Analysis Of Decision Support Systems for Candidate Selection Scholarship Recipients Using TOPSIS Method

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Abstract. The high cost of completing education is one of the problems that exist in Indonesia. In order to solve this issue, one of the things that can be done is to provide scholarship assistance to students who excel or are less able. In every educational institution, especially in high school (SMA), there are many scholarships offered to students who excel and less fortunate students. With so many students who want to get these scholarships, a decision support system is needed to receive scholarships as expected. The current manual system can be inaccurate, considering that several criteria must be carefully considered. The average value of report cards, behavior, attendance, the amount of parental income, and the number of dependents of parents are all criteria that must be considered when evaluating prospective scholarship recipients. This study uses the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method to select scholarship recipients. The objectives of this study are how to develop a Decision Support System model with the TOPSIS methods for determining exemplary student for scholarship.

Keywords: Decision Support System; TOPSIS; Scholarship

1 Introduction

Scholarships are assistance given by certain parties to help someone for the continuity of the educational pursuit. The scholarship is given to someone who has achievements in academic, non-academic or weak economic abilities and who has met the requirements determined by the school [1]. Providing scholarships for outstanding children is very important because it can help keep students studying. However, there are still many obstacles in its implementation, so the distribution of scholarships is often not right on target. This is because the selection of scholarship recipients still uses the manual method has not used a system or way to assist in making decisions, so it takes a long time in the decision-making process [2, 3].

The selection process for receiving scholarships at Senior High Schools starts from the registration of prospective participants, and then the assessment process is carried out manually, namely the assessment process that has not used a computerized system, so it takes quite a long

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time. The weakness of this manual method, namely the lack of accuracy and objectivity of the assessment, will result in results that are not on target. The selection of scholarship recipients is carried out to select prospective students who are outstanding and financially underprivileged by meeting the requirements or criteria that have been determined. The conditions that must be considered in assessing future scholarship recipients are the average value of report cards, behavior, attendance, the amount of parental income and the number of dependents of parents.

The more criteria that must be considered in the decision-making process, the relatively difficult it is to decide on a problem. Moreover, the decision-making effort of a particular issue, in addition to considering various criteria, also involves several decision-makers (multiple criteria decisions making). The application of a Web-based Decision Support System for the selection of scholarship recipients aims to make decisions taken quickly, accurately and not subjectively, so that scholarship recipients are obtained following the established criteria [4, 5].

Given the importance of distributing scholarships on target, a decision support system for selecting prospective scholarship recipients in high school is required to help simplify and minimize errors in decision making that will result in the distribution of scholarships that are not on target. Based on the above problems, the algorithm used in the decision support system for selecting scholarship recipients is the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS). The TOPSIS algorithm was chosen because it is a form of decision support algorithm based on the concept of decision-making techniques from several available alternative choices that aim to determine a positive ideal solution and a negative ideal solution [6, 7].

The Decision Support System can be used as a system that can assist in making decisions effectively and efficiently. A Decision Support System (DSS) is one of the artificial intelligences branches, part of a computer-based information system. The computer application issues a decision to be considered by the user or the user. Decision making is an essential step so that the results obtained will be as expected, with the help of decision-making methods, it can be done more efficiently, and the results obtained can also be more satisfying [8].

2 Research Methods

In this study, the researcher applied several methods to solve the problem. The research method used is by (a) literature study, at this stage, it is done by reading and studying reference books, scientific works and other sources from the internet. (b) At this stage, research, analysis and data collection will be carried out to obtain data directly from high school seniors, such as collecting documentation samples and interviews with competent parties in scholarship matters. (c) Program implementation (Coding), at this stage, the program coding is carried out to implement the design of a decision support system using the PHP programming language. (d) Testing: At this stage, the system is tested to determine whether the system is following the needs [9, 10].

The description of the recommended requirements is converted into a logical and physical system specification at the design stage. The logical design phase in the SDLC where all the functional features of the system are selected from the analysis phase, are described separately from the computer platform that will be used. The results of this stage are (a). Functional description of the data and processes present in the new system. (b) A detailed description of the system specifications, including inputs, outputs and processes. In this physical design phase, logical specifications are turned into technical details by which programming and system development can be completed. The results of this system are (a) Technical description (b) A detailed description of the system specification includes programs, files, network and system software [11]. At the design stage, there are several main activities carried out, namely:

- Designing application architecture
- Designing the user interface
- Design and integrate database
- Making prototypes
- Design and integrate system controls

The next stage is the implementation stage of the SDLC, where at this stage, several things are carried out, such as coding, testing and installation. The output of this stage is the source code and training procedures [12, 13].

