for part-time job by using AHP based VIKOR method. The main criteria for ranking the students are academic qualification, the monthly income of the student, the number of dependents of the family, the status of the parents, the total monthly income of the family and the family assets. The weights of the criteria were determined by AHP and the student's monthly income was found as the most critical criterion. With the VIKOR method, the 448 applicants were ranked, and first 50 students were invited for interview. Pençe, Tarhan, and Çetinkaya Bozkurt (2017) handled student selection problem for Turkey Education Foundation scholarship at Mehmet Akif Ersoy University Faculty of Education. The criteria are age, gender, class, number of courses failed, OSYM ranking, parental status, the number of dependents of the family, the annual income of the family and the status of the property of the family. As a result of AHP, the criteria with the highest weight was annual income of the student's family. At the end of the

study, 27 applicants were ranked by using the TOPSIS method and the first three candidate were found eligible for the scholarships.

The most important part of the scholarship selection process is to objective evaluation of the candidates. An objective scoring system could provide decision support to the commission for selecting appropriate students for scholarships. For this purpose, in this study MCDM based scoring system is proposed for an objective and compromised selection process.

2. METHOD

This study was conducted at the beginning of the 2017-2018 academic year, using the information given by 200 students who were studying at Akdeniz University Faculty of Economics and Administrative Sciences. In this study, firstly, the criteria affecting the selection of students for scholarship were determined. The importance weights of criterion calculated by using SWING method. Then, the candidate students were ranked by using the VIKOR method which is one of the multi-criteria decision-making method. Weights of criteria were used in VIKOR method as an input. Since the simplicity and the flexibility of use and understandable procedure makes the VIKOR method suitable for this ranking problem regarding the scholarship students. The VIKOR method was preferred in this study because it is an effective tool for multi-criteria decision making, especially in a situation where the decision maker cannot express or know its preference at the beginning of the system design. This method offers compromise solutions for problems related to conflicting criteria, focusing on raking and selecting a range of specific alternatives.

2.1. VIKOR Method

VIKOR method focuses on ranking and selecting from a set of alternatives and determines a compromise solution for a problem with conflicting criteria, which can help the decision-makers to reach a final decision. Here, the compromise solution is a feasible solution, which is the closest to the ideal, and a compromise means an agreement established by mutual concessions. The method provides a maximum group utility for the majority and a minimum of an individual regret for the opponent. It determines the compromise ranking list and compromises the solution by introducing the multi-criteria ranking index based on the particular measure of closeness to the ideal solution. This ranking index is an aggregation of all criteria, the relative importance of the criteria, and a balance between total and individual satisfaction (Liu, Mao, Zhang & Li. 2013). VIKOR method has been applied in many different fields such as supplier selection (Alimardani, Zolfani, Aghdaie, & Tamosaitiene, 2013; Fei, Deng, & Hu, 2019; Abdel-Baset, Chang, Gamal, & Smarandache, 2019), performance evaluation (Kumar, Aswin, & Gupta, 2020; Ture, Dogan, & Kocak, 2019; Buyukozkan & Karabulut, 2017; Wu, Lin, & Chang, 2011; Rezaie, Ramiyani, Nazari-Shirkouhi, & Badizadeh, 2014; Ranjan, Chatterjee, & Chakraborty, 2016; Kaya, İpekçi Çetin, & Kuruüzüm, 2011; Chen & Chen, 2010), personnel selection (Krishankumar, Premaladha, Ravichandran, Sekar, Manikandan, & Gao, 2020), service quality (Gupta, 2018; Yang, Su, & Wang, 2017; Lin, Chen, Chuang, & Lin, 2016), material selection (Jahan, Mustapha, Ismail, Sapuan, & Bahraminasab, 2011; Dev, Aherwar, & Patnaik, 2020) .

Assuming that the rows in the decision matrix represent the alternatives and the columns represent the criteria, the solution steps of the VIKOR method continue as follows (Opricovic & Tzeng, 2004; Büyüközkan & Ruan, 2008; Tong, Chen, & Wang, 2007; İpekçi Çetin & Çetin, 2016; Paksoy, 2017; Çetin & İpekçi Çetin, 2010):

Step 1. Determination the best f_i^* and the worst f_i^- values of all criterion functions, i=1, 2,…,n. If the i-th function represents a benefit, then

$f_i^* = \max_j f_{ij}$ $f_i^- = \min_j f_{ij}$ if the i-th function represents a benefit;

$f_i^* = \min_j f_{ij}$ $f_i^- = \max_j f_{ij}$ if the i-th function represents a cost. (1)

Step 2. Computation the values S_j and R_j, j=1, 2,…, J

$$S_j = \sum_{i=1}^{n} w_i (f_i^* - f_{ij}) / (f_i^* - f_i^-), \quad (2)$$

$$R_j = \max_i [w_i (f_i^* - f_{ij}) / (f_i^* - f_i^-)], \quad (3)$$

Here w_i are the weights of criteria.

