Design of Decision Support System Providing Scholarship with Analytical Hierarchy Process (AHP) Method on Yayasan Seri Amal St. Ignatius Medan

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Abstract. Yayasan Seri Amal St. Ignatius Medan, is one of the educational foundations in Medan that houses the St. Ignatius Medan who runs an education consisting of Kindergarten (TK), Primary School (SD), Junior High School (SMP), Senior High School (SMA). Yayasan Seri Amal St. Ignatius in each school year provides scholarships for all eligible students. The scholarship given is in the form of exemption from all tuition fees available. The scholarship is for 3 (three) students at every level of education. The scholarships are awarded by taking into account a number of criteria such as: economic ability, academic achievement, organization liveliness, and non academic achievement. In the process of determining scholarship recipients, the decisions taken are often influenced by the subjectivity of decision makers. Subjectivity can occur because there is no standard method in weighting criteria and systematic application to assess the eligibility of a student in accepting a scholarship. The issue in decision-making is essentially a form of selection of possible alternatives that are processed through a particular mechanism, in the hope of producing a the best decision. Many methods can be used in decision-making systems. One of them is the Analytical Hierarchy Process (AHP) method. The concept of the AHP method is to change the qualitative values into quantitative values. So that decisions can be more objective, because AHP is quite effective in simplifying and speed up the decision-making process by solving the problem into its parts. The research method used in this research is SDLC (System Development Life Cycle) method. The results of this study are expected to answer the needs of the school on the existence of a decision support system that can assist the Yayasan Seri Amal St. Ignatius Medan in this case the leadership of St. Ignatius at the level of kindergarten, elementary, junior high and high school in determining the students who are elected to obtain scholarships for each level of education.

1. Introduction
Rapid technological and economic growth has changed human lives in the last fifties and has caused modern society to face complex decision-making issues that can not be easily resolved because they contain many criteria, sub-criteria, and alternatives. Therefore, natural choice is almost impossible without the help of mathematics, which formulates the way in which we think we can make better decisions while ensuring the transparency of all its aspects[1]. The goal of analytical hierarchy (AHP) is to systematically and analytically mitigate complex decision-making problems by addressing each aspect of hierarchy failure to help analysts identify the preferred alternative[2]. The decision process AHP consists of three main parts: decomposition, preference measurement and synthesis[3]. Decision-
making in situations involving multiple criteria and many alternatives is a complex process and therefore requires a method that can address the hesitant of the decision maker[4]. Decision-making based on the classification process also needs to pay attention to the problem of class imbalance[5] and class imbalance issues can affect the quality of the resulting decisions[6] so we need to choose the right method to solve this problem[7]. One of the decision-making processes is in the benchmarking process[8]. In addition, the main difficulty in making decisions based on performance measurement is the presence of too large resources with minimal output[9]. Decision-making should pay attention to aspects of justice and truth[10]. Decision support system of determination of scholarship grant by AHP method at Yayasan Seri Amal St. Ignatius Medan is expected to be utilized by the Yayasan Seri Amal St. Ignatius Medan and head of St. Ignatius Medan which includes the kindergarten, elementary, junior high, and high school level to improve the quality and objectivity in determining the appropriate students to get the scholarship. Decision Support System Provision of Scholarships with AHP method is designed web-based, so it can also be used by other schools who want to apply it.

2. Related Works

The Analytical Hierarchical Process (AHP) was one of the most important mathematical methods for decision-making with multiple criteria and was widely studied in the literature of operational research literature as well as used to solve countless real problems[11]. Puspitasari et al. [12] have used Analytical Hierarchy Process for determining scholarship selection and obtain the accuracy about 90%. The scholars are those who are eligible. It includes an analysis of multi-criteria decision making by determining the priority criterion for students to be the most important in the selection process[13]. The goal of deciding how to choose a scholarship is to identify the most important criteria and sub-criteria for the selection of students and aim to select students who meet the criteria and sub-criteria[14].

3. Research Methodology

The system development methodology used is System Development Life Cycle (SDLC). SDLC is an approach through several stages to analyze and design the system in which the system has been developed very well through the use of specific analysis and user activity cycles. The steps in the SDLC method can be seen in figure 1.

![Figure 1. SDLC Method](image)

The design of decision support system for the determination of scholarship starts from the analysis of the needs of the St. Ignatius. Through the analysis of this requirement obtained a description of the decision support system that will be designed. After the process of system analysis, then will be done decision support system development. The flowchart design of decision support systems determining the award of scholarships at St. Ignatius can be seen in figure 2.
4. Result and Discussion

4.1. AHP Process
AHP Process can be seen in figure 3.

This decision support model describes a complex multi-factor or multi-criterion problem in the hierarchy, a hierarchy defined as representing a complex problem in a multi-level structure where the goal is the first level, followed by the factor level, criteria, subcriteria, etc. to the last level of the hierarchy.
alternative. In this hierarchy, a complex problem would be grouped into groups that are then processed in a hierarchical form to make the problem more structured and systematic.

4.2. System Flow Process Stages in Granting Scholarships at St. Ignatius School
The System Flow stages of the process of Granting Scholarships at St. Ignatius School can be seen in figure 4.

![Sequence Diagram](image)

**Figure 4.** Sequence Diagram

4.3. Application Design of Granting of Scholarships with AHP Method
The Application Design of Granting of Scholarship with AHP Method can be seen in figure 5.

![Scholarship Selection Table](image)

**Figure 5.** The Application Design of Granting of Scholarship with AHP Method

4.4. Discussion
The existence of the information system of determining the giving of students by AHP method can facilitate the Yayasan Seri Amal St. Ignatius in determining the eligible students to obtain students based on criteria: economic ability, academic achievement, organizational liveliness, and non-academic achievement.
Future research is expected to increase the ability of determining the provision of students when decision makers make decisions in conditions that contain doubt and uncertainty.

5. Conclusion
The conclusions drawn from the results of this study are as follows. First, the determination of scholarship with the manual process tend to be subjective. Second, the determination of scholarships with AHP method can assist the school in determining the students who are eligible to receive the scholarship. Third, the accuracy of the determination of scholarships with AHP method is quite high.

Acknowledgement
This work was funded by the Grant of Ministry of Research, Technology, and Higher Education (KEMENRISTEKDIKTI) of the Republic of Indonesia.

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