ILKOM Jurnal Ilmiah Vol. 13, No. 3, December 2021, pp. 272-284
Accredited 2nd by RISTEKBRIN No. 200/M/KPT/2020; E-ISSN 2548-7779 | P-ISSN 2087-1716

The selection of SNMPTN applicants using the TOPSIS and rank order centroid (ROC) methods

Muh. Nurtanzis Sutoyo [a,1*]; Andi Tenri Sumpala Mangkona [a,2]
[a] *Universitas Sembilanbelas November Kolaka, Jl. Pemuda No. 339, Kolaka 93517, Indonesia*
[1] *mns.usn21@gmail.com;* [2] *foleta.21@gmail.com*
** Corresponding author*

Article history: Received August 04, 2021; Revised November 19, 2021; Accepted November 19, 2021; Available online December 07, 2021

Abstract

One of the main functions of higher education is to develop personality abilities and shape the character of a dignified nation's civilization. One of the entry pathways for new student admissions at State Universities is the SNMPTN Path. While the number of participants who are accepted by looking at the quota on the SNMPTN line is only 20 percent of the capacity. Decision Support System as a solution that can assist policymakers in determining a decision. In this study, a decision support system was built using the TOPSIS method for selecting and ROC as a weighting for each criterion. Based on the results of the selection test for SNMPTN participants using the TOPSIS and ROC methods as weighting, it proves that it can display the cumulative ranking results of each alternative based on the criteria values owned.

Keywords: SNMPTN Applicants; TOPSIS Method; ROC Method

Introduction

Education is a strong foundation needed to achieve the advancement of the nation in the future. Furthermore, it is also vital to face a global competitive era among the nations around the world. Thus, education has been an essential precondition for facing the competitive global era.

According to the Law of National Education System Number 20th year 2003 that the function and purpose of education are to educate the life of the nation, aims for the development of potential learners in order to become a human being who believes and are cautious to God Almighty, have a noble character, knowledgeable, capable, creative, independent, physically and mentally healthy, and become a democratic and responsible citizen.

The government is obliged to accommodate the needs of every citizen in obtaining educational services in order to improve the intelligence and quality of the nation's life. This has been mandated in the 1945 Constitution, where the government is responsible for educating the nation's life and creating general welfare. Every Indonesian citizen has the same right to obtain an education without discrimination, both from poor economic and high economic status.

Higher Education is the level of education after secondary education of SMK/SMA/MA which includes Diploma Programs, Undergraduate Programs (S1), Masters Programs (S2), Doctoral Programs (S3), Professional Programs and Specialist Programs which are conducted based on culture and norms which is Indonesian norms. The functions of Higher Education as stated in the Law of the Republic of Indonesia Number 12 of 2012 Article 4 are as follows [1]:

1. Improving capabilities, shaping character and creating a dignified nation's civilization in order to educate the life of the nation.
2. Through Tridharma, Higher Education can develop innovative, responsive, creative, skilled, competitive, and cooperative academic activities.
3. Develop Science and Technology while still paying attention to and implementing human values.

There are several admissions paths for prospective students at State Universities, including the SNMPTN (Seleksi Nasional Masuk Perguruan Tinggi Negeri), the SNMPTN, and the Independent Path. In admitting prospective students to each university, the following values must be considered. Those are: credible, fair, transparent, efficient, flexible, and accountable. PTN (Perguruan Tinggi Negeri) as education providers after secondary education SMK/SMA/MA accept prospective students with high academic achievements who are predicted to graduate on time. The students who are in secondary education at SMK/SMA/MA now, have consistently high academic achievements, are entitled to the opportunity to become prospective students through the first pathway called SNMPTN [2].

http://dx.doi.org/10.33096/ilkom.v13i3.936.272-284

SNMPTN is the National Selection to Enter State Universities, which has a selection method based on academic achievement by using report cards from semester 1 to semester 5 and Academic Portfolio assessment. In addition, the SNMPTN assessment is also seen from the school index and alumni achievement.

To be eligible for SNMPTN Path there are general requirements and specific requirements. Some specific requirements for the acceptance of the SNMPTN Path are school requirements, student registration requirements, and selection at State Universities. Specifically for admission or selection at State Universities, student applicants will be eligible to be accepted if [2]:

1. Has completed SMK/SMA/MA education;
2. Already have an LTMPT account;
3. Has successfully passed the SNMPTN;
4. Has been declared to have passed the verification and satisfy the requirements set by each recipient state University.

Considering the seat on the SNMPTN which is only 20 percent of the capacity and the number of applicants, it is very important for the state University to determine the eligible applicants at the verification stage.

Thus, an application that can be used to determine the applicants on SNMPTN and save the calculation results is needed. DSS (Decision Support System) is a choice of approach to solve the problem of selecting applicants for the SNMPTN Path and is expected to accommodate and assist in decision making.

Decision Support Systems is an interactive system that supports the decision-making process by using data and decision models to solve semi-structured and unstructured problems [3]. One type of DSS is MADM (Multiple Attribute Decision Making). The basis of MADM is to first determine the weight value for each criterion. Then the calculation and ranking process is carried out to select each alternative with the given value. One method often used in MADM is TOPSIS (Technique for Order of Preference by Similarity to Ideal Solution). The TOPSIS is a method that can specifically assess the object being evaluated in its assessment. This method was introduced by Hwang and Yoon. It is stated to efficiently analyze the criteria for problem-solving from each alternative [4].

