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The Best Village Selection Decision Support System at the District Level Using the AHP Method (Case Study at the Pagar Merbau District Office)

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ABSTRACT

The empowerment of rural communities needs to be done institutional strengthening, increased motivation and self-help in community cooperation, so that in order to assess the success of village development, it is necessary to conduct a targeted, coordinated, integrated and sustainable assessment. with an assessment indicator. Village assessment is best done by comparing the latest development level based on village profile data in accordance with the assessment indicators. This study aims to build a decision support system to determine the best village based on the village assessment score using the Analytic Hierarchy Process (AHP) method. The data used is the village data in the Pagar Merbau sub-district. This best village assessment must pay attention to 6 criteria. The results of the accuracy testing that is performed produce accuracy values from the data output process as much as 5 data. The output of this system is the ranking of each village that has been assessed so as to produce recommendations for decision making in determining the best village.

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1. INTRODUCTION

Empowerment of rural communities, it is necessary to strengthen institutions, increase motivation and self-help of the community in the village, so that to assess the success of village development, it is necessary to carry out activities in a directed, coordinated, integrated and sustainable manner [1] [2]. Through these activities, an assessment can be made by comparing the latest level of development based on village profile data according to the assessment indicators. The assessment of the best village at this time is still not transparently open. In the government's efforts to carry out development in rural areas to realize the development strategy in the 2015-2019 national mid-term development plan, to support the government's plan, the implementation of the best village assessment is carried out as a way for the government to improve development [3] [4].

The implementation of the best village assessment activities must be carried out quickly, openly and competitively, although the amount of data entered is relatively large, the accuracy of calculations and reports can be achieved as much as possible and with better time efficiency in the completion of a report. The assessment of the best village based on the criteria that have been set to determine the best village often experiences problems, one of which is because each village has different characteristics, causing the criteria values for each village to be different and the number of villages participating [5]. Therefore, by utilizing technological advances, a support system is needed to provide recommendations for determining the best village in the Pagar Merbau sub-district, based on predetermined criteria.

DSS is an interactive information system that provides information, modeling, and manipulating data. The system is used to assist decision making in semi-structured and unstructured situations [6] [7] [8].

According to Daryanto (2003:13), Visual Basic is one of the development tools for building applications in the Windows environment. In application development, Visual Basic uses a visual approach to design the user interface in the form of a form while using basic language dialogs which tend to be easy to learn [9].

The advantages of Microsoft Access from a programmer's perspective are its compatibility with the Structured Query Language (SQL) programming language, queries can be viewed and edited as SQL statements, and SQL statements can be used directly in Macros and VBA Modules to directly manipulate data tables in Access. Users can mix and use the two types of languages (VBA and Macros) to program forms and logic as well as to apply object-oriented concepts [10] [11] [12].

Basically, the decision-making process is choosing an alternative. The main tool of AHP is a functional hierarchy with the main input being human perception. The existence of a hierarchy makes it possible to solve complex or unstructured problems in sub-problems, then arrange them into a hierarchical form.

AHP has many advantages in explaining the decision-making process. One of them is that it can be described graphically so that it is easily understood by all parties involved in decision making [13] [14] [15].

Unified Modeling Language (UML) is one of the language standards that is widely used in the industrial world to define requirements, make analysis and design, and describe architecture in object-oriented programming. UML is a visual language for modeling and communicating about a system using diagrams and supporting texts [16] [17] [18].

2. RESEARCH METHODS

The method used for data collection techniques from this research are: literature and interview techniques.

2.1 Analytical Hierarchy Process (AHP) Procedure

Basically, the procedure or steps in the Analytical Hierarchy Process (AHP) method include:

a. Define the problem and determine the desired solution, then arrange a hierarchy of the problems encountered. Hierarchy is setting goals which are the goals of the system as a whole at the top level.

b. Determines the priority of elements;

   1). The first step in determining the priority of elements is to make a pair comparison, which is to compare elements in pairs according to the given criteria.