Step 3. Computation the values Q_j, j=1, 2… J

$$Q_j = v(S_j - S^*)/(S^- - S^*) + (1-v)(R_j - R^*)/(R^- - R^*) \quad (4)$$

Where $S^* = \min_j S_j$, $S^- = \max_j S_j$, $R^* = \min_j R_j$, $R^- = \max_j R_j$

v is introduced as weight of the strategy of "the majority of criteria" (or "the maximum group utility"), here $v = 0.5$.

Step 4. Ranking the alternatives, sorting by the values S_j, R_j and Q_j. The results are three ranking lists.

Step 5. Proposing as a compromise solution the alternative (a') which is ranked the best by the measure Q (minimum) if the following two conditions are satisfied:

C1: "Acceptable advantage": $Q(a'') - Q(a') \geq DQ$ Where a'' is the alternative $DQ = 1/(J-1)$; J is the number of alternatives.

C2. "Acceptable Stability in decision making": The alternative a' must also be the best ranked by S or/and R. This compromise solution is stable within a decision-making process, which could be the strategy of maximum group utility (when v > 0.5 is needed), or "by consensus" v ≈ 0.5, or "with veto" (v < 0.5). Here, v is the weight of decision-making strategy of maximum group utility.

If one of the conditions is not satisfied, then a set of compromise solutions is proposed, which consists of:

- Alternatives a′ and a″ if only condition C2 is not satisfied, or
- Alternatives a′,a″,…,a(M) if condition C1 is not satisfied; and a(M) is determined

by the relation Q(a(M))−Q(a′)<DQ for maximum M (the positions of these alternatives are "in closeness").

The best alternative, ranked by *Q*, is the one with the minimum value of *Q*. The main ranking result is the compromise ranking list of alternatives, and the compromise solution with the "advantage rate".

2.1.1. *Weights calculation for criteria*

Weights express the relative importance of criteria. As decision makers expressing the importance of criteria can be supported with several methods such as SWING method, SMART, AHP, MACBETH, PAPRIKA (Pazsto, Jurgens, Tominc, & Burian, 2020; Nemeth, Molnar, Bozoki, Wijaya, Inota, Campbell, & Kalo, 2019). Due to its ease in application and the simplicity of its calculations, the SWING method was selected for determining the weights of the criteria. This method makes it easier and more reliable for researchers to get expert ideas.

In the SWING method, performance measurements are considered to be between 0-100. A score of 100 is given to the most important criterion, and then progress is made by providing a score of less than 100 to other criteria. The decision-maker scores all the criteria according to their importance. Finally, normalization is performed by dividing each score to the sum of all scores (Wang, Jing, Zhang, & Zhao, 2009).

In this study, for determining the criteria weights, scoring was done by six academicians who participated in Akdeniz University Scholarship and Social Services Committee. The weights of each criteria calculated with geometric mean of six scores given by academicians. Final weights presented in Table 1.

Table 1. *Criteria and weight of scholarship selection*

	Criteria effective in selection of scholarship	Weights
C1	Having a martyr relative	0.138
C2	The existence of an individual with disability in the student's family	0.135
C3	Monthly income of student's family	0.125
C4	Monthly income of student	0.110
C5	The number of people the head of the family is responsible for caring	0.096
C6	Type of student's social assurance	0.084
C7	Where the student earns his income	0.082
C8	Whether the place where the family lives is rent	0.059
C9	Student's place of residence	0.043
C10	The residence of the student's family	0.032
C11	Whether parents are alive and their marital status	0.028
C12	The father's profession	0.025
C13	The mother's profession	0.022
C14	Education level of the mother	0.010
C15	Education level of the father	0.010

As it can be seen from Table 1, the criterion of having a martyr relative has the highest weight. Education level of the mother and father are the criteria with the lowest weight criteria that is effective in selecting students to be awarded scholarships.