Several studies on Decision Support Systems, including Decision Support Systems, assess depression, anxiety, and stress disorders [5]. The study results indicate that the SPKK is very relevant in the case of giving priority and being able to accommodate decision-makers opinions. Decision Support System for selecting the best lecturers at STMIK Atma Luhur [6]. Decision Support System for selecting the best canvasser at PT. Eratel Prima [7].

The previous research on Decision Support Systems uses the TOPSIS method. It is the Decision Support System for determining priorities for community empowerment through clean and healthy living behavior [8]. From the research results using TOPSIS, it can be said that this method can be implemented in many aspects. Including determining the priority of community empowerment through clean and healthy living behavior. The implementation of TOPSIS in determining low-income families in Panca Karsa II Village [9]. The application of the TOPSIS in determining the best lecturers [10]. Decision Support System determines recipients of *Raskin* [11]; Decision Support System for selecting the best lecturers at STMIK Pelita Nusantara Medan [12]; and a Decision Support System for the determination of Scholarship recipients [13]. The research results with TOPSIS can produce the best solution to the problem and bring up alternative solutions based on the cumulative ranking results.

Meanwhile, the difference between the previous research and this research is the use of the TOPSIS method to select the applicants of the SNMPTN with the ROC weighting system. The reason for using the TOPSIS method is that this method can complete practical decision-making. It can also measure the relative performance of alternatives with simple concepts that are easy to understand. Furthermore, the computation is also very efficient [14]. The reason for using the Rank Order Centroid (ROC) is to assign weights to the sub-criteria according to the weights given based on the priority of selecting prospective students for the SNMPTN path.

Method

A. Decision Support System (DSS)

Decision Support System (DSS) is a system designed to support the decision-making process by policy makers in every company or agency. Decision Support System is used when there are several alternative decisions that require assessment but cannot be supported by the algorithm at all [15]. The **figure 1** are the components of a Decision Support System [15].

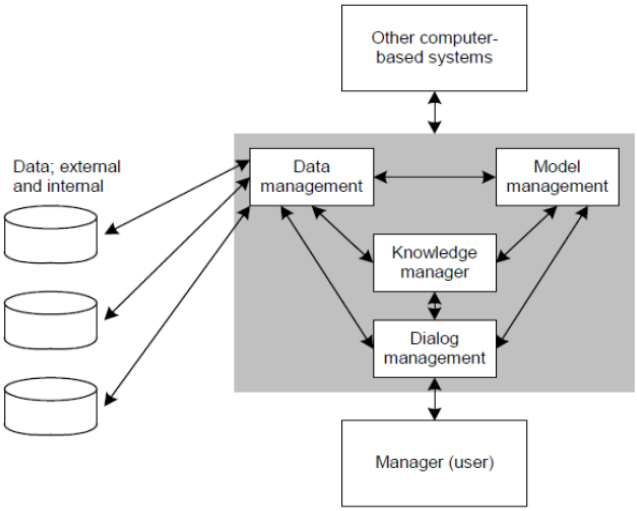


Figure 1. Decision Support System (DSS) Components

1. *Data Management,* contains relevant data for several situations and is managed by the system.
2. *Model Management,* contains various models, such as statistical models, management science models, and various other required quantitative models.
3. *Communication,* in this sub system the user can interact and give instructions.
4. *Knowledge Management,* selected sub-system that can support other sub-systems and act independently.

B. TOPSIS Method

The TOPSIS (The Technique for Order of Preference by Similarity to Ideal Solution) method is an example of a multi-criteria decision-making method. This method was introduced by Yoon and Hwang in 1981. The basis of the TOPSIS method is that each chosen alternative must have the shortest distance from the positive ideal solution and the longest distance from the negative ideal solution. The positive ideal solution is the sum of the highest (maximum) values for each criterion. The negative ideal solution is the sum of the lowest (minimum) values for each criterion.

The stages in solving a problem by implementing the TOPSIS method are as follows [14].

1. Create a normalization matrix.
2. Create a weighted normalization matrix.
3. Determine matrix for positive ideal solutions and negative ideal solutions.
4. Determine the distance between each alternative value with a positive ideal solution matrix and a negative ideal solution matrix.
5. Determine the preference value of each alternative.

The explanation of each stage of the TOPSIS method is depicted as follows.

The TOPSIS method requires a performance rating of each alternative Ai on each normalized Cj criterion, ie.

