

# Selection of Academic Achievements Scholarship Support Assistance Decision Support System (Study Case STMIK Bina Sarana Global)

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## Abstract:

Every citizen of Indonesia is entitled to get education. In this matter already stated in the 1945 Constitution article 31 paragraph 1. Based on the article, both the municipal government and regional governments have an obligation to provide services and ease in the provision of quality education for every citizen without any discrimination. PPA scholarships are awarded by DIKTI for educational tuition support for academic achievement. PPA scholarships are awarded to D3 and S1 students in their region Kopertis environments. It is expected that universities and Kopertis can adjust to this. In order for the existing scholarship program can be implemented in accordance with the principles of 3T are: Right on target, Exactly Amount, and Timely. Currently in STMIK BinaSarana Global there is no system to determine the scholarship recipients, because there is no suitable system for the selection of scholarship recipients so often the decision is not objective for applicants who apply for scholarships, to produce decision support system that suits the needs of the user is implemented with using AHP and TOPSIS methods to get the best results. This research uses decision support system with AHP and TOPSIS method so that by using this method the scholarship recipients are more screened in accordance with GPA, Achievement, and economic ability which aim to determine the students who are eligible to receive PPA scholarship. The merger of AHP and TOPSIS method with the calculation result using AHP is 0.0550, 0.2633, 0.1178, 0,5640 and calculated using TOPSIS in the highest ranking of 0.980 applied in the Decision Support System with PHP &MySQL.

**Keywords —AHP, TOPSIS, Decision Support System, Scholarship, PPA.**

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## I. INTRODUCTION

Free education or commonly called a scholarship is a financing that does not come from its own funding, but from the government and the universities themselves who organize. Scholarships for students today are very influential in the scope

of high school as a financial supporter in the process of achieving the pursuit and retain the knowledge and skills possessed.

Since 2012 the term Academic Achievement Scholarship Accreditation (PPA) and Student Learning Aid (BBM) is adjusted to the terms that are in line with the existing provisions of becoming Academic Achievement Improvement Scholarship

(Scholarship-PPA) and Education Cost Assistance for Academic Achievement (BPP-PPA) . It is expected that universities and Kopertis can adjust to this. In order for the existing scholarship program can be implemented in accordance with the principles of 3T are: Right on target, Exactly Amount, and Timely

Decision Support System (SPK) is a computer-based information system that has the main benefit is to provide information for management in decision making. The methods used in the selection of scholarships are Analytical Hierarchy Process (AHP) and Technique For Order Preference by Similarity to Ideal Solution (TOPSIS). According to Saaty in (Sumiati, 2007) the AHP method helps solve complex problems by restructuring a hierarchy of criteria, interested parties and by drawing considerations for developing weights or priorities. The TOPSIS method is often used extensively on the scope of the decision support system to complete an intuitive and applicable selection or evaluation (Yasin& Adnan, 2015). TOPSIS method can also be used in dealing with multi dimensional problems in the selection of employees, this method is used to assist in terms of employee recruitment process (Lestari & Priyodiprodjo, 2011). the advantages of the TOPSIS method include "TOPSIS is a method that has a concept in which one of the best chosen alternatives not only has the shortest distance from the ideal ideal solution, but also has the longest distance from the ideal ideal solution" (Perdana& Widodo, 2013).

**II. THEORETICAL REVIEW**

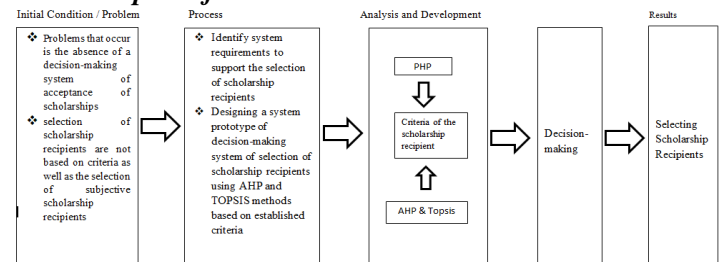
In this study the authors take several references that are used to be a reference material.

