

The Implementation of Weighted Products in the Support System of Scholarship Acceptance Decisions at the MA AL-Falahiyah AL-Asytari

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Abstract

Scholarships are a form of appreciation given to individuals in order to continue their education to a higher level. The scholarship program held to ease the burden on students in pursuing a period of study. Especially in matters of cost. MA Al-Falahiyah Al-Asytari organizes a scholarship program for students based on criteria determined by the school. The need for a scholarship naming decision system is one of the core needs so that the selection of scholarship acceptance is more objective and practical. Development of a Decision Support System (DSS) using the Weighted Product model chosen because it was able to select the best alternatives from several alternatives and their advantages in weighting techniques. In designing the system using Unified Modeling Language (UML) and making applications using PHP and MySQL as a database. From the research the authors have described, it concluded that the weight product method could use as one method in developing a decision support system for scholarship recipients at the MA Al-Falahiyah Al-Asytari, by inputting data from students who submit scholarships to calculating grades based on criteria which specified

Keywords: Decision Support System; Weighted Product; Scholarship Acceptance; Waterfall; UML

1. Introduction

School is a significant thing for human life in the absence of school, so the quality of public education in Indonesia disrupted. The life he lives will also not be guaranteed; there is much unemployment everywhere because the knowledge he has is unable to meet the desired standards. Generally, school is an educational institution that is formal, non-formal or informal, which is established by the state or private that designed to teach, educate through the education that has been given by educators. To make a school must have adequate facilities and infrastructure such as study rooms, libraries, office spaces, mosques, computer rooms or others. Besides, schools must also have programs that can support teaching and learning activities, one of which is a scholarship program.

Scholarships are a form of appreciation given to individuals in order to continue their education to a higher level. The award can be in the form of specific access to an institution or an award in the form of financial assistance (Murniasih, (2009)). Government institutions,

companies or foundations can give scholarships. School-based scholarships are a work program in every school. The scholarship program held to ease the burden on students in pursuing a period of study. Especially in matters of cost. Scholarships gave to students selectively according to the type of scholarship held. Scholarships are income for those who receive and the purpose of the scholarship is to help ease the burden of the educational costs of students who get scholarships. MA Al-Falahiyah Al-Asytari is one of the madrasas at the level of senior high school in the city of Tangerang, which organizes a scholarship program for students based on criteria determined by the school. The selection process for scholarship recipients at MA Al-Falahiyah Al-Asytari is still experiencing problems in the decision-making process. This is because there is no objective method to decide quickly. The need for a scholarship naming decision system is one of the core needs so that the selection of scholarship acceptance is more objective and practical.

According to Surbakti in Septarini (2017), Decision Support is defined by "Interactive

computer-based systems that help decision-makers utilize data and models to solve unstructured problems. DSS exploits the resources of individuals intellectually with computer capabilities for management decision making related to semi-structured problems".

This system used to help make decisions in semi-structured and unstructured situations. Development of a decision support system (DSS) using the Weighted Product model chosen because it was able to select the best alternatives from several alternatives and their advantages in weighting techniques. The choice of this method based on computational complexity that is not too difficult so that the time needed to produce calculations is relatively short.

Research related to the decision support system title carried out including Taufiq & Sugiharto (2011) research on decision support systems with multiple criteria has a positive impact on agencies, in order to accelerate and improve accuracy in the employee performance appraisal process. Taufiq et al. (2020), by using a decision support system, it will get the advantage of being easy to access, faster and more precise in the process undertaken. Septarini (2017), not only in the world of education, but decision support systems can also use in various fields, such as the calculation of the amount of production and Septarini et al. (2018) research in determining the quality of service at a workshop.

Based on the description above, this decision support system expected to provide input for schools to determine the decisions taken in selecting students who are entitled to receive scholarships based on predetermined criteria. This system also expected to overcome several problems that occur due to manual data file storage, such as the risk of substantial losses and the need for a place to store the data.

2. Research Methods

The research began with data collection using interviews, observation and literature studies. In designing the system using Unified Modeling Language (UML) and making applications using PHP and MySQL as a database. As for the sample of the data in this study is the data available at the MA Al-Falahiyah Al-Asytari, which includes student personal data based on the main criteria needed, as well as weighting the criteria obtained from the results of interviews and observations. The system developed in this study used the waterfall model. The depiction of the Waterfall

method, according to Sommerville (2011) can see in Figure. Following the steps in the waterfall, the system development done in the following order: 1) Definition and analysis of needs; 2) System and software design; 3) Implementation and Unit testing; 4) Integration and Testing Systems; 5) Operations and maintenance

Because of it classified as practical in its implementation, this method widely used in the design of a system application.

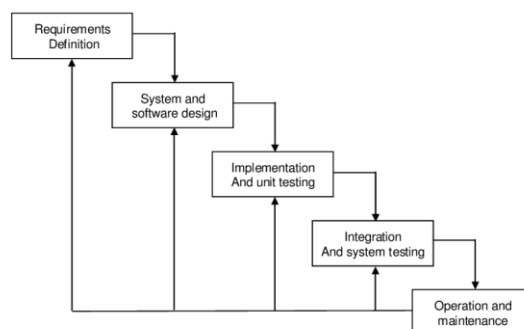


Figure 1. Waterfall Sommerville Method

In this study, it can explain that the current system at MA Al-Falahiyah Al-Asytari includes six criteria, namely the average value of the last report card, attendance, attitude and activeness in extracurricular activities. Following is the process of receiving scholarships at MA Al-Falahiyah Al-Asytari.

