

DECISION SUPPORT SYSTEM FOR DETERMINATION OF ACCEPTANCE OF WEB-BASED SCHOLARSHIP IN TALANGPADANG STATE VOCATIONAL SCHOOL USING Analytical Hierarchy Process (AHP) METHOD

Rima Mawarni, M.Kom
Meri Parida, M.Kom

STMIK Dian Cipta Cendikia Kotabumi
Jl. Negara No. 03 Candimas Kotabumi – Lampung Utara
E-mail : rima@dcc.ac.id

ABSTRACT

Processing of scholarship data in SMK 1 Talangpadang generally still uses Microsoft Excel, while for data processing takes a long time. The problem that often arises is the scattering of the file for distributing scholarship receipts every year. This scholarship consists of Academic Achievement, Non Academic Achievement, Personality, Mileage, Report Card, Organizations, Dependent Parents, Parent's Income, and Parent's Status.

The method used in this study is the Analytical Hierarchy Process (AHP) Method found by Thomas L. Saaty. AHP can also help in determining several criteria by using a different analysis from each of the specified sources.

Keywords: *decision support systems, achievement scholarships, junior high school, mysql, php script, ahp.*

1. INTRODUCTION

In the current era of globalization, education is important in life because it is a bridge connecting children with their future. Education is one of the building blocks of the body and the development of a child to get a better future.

Scholarships are educational assistance provided not only to students whose parents or guardians are less able but also to students who excel. Scholarship data processing at SMK Negeri 1 Talangpadang in general still uses Microsoft Excel, so data

processing requires a long time. The method used in this decision making system is the Analytical Hierarchy Process (AHP) method discovered by Thomas L. Saaty.

By looking at the problems that exist in making decisions in the selection of scholarship recipients, the decision support system using the AHP method is deemed appropriate to be used in assisting in making decisions to determine the scholarship recipients. It is expected that the results in this study can help decision makers in determining the recipients of scholarships.

II. Literature review

1. Understanding the system

Understanding the System according to Jacob entitled "Introduction to Information Systems" (2012: 01) The system is a network of interrelated procedures, collected together to carry out an activity or for a particular purpose.

1. Decision Support System

Decision support systems (decision support systems or abbreviated DSS) are part of computer-based information systems including knowledge-based systems (knowledge management) that are used to support decision making in an organization or company. The concept of a Decision Support System was first used in the early 1970s by Michael S. Scott Morton using the

term "management decision system". This concept is a mechanism based on the use of data and models to solve unstructured problems. [3]

The characteristics of a decision support system (Decision Support System) are as follows:

1. The main purpose of the Decision Support System is to improve the quality of decisions and performance. Decision Support Systems do not merely present more, better and more accurate information at the time just right.
2. Decision Support System is intended for a complex environment, less structured and even political nature.
3. Decision Support System relies on exception reports and the like to support the problem identification process.
4. Decision Support Systems combine "modeling" and other analysis techniques with the function of restatement of data.
5. Decision Support Systems focus on the principle of "easy to use" and "flexible" in dealing with certain users or groups of users.
6. Decision Making Process

2. Analytic Hierarchy Process (AHP) Method

AHP is a decision support model developed by Thomas L. Saaty. This decision support model will describe a complex multi-factor or multi-criteria problem into a hierarchy,

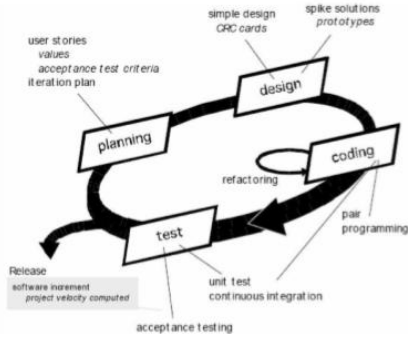
according to Saaty, hierarchy is defined as a representation of a complex problem in a multi-level structure where the first level is the goal, followed by the level of factors, criteria, sub criteria, and so on down to the last level of alternatives. [5]

AHP is often used as a method of solving problems compared to other methods for the following reasons:

- a. The hierarchical structure, as a consequence of the chosen criteria, reaches the deepest sub-criteria.
- b. Take into account validity up to the tolerance limit of the inconsistencies of various criteria and alternatives chosen by decision makers.
- c. Take into account the resilience of the decision making sensitivity analysis output.

