Scholarship Acceptance Decision Support System With Simple Additive Weighting (SAW) Method At Sudirman Islamic High School

Layth Nabeel Al-Rawi, Alpen Adria
University Klagenfurt, Austria

Abstract — Sudirman Ambarawa Islamic High School is a Private Upper Level Secondary School located in Ambarawa, precisely on Jalan Jendral Sudirman No.2A Ambarawa, Semarang Regency, Central Java. It is very strategically located because it is on the edge of the Semarang-Yogyakarta Main Road. Sudirman Ambarawa Islamic High School is under the leadership of the Sudirman Islamic Education Center Foundation (YAPPIS). The scholarship acceptance system at Sudirman Ambarawa Islamic High School records and selects prospective scholarship recipients is still manually, namely only by using the Microsoft Excel program, which results in data input errors and the results of the selection of scholarship recipient students.

The problems that occur at Sudirman Ambarawa Islamic High School will be resolved by supporting scholarship admission decisions. This system is needed in helping to make decisions to provide scholarships based on predetermined conditions or criteria in accordance with the standards of the Simple Additive Weighting method applied. So far, the selection process for scholarship admissions at Sudirman Ambarawa Islamic High School uses a manual process that only uses the Microsoft Excel computer program, where the consideration is also carried out manually, only doing a simple mathematical calculation process.

Keywords— SAW Method, Decision Support System, Scholarships

I. INTRODUCTION

The rapid development of information technology in all aspects of life is increasingly facilitating human work. In fact, in life, humans often encounter problems in decision-making [1]. Humans have created a system that can be used to determine the best choice in a problem, namely the decision support system (SPK). Scholarships can be called provisions in the form of financial or educational assistance support distributed by individuals, students or students who are used for the continuity of education carried out for those whose economic abilities are underprivileged or have achievements in non-academic and academic fields and have met the criteria or conditions determined by the scholarship provider. Scholarships can be awarded by companies, government agencies, foundations, universities or other agencies [2]. The author will use the Simple Additive Weighting (SAW) method at Sudirman Ambarawa Islamic High School. This SAW method includes the weighted summation method. The initial design of the Simple Additive Weighting (SAW) method was actually to look for the weighted summation of the values of each specified criterion. The scholarship acceptance system at Sudirman Ambarawa Islamic High School records and selects prospective scholarship recipients is still manually, namely only by using the Microsoft Excel program, which results in data input errors and the results of the selection of scholarship recipient students. The selection process in choosing scholarship recipients at Sudirman Islamic High School has 5 criteria including parental income, the number of family members covered, student classes, student achievement and conditions of residence. The weight value of the criteria uses the income ratio of parents: 25%, the number of dependents: 20%, student classes: 15%, student achievement: 15%, conditions of residence: 25% (Source: SMA Islam Sudirman Ambarawa). The problems that occur at Sudirman Ambarawa Islamic High School will be resolved by supporting scholarship admission decisions. This system is needed in helping to make decisions to provide scholarships based on predetermined conditions or criteria in accordance with the standards of the Simple Additive Weighting method applied.

II. LITERATURE REVIEW

A. Decision Support System

A decision support system is an information system in which there is modeling, information and data manipulation that is useful for assisting in decision making when the situation is semi-structured. The decision support system (SPK) is said to be part of a set of computer information systems that are included in the knowledge-based system used to help make decisions within an agency or company. It is also said to be a system that can process data into information results that are used to make decisions on a specific problem. SPK can be imagined as a system that has the ability to help with decision modeling, and ad hoc analysis of data, leading directly to decisions, goals about future planning. [3]
B. Simple Additive Weighting

The method (Simple Additive Weighting) or SAW is very familiar with other names of weighted summation methods. The basic concept of the SAW method is to look for weighted summations on performance ratings in each criterion in all aspects. The method (Simple Additive Weighting) or SAW is recommended to solve selection problems in decision-making systems in more than one or many processes. The SAW Simple Additive Weighting method is a method that is very widely used for decision making that has a lot of attributes. The Simple Additive Weighting or SAW method requires a decision matrix normalization system (X) to a single scale that can be compared with all existing alternative rating values. [4] The Simple Additive Weighting (SAW) method has several stages in completion, namely as follows:

1) Determining Alternatives (Ai)
2) Determine the criteria or conditions that will be used for reference in the decision-making process (Cj)
3) Determine the weight of the preference value or importance level (W) on each criterion or condition
4) Determine the Match Value of each criterion
5) Matrice the decision (X) obtained from the match rating on each alternative (Ai) with each criterion (Cj).
6) Carry out the decision matrix normalization step (X) by calculating the normalized performance rating value (rij) from alternative data (Ai) on the criteria (Cj) with the formula:

\[ r_{ij} = \left\{ \begin{array}{l}
\frac{x_{ij}}{\text{Max}_i x_{ij}} \\
\frac{\text{Min}_i x_{ij}}{x_{ij}}
\end{array} \right. \]

If j is a benefit attribute

If j is the cost attribute

1) The result of normalization (rij) forms a normalized matrix (R).

\[ R = \begin{bmatrix}
    r_{11} & r_{12} & \cdots & r_{1j} \\
    \vdots & \vdots & \ddots & \vdots \\
    r_{ij} & r_{ij} & \cdots & r_{jj}
\end{bmatrix} \]

2) The final result of the preference value (Vi) is obtained from the calculation of the sum of the normalized multiplication of the matrix row element (R) with the preference weight value (W) corresponding to the matrix column element (W).

\[ V_i = \sum_{j=1}^{n} w_j r_{ij} \]

Dengan :
- \( V_i \) = rankings for each alternative
- \( W_j \) = the weight value of each criterion
- \( rij \) = normalized performance rating value. [5]

III. SYSTEM DEVELOPMENT METHODS

The research method used is Research and Development (R&D), R&D is a research method used to produce a certain product, and test the effectiveness of the product [6]. In this study, it only uses the 6 steps of the research process because this research produces an information and development system that can be described as follows [6]:

![Figure 1. Research and development procedure steps](image-url)
A. Flowchart

Flowcharts are used to describe and simplify processes or procedures to be easily understood and viewed based on sequences or flows in a program.

<table>
<thead>
<tr>
<th>TEMA</th>
<th>KOMPUTER</th>
<th>STAFF HIGHERADMIN</th>
<th>PERALI SEDERAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Data Siswa</td>
<td>Get Data Siswa</td>
<td>Input Data Klienes Bank Mandiri</td>
<td>Language Processing System</td>
</tr>
<tr>
<td>Use Case Siswa</td>
<td>User Siswa</td>
<td>Language Processing System</td>
<td>Language Processing System</td>
</tr>
</tbody>
</table>

Table 1. Flowchart System

B. ERD (Entity Relationship Diagram)

ERD (Entity Relationship Diagram) is used to describe the relationships between data in a database based on basic data objects that have relationships connected by a relationship.

C. UML (Unified Modeling Language)

Based on the analysis of the data process carried out, it is known that the actors involved in the system are officers (users), students and principals. The actor is modeled in the design of the system using use case diagram, class diagram, sequence diagram, activity diagram, and deployment diagram.

1) Use Case Diagram

The use case diagram has several interconnected actors, namely Officers, Students and Principals. The use case design can be seen in the image below.
IV. RESULTS AND DISCUSSION

The results of this study are in the form of information system software that processes scholarship recipient data using the language of the VB.net program. Xampp is a software that functions as a stand-alone server consisting of the Apache HTTP Server and MySQL Database programs.

A. Development Results

The results of the development in this research using the Research and Development (R&D) development model are a Development of a Scholarship Admission Decision Support System With the Simple Additive Weighting (SAW) Method at Sudirman Ambarawa Islamic High School.

1) Login Form

This form is to enter the main menu form if you fill in the matching username and password, it will enter the menu form, if the username and password do not match, an incorrect username and password message will appear.
2) Form Menu
Form menu is a form to display or open the master form menu, scholarship menu, report menu, and exit.

3) Student Form
This form is used to fill in student data at Sudirman Ambarawa Islamic High School then the data is stored in the database.

4) Criteria Form
This form is used to fill in what criteria are used for the selection calculation process for prospective scholarship recipients using the Simple Additive Weighting method.
5) Result Process Form
This form is a form for the scholarship acceptance calculation process using the Simple Additive Weighting (SAW) Method.

6) Result Form
This form is a form of student results who get / do not get a scholarship using the Simple Additive Weighting (SAW) Method.

7) Report Form
V. CONCLUSION

The description of the research entitled "Scholarship Admission Decision Support System With Simple Additive Weighting (SAW) Method at Sudirman Ambarawa Islamic High School" can be concluded as follows:

1) By using this decision support information system, it can help the student affairs department to manage the scholarship admission selection process.

2) The results of the calculation of scholarship admission selection using the Simple Additive Weighting (SAW) method provide more accurate results in presenting scholarship selection information and can enter data concisely and report making can be presented faster.

REFERENCES