1. Scholarship selectors provide a scholarship form to the homeroom teacher, then students who will submit the scholarship request a form.
2. After students get the scholarship form, students fill out the form entirely and signed by parents, and attach a photocopy of the latest report card grades, then collected at the homeroom teacher.
3. Homeroom teacher checks the completeness of the form; if the form filled in and the requirements are incomplete, the form is returned to students to complete again.
4. After all, forms have been collected at the homeroom teacher and completed; the scholarship forms returned to the scholarship selection team.
5. After the scholarship selectors receive the scholarship submission form, the scholarship selection team processes the selection of scholarship recipients.
6. After it has decided who is entitled to get a scholarship selection scholarship archives, the

scholarship recipient's data and gives announcements to students.

3. Analysis and Discussion

3.1 Analysis of the Current System

Based on research conducted at MA Al-Falahiyah Al-Asytari, it can describe as follows:

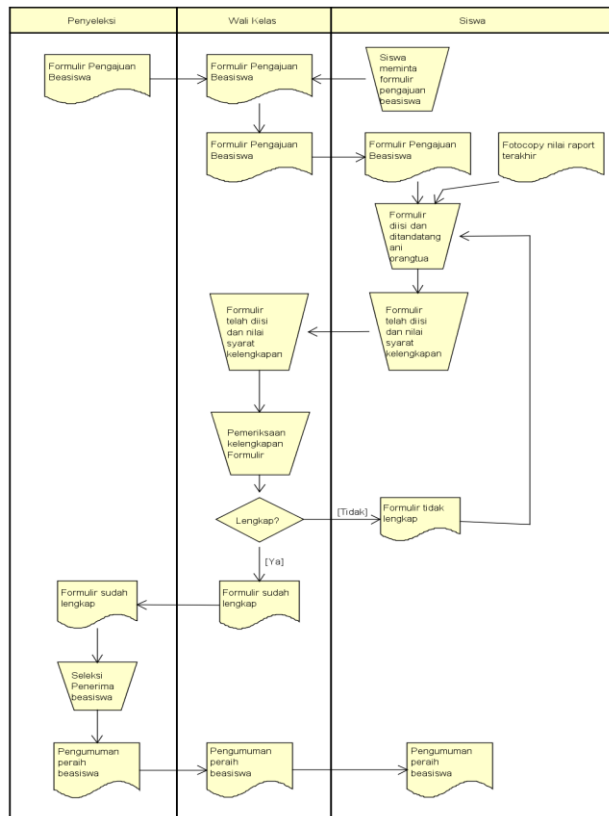


Figure 2 Current System Flowchart

3.2 Proposed System Design

A. System Requirements Analysis

1. Weight Product Method

In the process of the Weighted Product method, criteria needed to use as material for calculations in determining scholarships. The criteria for determining scholarships can see in the table below:

Table 1. Criteria

Criteria	Information
C1	Report Card Average Value
C2	Attendance
C3	Attitude
C4	Extracurricular

The importance / compatibility rating of each criterion is assessed by 1 to 5, namely: 1 =

Very Low, 2 = Low, 3 = Enough, 4 = High, 5 = Very High

Next decision making Giving preference weight and type of criteria for each criterion as W (initial weight) can see in the following table:

Tabel 2. Weight Criteria

Criteria	Level of Importance	Weight	Type
C1	Very high	5	Benefit
C2	Medium	3	Cost
C3	Medium	3	Benefit
C4	Low	2	Benefit

The value of each alternative in each criterion:

Table 3. Alternatives

Alternatives	Criteria			
	C1	C2	C3	C4
Ajay Hidayat	4	3	4	4
Junariah	4	2	4	4
Meta Noviyanti	3	3	4	4
M. Fajri	4	1	4	4
Nurdianah	4	2	4	4
S. Ramadhan	4	3	4	4
Samsiyah	4	2	4	4
Siti Masiroh	3	3	4	4
Sri Tristiani	3	2	4	4
Sutrisna	3	4	4	4