1. Extreme Programming

Extreme Programming is one of the systems development models of several models in the Agile Process approach (a type of short-term flexible system development). In the development of systems that use Extreme Programming there are four stages, namely: Planning, Design, Coding, and Testing (Pressman, 2005). For more details, can be seen in Figure 1.1. [4]



Picture 1.1 Extreme Programming Process

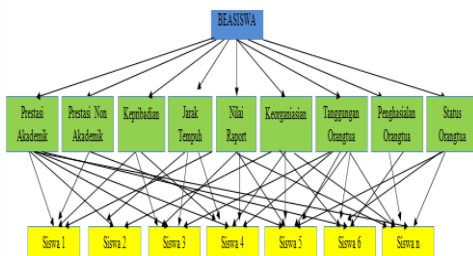
2. RESEARCH METHODOLOGY

2.1 Trial Design

In developing the AHP method there are a number of basic principles that must be carried out:

1) Decomposition (Making Hierarchy)

This principle is the solution of whole problems into its elements into a hierarchical form of the decision making process where each element is interconnected. If you want to get accurate results, the solution is done on the elements until it is not possible to do further solutions so that several levels are obtained from the existing problems. The decision hierarchy structure can be said to be Complete and incomplete. A hierarchy is called complete when all elements at one level are related to all elements at the next level, while an incomplete decision hierarchy is the opposite of complete.



Picture 2.1 Struktur Hierarchy

2. Comparative Judgment (Assessment of Criteria and Alternatives)

This principle provides an assessment of the relative importance of two elements at a given level in relation to the level above it. This assessment is at the core of the use of the AHP method. This assessment can be presented in the form of a matrix called a pairwise comparison matrix which is a paired comparison matrix that contains the level of preference of several alternatives for the criteria. The preference scale with a scale of 1 shows the lowest level up to the 9 highest level scale. For pairwise comparison scales are presented in the following table: [3]

Table 2.1 Pair Comparison Rating Scale

Integrity	Information
1	Both elements are equally important
3	One element is slightly more important than the other elements
5	One element is more important than the other
7	One element is clearly more absolutely important than the other elements
9	One element is absolutely more important than the other elements
2,4,6,8	Values between two values are close together

In assessing the relative importance of the two elements a reciprocal axiom applies, meaning that if element *i* is valued 3 times more important than *j*, then element *j* must be equal to 1/3 times its importance compared to element *i*. In addition, if two elements are compared to produce the number 1 it is equally important.

The calculation of logical consistency is done by following the steps as follows

- a. Multiplying matrices with corresponding priorities.
- b. Add up the multiplication results per line.
- c. The sum of each row is divided by the priority concerned and the results added up.
- d. The result *c* divided by the number of elements, will be obtained λ_{maks} (eigen value).
- e. Consistency Index (CI) = $(\lambda_{maks} - n) / (n - 1)$.
- f. Consistency Ratio = CI / RI, where RI is the random consistency index. If the consistency ratio is ≤ 0.1 , the results of the data calculation can be justified.

1) Synthesis of Priority

This principle presents a pairwise comparison matrix which then eigenvectors are searched to obtain local priority. Because the pairwise comparison matrix exists at each level, then to get a global priority can be synthesized between local priority.

2) Logical Consistency

Is the most important characteristic. This can be achieved by impressing all the eigenvectors obtained from the hierarchical level and subsequently a weighted composite vector which results in a decision making sequence.