2.1.2. *Establishment of decision matrix*

The decision matrix consists of 15 criteria and 200 alternatives (students). Students are studying Akdeniz University Faculty of Economics and Administrative Sciences. The values of students for the criteria are obtained from the Scholarship Application Form and Scoring System which created by Social Services. Sample values of data can be seen in Table 2.

Table 2. *Decision matrix*

Weights	0,138	0,135	0,125	0,110	0,096	0,084	0,082	0,059	0,043	0,032	0,028	0,025	0,022	0,010	0,010
Student Number	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15
1	10	10	100	80	4	60	40	50	100	40	30	60	0	50	50
2	10	10	100	100	2	40	100	50	40	40	30	30	100	30	20
3	10	10	100	100	6	100	100	0	70	40	0	30	100	40	20
4	10	10	100	100	4	60	60	0	40	40	0	30	100	50	40
5	10	10	100	80	4	60	80	50	40	40	30	60	100	40	40
6	10	10	100	100	5	60	60	0	100	30	0	30	0	40	40
7	10	10	100	60	3	60	60	0	100	40	0	30	100	40	40
8	10	10	100	80	5	60	40	0	80	40	0	100	60	30	30
9	10	10	100	20	0	0	40	0	100	30	0	80	100	40	40
10	10	10	0	80	9	100	40	50	40	40	0	60	0	50	50
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
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.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
191	10	10	80	100	5	40	40	50	100	40	0	40	0	40	20
192	10	10	100	80	12	100	100	0	100	40	30	0	0	50	50
193	10	10	100	100	9	100	60	50	80	30	0	80	100	20	20
194	10	10	100	80	4	60	40	0	80	30	0	40	100	40	40
195	10	10	100	60	4	100	60	0	80	40	0	100	100	40	40
196	10	10	100	60	4	60	60	0	80	40	0	30	100	30	30
197	10	10	100	80	3	100	80	50	100	40	30	0	100	40	40
198	10	10	100	60	3	60	80	50	40	40	60	60	0	20	20
199	10	10	100	20	5	60	40	0	100	30	60	0	100	40	40
200	10	10	80	80	6	0	40	50	70	40	0	40	100	20	10

2.1.3. *Calculations of VIKOR Method*

Firstly, the best f_i^* and the worst f_i^- values of all criterion functions are determinate from equation (1). After that with using the equation (2), (3) and (4); Sj, Rj and Qj are calculated for each student j=1,2,…,200. (Qj values are computed by selecting v=0.5). Table 3 and Table 4 gives the S and R scores of students respectively while Table 5 gives Q scores and their corresponding rankings.

The students whose numbers are 119, 44 and 89 have the highest score respectively according to VIKOR method. The student with the lowest score is the student 66.

The best alternative (student) according to the Q-values is the student 119 with the minimum value of Q. It satisfies condition C1 and C2. Because $Q(a'') - Q(a') = 0.180 - 0.166 \geq DQ = 0.005$ and this student is also the best ranked by R. Therefore, student 119 has an acceptable advantage and acceptable stability with respect to the other students.

