

IMPLEMENTATION OF DECISION SUPPORT SYSTEM FOR SELECTION OF DEPARTMENTS WITH VIKOR METHOD IN SMK PARIWISATA DEPOK

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Abstract— The choice of majors is very important for vocational high school students. There are several factors that influence the decision making of majors. Therefore the writing of this thesis has the purpose of, among others, helping vocational high schools to be able to choose majors in accordance with the wishes and abilities of students. The purpose of writing this thesis is one of the graduation requirements for the Strata Satu (S1) program for the Nusa Mandiri Jakarta (STMIK) program. To achieve the objectives in this study, the authors used quantitative analysis methods. Quantitative analysis in this research is to process the normalization of each criterion value from each alternative that can produce a value and rank in seeing the best majors for students by using the *Vise Kriteriajumska Optimizacija I Kompromisno Resenje (Vikor)* method. Method of *Vise Kriteriajumska Optimizacija I Kompromisno Resenje (Vikor)* helps solve complex problems by determining from the criteria, final score results in vikor and by drawing various considerations to develop weights or priorities.

Keywords: Decision Support System, *Vise Kriteriajumska Optimizacija I Kompromisno Resenje (Vikor)*, Selection of Majors.

Abstrak— *Pemilihan jurusan sangat penting bagi siswa sekolah menengah kejuruan. Ada beberapa faktor yang mempengaruhi dalam pengambilan keputusan pemilihan jurusan. Maka dari itu penulisan skripsi ini mempunyai maksud antara lain membantu sekolah menengah kejuruan untuk dapat memilih jurusan yang sesuai dengan*

*keinginan dan kemampuan siswa. Adapun tujuan dari penulisan skripsi ini adalah salah satu syarat kelulusan pada program Strata Satu (S1) untuk program (STMIK) Nusa Mandiri Jakarta. Untuk mencapai tujuan dalam penelitian ini, penulis menggunakan metode analisis kuantitatif. Analisis kuantitatif dalam penelitian ini yaitu memproses normalisasi tiap nilai kriteria dari masing-masing alternatif yang bisa menghasilkan sebuah nilai dan peringkat dalam melihat jurusan yang terbaik untuk para siswa dengan menggunakan metode *Vise Kriteriajumska Optimizacija I Kompromisno Resenje (Vikor)*. Metode *Vise Kriteriajumska Optimizacija I Kompromisno Resenje (Vikor)* ini membantu memecahkan persoalan yang kompleks dengan menentukan dari kriteria, hasil nilai akhir vikor dan dengan menarik berbagai pertimbangan guna mengembangkan bobot atau prioritas.*

Kata Kunci: *Sistem Pendukung Keputusan, Vise Kriteriajumska Optimizacija I Kompromisno Resenje (Vikor), Pemilihan Jurusan.*

INTRODUCTION

SMK Pariwisata Depok is a vocational secondary education institution whose aim is to develop students' talents to prepare students for the future (Rahmayu & Serli, 2018). The choice of majors is something that will be bypassed in education and with many decision considerations. Before continuing the lecture and work world levels vocational high school students need to choose the desired majors as an effort to further their future achievements (Purwitasari & Pribadi,

2015). The selection of majors starts from the stage before entering school.

Vocational education is education that aims to prepare students who have skills and knowledge that are in accordance with their needs and can develop their potential in the world of work and are able to adapt to technological developments (Latifah & Hasugian, 2018). SMA / MA and SMK are the top educational levels where students will choose and participate in the selection in the field of study or class majors according to the ability of the values possessed by students (Purwitasari & Pribadi, 2015).

In the procedure for selecting majors at Depok Tourism Vocational Schools, prospective students are seen based on the scores obtained such as the national exam scores taken from several criteria. In determining majors, there are complaints felt by vocational students (Vocational High Schools) related to the talents and abilities of individuals (Frieyadi & Ramadhan, 2018).

Currently, the process of determining the majors is still using manual methods so it requires quite a long time due to having to record a lot of student value data and also still not quite right because they have not used calculations which will result in the determination of these goals to be inaccurate.

The above phenomenon indicates that students need to choose the appropriate majors for their future. Therefore it is necessary to conduct research to see how many problems experienced by students in the selection of these majors.

MATERIALS AND METHODS

Method of Vise Kriterijumska Optimizacija I Kompromisno Resenje (VIKOR) is a method in multi-criteria decision making or often known as Multi-Criteria Decision Making (MCDM). MCDM is used to solve problems based on conflicting and disproportionate criteria. The method focuses only on the ranking and selection of a set of alternative criteria that can conflict with each other to make decisions in obtaining the final decision (Nofriansyah & Defit, 2017).