- A. Decision Support System Selection of Scholarship Recipients In Sma 1 Boja Using Analytical Hierarchy Process (Ahp) Method, (BagasDistaAriyadi, 2013) Decision Support System Selection of Scholarship Recipients will provide a convenience for the school in conducting the selection process of scholarship recipients and can be an alternative in decision-making solutions determining scholarship recipients in SMA 1 Boja
- B. Decision Support System Selection of High Performance Employees Using Analytical Hierarchy Process Method (Case Study:

Pt.CapellaDinamikNusantara Takengon), (KamaliaSafitri, FinceTinusWaruwu, 2017) The decision support system of employee achievement at PT. Capella Dinamik Nusantara Takengon by using AHP method can help the company in choosing the right achievement employee to be a material consideration in the process of selecting employee achievement padaperusahaan

- C. Decision Support System for Scholarship Recipients To New Students Using TOPSIS Method (Case Study: SunanKalijaga State Islamic University, Yogyakarta) By: (Nuri Guntur Perdana, 2013) The scholarship recipient decision support system recommends scholarship recipients in the order of the greatest preference values up to the smallest of each scholarship available
- D. Decision Support System To Determine Student Academic Achievement with TOPSIS Method (Fitriana, Harliana, &Handaru, 2015) Using TOPSIS method can make it easier for teachers to determine student achievement accurately and quickly
- E. Decision Support System Determination of BPP-PPA Scholarship Candidates Using the AhpPromethee Method I (Satriani, Cholissodin, &Fauzi, 2018). With AHP Algorithm - PHOMETHEE I can be implemented to determine candidate receiving scholarship of BPP-PPA

**2.1 Conceptual framework**



The explanation for the above problem-solving mindset design can be explained as follows:

1. Initial Condition / Problem  
Problems that occur is the absence of a decision-making system of acceptance of scholarships, selection of scholarship recipients are not based on criteria as well as the selection of subjective scholarship recipients.
2. Process  
Once identified and identified the existing problems, then began to design a system in selecting the recipient of the scholarship, by collecting the information - information that has been collected.
3. Analysis and Development  
The decision-making system using PHP data source comes from the information of criteria of the

scholarship recipients that have been obtained from the previous stage and the calculation analysis is done by using AHP & TOPSIS method

4. Results
  - a. It is hoped that using AHP and Topsis method can provide an easier result in decision making acceptance of BPP-PPA scholarship in STMIK Bina Sarana Global.
  - b. Expected a scholarship acceptance decision in accordance with the conditions specified.

### III. SYSTEM DESIGN AND APPLICATIONS

#### A. Design Engineering

Using the SDLC method or System Development Life Cycle with waterfall model that is with the stages of software requirements analysis, software design, program code generation, software testing, and support or maintenance

#### B. Testing Technique.

Using black box testing and Focus Group Discussion (FGD) to produce documents that serve as evidence that software that has been developed can meet the needs of users.

Table 3.1 Testing login form

Cases and Test Results (Normal Data)			
Input Data	Target	Observation result	Conclusion
Student data	The system start page appears	Login with student data can go to system start page	matching
Cases and Test Results (Incorrect Data)			
Input Data	Target	Observation result	Conclusion
Unlisted data	Displays message "Useaname or Wrong Password"	Displays message "Useaname or Wrong Password"	Matching
Data is empty or not filled all	Displays the message "Please fill out this field."	Displays the message "Please fill out this field."	Matching

Table 3.2 Testing the Upload Certificate form

Cases and Test Results (Normal Data)			
Input Data	Target	Observation result	Conclusion
Certificate Data	Certificate uploaded page appears	Login with student data can go to system start page	matching
Cases and Test Results (Incorrect Data)			
Input Data	Target	Observation result	Conclusion
Certificate data with an inappropriate format	Displays message "wrong certificate format"	Displays message "wrong certificate format"	Matching
File data is empty or not filled	File data is empty or not filled.	File data is empty or not filled...	Matching