The type of data used in this study includes parameters of academic achievement, non-academic achievement, personality, distance traveled, report card grades, organization, number of dependents of parents, amount of parental income, parental status. Each criterion is given 4 intensities which are very good, good, enough, and less. Hearing structure can be seen in Table 2.2

2.2 Rating based on parameters

NO.	Parameter	Intensitas			
		Sangat Baik	Baik	Cukup	Kurang
1	Prestasi Akademik	Nasional	Provinsi / Kota	Sekolah	Tidak Ada
2	Prestasi Non Akademik	Nasional	Provinsi / Kota	Sekolah	Tidak Ada
3	Kepribadian	Sangat Baik	Baik	Cukup	Kurang
4	Jarak Tempuh	≥ 10 KM	≥ 7 KM	≥ 4 KM	≤ 1 KM
5	Nilai Raport	≥ 1500	≥ 1400	≥ 1300	≤ 1100
6	Konorganisasi	≥ 3 Organisasi	≥ 2 Organisasi	≥ 1 Organisasi	≤ 0 Organisasi
7	Tanggungjawab Orang tua	> 5 Tanggungjawab	> 4 Tanggungjawab	> 3 Tanggungjawab	$= 1$ Tanggungjawab
8	Pendapatan Orang tua	$< 1500000 \leq 2500000$	$< 1500000 = 1500000$	$< 2500000 \leq 3500000$	$\geq 3500000 > 5500000$
9	Status Orang tua	Tidak Pensiun	Pensiun	Pensiun	Tidak Pensiun

1. Interview method

To obtain data as a source of facts the author conducted an interview as a step to get information from various parties concerned.

2. Method of direct observation (Observation)

How to collect data by jumping directly into the field by carrying out research, the writer gets the ease in collecting data because he gets the freedom to find information from various parties concerned.

Data Acquisition:

a. Academic Achievement, Non-Academic Achievement, Organizational, Report Card Value, Number of Dependents of Parents, Amount of Parent Income, and Parental Status: Obtained from forms distributed to each student.

b. Personality value is obtained from the counseling guidance teacher by calculating several indicators including responsibility, mutual respect, confidence, courtesy and competitive.

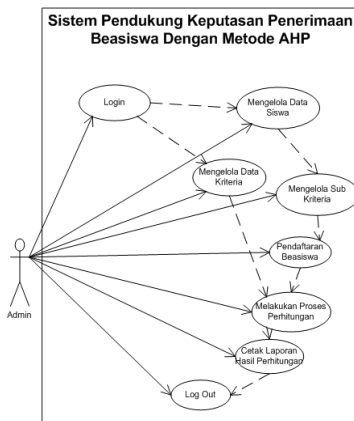
2.2 Determination of Scholarship Criteria

In selecting scholarships using the AHP method, criteria and weight are needed to do the calculations so that the best alternative will be obtained.

Table 2.3 Scholarship Criteria

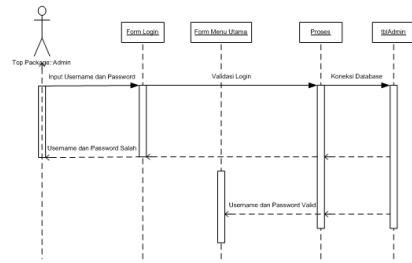
Criteria	Information
K ₁	cademic achievement
K ₂	Non Academic Achievement
K ₃	Personality
K ₄	Milieage
K ₅	Report Card Value
K ₆	Organization
K ₇	Number of dependents of parents
K ₈	Parents' Earnings
K ₉	Parental Status

