

Decision Support System For Giving Scholarship With Analytical Hierarchy Process And Profile Matching Methods

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Abstract: Muhammadiyah 4 Vocational School Jakarta is one of the vocational high schools in Jakarta that has implemented and run a scholarship program annually. Determining these scholarships' awarding will naturally experience many difficulties because of the large number of students who potentially receive scholarships and the absence of criteria so that assessment is still subjective. Therefore, Muhammadiyah 4 Jakarta Vocational School requires a decision support system that can compare scholarship applicants' value to facilitate the decision-making process to get accurate scholarship recipients. This decision support system uses the Analytical Hierarchy Process (AHP) method to compare each criterion's value that will produce criteria weighting and the Profile Matching method to determine the final value of scholarship recipients at SMK Muhammadiyah 4 Jakarta. This decision support system is a report of decision results containing the awardees who have been ranked based on the highest to lowest scores. The decision support system for determining scholarship recipients was made using MySQL as a database and PHP Framework as a system creation tool.

Index Terms: Decision Support System, Scholarship, Analytical Hierarchy Process, Profile Matching

1 INTRODUCTION

Vocational High School or known as Sekolah Menengah Kejuruan (SMK) is an educational institution that seeks to create human resources who have the ability, skills, and expertise to develop their skills so that they are capable of works and to continue to higher education levels. According to Government Regulation no. 29 of 1990 article 2 paragraph (1) states that vocational schools aim to increase students' knowledge in self-development and improve students' abilities as society members. According to Government Regulation no. 29 of 1990 article 3 paragraph (2) states that vocational schools aim to prepare students to fulfill employment opportunities, prepare students to have careers, and prepare graduates to become productive, adaptive, and normative citizens. To realize the importance of the quality of learning, the government and the private sector continue to work together to implement this work through various efforts, including development and improvement of curriculum and evaluation systems, improvement of educational facilities, development, and procurement of teaching materials well as training. However, the government's efforts have not been meaningful enough to improve the quality of education. (Susanto & Sudiyatno, 2014). Student scores are an important component of learning in schools, both public and private schools because scores are among the benchmarks for students' mastery of subject matter. Student scores become a reference for teachers to make decisions about grade promotion, as well as a material for evaluating learning outcomes for students' parents or guardians (H,aand). The development of information technology is growing rapidly in all fields, which encourages creativity and innovation to solve the problems at hand. The existence of various technologies today makes it easy to find the right solution to a problem.

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2 LITERATUR REVIEW

According to a research journal written by Pangeran Manurung (2010) entitled "Decision Support System for Scholarship Admission Selection with the AHP and TOPSIS Methods", the Decision Support System (DSS) is a system used as a problem-solving tool to help decision-makers (managers) to determining decisions but not to replace the capacity of managers only to give consideration. Decision Support Systems are intended for decisions that require assessment or decisions that cannot be supported at all by algorithms (Simamora, 2019). According to Kusri (2007: 133), the decision-making process is choosing an alternative. The main tool of AHP is a functional hierarchy, with the main input being human perception. A hierarchy allows solving complex or unstructured problems in sub-problems, then arranging them into a hierarchical form. AHP has many advantages in explaining the decision-making process. One of them is that it can be depicted graphically to be easily understood by all parties involved in decision-making (Simamora, 2019). According to Muhammad Fauzi (2019), profile matching is a decision-making mechanism assuming there is an ideal variable predictor level that applicants must have. A comparison process will be carried out between individual competencies into standard competencies (Fauzi, 2019).

3 METHODOLOGY

The research was conducted through 4 stages as. In the first stage, the preparatory stage begins by determining the research topic by means of a survey to the relevant agencies (SMK Muhammadiyah 4 Jakarta) and conducting interviews after that determine the problem formulation and collect the required data by means of observation, document analysis and question and answer. The second stage is the analysis and system processing stage, this stage is the most important stage because at this stage the authors identify the research needs to further design the system and identify objectives, criteria and alternatives for data processing with the method that has been selected, namely the Analytical method. Hierarchy Process. The third stage is the implementation stage, after changing the form of the data so that it can be

(questionnaire).