Table 3. *S scores of students*

Rank	Student No	Si	Rank	Student No	Si	Rank	Student No	Si	Rank	Student No	Si	Rank	Student No	Si
1	89	0.247	41	133	0.446	81	166	0.510	121	8	0.547	161	99	0.580
2	183	0.271	42	3	0.446	82	198	0.511	122	88	0.549	162	20	0.581
3	121	0.316	43	16	0.450	83	184	0.512	123	126	0.549	163	153	0.585
4	163	0.340	44	106	0.452	84	11	0.512	124	39	0.549	164	152	0.586
5	25	0.352	45	162	0.452	85	164	0.513	125	136	0.552	165	170	0.586
6	142	0.353	46	165	0.454	86	195	0.514	126	135	0.552	166	95	0.587
7	129	0.356	47	123	0.455	87	112	0.514	127	81	0.553	167	63	0.588
8	80	0.359	48	23	0.457	88	154	0.514	128	120	0.553	168	77	0.591
9	51	0.366	49	176	0.458	89	177	0.514	129	179	0.554	169	141	0.593
10	104	0.368	50	33	0.458	90	174	0.515	130	19	0.555	170	61	0.596
11	160	0.373	51	134	0.462	91	105	0.516	131	75	0.555	171	199	0.597
12	56	0.377	52	5	0.463	92	90	0.516	132	137	0.555	172	79	0.598
13	193	0.392	53	125	0.463	93	22	0.518	133	30	0.556	173	117	0.607
14	57	0.397	54	53	0.470	94	72	0.522	134	32	0.556	174	158	0.611
15	98	0.401	55	46	0.470	95	127	0.523	135	28	0.559	175	132	0.612
16	60	0.402	56	2	0.471	96	114	0.524	136	35	0.559	176	155	0.615
17	71	0.402	57	27	0.474	97	187	0.525	137	128	0.560	177	140	0.617
18	192	0.415	58	67	0.477	98	24	0.527	138	7	0.564	178	156	0.618
19	50	0.415	59	143	0.479	99	191	0.527	139	74	0.564	179	116	0.619
20	14	0.416	60	21	0.479	100	69	0.527	140	194	0.565	180	65	0.622
21	43	0.416	61	107	0.480	101	161	0.528	141	62	0.565	181	93	0.622
22	18	0.417	62	108	0.482	102	13	0.531	142	103	0.565	182	86	0.623
23	181	0.421	63	94	0.482	103	186	0.531	143	113	0.565	183	169	0.625
24	159	0.422	64	68	0.484	104	47	0.533	144	87	0.567	184	157	0.629
25	119	0.422	65	17	0.484	105	150	0.533	145	64	0.569	185	31	0.629
26	146	0.423	66	109	0.486	106	6	0.535	146	168	0.569	186	178	0.631
27	197	0.426	67	1	0.488	107	78	0.535	147	190	0.569	187	124	0.634
28	173	0.427	68	97	0.488	108	4	0.535	148	196	0.569	188	130	0.640
29	58	0.427	69	48	0.488	109	49	0.537	149	200	0.573	189	110	0.647
30	182	0.433	70	73	0.491	110	38	0.538	150	52	0.573	190	37	0.649
31	44	0.437	71	26	0.497	111	148	0.539	151	172	0.574	191	40	0.652
32	59	0.437	72	144	0.498	112	91	0.539	152	151	0.574	192	180	0.654
33	118	0.438	73	41	0.499	113	189	0.541	153	138	0.575	193	82	0.656
34	70	0.439	74	42	0.503	114	122	0.542	154	29	0.575	194	54	0.658
35	55	0.440	75	145	0.504	115	36	0.543	155	102	0.576	195	34	0.661
36	131	0.441	76	12	0.504	116	147	0.544	156	188	0.576	196	149	0.668
37	15	0.442	77	96	0.505	117	84	0.544	157	85	0.577	197	139	0.674
38	45	0.442	78	92	0.506	118	175	0.544	158	111	0.578	198	9	0.695
39	167	0.443	79	171	0.506	119	115	0.545	159	10	0.579	199	101	0.747
40	185	0.445	80	100	0.509	120	83	0.546	160	76	0.580	200	66	0.774