2.2 Use Case Sistem



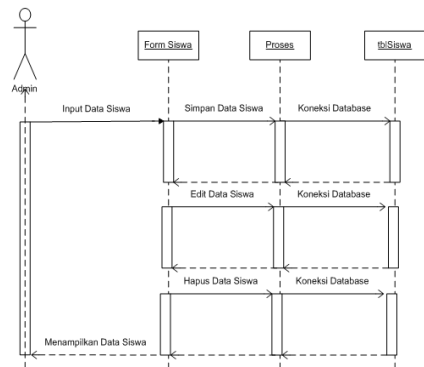
Gambar 2.3 Use Case Sistem

2.3 Squence Diagram Login Sistem



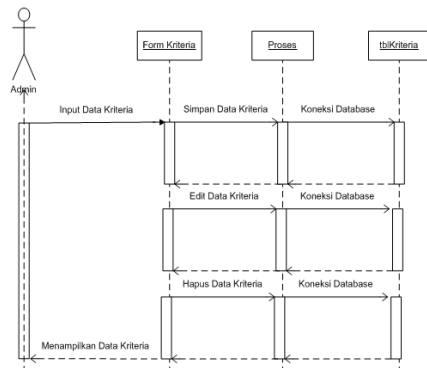
Picture 2.4 Squence Diagram Login Sistem

2.4 Squence Diagram Student Data



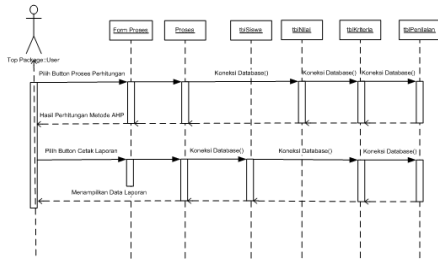
Picture 2.5 Squence Diagram Student Data

2.5 Squence Diagram Data Kriteria



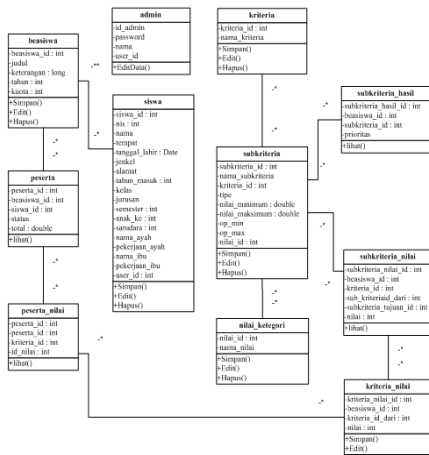
Picture 2.6 Squence Diagram Data Kriteria

2.6 Sequence Diagram Scholarship Calculation



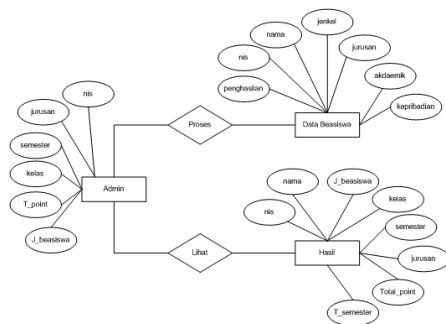
Picture 2.7 Sequence Diagram Perhitungan beasiswa

2.7 Diagram Class



Picture 2.8 Class Diagram

2.8 Normalisasi



Picture 2.9 Normalisasi

III. RESULTS AND DISCUSSION

3.1 Hardware and Software Requirements

Based on the system implementation by the author, the hardware needed to prepare the proposed system. The hardware needed is a set of computers with the following specifications:

1. Intel Core Duo Processor
2. 2 GB RAM
3. 500 GB hard drive
4. Keyboard, VGA, Mouse, and standard type printers

The software / software needed for implementing a decision support system for determining the acceptance of this scholarship is:

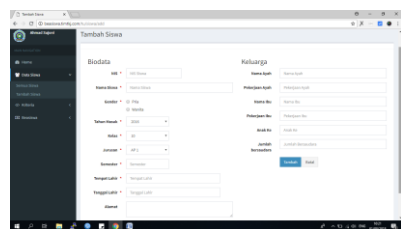
1. Windows 7 Operating System
2. MySQL database as a DBMS (Data Base Management System)
3. PHP as a MySQL database accesser
4. Adobe Dreamweaver CS5 as a display system design.
5. Browser (Mozilla Firefox / Google Chrome)
6. Xampp V.5.6.28