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}} \quad (1)$$

The value of the positive ideal solution, A+, and the negative solution, A-, is determined from the results of the normalized weight rating (yij) as.

$$y_{ij} = w_i r_{ij} \quad (2)$$

$$A^+ = \left(y_1^+, y_2^+, y_3^+, ..., y_n^+\right) \quad (3)$$

$$A^- = \left(y_1^-, y_2^-, y_3^-, ..., y_n^-\right) \quad (4)$$

where i = 1, 2, ..., m and j = 1, 2,..,n. With

$$y_j = \begin{cases} \max\limits_i y_{ij}, \text{ jika j adalah atribut keuntungan} \\ \min\limits_i y_{ij}, \text{ jika j adalah atribut biaya} \end{cases} \quad (5)$$

Calculate the distance between alternative *Ai* and the positive ideal solution which is formulated as.

$$D_i^+ = \sqrt{\sum_{j=1}^{n}\left(y_{ij} - y_i^+\right)^2} \quad (6)$$

Next, calculate the distance between alternative *Ai* and the negative ideal solution using equation (7).

$$D_i^- = \sqrt{\sum_{j=1}^{n}\left(y_{ij} - y_i^-\right)^2} \quad (7)$$

The last step is to calculate the preference value for each alternative (*Vi*) using the following equation.

$$V_i = \frac{D_i^-}{D_i^- + D_i^+} \quad (8)$$

C. Rank Order Centroid

Rank Order Centroid (ROC) weighting is assigned based on the value of the most important criteria of each criterion. According to Jeffreys and Cockfield [1], in the ROC weighting technique, the weight on each criterion is assigned by considering the level of the criteria assessed from the priority criteria. In general, it can be written as $C1 \geq C2 \geq C3 \geq ... \geq Cn$ which means that the 1st criterion takes precedence over the 2nd criterion, the 2nd criterion takes precedence over the 3rd criterion, and so on until the nth criterion. Likewise, to determine the weight, the same requirements are given; $W1 \geq W2 \geq W3 \geq ... \geq Wn$ where W1 is is the weight for the 1st criterion, C1, and so on. Further explanation can be described as follows.

If

$$C1 \geq C2 \geq C3 \geq ... \geq Cn \quad (9)$$

then

$$W1 \geq W2 \geq W3 \geq ... \geq Wn \quad (10)$$

So, if *k* is the number of criteria, then

$$W_1 = \frac{\left(\frac{1}{1} + \frac{1}{2} + \frac{1}{3} + ... + \frac{1}{k}\right)}{k} \quad (11)$$

$$W_2 = \frac{\left(0 + \frac{1}{2} + \frac{1}{3} + ... + \frac{1}{k}\right)}{k} \quad (12)$$

$$W_3 = \frac{\left(0 + 0 + \frac{1}{3} + ... + \frac{1}{k}\right)}{k} \quad (13)$$

$$W_k = \frac{\left(0 + ... + 0 + \frac{1}{k}\right)}{k} \quad (14)$$

So, it can be concluded that the weighting using the ROC (Rank Order Centroid) method can be formulated.

$$W_k = \frac{1}{k}\sum_{i=1}^{k}\left(\frac{1}{i}\right) \quad (15)$$

D. Applicants Criteria

In selecting eligible applicants for the SNMPTN Path at Universitas Sembilan Belas November Kolaka, based on the Rector's Decree, several criteria are used, including:

1. Region, is the domicile (origin) of the applicant.
2. School accreditation is a form of government recognition in an educational institution.
3. Family, is the status of the applicant to decide whether he/she is included in the category of low-income family
4. The average score of study. This is the average value of the student report cards from semester 1 to semester 5.

5. Ranking, is a classification of data sorted carried out by schools by considering the achievements of students.

Result and Discussion

A. Weighting Criteria and Sub Criteria

The criteria and sub-criteria used for the selection of SNMPTN applicants in this study can be seen in **Table 1**.

Table 1. Description of Criteria and Sub Criteria

Criteria	Sub Criteria
Region (C1)	In District Out of District Out of Province
School Accreditation (C2)	Accredited A Accredited B Accredited C Others
Family (C3)	Bidikmisi Non Bidikmisi
Average Lesson Score (C4)	Average score x 0.4
School Ranking (C5)	1 – 10 11 – 20 21 – 50 > 50

While the weight given to each criterion is 0.35; 0.15; 0.20; 0.25 and 0.10. The weight assigned to each criterion is determined by each university. To assign weight to each Sub Criteria is conducted using ROC weighting. An example of calculating each Sub Criteria is depicted as follows.

Region Criteria (C1)

$$W_{dalam\_kab} = \frac{\left(\frac{1}{1}+\frac{1}{2}+\frac{1}{3}\right)}{3} = 0{,}611$$

$$W_{luar\_kab} = \frac{\left(0+\frac{1}{2}+\frac{1}{3}\right)}{3} = 0{,}277$$

$$W_{luar\_prov} = \frac{\left(0+0+\frac{1}{3}\right)}{3} = 0{,}110$$

School Accreditation Criteria (C2)

$$W_{akreditasiA} = \frac{\left(\frac{1}{1}+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}\right)}{4} = 0{,}521$$

$$W_{akreditasiB} = \frac{\left(0+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}\right)}{4} = 0{,}271$$

$$W_{akreditasiC} = \frac{\left(0+0+\frac{1}{3}+\frac{1}{4}\right)}{4} = 0{,}146$$

$$W_{lainnya} = \frac{\left(0+0+0+\frac{1}{4}\right)}{4} = 0{,}063$$

Family Criteria (C3)

$$W_{bidikmisi} = \frac{\left(\frac{1}{1}+\frac{1}{2}\right)}{2} = 0{,}750$$

$$W_{non\_bidikmisi} = \frac{\left(0 + \frac{1}{2}\right)}{2} = 0{,}250$$

The Average Score Criteria (4) does not use ROC weighting but the average value of the subjects is multiplied by 0.4.