4. Logical Consistency

Consistency has two meanings. First, similar objects can be grouped according to uniformity and relevance. Second, it concerns the level of relationship between objects based on certain criteria.

B. Profile Matching

Profile Matching is a decision-making mechanism. It is a process of comparing the actual value of a profile to be assessed with the expected profile value. It can be seen that the difference in competence, the smaller the resulting gap, the greater the value, which means that students have a greater chance of getting the scholarship (Setiyowati, Ramadhani, & Amin, 2019). A comparison process will be carried out between individual competencies into standard competencies in the profile matching process. The smaller the resulting gap, the greater the weighted value. Candidates who have a large value weight means they have a greater chance of getting a scholarship (Fauzi, 2019).

C. Categorize Core and Secondary Factor

Each criterion is grouped into 2, namely the core factor and secondary factor groups. Core factor is an aspect (competence) that stands out or is most needed. The calculation formula of the core factor is as follows:

$$NCF = (\sum NC(i,s,p)) / (\sum IC)$$

Explanation:

NCF : Mean value of core factor

NC : Total value core factor

IC : Total item core factor

Secondary factor are items other than the existing aspects of the core factor. The calculation of the secondary factor is as follows:

$$NSF = (\sum NS(i,s,p)) / (\sum IS)$$

Explanation:

NSF : Mean value of secondary factor

NS : Total value secondary factor

IS : Total item secondary factor

4 FINDING/ RESULTS

I. Comparison of Interest Criteria in Selection of Scholarship Recipients

The author collects and analyzes the data that has been collected. And then it is used as a model for the recommendation system that is currently being built. Based on the questionnaire that has been conducted, the level of importance comparison between criteria can be determined.

- 1) Student scores 3 (three) times more important than achievement
- 2) Student scores is 2 (two) times more important than the semester rank
- 3) Student scores (two) times more important than parental allowance
- 4) Achievement is 2 (two) times more important than parental allowance
- 5) Achievement is 2 (two) times more important than semester rank
- 6) Semester 2 rank (two) times more important than parental allowance

**TABLE 2
INTEREST COMPARISON PER CRITERIA**

Criteria	Scores	Achievement	Semester Rank	Parent Allowance
Scores	1	3	2	2
Achievement	1/3	1	2	2
Semester Rank	1/2	1/2	1	2
Parents Allowance	1/2	1/2	1/2	1

Step-1: Explain the above matrix into decimal form

1,0000	3,0000	2,0000	2,0000
0,3333	1,0000	2,0000	2,0000
0,5000	0,5000	1,0000	2,0000
0,5000	0,5000	0,5000	1,0000

Step-2: Multiply the Matrix that has been described in step 1 with itself

1,0000	3,0000	2,0000	2,0000
0,3333	1,0000	2,0000	2,0000
0,5000	0,5000	1,0000	2,0000
0,5000	0,5000	0,5000	1,0000

Step-3: The multiplied result of the matrix

3,9999	8,0000	11,0000	14,0000
2,6666	3,9999	5,6666	8,6666
2,4166	3,5000	4,0000	6,0000
1,4166	2,7500	3,0000	4,0000

Step-4: Add up each row resulting from the multiplication of the matrix

36.9999
21,0000
15,6670
11,1670

Step-5: Normalize by dividing each rows in the matrix by the total rows, producing an Eigen Vector.

36.9999	<i>Eigenvector</i>	0,4362
21,0000		0,2475
15,6670		0,1847
11,1670		0,1316
84,8328		

Step-6: Determine the weight of each criterion taken from the Eigen Vector.