   2). The pairwise comparison matrix is filled in using numbers to represent the relative importance of an element to other elements.

c. Synthesis

   Considerations for pairwise comparisons are synthesized to obtain overall priorities. The things that are done in this step are:

1). Sum the values of each column in the matrix.
2). Divide each value from the column by the corresponding column total to obtain a normalized matrix.
3). Add up the values of each row and divide by the number of elements to get the average value.

d. Consistency Gauge
In decision making, it is important to know how good the consistency is because we don't want judgmental decisions with low consistency. The things that are done in this step are:
1). Multiply each value in the first column by the relative priority of the first element, the value in the second column by the relative priority of the second element, and so on.
2). Sum each row.
3). The result of the row sum is divided by the corresponding relative priority element.
4). Add the quotient above with the number of elements, the result is called max.

e. Calculate the Consistency Index (CI) with the formula:

$$CI = (max-n) / n \quad \ldots\ldots (1)$$

Where:
C1 = Consistency Index
max = Maximum Eigenvalue
n = Number of Elements

f. Calculate the Consistency Ratio (CR) with the formula:

$$CR = CI/RC \quad \ldots\ldots (2)$$

Where:
CR = Consistency Ratio
CI = Consistency Index
IR = Random Consistency Index

Check hierarchy consistency. If it is more than 10%, then the data judgment assessment must be corrected.

3. RESULTS AND DISCUSSION

3.1 System Implementation

After designing a decision-making system that fits the needs in selecting the best village in the fence merbau sub-district, the results of the interface implementation design describe the appearance of the application built on a desktop-based decision support system. At this stage the system that has been designed will be put into operation.

a. Hardware Requirements (Hardware)
Hardware (Hardware) is a series of main computer equipment in working with the help of the operating system to solve a problem at hand. To be able to run the system, the hardware needed is:
1). A computer device with a Pentium IV type or a laptop with an Intel Atom processor or more and has a minimum of 1 GB of RAM.
2). SVGA or LCD monitor that functions as a display device that interacts directly with the operator.
3). Hard disk with a minimum storage capacity of 120 Gb as a data container.
4). Printer Epson / Dot Matrix or Canon / Bubble Jet as a tool for printing reports.

b. Software Requirements (Software)
In this case, software is a computer program designed in a language that is understood by the computer. Computer hardware will not be able to do anything without software (software). The software that will be used in this system are:
1). Windows XP, Windows Seven and Windows 8 for early computer operating systems.

2). Microsoft Visual Studio 2010.
3). Microsoft Access 2007.

3.2 System Implementation Stages

The discussion carried out at this stage is a face-to-face description of the system.

a. Login Form

The login form is the main form to enter the system, by first inputting the user id and password, if the user id and password are Validation, the main menu will appear. The login form display can be seen in Figure 2 below.

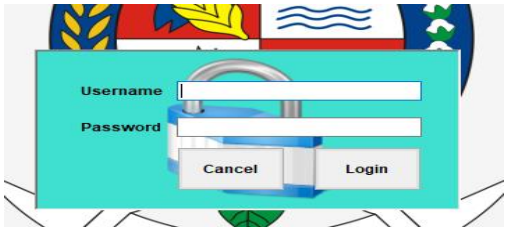

Figure 2. Display of User Login Form

b. Main course

A good program is a program that has integration and is run using the main menu as the main access to the program. So that it can provide friendliness to the user and make users comfortable using the program.

The main form is the main display of the program content, where with the main menu display the user can operate the program optimally and can also use the existing facilities in the program, as for the main menu form as shown in Figure 3 below:

Figure 3. Main Menu Display

c. Criteria Data Form

The criteria data input form in Figure 4 serves to input the best village data criteria. This form has 5 buttons, namely: new to fill in new criteria data, Save to save and add criteria data, delete button to delete criteria data, Edit button functions to change criteria data, cancel button functions to clear existing data on the criteria data form , the criteria data form can be seen in Figure 4 below:

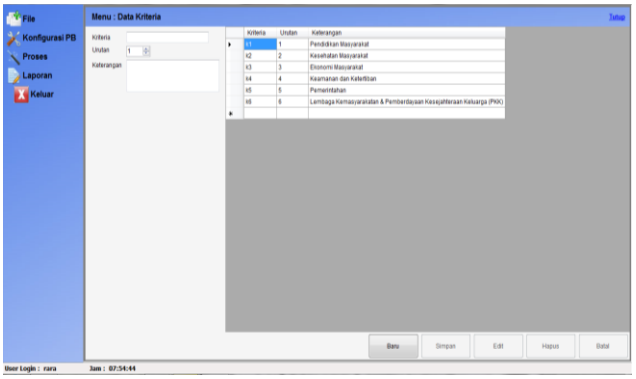

Figure 4. Criteria Form Display

d. Sub Criteria Form

The sub-criteria data input form in Figure 5 serves to record village data according to predetermined criteria. This sub-criteria form has 5 buttons, namely: New to fill in new sub-criteria data, Save to save and add sub-criteria data, delete button to delete sub-criteria data, Edit button functions to change sub-criteria data, cancel button works To clear the data in the criteria data form, the criteria data form can be seen in Figure 5 below:

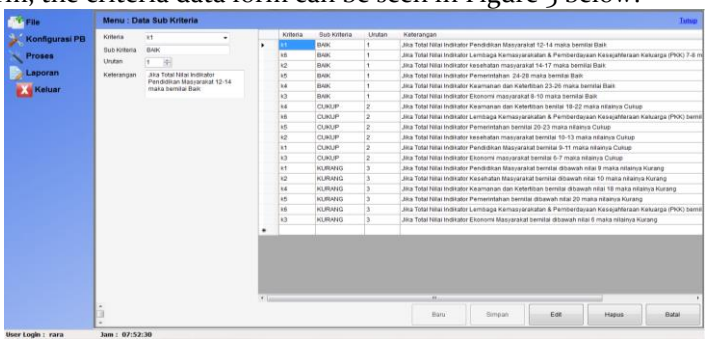

Figure 5. Sub Criteria Form Display

e. Pairwise Comparison Form

Priority pairwise comparison input form functions to process criteria data and also row and column values so that they get Priority values. On the Priority Paired Comparison form there are 2 buttons, namely: the Process button functions to process the value data that has been divided by the number of pools and also calculates the row value so as to produce a Priority Pairwise Comparison value, Save serves to store the processed data.

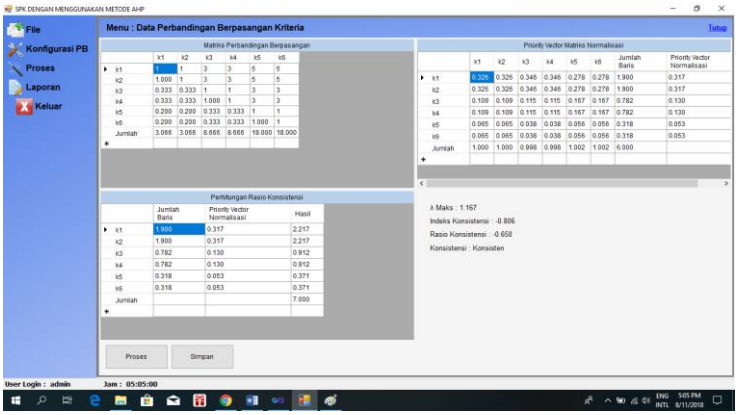

Figure 6.TPriority Pairwise Comparison view.

f. Priority Paired Comparison Sub Form

The Priority Paired Sub comparison input form in Figure 7 serves to determine the quality of each village based on predetermined criteria, so that the sub-district office can determine which village is the best. The priority paired comparison form for sub-criteria has 2 buttons, namely: the Process button functions to process the value of each village based on the criteria, Save functions to store and add data.

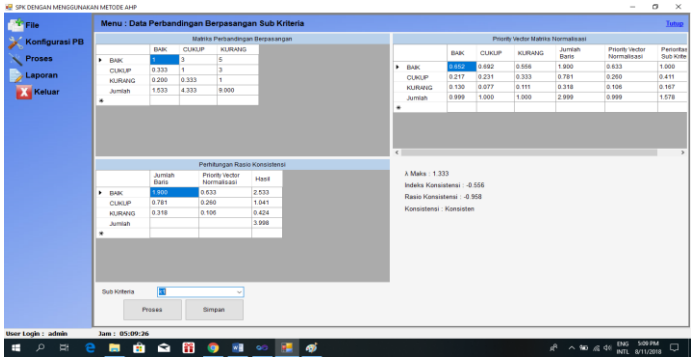

Figure 7.Sub-criteria pairwise comparison display

g. Village Data Form

The village data input form functions to input village data in the fence merbau sub-district, the village form has 5 buttons that function as follows: the Save button functions to save village data, the Change button functions to change village data that has an identity error at the time of inputting the data is done, the Delete button functions to delete village data that has been stored in the database, the new button functions to start entering new village data, the village data form can be seen in Figure 8 below.