School Ranking Criteria (C5)

$$W_{p1-10} = \frac{\left(\frac{1}{1} + \frac{1}{2} + \frac{1}{3} + \frac{1}{4}\right)}{4} = 0{,}521$$

$$W_{p11-20} = \frac{\left(0 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4}\right)}{4} = 0{,}271$$

$$W_{p21-50} = \frac{\left(0 + 0 + \frac{1}{3} + \frac{1}{4}\right)}{4} = 0{,}146$$

$$W_{p>50} = \frac{\left(0 + 0 + 0 + \frac{1}{4}\right)}{4} = 0{,}063$$

For a more detail value of the weight of each criterion and the weight of each sub-criteria with ROC weighting can be seen in **Table 2**.

Table 2. Criteria and Sub Criteria Weight Score

Criteria	Sub Criteria	Weight
Region (C1) W = 0,35	In District Out of District Out of Province	0.611 0.277 0.110
School Accreditation (C2) W = 0,15	Accredited A Accredited B Accredited C Others	0.521 0.271 0.146 0.063
Family (C3) W = 0,20	Bidikmisi Non Bidikmisi	0.750 0.250
Average Lesson Score (C4) W = 0,25	Average score x 0.4	
School Ranking (C5) W = 0,10	1 – 10 11 – 20 21 – 50 > 50	0.521 0.271 0.146 0.063

B. TOPSIS method calculation

Data obtained from SNMPTN applicants was 57 people. Meanwhile, the regulation states that the seat for SNMPTN is only 20% of the total quota. The total targeted quota is 200 people. So, 20% from 200 is 40 people. So that, from 57 prospective students who will be selected, there were 17 people who did not get accepted (failed). The data for the applicants of the SNMPTN can be found in **Table 3**.

Table 3. Applicant's data

Alternative	C1	C2	C3	C4	C5
Applicant_1	DK	C	T	71.67	25
Applicant_2	DK	A	Y	73.00	4
Applicant_3	DK	B	T	62.00	20
Applicant_4	DK	A	Y	68.33	5
Applicant_5	DK	A	Y	65.17	14
Applicant_6	DK	C	T	68,17	23
Applicant_7	DK	A	Y	76.00	13
Applicant_8	LK	A	Y	67.67	12

Alternative	C1	C2	C3	C4	C5
Applicant_9	DK	B	Y	71.50	4
Applicant_10	LP	A	Y	73.17	13
…	…	…	…	…	…
Applicant_50	LK	B	Y	68.33	15
Applicant_51	DK	A	Y	76.50	5
Applicant_52	DK	B	Y	71.67	10
Applicant_53	DK	A	Y	61.83	12
Applicant_54	LK	B	Y	69.17	17
Applicant_55	LK	A	T	64.17	39
Applicant_56	DK	C	T	61.83	31
Applicant_57	DK	A	Y	75.50	13

Create a rating (assessment) based on the weight value of the sub-criteria as shown in **Table 4**.

Table 4. Rating (Assessment) Suitability

Alternative	C1	C2	C3	C4	C5
Applicant_1	0.611	0.146	0.250	28.67	0.146
Applicant_2	0.611	0.521	0.750	29.20	0.521
Applicant_3	0.611	0.271	0.250	24.80	0.271
Applicant_4	0.611	0.521	0.750	27.33	0.521
Applicant_5	0.611	0.521	0.750	26.07	0.271
Applicant_6	0.611	0.146	0.250	27.27	0.146
Applicant_7	0.611	0.521	0.750	30,40	0.271
Applicant_8	0.277	0.521	0.750	27.07	0.271
Applicant_9	0.611	0.271	0.750	28,60	0.521
Applicant_10	0.11	0.521	0.750	29.27	0.271
…	…	…	…	…	…
Applicant_50	0.277	0.271	0.750	27.33	0.271
Applicant_51	0.611	0.521	0.750	30.60	0.521
Applicant_52	0.611	0.271	0.750	28.67	0.521
Applicant_53	0.611	0.521	0.750	24.73	0.271
Applicant_54	0.277	0.271	0.750	27.67	0.271
Applicant_55	0.277	0.521	0.250	25.67	0.146
Applicant_56	0.611	0.146	0.250	24.73	0.146
Applicant_57	0.611	0.521	0.750	30.20	0.271

Create a normalized matrix with equation (1), an example of a calculation as follows.

$$|x1| = \sqrt{0{,}611^2 + 0{,}611^2 + 0{,}611^2 + ... + 0{,}611^2} = 3{,}739$$

$$r_{11} = \frac{0{,}611}{3{,}739} = 0{,}163$$

and so on, so that the normalized matrix R is obtained.

$$R = \begin{bmatrix} 0,373 & 0,021 & 0,063 & 821,778 & 0,021 \\ 0,373 & 0,271 & 0,563 & 852,640 & 0,271 \\ 0,373 & 0,073 & 0,063 & 615,040 & 0,073 \\ 0,373 & 0,271 & 0,563 & 747,111 & 0,271 \\ 0,373 & 0,271 & 0,563 & 679,471 & 0,073 \\ \dots & \dots & \dots & \dots & \dots \\ 0,373 & 0,271 & 0,563 & 611,738 & 0,073 \\ 0,077 & 0,073 & 0,563 & 765,444 & 0,073 \\ 0,077 & 0,271 & 0,563 & 658,778 & 0,021 \\ 0,373 & 0,021 & 0,563 & 611,738 & 0,021 \\ 0,373 & 0,271 & 0,563 & 912,040 & 0,073 \end{bmatrix}$$