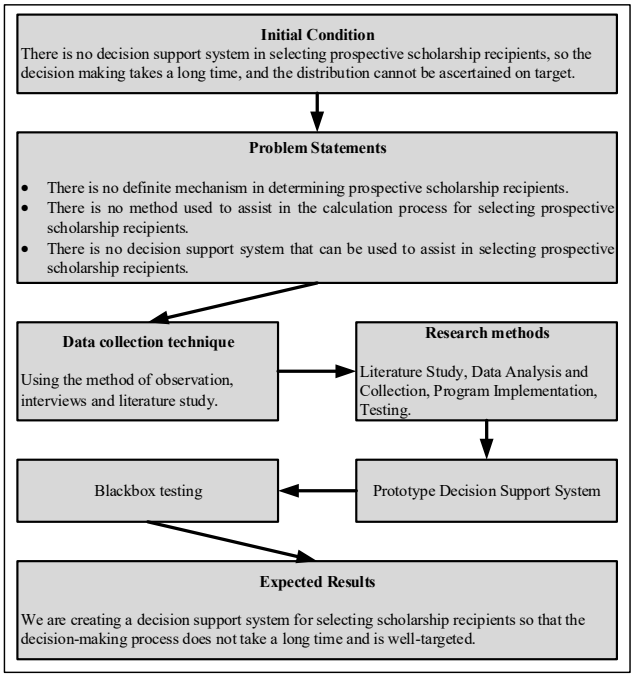

Fig 1. Research Framework

3 Results and Discussion

Implementation is the stage of implementing and testing the system based on the results of the analysis and design that have been done previously. This section implements the design results into a web-based information system application using the PHP programming language and MySQL database. To run this application, you need a computer with a minimum of 512 MB RAM, 20 GB hard disk, Windows 7 operating system. It is recommended to use a browser using Google Chrome to get better results. The use of PHP, Apache Server, and MySQL XAMPP tools makes it easier to configure. Visual Studio Code tools are used as a text editor for designing the user interface.

This page will display the criteria code, criteria name, criteria attributes and actions. In the action section, there are two options, namely, change and delete criteria. The other three additional buttons are print criteria, add criteria and refresh, whose function is to search for criteria data using the criteria name keyword (Fig. 2).

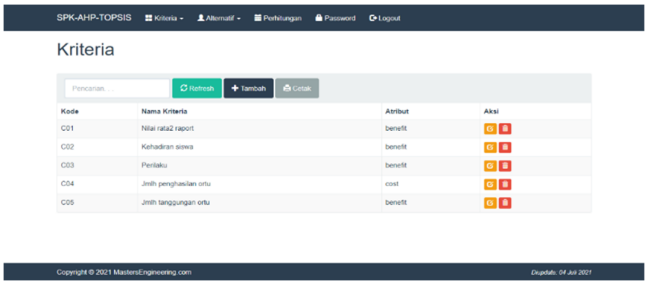

Fig 2. Criteria Data Using

This criterion weight page displays the comparison value of each criterion. On this page, there is also a change button whose function is to modify the value of the comparison criteria (Fig 3).

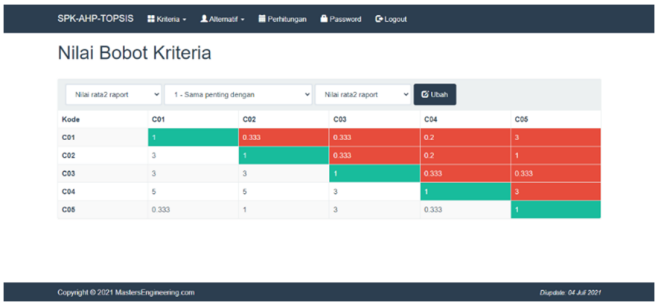

Fig 3. Criteria Value

Criteria data as a basis for assessment of alternatives. The criteria can be in the form of costs or benefits. Benefit means that the greater the value, the better. On the contrary, the lower the cost, the better the value. For example, in the case study of receiving a scholarship, the value of the report card is a benefit because the greater the value of report card, greater the chance of being selected. Meanwhile, the cost is the income of the parents because if the income of the parents is significant, it will reduce the opportunity to get a scholarship [14].

