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Topsis Method for Selection of New Student Admissions at the Faculty of Communication and Information Technology at the National University of Jakarta

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ABSTRACT

Selection of new admissions is the usual routine universities every year, this activity is done as a way to get students who have quality standards in accordance with the acceptance criteria determined by the university. However, at the National University in particular on FTKI, admission is actually doing is good enough but the results of the selection has not been implemented to the maximum, making it less optimal data processing activities such selection. Because the need for Decision Support System to be the result of the value of some of the criteria for the standardization of prospective students. In making the decision support system, TOPSIS method is used to determine students based on proper criteria by comparing the level of the quality of each prospective student using TOPSIS calculation will produce a ranking to help become FTKI UNAS selection consideration. The criteria used in this TOPSIS SPK, among others: CBT Computer, Mathematics and Language CBT, CBT Sciences, Interview, Department of the Home School, Home School Accreditation and Average - Average Value UN. The system in this research alternative filter 75 of the total 275 alternative data. The system accuracy up to 82% by making comparisons and calculations manually. CBT Computer, Mathematics and Language CBT, CBT Sciences, Interview, Department of the Home School, Home School Accreditation and Average - Average Value UN. The system in this research alternative filter 75 of the total 275 alternative data. The system accuracy up to 82% by making comparisons and calculations manually. CBT Computer, Mathematics and Language CBT, CBT Sciences, Interview, Department of the Home School, Home School Accreditation and Average - Average Value UN. The system in this research alternative filter 75 of the total 275 alternative data. The system accuracy up to 82% by making comparisons and calculations manually.

1. Introduction

The initial step is usually done in the university new admissions is in the presence of selection, this is done in order to get qualified prospective students with the standards that exist in each university. Currently there is no selection process in the prospective new students at the National University in computing, because the reason for the existence of the filters in the selection criteria and therefore needed special as reference weights selection criteria. In the implementation of this selection a lot university authorities who have had problems in the selection process of prospective new students. Still many receipts that do not match the criteria specified. So to solve this problem and therefore the university should require support systems, namely Decision Support System (DSS).

Under these circumstances the need for a decision support system for the selection of candidates for the new students, this system makes it easy to find the right candidate with the candidate criteria.

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TOPSIS method is selected to determine the student based on the right criteria. In comparing the level of the quality of students, TOPSIS will result in an appropriate decision to help the Support System Problems. TOPSIS was chosen because the concept is fairly simple and easy to understand in general, efficient computation, and have the right capabilities to measure the relative performance of the alternatives in the form of a mathematical decision.

The author uses the 10 journals as reference. Based on the first journal, the journal is to discuss the development of new admissions using TOPSIS method, the system is made because the need to make the selection, then using AHP method can result in a decision support system with 6 criteria as a priority of reference, the following ranking and accuracy of the system is reached 80% [1] in the second reference journals, making the system about scholarships in one school in Pekan baru, the method used in this paper is the AHP and TOPSIS, TOPSIS method itself can recommend selecting the students who will receive the scholarship. The criteria in this journal include rapot result, the income of parents, siblings jurmlah as perangkingan criteria. the previous system used only manually using excel later in sorting and then they invented a system that uses TOPSIS that draws calculation ideal solution negative and positive resulting in a preference ranking of the participants candidate Misi who participated in the selection, then for testing, when done in real time, SPK takes lenih slightly compared to Non-SPK [7]. In addition to SAW and AHP method, there are other methods that can be used to solve the problem of making decisions, among others, TOPSIS method, Linear Programming Techniques for Multidimensional (LINMAP), Fuzzy Association theory method, PROMETHEE, Moora, and ELECTRE. But with the approach of positive ideal solution and negative ideal solution can produce fairly good accuracy in decision making.

Based on the journals - journals above, the authors recommend the student selection decision support system for use TOPSIS method in the selection process for new students at the Faculty of Technology and Informatics at the University Komnikasi nasioanl, uses TOPSIS system with the following criteria: *Computer Based Systems* kejurusn system an information and informatics Engineering, Mathematics and Computer Based System Language, Computer Based System Sciences, Interview, Department of the Home School, Home School Accreditation and Average - Average Value UN, Then the data will be inputted into the data alternative is to be calculated by the method of TOPSIS and expected with the calculation of this research can be taken into consideration for the university to get learners who qualified in accordance with the prescribed criteria and become a reference for the next school year.