Multiply the preference weights with the normalized matrix based on equation (2), so that the *y* matrix is obtained as follows.

$$Y = \begin{bmatrix} 0,057 & 0,008 & 0,011 & 0,035 & 0,006 \\ 0,057 & 0,028 & 0,033 & 0,036 & 0,021 \\ 0,057 & 0,015 & 0,011 & 0,030 & 0,011 \\ 0,057 & 0,028 & 0,033 & 0,034 & 0,021 \\ 0,057 & 0,028 & 0,033 & 0,032 & 0,011 \\ \dots & \dots & \dots & \dots & \dots \\ 0,057 & 0,028 & 0,033 & 0,030 & 0,011 \\ 0,026 & 0,015 & 0,033 & 0,034 & 0,011 \\ 0,026 & 0,028 & 0,011 & 0,032 & 0,006 \\ 0,057 & 0,008 & 0,011 & 0,030 & 0,006 \\ 0,057 & 0,028 & 0,033 & 0,037 & 0,011 \end{bmatrix}$$

Next, the value of the positive ideal solution (A+) is calculated using equation (3).

$$y_1^+ = \max\{0,057;0,057;0,057;\dots;0,057\} = 0,057$$
$$y_2^+ = \max\{0,008;0,028;0,015;\dots;0,028\} = 0,028$$
$$y_3^+ = \max\{0,011;0,033;0,011;\dots;0,033\} = 0,033$$
$$y_4^+ = \max\{0,035;0,036;0,030;\dots;0,037\} = 0,038$$
$$y_5^+ = \max\{0,006;0,021;0,011;\dots;0,011\} = 0,021$$

And the value of the negative ideal solution (A-) is calculated using equation (4).

$$y_1^- = \min\{0,057;0,057;0,057;\dots;0,057\} = 0,010$$

$$y_2^- = \min\{0,008;0,028;0,015;\dots;0,028\} = 0,003 \quad y_3^- = \min\{0,011;0,033;0,011;\dots;0,033\} = 0,011$$

$$y_4^- = \min\{0,035;0,036;0,030;\dots;0,037\} = 0,027 \quad y_5^- = \min\{0,006;0,021;0,011;\dots;0,011\} = 0,003$$

Calculate the distance between the weighted value of each alternative and the positive ideal solution D_i+ using equation (6).

$$D_i^+ = \sqrt{(0,057-0,057)^2 + \dots + (0,006-0,021)^2} = 0,000$$

and so on, so that the positive ideal solution value of all alternatives is obtained. Furthermore, the distance between the weighted value of each alternative and the negative ideal solution D_i- is calculated using equation (7).

$$D_i^- = \sqrt{(0,057-0,010)^2 + \dots + (0,006-0,003)^2} = 0,000$$

and so on, so that the negative ideal solution value of all alternatives is obtained.

The result of the calculation of the distance between the values of each alternative to the positive ideal solution and the distance to the negative ideal solution are shown in **Table 5**.

Table 5. Calculation Results of Positive and Negative Ideal Values

Alternative	D+	D-
Applicant_1	0.034	0.048
Applicant_2	0.002	0.061
Applicant_3	0.029	0.049
Applicant_4	0.005	0.061
Applicant_5	0.012	0.058
Applicant_6	0.034	0.048
Applicant_7	0.010	0.059
Applicant_8	0.033	0.038
Applicant_9	0.014	0.057
Applicant_10	0.048	0.035
…	…	…
Applicant_51	0.001	0.061
Applicant_52	0.014	0.057
Applicant_53	0.013	0.058
Applicant_54	0.036	0.031
Applicant_55	0.042	0.030
Applicant_56	0.035	0.047
Applicant_57	0.010	0.059

Next, calculate the priority value of each alternative by applying equation (8). Example calculation is depicted as follows.

$$V_1 = \frac{0{,}048}{(0{,}048 + 0{,}034)} = 0{,}587$$

and so on, the result of the calculation of the priority value of each alternative is shown in **Table 6**.

Table 6. Alternative Priority Value

No	Alternative	D+	D-	V
1	Applicant_49	0.000	0.061	1,000
2	Applicant_51	0.001	0.061	0.989
3	Applicant_31	0.002	0.061	0.969
4	Applicant_27	0.002	0.061	0.968
5	Applicant_2	0.002	0.061	0.963
…	…	…	…	…
39	Applicant_50	0.036	0.031	0.465
40	Applicant_39	0.047	0.039	0.454
41	Applicant_36	0.047	0.039	0.450
42	Applicant_10	0.048	0.035	0.424
…	…	…	…	…
51	Applicant_17	0.056	0.013	0.184
52	Applicant_37	0.056	0.012	0.180
53	Applicant_34	0.056	0.012	0.178
54	Applicant_12	0.057	0.012	0.172
55	Applicant_21	0.057	0.012	0.169

No	Alternative	D+	D-	V
56	Applicant_42	0.061	0.005	0.074
57	Applicant_28	0.060	0.004	0.066

From the results of the calculation of the priority value based on Table 6, and based on the number of applicants who were accepted as many as 40 people, the applicants in positions 41 to 57 were declared failed or did not satisfy the requirements set by the Higher Education.