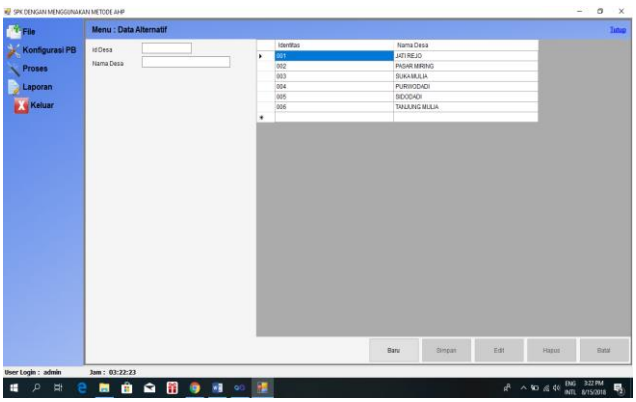

Figure 8. Village Data Display

h. System Test

The process of testing the decision support system for selecting the best village in Pagar Merbau District is done by testing the application by entering data into the form provided. This stage is a continuation of the implementation stage. The test will be carried out by processing data with the AHP method which has been implemented manually in the previous chapter, at this testing stage it allows the system engineer to get a series of input conditions that fully contain all the functional requirements for a program so that the sub-district can determine the best village, because the program system that has been built to run as optimally as possible. The results of the AHP decision form can be seen in Figure 9 below:

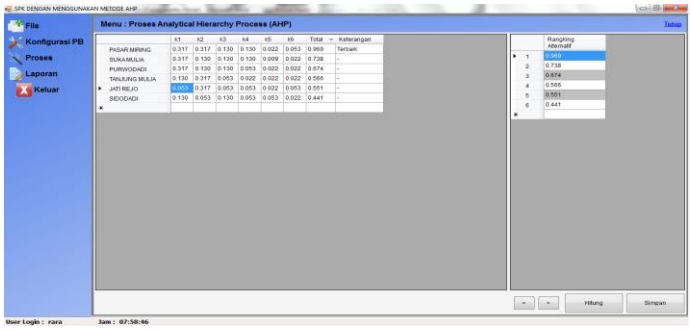

Figure 9.AHP Decision Result Display

After getting the results, it will be printed in the form of a report, then the results of the draft report are as shown in Figure 10 below:

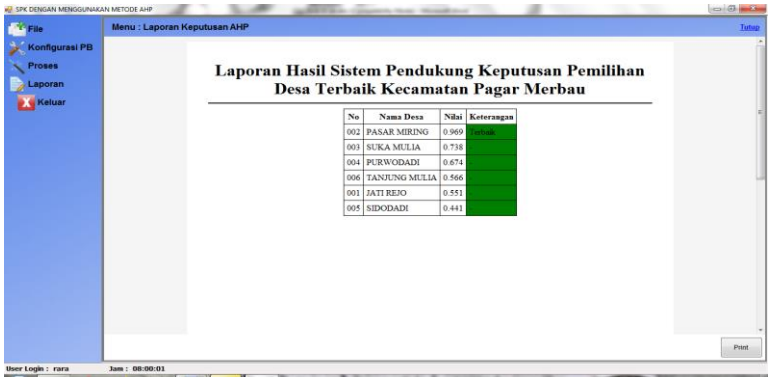

Figure 10. Report Result Display

4. CONCLUSION

The conclusions outlined in the decision support system for selecting the best village at the sub-district level (case studies for the sub-district of fence merbau are; The best village selection decision support system has six criteria, namely: community education, public health, security and order, community economy, village government, and PKK, and apply the AHP method as a problem solving method to find the best village accurately and objectively.

Designing applications with UML (Unifield Modeling Language) modeling, which consists of Use Diagrams, Activity diagrams, Class Diagrams. The program database uses Microsoft Access which consists of: Login Database, Village Data Database, Criteria Database, Sub-criteria Database and Normalized Matrix Database. The system was built using the Visual Studio 2010 programming language, and the implementation of the system consisted of a login display, the main menu consisting of files, pairwise comparison configurations, processes, and reports.

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