Table 4. *R scores of students*

Rank	Student No	Ri	Rank	Student No	Ri	Rank	Student No	Ri	Rank	Student No	Ri	Rank	Student No	Ri
1	44	0.135	41	39	0.137	81	80	0.137	121	121	0.137	161	161	0.137
2	119	0.135	42	40	0.137	82	81	0.137	122	122	0.137	162	162	0.137
3	1	0.137	43	41	0.137	83	82	0.137	123	123	0.137	163	163	0.137
4	2	0.137	44	42	0.137	84	83	0.137	124	124	0.137	164	164	0.137
5	3	0.137	45	43	0.137	85	84	0.137	125	125	0.137	165	165	0.137
6	4	0.137	46	45	0.137	86	85	0.137	126	126	0.137	166	166	0.137
7	5	0.137	47	46	0.137	87	86	0.137	127	127	0.137	167	167	0.137
8	6	0.137	48	47	0.137	88	87	0.137	128	128	0.137	168	168	0.137
9	7	0.137	49	48	0.137	89	88	0.137	129	129	0.137	169	169	0.137
10	8	0.137	50	49	0.137	90	89	0.137	130	130	0.137	170	170	0.137
11	9	0.137	51	50	0.137	91	90	0.137	131	131	0.137	171	171	0.137
12	10	0.137	52	51	0.137	92	91	0.137	132	132	0.137	172	172	0.137
13	11	0.137	53	52	0.137	93	92	0.137	133	133	0.137	173	173	0.137
14	12	0.137	54	53	0.137	94	93	0.137	134	134	0.137	174	174	0.137
15	13	0.137	55	54	0.137	95	94	0.137	135	135	0.137	175	175	0.137
16	14	0.137	56	55	0.137	96	95	0.137	136	136	0.137	176	176	0.137
17	15	0.137	57	56	0.137	97	96	0.137	137	137	0.137	177	177	0.137
18	16	0.137	58	57	0.137	98	97	0.137	138	138	0.137	178	178	0.137
19	17	0.137	59	58	0.137	99	98	0.137	139	139	0.137	179	179	0.137
20	18	0.137	60	59	0.137	100	99	0.137	140	140	0.137	180	180	0.137
21	19	0.137	61	60	0.137	101	100	0.137	141	141	0.137	181	181	0.137
22	20	0.137	62	61	0.137	102	101	0.137	142	142	0.137	182	182	0.137
23	21	0.137	63	62	0.137	103	102	0.137	143	143	0.137	183	183	0.137
24	22	0.137	64	63	0.137	104	103	0.137	144	144	0.137	184	184	0.137
25	23	0.137	65	64	0.137	105	104	0.137	145	145	0.137	185	185	0.137
26	24	0.137	66	65	0.137	106	105	0.137	146	146	0.137	186	186	0.137
27	25	0.137	67	66	0.137	107	106	0.137	147	147	0.137	187	187	0.137
28	26	0.137	68	67	0.137	108	107	0.137	148	148	0.137	188	188	0.137
29	27	0.137	69	68	0.137	109	108	0.137	149	149	0.137	189	189	0.137
30	28	0.137	70	69	0.137	110	109	0.137	150	150	0.137	190	190	0.137
31	29	0.137	71	70	0.137	111	110	0.137	151	151	0.137	191	191	0.137
32	30	0.137	72	71	0.137	112	111	0.137	152	152	0.137	192	192	0.137
33	31	0.137	73	72	0.137	113	112	0.137	153	153	0.137	193	193	0.137
34	32	0.137	74	73	0.137	114	113	0.137	154	154	0.137	194	194	0.137
35	33	0.137	75	74	0.137	115	114	0.137	155	155	0.137	195	195	0.137
36	34	0.137	76	75	0.137	116	115	0.137	156	156	0.137	196	196	0.137
37	35	0.137	77	76	0.137	117	116	0.137	157	157	0.137	197	197	0.137
38	36	0.137	78	77	0.137	118	117	0.137	158	158	0.137	198	198	0.137
39	37	0.137	79	78	0.137	119	118	0.137	159	159	0.137	199	199	0.137
40	38	0.137	80	79	0.137	120	120	0.137	160	160	0.137	200	200	0.137