C. System Implementation

The following is the user page for the SNMPTN admission selection system by implementing the TOPSIS and ROC methods for weighting. The front page is a dialog page that will appear the first time the application is run. The front page for the selection of SNMPTN applicants with TOPISIS and ROC method can be as shown in **Figure 2**.

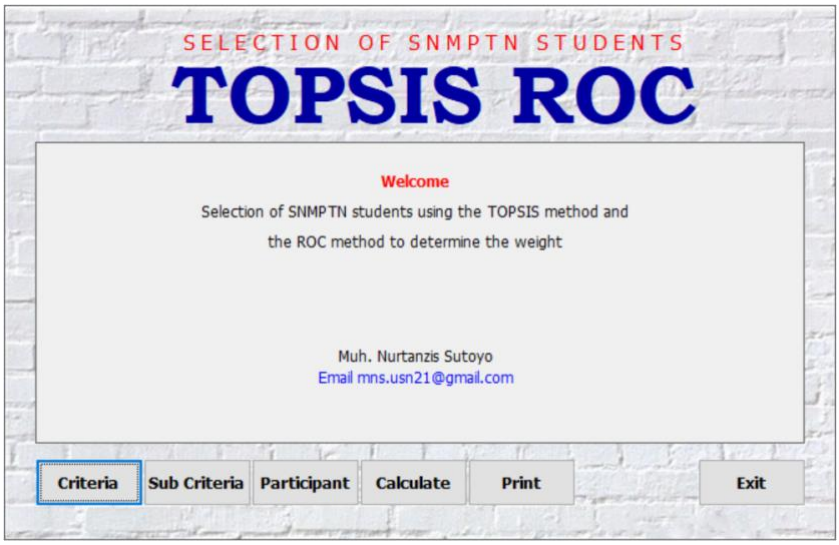


Figure 2. System Main Page

The criteria page is a dialog page for adding, correcting or deleting criteria data and their weights in the selection of SNMPTN applicants with the TOPSIS ROC method is shown in **Figure 3**.

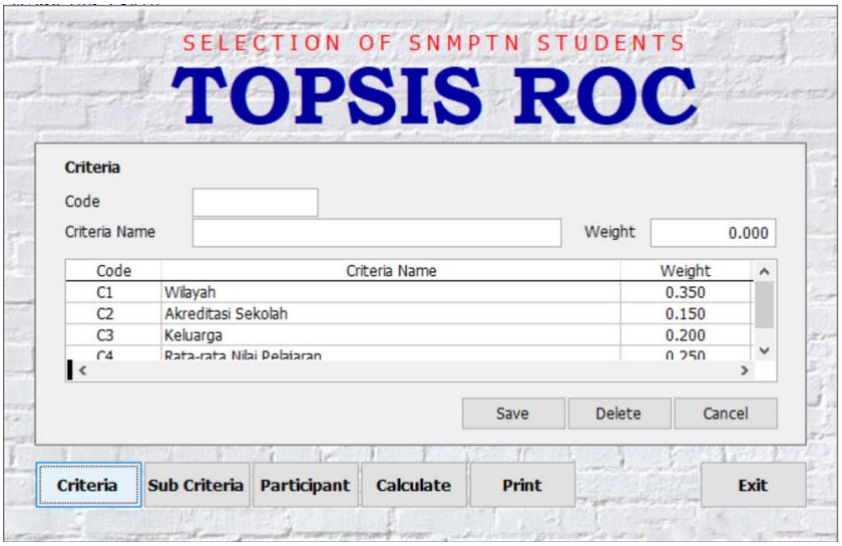


Figure 3. Criteria Input Page

The sub-criteria page is a dialog page for adding, correcting or deleting sub-criteria data and their weights based on the criteria for the selection of SNMPTN applicants with the TOPSIS ROC method is shown in **Figure 4**.

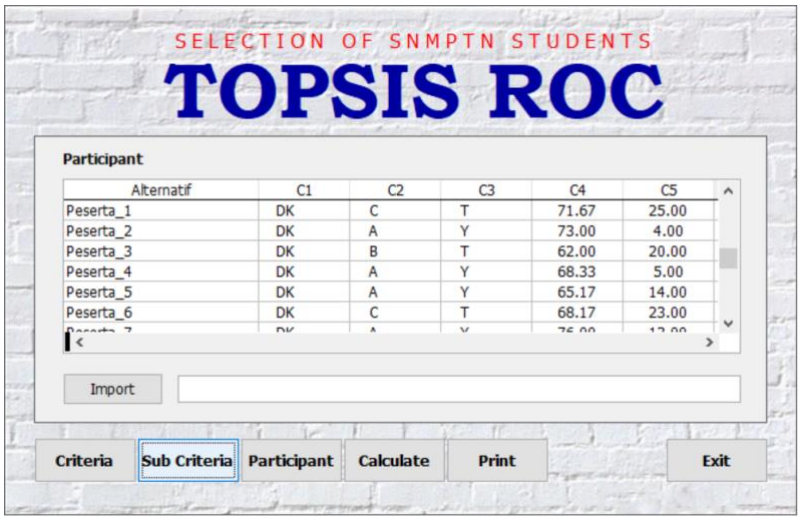


Figure 4. Sub Criteria Input Page

The applicant page is a dialogue page importing applicants selection data for the SNMPTN path with TOPSIS ROC method. The applicant page is shown in **Figure 5**.