2. Research methods

Decision Support System is made using a method Technique For Others Reference by Similarity to Ideal Solution (TOPSIS) on the selection process of new students in the Faculty of Communication and Information Technology at the National University. TOPSIS method chosen because has advantages among others: computational efficient and has the ability to measure the relative performance of the alternatives a decision in the form of a simple mathematical The method of data collection:

a) Interviews: Interviews conducted by the admissions committee for new students to get the criteria necessary criteria then the FTKI part of the criteria required in accordance with the faculty in the selection process. The results obtained from these interviews is the 7 criteria which shall be used as a reference for the selection and then the data can be used in this decision support system.
b) Documentation: The documentation obtained from the National University BPSI form of personal data and assessment data prospective new admissions tenologi faculty of communication and informatics in Jakarta national university academic year 2019/2020.

In the design of the system is done from the analysis of data and information that has been able, in this research its own data taken at the national university information system. The system design is described in the flowchart, the following flowchart support system Informartika Faculty of Technology and the National University in the following figure.

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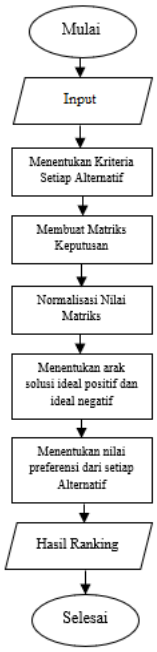

Fig 1. Flowchart System

Flowchart The following figure describes the process flow of new admissions FTKI UNAS with TOPSIS method. Selection criteria for acceptance have 7, The criteria and weighting in the system is as follows:

Table 1.
Criteria, Weight, Range and Values

Criteria		Weight	Range	value Normalization
C1	CBT Computer	30%	0-100	0-100
C2	CBT MTK & BHS	15%	0-100	0-100
C3	CBT Sciences	20%	0-100	0-100
C4	Interview test	10%	0-100	0-100
C5	Home School Programs	10%	School of Engineering	25
			SMA IPA	50
			SMA IPS	75
			SMK JL	100
C6	US accreditation	5%	A	25
			B	50
			C	75
			TT	100
C7	Rata2 Value UN	10%	0-100	0-100

In Table 1 explains what used to be a consideration in the selection process of new students, 7 of these criteria has a value in accordance with their respective weights specified in this system each period PPMB can set the desired weight as needed. On the value of the normalization is done because in the process of TOPSIS must be a number so that the data that has several sub-criteria should be made to have a value normalization, the authors make the normalization value C5 and C6. The next process is to define the decision matrix is done by inserting the value of each alternative based on criteria ,. Matrix decisions are made by each - each alternative can be seen in the following table:

Table 2.
Decision matrix

Alternative	Value Every Criteria						
	C1	C2	C3	C4	C5	C6	C7
A1	A1	A1	A1	A1	A1	A1	A1
	C1	C2	C3	C4	C5	C6	C7
A2	A2	A2	A2	A2	A2	A2	A2

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Alternative	Value Every Criteria						
	C1	C2	C3	C4	C5	C6	C7
	C1	C2	C3	C4	C5	C6	C7
A3	A3	A3	A3	A3	A3	A3	A3
	C1	C2	C3	C4	C5	C6	C7
A4	A4	A4	A4	A4	A4	A4	A4
	C1	C2	C3	C4	C5	C6	C7
AN	AN	AN	AN	AN	AN	AN	AN
	CN	CN	CN	CN	CN	CN	CN

After making the decision matrix and then made the decision matrix normalized (R) after the matrix has been normalized, they invented a form of normalization weighted matrix. which will multiply the weight value of the existing criteria resulting normalized weighted matrix or called (Y). Rij can be calculated by the method eucledean length of a vector as follows:

$$R_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}}$$ .....[1]

Rij : element value ternormalisasi
Σmi = 1 : Sigma matrix or amount of matrix calculations
x2ij : Matrix keseluruhsan alternative data
Yij can be calculated with the provisions The rating is based on the normalized weights (yij) as:

$$y_{ij} = w_i r_{ij}$$ .....[2]