The steps in the calculation using the VIKOR method include:

- a. Perform the normalization method by using the following formula:

$$R_{ij} = \left(\frac{x_j^+ - x_{ij}}{x_j^+ - x_j^-} \right) \dots \dots \dots (1)$$

Where Rij and Xij (i=1,2,3,..,m and j=1,2,3,..,n) is an element of the decision-making matrix

(alternative i to criterion j) and X⁺_j is the best element of the criteria j, X_j is the worst element of the criteria j.

- b. How to calculate the S and R values using the following formula

$$S_i = \sum_{j=1}^n w_j \left(\frac{x_j^+ - x_{ij}}{x_j^+ - x_j^-} \right) \dots \dots \dots (2)$$

dan

$$R_i = \text{Max } j \left[W_j \left(\frac{x_j^+ - x_{ij}}{x_j^+ - x_j^-} \right) \right] \dots \dots \dots (3)$$

Where W_j is the weight of each criterion.

- c. Doing How to Determine the index value with the following formula

$$Q_i = \left[\frac{S_i - S^+}{S^+ - S^-} \right] v + \left[\frac{R_i - R^+}{R^+ - R^-} \right] (1 - v) \dots \dots \dots (4)$$

Where:

- S⁻ = min S_i
- S⁺ = max S_i and
- R⁻ = Min R_i
- R⁺ = max R_i
- V = 0,5

- d. Ranking results are the results of sequencing from S, R, and Q.
- e. The best alternative ranking solution based on the minimum Q value becomes the best ranking with the following conditions:

$$Q(A^{(2)}) - Q(A^{(1)}) \geq DQ \dots \dots \dots (5)$$

Where:

- A⁽²⁾ = alternative second order Q and
- A⁽¹⁾ = the best-ranked alternative to ranking Q

While

$$DQ = 1 - (m - 1) \dots \dots \dots (6)$$

where m is an alternative number.

Alternatives A⁽²⁾ must be ranked best on S and / or R.

RESULTS AND DISCUSSION

The following are the results of the assessment of paired weights of the 4 subject criteria that were sampled at the SMK Pariwisata Depok.

- 1. The first step is to determine the criteria weights for 4 UNBK subjects, namely Bahasa Indonesia, Mathematics, Bahasa Inggris and

IPA, which are derived from the relative priority of each criterion concerned.

- The second step is to weight criteria

Table 1 Criteria Weight Weights

Criteria	Criteria Name	Weight Value
C1	Bahasa Indonesia	0.5579
C2	Matematika	0.2633
C3	Bahasa Inggris	0.1218
C4	IPA	0.0569

Sources: (SMKPariwisataDepok, 2019)

Table 2 Alternative Values for each criterion

No	Alternative Programs	Criteria			
		B. Indo	B. Inggris	MTK	IPA
1	Akomodasi Perhotelan	90	90	84	73
2	Administrasi Perkantoran	80	85	90	70
3	Jasa Boga	75	82	73	75
4	Teknik Komputer Jaringan	85	87	73	85
		90	90	90	85
	At a minimum	75	82	73	70

Sources: (SMKPariwisataDepok, 2019)

- The third step is to normalize the 4 subjects

$$R11 = \frac{(90 - 90)}{(90 - 75)} = \frac{0}{15} = 0$$

$$R12 = \frac{(90 - 80)}{(90 - 75)} = \frac{10}{15} = 0.667$$

$$R13 = \frac{(90 - 75)}{(90 - 75)} = \frac{15}{15} = 1$$

$$R14 = \frac{(90 - 85)}{(90 - 75)} = \frac{5}{15} = 0.333$$

$$R21 = \frac{(90 - 90)}{(90 - 82)} = \frac{0}{8} = 0$$

$$R22 = \frac{(90 - 85)}{(90 - 82)} = \frac{5}{8} = 1$$

$$R23 = \frac{(90 - 82)}{(90 - 82)} = \frac{8}{8} = 1$$

$$R24 = \frac{(90 - 87)}{(90 - 82)} = \frac{3}{8} = 0.375$$

$$R31 = \frac{(90 - 84)}{(90 - 73)} = \frac{6}{17} = 0$$

$$R32 = \frac{(90 - 90)}{(90 - 73)} = \frac{0}{17} = 0$$

$$R33 = \frac{(90 - 73)}{(90 - 73)} = \frac{17}{17} = 1$$

$$R34 = \frac{(90 - 73)}{(90 - 73)} = \frac{17}{17} = 1$$

$$R41 = \frac{(90 - 73)}{(90 - 70)} = \frac{12}{15} = 0.8$$

$$R42 = \frac{(90 - 70)}{(90 - 70)} = \frac{15}{15} = 1$$

$$R43 = \frac{(90 - 75)}{(90 - 70)} = \frac{10}{15} = 0.667$$

$$R44 = \frac{(90 - 85)}{(90 - 70)} = \frac{0}{15} = 0$$

- The fourth step is to calculate the value to get the results S and R

Table 3. Normalization of Alternative Values multiplied by weights

Alternative Programs	Criteria			
	B. Indo	B. Inggris	MTK	IPA
Akomodasi Perhotelan	0 x 0.5579	0 x 0.2633	0 x 0.1218	0.8 x 0.0569
Administrasi Perkantoran	0.667x 0.5579	1 x 0.2633	0 x 0.1218	1 x 0.0569
Jasa Boga	1 x 0.5579	1 x 0.2633	1 x 0.1218	0.667x 0.0569
Teknik Komputer Jaringan	0.333 x 0.5579	0.375 x 0.2633	1 x 0.1218	0 x 0.0569