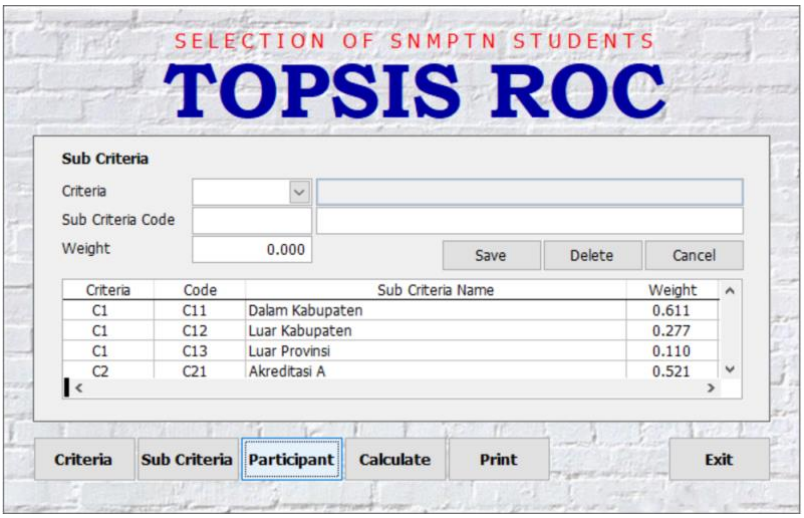


Figure 5. Applicants Input Page

The count page is a dialog page for calculating the selection data for the SNMPTN applicants with the TOPSIS ROC method. On this page, there are two calculation processes, the calculation of the suitability rating (weighting) with the ROC, and the calculation for selecting with TOPSIS. The calculation page is as shown in **Figure 6**.

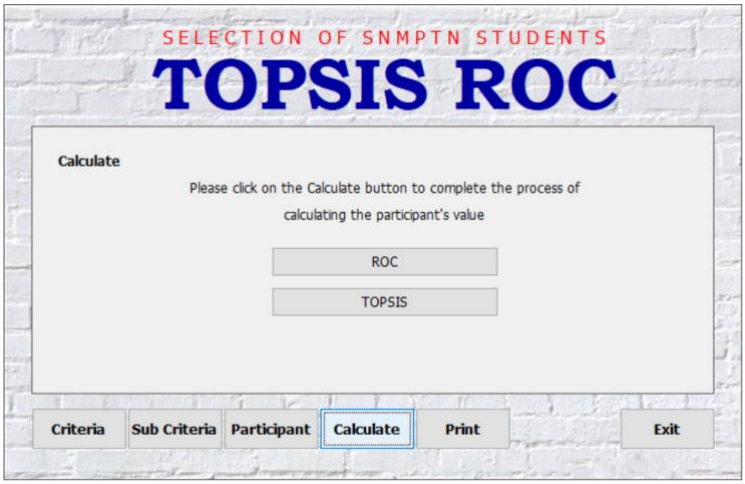
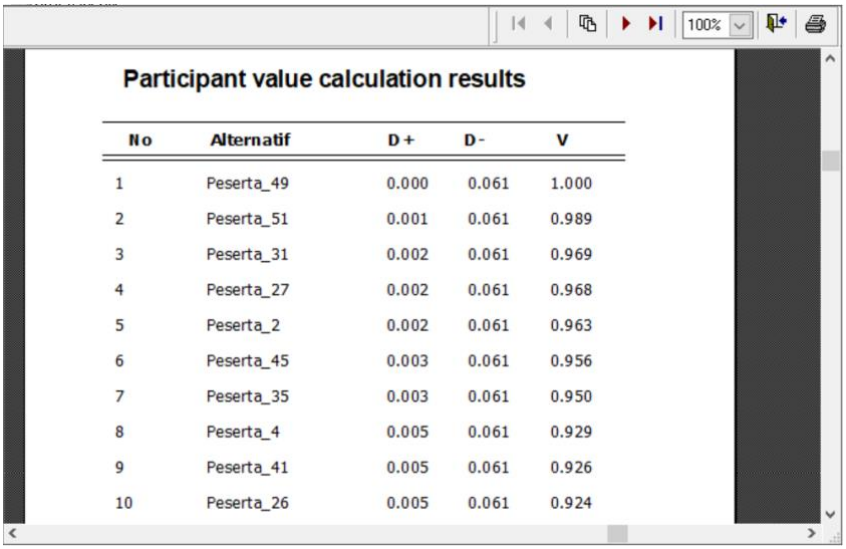


Figure 6. Calculation page

The next dialogue page is a printed page based on the calculation results of the selection of the SNMPTN applicants with the TOPSIS ROC method. The calculation result report is as shown in **Figure 7**.