Yij : normalized weighted value of each alternative
Wi : The weight given to each criterion
Having already become normalized weighted matrix further define the value of a positive ideal solution and negative ideal solution which serves to determine the distance of each alternative positive ideal solution value or (D +) and negative ideal solution value or (D-).Determining the ideal solution positive (A +) is calculated by the following formula:

$$A^+ = (y1^+, y2^+, y3^+, \dots , yn^+)$$ .....[3]

A + : positive ideal solution
y + : Normalized weighted max on every alternate yij
Determining the ideal solution negative (A-) is calculated as follows:

$$A^- = (y1^-, y2^-, y3^-, \dots , yn^-)$$ .....[4]

A- : positive ideal solution
y- : Normalization weighted min on each alternative yij
After determining the matrix has been established, the next could determine the distance of each solution, performed on each of the alternatives. Determine the ideal distance positive as follows:

$$D_i^+ = \sqrt{\sum_{j=1}^{n} \left(y_{ij} - y_i^+\right)^2}, \text{ i=1,2,3, } \dots \text{ m}$$ ...[5]

At + : Distance to the positive ideal solution
Σ nj = 1 : The sum of all positive ideal alternative
Determine the ideal distance Negative as follows:

$$D_i^+ = \sqrt{\sum_{j=1}^{n} \left(y_{ij} - y_i^-\right)^2}, \text{ i=1,2,3, } \dots \text{ m}$$ ...[6]

Di- = Distance negative ideal solution
Σ nj = 1: The sum of all the negative ideal alternative
Sselanjutnya do preferences of each alternative is obtained from any distance calculation formula ideal solution, Define preferences formula can be calculated with the following formula:

$$V = \frac{Di^-}{Di^- + Di^+}, \text{ i=1,2,3, } \dots \text{ m}$$ .....[7]

Vi : Value of preference

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After calculating the preference value of each alternative, a score of preference are the end result of this TOPSIS calculation. The preference value will do a ranking .. ranking is done by sorting all the values of preference (Vi) from largest to smallest. Alternatives that have a preference value of the largest and most ideal would be taken into consideration in the decision making.

3. Results and Discussion

Data for new students in 2019/2020 odd semester used in this system consists of 275 data from 134 prospective new students 141 Information Systems and Information Engineering Prospective new students, used seven criteria including: CBT Computer, Mathematics and Language CBT, CBT Science, Interview, Department of the Home School, Home School Accreditation and Average - Average Value UN. The value data of participants as follows:

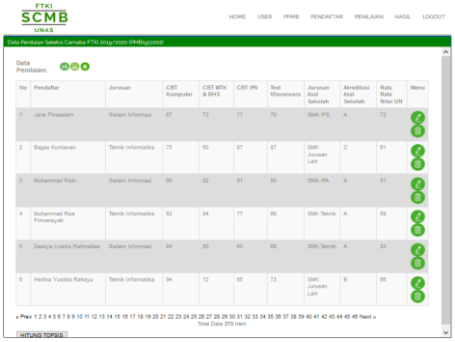

Fig 2. Data Value New Student Candidate FTKI 2019/2020.

In this system, the initial phase of the system is requesting information for a period of Admissions Committee (PPMB) carried along with the weights given to each criterion, each weighting in the period can be tailored to the needs of selection can be changed with the provisions of the university, with this system is quite flexible to the magnitude of each new school year. The following data input form PPMB:

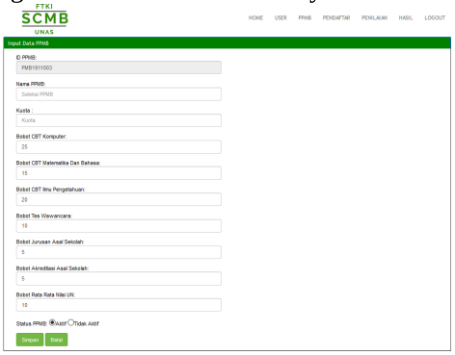

Fig 3. Form Input Period, Weights and Quota Selection

Then enter data from any prospective new students FTKI obtained from the PPMB, there are two criteria that sydah can be inputted to the data of applicants who will be normalized seusuai with other values in accordance with Table 1, the Accreditation Home School and Home School Programs. Charging data to form the new student applicants as follows:

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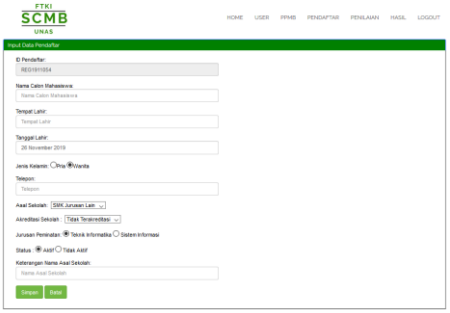

Fig 4. Personal Data Input Form Prospective New Students

Next to filling value of each alternative by selecting the registrant's name by the registrant ID. Filled in on the form the following assessment:

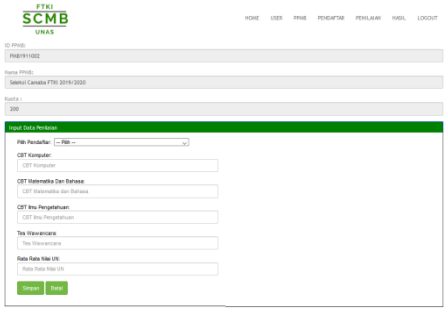

Fig 5. Form Input Data Rate

Kemudiaan on assessment data when the 'Calculate TOPSIS' do produce a calculation based on the stage of determining TOPSIS include: Data that has already normalized data assessment, Make a decision matrix that has been normalized, Creating a matrix that has been normalized it becomes weighty, Determining the social matrix ideal negatef and the positive ideal solution matrix, Determining the distance between the alternative (D) with a positive ideal solution, Determining the distance between alternative (D) with the negative ideal solution, determining the values for each alterntif preferesnsi (Vi) then perform maintenance or ranking of any data alternative.

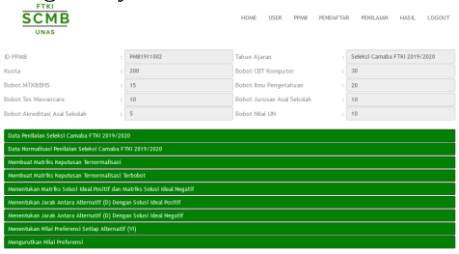

Fig 6. Calculation Stages TOPSIS

Can be described calculations, the first value of each criterion and then summed perkolom raised to 2 in accordance with the value of each criterion, after the result of the number of columns in the roots. Once the value of each criterion in the decision matrix is divided by the root of each of the criteria resulting normalized decision matrix (matrix R).

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Matrices that have been normalized to be multiplied by the weight of each criteria that have been determined at the beginning PPMB input form, resulting in a weighted normalized matrix. Here is a view of A1, A2, C1 and C2 of the student data that is taken as an example of multiplication results at every weight mariks criteria.

0.063321532039 56x30 =1.8996459611868	0.046932429629321x15 =0.70398644443982
0.052147144032579x30 =1.5644143209774	0.046932429629321x15 =0.70398644443982

Next, determine the positive ideal solution:

Next, determine the ideal solution Negative:

After determining each solution, and then determining the distance alternative to the positive ideal solution and negative ideal solution :,

D^+	2.1901800493683
D^-	1.4079728888796

The last step determines the value of the preference by the formula of ideal solution within the positive and negative ideal solution superbly previously obtained on all the criteria, as follows:

0.83402998469364/(0.83402998469364+0.56418057645658)	0.59649812972914
0.61796824129776/(0.61796824129776+0.85070622339175)	0.42076597377786
0.84704514599957/(0.84704514599957+0.68997258912975)	0.5510965336573
0.66649913892001/(0.66649913892001+0.67369399977742)	0.49731573731813

After a preference obtained from the ideal distance formula of positive and negative, it will produce weight. Then, this weight will be a ranking order of preference results from the formula (Vi) are sorted in ascending from the biggest to the smallest and has a ranking for each alternative, to see the results of a ranking as follows:

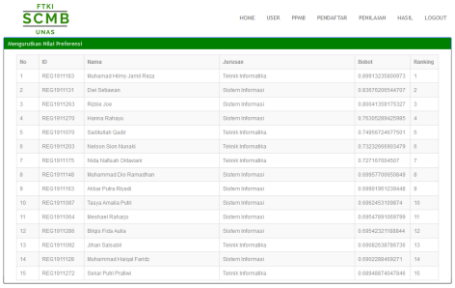

Fig 7. Results Ranking of Selection Weight

In figure 7 is the end result of the alternative highest to the lowest. In the system of this decision, on the home is being given an option for prospective students to see the results of the selection according to the department, the display seen by prospective students in the form of: ID votes, the name of the registrant, Results Pass or fail and also the weight that has been normalized, Weights in normalization with the maximum and minimum conditions so that new students can easily understand the results of TOPSIS calculation for selection, the selection results include:

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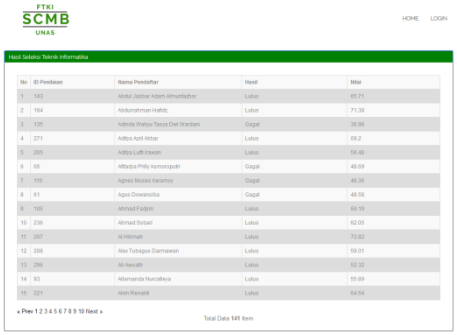

Fig 8. Selection Technical Information

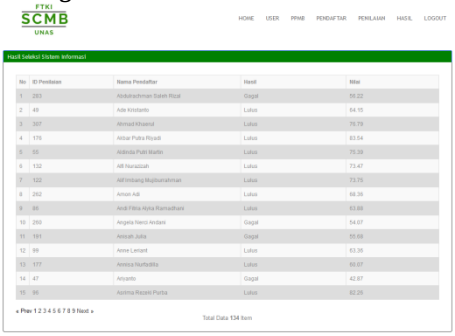

Fig 9. Results Information System Selection

In figure 8 and 9 show the results of selection that has been sorted by the Department and in ascending berdsarkan pendafar name.

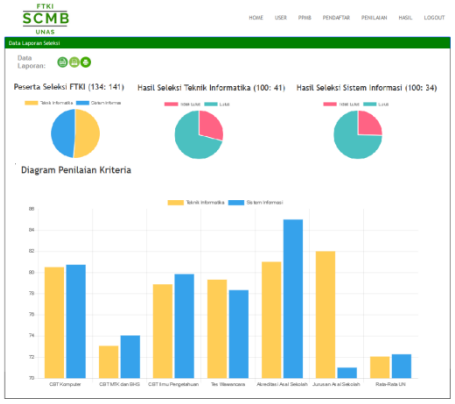

Fig 10. Graphs and Charts Analysis Data Selection

In Figure 10, the data made into a pie chart and a rod in order to facilitate top management to read the results of analysis. Perbandinan then testing for the selection of new students and NON-SPK SPK, testing is done by comparing the calculation results with the results of manual calculation system to the university results data using the same method, namely TOPSIS. The results of the comparison test as follows:

Table 3.
Comparison Value and Ranking System and Manual

No.	name aternatif	Final Score System	Value End Excel	Rank System	Rank Excel
1	Dwi Setiawan	.8991	.8991	2	2
2	pearl Vania	.5298	.5298	138	147
3	Satrio Adi Putra	.3591	.3591	264	226

In Table 3 the results of the calculations manually and the system is using 275 Data alternative then determined the appropriate data and does not match then generate equal weighting to 82% or equal to

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screening up to 225 suitable alternatives on the value of final weight and rankng and also with quota specified in the selection system. As for testing the effectiveness of SPK and SPK NON following asebagai.

Table 3.
Effectiveness Testing and NON-SPK SPK

No.	Effectiveness criteria	SPK	NON-SPK
1	process TOPSIS	70s	92,4s
2	aternatif	275	275
3	Proximity Data Rill	82%	73%

The accuracy of the test results that do., This CMS can perform calculations faster and also has a 82% accuracy which is greater than the NON SPK 73%.

4. Conclusion

Based on the research results for decision support system of web-based method Technique For Others Reference by Similarity to Ideal Solution (TOPSIS) made to the selection of new students in the Faculty of Communication and Information Technology at the National University can be considered from the university, while elaborated conclusion of the system are made include:

a. This system can help in the selection process of new students in determining the new students that fit the criteria based on the value dipereoleh participants.
b. Of the total of 275 participants camaba selection, the system successfully filter out 75 alternatives that do not qualify based on weight, the criteria and quota period.
c. From the tests anatara NON-SPK SPK and the selection of the application of new students FTKI UNAS, these systems obtain up to 82% accuracy in conformity to the data rill.

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