Table 3.3 Data Percentage of Respondents After Processed

No.	Question	Results
1.	Do you think of the Scholarship Decision Support System is applicable to STMIK Bina Sarana Global and give an opinion on this matter?	Be accepted
2.	What are the Benefits of Scholarship Support System for Scholarship for STMIK BinaSarana Global?	Be accepted
3.	Does the function that exist in Decision Support System according to user needs?	Be accepted
4	Is there a problem while using this system and give your opinion?	Be accepted
5	Is the System view easy to understand and give your comment?	Be accepted

Based on the results of tests conducted both using Black Box testing and Focus Group Discussion, the testers get the result that the Decision Support System of Academic Achievement Award Recipients can be accepted by STMIK BinaSarana Global, as a means of selecting scholarship recipients by taking into account inputs, suggestions and recommendations of the results FGD and Black Box.

IV. RESULT AND DISCUSSION

A. Grouping and data analysis.

Data collection process, analysis, interpretation of parameter data. The determination of the criteria of decision support system of academic achievement improvement achievement (PPA) is done by semester selection, Comulative Achievement Index (GPA), Certificate (award), and Finance (arrears tuition fee).

Table 4.1. Added Matrix Comparison Matrices

	Student Rankings	IPK	Achievement	Economics
Student Rankings	1	0,2	0,33333333	0,14285714
IPK	5	1	3	0,33333333
Achievement	3	0,33333333	1	0,2
Economics	7	3	5	1

From the sum of matrices above pairwise comparison can be sought weight calculation for ahp like table below .

Table 4.2. matched pair matrix weight.

	root	quality
Student Rankings	0,312394	0,055022
IPK	1,495349	0,263378
Achievement	0,66874	0,117786
Economics	3,201086	0,563813
	5,677569	

B. Calculates a normalized matrix.

After the data of prospective recipients in the conversion then the author normalizes for each data value of each criterion has the same length of decision matrik normalized by the formula as follows:

$$rij = \frac{xij}{\sqrt{\sum_{i=1}^m X_{ij}^2}}$$

Information:  
 i = 1,2,...,m; dan  
 j = 1,2,...,n,

C. Calculating alternative distance with positive ideal solutions

The distance from each alternative to get the approach distance from each alternative to a positive ideal solution. The approximate distance to a positive ideal solution is obtained by the formula:

$$D_i = \sqrt{\sum_{i=1}^n (y_i^+ - y_{ii})^2}$$

Information:  
 i = 1,2,...,m.

Table 4.3. Normally Weighted Matrices

	Tingkatan Mahasiswa	IPK	Prestasi	Ekonomi
Jamal	0,012	0,105	0,041	0,345
FitriNurLathifah	0,023	0,119	0,014	0,115
DwiBaskoro	0,035	0,121	0,082	0,345
MuhamadAfrizal	0,023	0,116	0,027	0,115
NoviaUlfah	0,023	0,126	0,068	0,230

So obtained an alternative distance to the ideal ideal solution as follows:

Table 4.4. Distance Between Positive Ideal Solutions

	D+
Jamal	0,051
FitriNurLathifah	0,24
DwiBaskoro	0,005
MuhamadAfrizal	0,237
NoviaUlfah	0,116

Table 4.5. Distance Between Ideal Negative Solutions.

	D-
Jamal	0,232
FitriNurLathifah	0,018
DwiBaskoro	0,242
MuhamadAfrizal	0,021
NoviaUlfah	0,129

Table 4.6. Value of proximity of each alternative

DwiBaskoro	0,98
Jamal	0,819
NoviaUlfah	0,526
MuhamadAfrizal	0,081
FitriNurLathifah	0,07

From the table above can be concluded that the students who get the highest score to get a scholarship is DwiBaskoro with a value of 0.980 and followed by Jamal with 0.819 noviaulfah with 0,526 muhamadAfrizal 0.081 and last fitrinurlathifah 0.07.