Criteria	Weight
Scores	0,4362
Achievement	0,2475
Semester Rank	0,1847
Parent Allowance	0,1316

II. Testing the Analytical Hierarchy Process Method

AHP model testing is done by calculating the Consistency Index (CI) value and the Consistency Ratio (CR) value, with the following steps:

Step-1: Multiplies the decimal number of each criterion matrix by the eigen vector

Kriteria	Scores	Achievement	Semester Rank	Parent Allowance	Eigen Vector	Result
Scores	1,0000	3,0000	2,0000	2,0000	0,4362	1,8113
Achievement	0,3333	1,0000	2,0000	2,0000	0,2475	1,0255
Semester Rank	0,5000	0,5000	1,0000	0,5000	0,1316	0,7898
Parents Allowance	0,5000	0,5000	2,0000	1,0000	0,1847	0,5658

Step-2: Calculating the Consistency Vector by determining the average Weighted Sum Vector value.

Result	Eigen Vector		
1,8113	0,4362	=	4,1525
1,0255	0,2475	=	4,1434
0,7898	0,1847	=	4,2761
0,5658	0,1316	=	4,2994

Step-3: Calculate the average value of the Consistency Vector.

$$x = \frac{(4,1525 + 4,1434 + 4,2994 + 4,2761)}{4} = 4,2179$$

Step-4: Calculating the Consistency Index value

$$CI = \frac{(\pi - n)}{n : \text{total criteria}}$$

$$CI = \frac{n - 1}{(4,2179 - 4)}$$

$$CI = \frac{4 - 1}{4 - 1}$$

$$CI = 0,0726$$

Step-5: Calculating the Consistency Ratio

Calculating the Consistency Ratio, it takes a Random Index (RI) value which is obtained from the Cartridge CR = CI / RI table, for n = 4, the RI value is 0.90.

$$CR = 0,0726/0,90$$

$$CR = 0,0807$$

From the results of the calculations that have been done above, the comparison value is said to be consistent if the CI = 0.0726 and the CR is not more than 0.10. CR = 0.0807, so that the comparative score of the scholarship acceptance

criteria at SMK Muhammadiyah 4 Jakarta is consistent and does not require a revision of the assessment.

5 DISCUSSION

The Profile Matching method is used for the calculation of students by requiring criteria and weights. The output that will be produced is the highest alternative to the lowest alternative. The alternative referred to is the student receiving the scholarship. In this case the criteria are divided into 4 (four), namely grades, achievements, semester rankings and parental benefits.

The criteria needed for decision making determining scholarship acceptance are based on predetermined criteria as in the following table:

TABLE 3
CRITERIA PROVISION

Criteria	Code	Terms	Positive Value	Status
Scores	K1	Mean of Scores	1	CF
Achievement	K2	Achievement level	1	CF
Semester Rank	K3	Semester rank	1	CF
Parent Allowance	K4	Parent allowance	1	FS

After calculating using the GAP formula. So that the ranking results obtained at the scholarship acceptance are as in the table below:

TABLE 4
RESULT CALCULATION

Alternative	Kriteria				Result	Ranking
	Scores	Achievement	Semester Rank	Parent Allowance		
A4	2,4	2,7	3	2	2,7046	1
A3	3	2,7	3	2	2,3471	4
A2	3	3	3	1,8	2,4956	3
A1	1,8	3	2,4	2	2,4956	2
Weight	0,4362	0,2475	0,1316	0,1847		

Based on the table above, the ranking results can be selected, which alternatives can receive scholarships.

6 COCLUSION

Based on the analysis that has been carried out at SMK Muhammadiyah 4 Jakarta, the conclusions are first, the decision support system using the AHP method and the Profile Matching method can facilitate the Academic Section of SMK Muhammadiyah 4 Jakarta in making decisions by providing recommendations for more objective scholarship recipients. Second, With this decision support system, it can make it easier to determine each criterion's weight. The decision-making process can set priorities that must be prioritized and the results obtained will be more accurate, then in this system, data storage is well integrated because it uses a database.

7 RECOMMENDATIONS

From the conclusions that have been expressed, there are several suggestions or considerations that need to be considered in supporting this decision support system, namely: It is hoped that the next researcher will perfect and

adapt this research according to the needs needed. Filling in data in a decision support system still requires accuracy to get more accurate results.

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