Table 5. *Q scores for v=0.50 and students rankings*

Rank	Student No	Qi	Rank	Student No	Qi	Rank	Student No	Qi	Rank	Student No	Qi	Rank	Student No	Qi
1	**119**	0.166	41	133	0.689	81	166	0.749	121	8	0.785	161	99	0.816
2	**44**	0.180	42	3	0.689	82	198	0.750	122	88	0.786	162	20	0.817
3	**89**	0.500	43	16	0.692	83	184	0.751	123	126	0.787	163	153	0.820
4	183	0.523	44	106	0.694	84	11	0.751	124	39	0.787	164	152	0.821
5	121	0.565	45	162	0.695	85	164	0.753	125	136	0.789	165	170	0.822
6	163	0.588	46	165	0.696	86	195	0.753	126	135	0.790	166	95	0.822
7	25	0.599	47	123	0.697	87	112	0.753	127	81	0.790	167	63	0.823
8	142	0.601	48	23	0.699	88	154	0.753	128	120	0.790	168	77	0.827
9	129	0.604	49	176	0.700	89	177	0.753	129	179	0.791	169	141	0.829
10	80	0.606	50	33	0.700	90	174	0.755	130	19	0.792	170	61	0.831
11	51	0.613	51	134	0.704	91	105	0.755	131	75	0.792	171	199	0.832
12	104	0.614	52	5	0.705	92	90	0.756	132	137	0.792	172	79	0.833
13	160	0.619	53	125	0.705	93	22	0.757	133	30	0.793	173	117	0.842
14	56	0.623	54	53	0.711	94	72	0.761	134	32	0.793	174	158	0.845
15	193	0.638	55	46	0.711	95	127	0.762	135	28	0.796	175	132	0.846
16	57	0.642	56	2	0.713	96	114	0.763	136	35	0.796	176	155	0.849
17	98	0.646	57	27	0.715	97	187	0.763	137	128	0.797	177	140	0.851
18	60	0.647	58	67	0.718	98	24	0.765	138	7	0.801	178	156	0.852
19	71	0.647	59	143	0.720	99	191	0.766	139	74	0.801	179	116	0.853
20	192	0.659	60	21	0.720	100	69	0.766	140	194	0.801	180	65	0.855
21	50	0.660	61	107	0.721	101	161	0.767	141	62	0.802	181	93	0.856
22	14	0.660	62	108	0.722	102	13	0.769	142	103	0.802	182	86	0.857
23	43	0.660	63	94	0.723	103	186	0.769	143	113	0.802	183	169	0.859
24	18	0.661	64	68	0.724	104	47	0.771	144	87	0.803	184	157	0.862
25	181	0.665	65	17	0.725	105	150	0.771	145	64	0.805	185	31	0.863
26	159	0.666	66	109	0.727	106	6	0.773	146	168	0.806	186	178	0.864
27	146	0.667	67	1	0.728	107	78	0.773	147	190	0.806	187	124	0.868
28	197	0.670	68	97	0.729	108	4	0.773	148	196	0.806	188	130	0.873
29	173	0.670	69	48	0.729	109	49	0.775	149	200	0.809	189	110	0.880
30	58	0.671	70	73	0.731	110	38	0.776	150	52	0.810	190	37	0.881
31	182	0.676	71	26	0.737	111	148	0.777	151	172	0.810	191	40	0.884
32	59	0.681	72	144	0.738	112	91	0.777	152	151	0.810	192	180	0.886
33	118	0.681	73	41	0.739	113	189	0.779	153	138	0.811	193	82	0.888
34	70	0.682	74	42	0.743	114	122	0.780	154	29	0.811	194	54	0.890
35	55	0.683	75	145	0.744	115	36	0.781	155	102	0.812	195	34	0.892
36	131	0.684	76	12	0.744	116	147	0.781	156	188	0.812	196	149	0.900
37	15	0.685	77	96	0.745	117	84	0.782	157	85	0.813	197	139	0.906
38	45	0.685	78	92	0.745	118	175	0.782	158	111	0.814	198	9	0.925
39	167	0.686	79	171	0.745	119	115	0.783	159	10	0.815	199	101	0.975
40	185	0.688	80	100	0.749	120	83	0.784	160	76	0.816	200	**66**	**1.000**

3. DISCUSSION and CONCLUSION

In this study, with the help of researchers and social aid service experts, the criteria which must be considered while selecting students for scholarship are determined. Then, these criteria were weighted by the scholarship committee members with SWING method. The criterion of having a martyr relative was found as the most important criterion. The second most important criterion is the presence of a disabled person in the family. The lowest scoring criteria among the 15 criteria are the education level of both the father and mother. Weights which was found by the SWING method were used in the VIKOR method.

According to the results of the VIKOR method, the student in the first place (number 119) stays in a rented house, his/her family lives in the rural area without paying rent. The student has no disability in himself/herself or his/her family but has martyr relative. His/her parents are alive and living together. And his/her father works as a civil servant. The number dependent member of the family is 4.

It was determined that there were only two students who had martyr relationship in their families. The VIKOR method placed these two students in the first two places as this criterion has the highest weight.

It is tried to provide a decision support on student selection for scholarship by using SWING and VIKOR methods in this study. The criteria affecting the selection of student for scholarship were determined with the cooperation of researchers and social aid service experts. If MCDM methods will be used in student selection for scholarship, the determination of criteria and the determination of their weights is the most important part, because results are very sensitive to these parameters. The expertise and number of people whose opinion will be taken in determining the parameters will increase the reliability of the results. So that, by applying more experts in scholarship field may increase the reliability of the study. In this study, the application of integrated VIKOR method recommended to commission to help their decision in student selection for scholarship. Although the proposed system will provide an objective decision mechanism, it cannot be said that it eliminates the need for an interview.

In addition, different multi-criteria decision-making methods can be applied, and the results can be compared. By integrating methods into a computer software, a decision support platform can be developed for the use of commissions.

Declaration of Conflicting Interests and Ethics

The authors declare no conflict of interest. This research study complies with research publishing ethics. The scientific and legal responsibility for manuscripts published in IJATE belongs to the author(s).

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