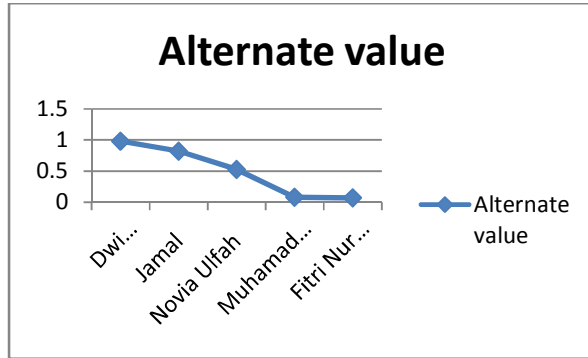


Figure 4.1 Alternative Ratings Graph

#### D. Screen Design

Here is a screen display program created using PHP and MySQL database for decision support system selection of scholarship recipients increase academic achievement at STMIK BINA GLOBAL MEANS.

#### 1. Display Student Menu

Student display screen is used to upload student certificate in accordance with the request from the DIKTI requirements and will be able to see the results of anyone who register and certificate that successfully validated by Prodi.

Figure 4.2. Student Menu

#### 2. Display Prodi Menu

Prodi menu display displays validation of certificates that have been uploaded by the student for the requirement of submission of scholarship in accordance with the selected category with the certificate yagn filed in the appropriate or not.

Figure 4.3. Prodi Menu

#### 3. View Menu Leader

Display The main menu displays only the entire dashboard page of the AHP and Topsis calculation process according to the data that has been input before before.

	Tingkatan/Institusi	IPK	PRESTASI	EKSD/CIH	PRODUCT	AKAR
Tingkatan Mahasiswa	1	0.2	0.333333333333333	0.142857142857143	0.0095238095238095	0.31239399399203
IPK	5	1	3	0.333333333333333	5	1.495348781212
PRESTASI	3	0.333333333333333	1	0.2	0.2	0.68740309497642
EKSD/CIH	7	3	5	1	105	3.201068720437
					TOTAL AKAR	5.8775889528333
SUM	18	4.53333333333333	9.33333333333333	1.87619047619048		
SUM X PRODUCT	0.8803598759603	1.1939818940045	1.0993395044566	0.94050793588768		
I_MAX	4.1187389183091					
CI	0.039579639436355		Konstanta			
RC	0.9					
CR	0.043877377151506					

	Tingkatan/Institusi	IPK	PRESTASI	EKSD/CIH
Ester Aumella	0.2878124151242	0.2078714587734	0.3238908338178	0.20851441405707
Ripal Ardiansyah	0.80178372573727	0.71715653276824	0.646876166676355	0.62584324217122
Stefany Maria Bemadeta	0.5345248392485	0.66518866807489	0.44507125007287	0.41702862614415
M. Buci Bando	0	0	0.48507125007287	0.62584324217122
Sadarnan Warunu	0	0	0.080845208345444	0

	IPK	PRESTASI	EKSD/CIH
Ester Aumella	0.114705379611189	0.05474884320229	0.03808898341806
Ripal Ardiansyah	0.18888350914429	0.076179716665612	0.35268929754629

Figure 4.4. Leader Menu

#### V. CONCLUSIONS

Based on the results of research and discussion of the decision support system of academic achievement improvement recipients (PPA), from this study the researchers take the following conclusion:

1. By using the decision support system of scholarship acceptance improvement of academic achievement by the method of ahp and topsis the decrease of complaints from students to the scholarship
2. By using a decision support system of scholarship recipients to improve academic achievement can help students receive information related to the recipient of the scholarship clearly and transparency calculation

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