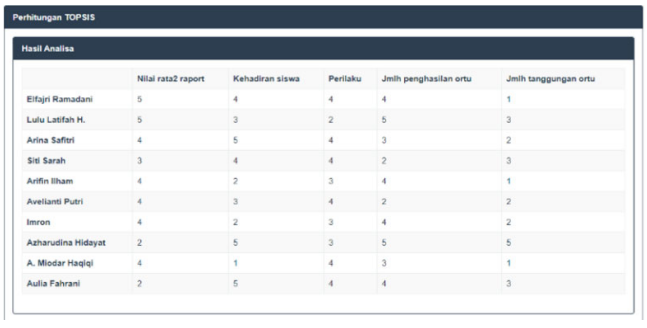

Fig 4. Topsis Calculate

Normalisasi Terbobot

	C01	C02	C03	C04	C05
A1	0.05061	0.04148	0.06143	0.14364	0.01946
A10	0.05061	0.03111	0.03071	0.17955	0.05838
A2	0.04049	0.05186	0.06143	0.10773	0.03892
A3	0.03036	0.04148	0.06143	0.07182	0.05838
A4	0.04049	0.02074	0.04607	0.14364	0.01946
A5	0.04049	0.03111	0.06143	0.07182	0.03892
A6	0.04049	0.02074	0.04607	0.14364	0.03892
A7	0.02024	0.05186	0.04607	0.17955	0.0973
A8	0.04049	0.01037	0.06143	0.10773	0.01946
A9	0.02024	0.05186	0.06143	0.14364	0.05838

Fig 5. Weighted normalization

TOPSIS ranking menu, this menu is a menu that contains the final results of the assessment using the TOPSIS method. This menu can be accessed by clicking the ranking button on the main menu, and three menus will appear that can be selected, then the results of the assessment of each method will appear.

Perangkingan

	Total	Rank
A1 - Elfajri Ramadani	0.491	7
A10 - Lulu Latifah H.	0.309	9
A2 - Arina Safitri	0.575	4
A3 - Siti Sarah	0.663	3
A4 - Arifin Ilham	0.548	5
A5 - Avelianti Putri	0.728	1
A6 - Imron	0.494	6
A7 - Azharudina Hidayat	0.195	10
A8 - A. Miodar Haqiqi	0.69	2
A9 - Aulia Fahrani	0.387	8

Cetak

Fig.6. Ranking

System and Program Trial

Tests are carried out to ensure that the system created is not error-free. The testing method used is the application testing method using a black box testing approach. With black-box testing, the tester views the program as a black box and is entirely indifferent to the program's internal structure or system. Testing this model is carried out to show that the system has been running correctly, namely the input, process and output according to needs.

No	Class Test	Item Test	Type of Test	Results
1	Login	Input username & password	*Black Box*	Accepted
2	Processing criteria data	• Add data • Change data • Clear data • Print data • Data Search	*Black Box*	Accepted

No	Class Test	Item Test	Type of Test	Results
3	Alternative data processing	• Add data • Change data • Clear data • Print data • Data Search	*Black Box*	Accepted
4	Processing of criteria weight comparison values	Change the criterion weight comparison value	*Black Box*	Accepted
5	Alternative weight value processing	• Change alternative weight value • Data Search	*Black Box*	Accepted
6	Calculation Process	• Measuring the consistency of criteria • Calculation of TOPSIS method	*Black Box*	Accepted
7	Password	Change password	*Black Box*	Accepted
8	Logout	Redirect to login form	*Black Box*	Accepted

4 Conclusion

Based on the research described above, it can be concluded that (a) the existence of a decision support system indirectly creates a definite mechanism in the selection process for prospective scholarship recipients, using predetermined criteria and weights. (b) The application of the TOPSIS method in making a decision support system application for the selection of prospective scholarship recipients at senior high school has been successfully implemented, namely by determining the criteria used as a reference for decision making, rating the suitability of each alternative on each criterion, assigning weights to each criterion, performing normalization of the matrix. The last process is to do a ranking to find the most significant value from each alternative to determine the scholarship recipients' prospective students. (c) With the application of a decision support system for the selection of prospective scholarship recipients at senior high school, it is hoped that in the future, it will assist the school in selecting prospective scholarship recipients effectively and efficiently and on target.

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