Participant value calculation results

No	Alternatif	D+	D-	V
1	Peserta_49	0.000	0.061	1.000
2	Peserta_51	0.001	0.061	0.989
3	Peserta_31	0.002	0.061	0.969
4	Peserta_27	0.002	0.061	0.968
5	Peserta_2	0.002	0.061	0.963
6	Peserta_45	0.003	0.061	0.956
7	Peserta_35	0.003	0.061	0.950
8	Peserta_4	0.005	0.061	0.929
9	Peserta_41	0.005	0.061	0.926
10	Peserta_26	0.005	0.061	0.924

Figure 7. Calculation Result Report

The TOPSIS and ROC methods are not only for the selection of SNMPTN applicants, but can be used for the selection of Independent Path applicants by adding or subtracting the criteria used.

Conclusion

Based on system testing and the results of manual calculations carried out for the selection of SNMPTN applicants using the TOPSIS and ROC methods, there is no difference in the results of the calculations (similar). The Decision Support System for selecting prospective students for the SNMPTN Path using the TOPSIS with ROC weighting method can display the result based on the cumulative ranking results of the criteria for all alternatives. Then, the policymakers can determine certain solutions from the calculated values obtained.

References

[1] A. Rahma, "Sistem Pendukung Keputusan Seleksi Masuk Mahasiswa Menggunakan Metode SMARTER," Bandung, 2013.

[2] LTMPT, *Informasi Seleksi Nasioanl Masuk Perguruan Tinggi Negeri (SNMPTN) 2020*. Jakarta, 2020.

[3] E. Perdani, A. Suryanto, R. Devi, and S. Sukamta, "Sistem Pendukung Keputusan Penerimaan Siswa Baru Dengan Metode Simple Additive Weighting (SAW)," *EDUKOM*, vol. 1, no. 1, 2014.

[4] Q. Xu, Y. . Zhang, J. Zhang, and X. . LV, "Improved TOPSIS Model and its Application in the Evaluation of NCAA Basketball Coaches," *Mod. Appl. Sci. [online]*, vol. 9, no. 2, pp. 259–268, 2015.

[5] S. Kusumadewi and H. Wahyuningsih, "Model Sistem Pendukung Keputusan Kelompok Untuk Penilaian Gangguan Depresi, Kecemasan Dan Stress Berdasarkan Dass-42 Group," *J. Teknol. Inf. dan Ilmu Komput.*, vol. 7, no. 2, pp. 219–228, 2020, doi: 10.25126/jtiik.202071052.

[6] Laurentinus and S. Rinaldi, "Implementasi Metode Analytical Hierarchy Proces S Dan Simple Additive Weighting Untuk Pemilihan Dosen Terbaik Studi Kasus Decision Support System To Choose the Best Lecturer Performance With Analytical Hierarchy Proces S and Simple," *J. Teknol. Inf. dan Ilmu Komput.*, vol. 6, no. 6, pp. 655–664, 2019, doi: 10.25126/jtiik.201961636.

[7] V. Hardita, E. Utami, and E. Luthfi, "Penerapan Simple Additive Weighting pada Pemilihan Canvasser Terbaik PT.Eratel Prima," *J. Teknol. Inf. dan Ilmu Komput.*, vol. 6, no. 5, p. 567, 2019, doi: 10.25126/jtiik.2019651218.

[8] A. C. Murti and A. A. Chamid, "Bersih Dan Sehat Menggunakan Metode Topsis Decision Support System for Determining the Priority of Community Empowerment Through Clean," *J. Teknol. Inf. dan Ilmu Komput.*, vol. 6, no. 5, 2019, doi: 10.25126/jtiik.201961049.

[9] I. Muzakkir, "Penerapan Metode Topsis Untuk Sistem Pendukung Keputusan Penentuan Keluarga Miskin Pada Desa Panca Karsa Ii," *Ilk. J. Ilm.*, vol. 9, no. 3, pp. 274–281, 2017, doi: 10.33096/ilkom.v9i3.156.274-281.

[10] G. Wibisono, A. Amrulloh, and E. Ujianto, "Penerapan Metode Topsis Dalam Penentuan Dosen Terbaik," *Ilk. J. Ilm.*, vol. 11, no. 2, pp. 102–109, 2019, doi: 10.33096/ilkom.v11i2.430.102-109.

[11] M. Handayani, "Sistem Pendukung Keputusan Penentuan Penerimaan Raskin Menggunakan Metode TOPSIS," *J. Teknol. Inf.*, vol. 1, no. 1, p. 54, 2017, doi: 10.36294/jurti.v1i1.43.

[12] R. Simanjorang, "Sistem Pendukung Keputusan Pemilihan Dosen Terbaik dengan Menggunakan Metode TOPSIS," *Media Inf. Anal. dan Sist.*, vol. 4, no. 1, pp. 11–15, 2019.
[13] S. F. Rodiyansyah, "the Technique for Order of Preference By Similarity To Ideal Solution (TOPSIS) Untuk Penentuan Penerima Beasiswa," *J-Ensitec*, vol. 1, no. 2, 2015, doi: 10.31949/j-ensitec.v1i02.23.
[14] Kusumadewi, Hartati, Hardjoko, and Wardoyo, *Fuzzy Multi-Attribute Decision Making (Fuzzy MADM)*. Yogyakarta: Graha Ilmu, 2006.
[15] E. Turban and Aronson, *Decision Support Systems and Intelligent Systems*. Prentice Hall International: New Jersey, 2001.