3.1 Display Login Form



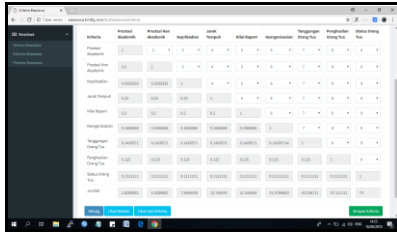
Picture 3.1 Display Login Form

3.2 Display Student Data Input Form



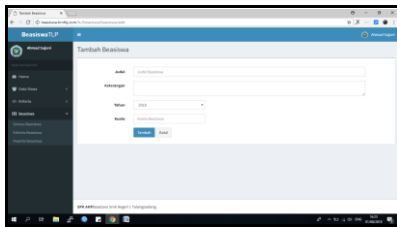
Picture 3.2 Display Student Data Input Form

3.3 Display Weighting Form



Picture 3.3 Display Weighting Form

3.4 Display Scholarship Input Form



Picture 3.4 Display Scholarship Input Form

3.5 Display Student Input Form



Picture 3.5 Display Student Input Form

3.6 Display Scholarship Selection Report



Picture 3.6 Display Scholarship Selection Report

3.8 Black Box Testing Scenarios

The test scenario uses the Black Box method where the test carried out is testing the functionality of the system, whether the system functions with the desired results or not. In the application application of the Decision Support System for Determination of Scholarship Acceptance Using the AHP Method at SMK Negeri 1 Talangpadang, testing refers to functions owned by the system, then compares the outputs with expected results. If the expected results match the test results, it means that the software is in accordance with a predetermined design. If it is not appropriate, it is necessary to further check and repair.

Table 3.1 Black Box Testing

No	Testing Class	Job Evaluation Criteria
1	Authentifikasi Administrator	System simulation checks the administrator login process, successful or not, then saves the administrator session during the login process, and turns off the session when the administrator has logged out, so the system cannot be opened again unless it has to log back in
2	Data Processing	The system can display student profiles, add delete and change student data
3	Data Processing Criteria	The system can display criteria data, and delete criteria data and criteria weights
4	The system can display criteria data, and delete criteria data and criteria weights	The system can display sub-criteria data, and delete sub-criteria data and sub-criteria weights
5	Processing student intensity	The system can display choices for student grades and a total weight will be calculated criteria and sub-criteria

4. Conclusion

After conducting research at SMK N 1 Talangpadang, the authors draw the following conclusions:

1. Application built using PHP Script and MySQL database, making it easier for users to use it.
2. The application of a decision support system that was built can provide convenience and minimize errors that might occur in the process of selecting scholarship acceptance candidates at SMK Negeri 1 Talangpadang.
3. The weighting method used is the Analytical Hierarchy Process (AHP) method so that the results of the implementation of the system can make it easier to select students for scholarships with assessment data according to established criteria.

References

- [1]. Abadi, Friska. "Determination of Fund Aid Recipients for Middle Schools in Banjar District Using the AHP TOPSIS Method with a Fuzzy Approach." (2016).
- [2]. Ariyadi, Bagas Dista. "Decision Support System for Scholarship Recipient Selection in Boja 1 High School Using Analytical Hierarchy Process (AHP) Method." Dian Nuswantoro University (2013)
- [3]. Iskandar, Fauziah Mayasari, Arief Andy, and Rekyan Regasari. "The Support System for PPA and BBM Scholarship Support Decisions Using the AHP Fuzzy Method." Smatika Journal 3 (2013).
- [4]. Sidiq, Abdul Hafidh. "Design and Build of Administrative Information System for UIN Sunan Kalijaga Scholarship Using Agile Process Approach with Extreme Programming Model." (2013).
- [5]. Saaty, T.L., (2009), "Decision Making for Leaders in the Analytical Hierarchy Process", University of Pittsburgh.