Sources: (Nur & Susliansyah, 2019)

- The next step in the calculation of each alternative is multiplied by the weight of the result as follows

Table 4 Alternative multiplication results with weights

Alternative Programs	Criteria			
	B. Indo	B. Inggris	MTK	IPA
Akomodasi Perhotelan	0.000	0.000	0.000	0.046
Administrasi Perkantoran	0.372	0.263	0.000	0.057
Jasa Boga	0.558	0.263	0.122	0.038
Teknik Komputer Jaringan	0.186	0.099	0.122	0.000

Sources: (Nur & Susliansyah, 2019)

- The next step is to calculate the S value of each alternative above.

$$S A1 = (0+ 0+ 0+ 0046) = 0,046$$

$$S A2 = (0.372 + 0.263 + 0 + 0.057) = 0,692$$

$$S A3 = (0.558 + 0.263 + 0.122 + 0.038) = 0,981$$

$$S A4 = (0.186 + 0.099 + 0.122 + 0) = 0,406$$

7. Then do the sums to get the value of R of each alternative above.

$$\text{Value of R (A1)} = 0.046$$

$$\text{Value of R (A2)} = 0.263$$

$$\text{Value of R (A3)} = 0.558$$

$$\text{Value of R (A4)} = 0.186$$

Then from the calculation of R and S above the results are obtained as follows

Table 5 Values of S and R

(Alternative)	S Value	R Value
Alternative (A1)	0.046	0.046
Alternative (A2)	0.692	0.263
Alternative (A3)	0.981	0.558
Alternatif (A4)	0.406	0.186

Sources: (Nur & Susliansyah, 2019)

8. The last step of the results obtained S and R values are calculated vikor, here if the alternative value gets the smallest vikor index value then the best value.

Q value (A1)

$$= \frac{[0.981-0.046]}{[0.981-0.046]} * 0.5 + \frac{[0.558-0.046]}{[0.558-0.046]} * (1 - 0.5)$$

$$= (1*0.5) + (0*0.5)$$

$$= 0.5$$

Q value (A2)

$$= \frac{[0.692-0.046]}{[0.981-0.046]} * 0.5 + \frac{[0.263-0.046]}{[0.558-0.046]} * (1 - 0.5)$$

$$= (0.69 * 0.5) + (5.75 * 0.5)$$

$$= 0.633$$

Q value (A3)

$$= \frac{[0.981-0.981]}{[0.981-0.046]} * 0.5 + \frac{[0.558-0.046]}{[0.558-0.046]} * (1 - 0.5)$$

$$= (1*0.5) + (1*0.5)$$

$$= 1$$

Q value (A4)

$$= \frac{[0.981-0.406]}{[0.981-0.046]} * 0.5 + \frac{[0.558-0.186]}{[0.558-0.046]} * (1 - 0.5)$$

$$= (0.39*0.5) + (0.274*0.5)$$

$$= 0.329$$

From the vikor index calculation above, if the results are ranked as follows

Table 6 Vikor Index Ranking Values

No	Alternative	S value
1	Jasa Boga (A3)	1
2	Administrasi Perkantoran (A2)	0,633
3	Akomodasi Perhotelan (A1)	0,5
4	Teknik Komputer Jaringan (A4)	0,329

Sources: (Nur & Susliansyah, 2019)

From the above table 6, it is found that alternative 4 (Computer Network Engineering) has the smallest vikor index, 0.329. So alternative 4 (Computer Network Engineering) is ranked 1 in the process of completing the vikor method

CONCLUSION

The results show that the Vikor method helps the selection process in determining the best majors out of the 4 majors above, here the Vikor method is a method that greatly facilitates students in determining the best majors. The Decision Support System can avoid mistakes in the process of selecting majors in accordance with predetermined criteria and can increase the potential and abilities of students in the process of selecting majors. The decision support system method is expected to use other methods to compare VIKOR methods with other methods such as simple additive weighting (SAW) such as Weighting Product (WP), TOPSIS or Fuzzy Mamdani and Fuzzy Tsukamoto in making selection decision support systems. majoring in this vocational high school.

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