Perbaiki Bobot

$$W_1 = \frac{5}{5+3+3+2} = 0,38$$

$$W_2 = \frac{4}{5+3+3+2} = 0,23$$

$$W_3 = \frac{4}{5+3+3+2} = 0,23$$

$$W_4 = \frac{2}{5+3+3+2} = 0,15$$

Then Vector S can be calculated as follows:

$$S_1 = (4^{0,38})(3^{-0,23})(4^{0,23})(4^{0,15}) = 2,2543$$

$$S_2 = (4^{0,38})(2^{-0,23})(4^{0,23})(4^{0,15}) = 2,4754$$

$$S_3 = (3^{0,38})(3^{-0,23})(4^{0,23})(4^{0,15}) = 2,0182$$

$$S_4 = (4^{0,38})(1^{-0,23})(4^{0,23})(4^{0,15}) = 2,9048$$

$$S_5 = (4^{0,38})(2^{-0,23})(4^{0,23})(4^{0,15}) = 2,4754$$

$$S_6 = (4^{0,38})(2^{-0,23})(4^{0,23})(4^{0,15}) = 2,4754$$

$$S_7 = (4^{0,38})(2^{-0,23})(4^{0,23})(4^{0,15}) = 2,4754$$

$$S_8 = (3^{0,38})(3^{-0,23})(4^{0,23})(4^{0,15}) = 2,0182$$

$$S_9 = (3^{0,38})(2^{-0,23})(4^{0,23})(4^{0,15}) = 2,2161$$

$$S_{10} = (3^{0,38})(4^{-0,23})(4^{0,23})(4^{0,15}) = 1,8885$$

The Vector V value that will be used for ranking can be calculated as follows:

$$V_1 = \frac{2,2543}{23,2017} = 0,0971 \quad V_2 = \frac{2,4754}{23,2017} = 0,1066$$

$$V_3 = \frac{2,0182}{23,2017} = 0,0869 \quad V_4 = \frac{2,9048}{23,2017} = 0,1251$$

$$V_5 = \frac{2,4754}{23,2017} = 0,1066 \quad V_6 = \frac{2,4754}{23,2017} = 0,1066$$

$$V_7 = \frac{2,4754}{23,2017} = 0,1066 \quad V_8 = \frac{2,0182}{23,2017} = 0,0869$$

$$V_9 = \frac{2,2161}{23,2017} = 0,0955 \quad V_{10} = \frac{1,8885}{23,2017} = 0,0813$$

The most significant value is in V4 so that Muhammad Fajri's alternative chosen as the best alternative.

2. Analysis of Non-Functional Needs

The software specifications used to run this system are:

- a) Windows 7 operating system
- b) XAMPP
- c) Browser

A. Text editor Analysis of Functional Needs

The functional requirements for this system are:

- a) The system can log in and log out
- b) The system can create, read, update, delete criteria, sub-criteria, and alternatives
- c) The system can calculate weighted products
- d) The system can display the results of weighted product calculations
- e) The system can change the password
- f) The system can export data design

1) Use Case Diagram

In developing this system consists of a menu of criteria, sub-criteria, alternatives, and can do calculations using the weighted product method. The results gave in the form of ranking of alternatives to the criteria. Users of this system consist of the Administrator level and vice principal level, as illustrated in the Usecase diagram below.

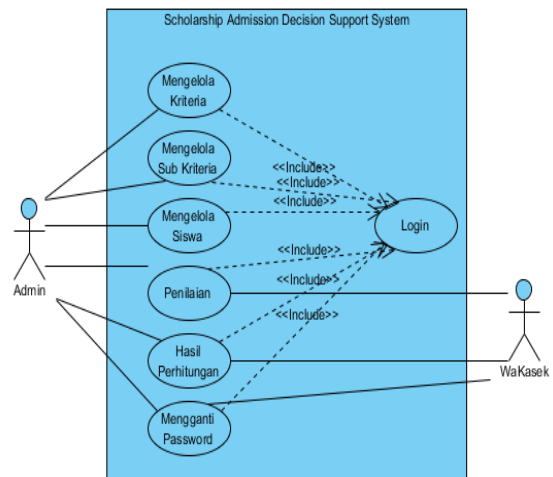


Figure 3. Use Case Diagram

The use case picture above explains the two system user users that will design. The first user is the Administrator who can manage criteria, manage sub-criteria, manage the system, make an assessment, get the calculation results, replace the password and finally log out for the second user, vice-principal. Where he can get the results of calculations, change passwords and logout. Both users must be able to access the information first by logging in.

2) Class Diagram

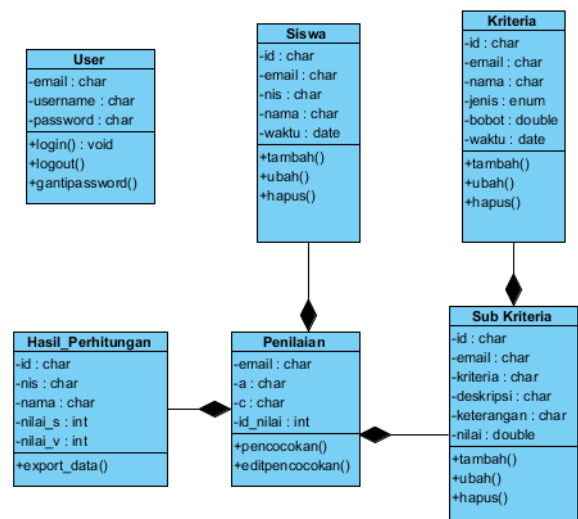


Figure 6 Class Diagram

In the class diagram, three tables are consisting of the User table, the Student table, the Criteria table, the Sub Criteria Table, the Rating table and finally the calculation table. Each table has fields that have been adjusted according to needs so that the database load is not too heavy.

B. Implementation

1) Login

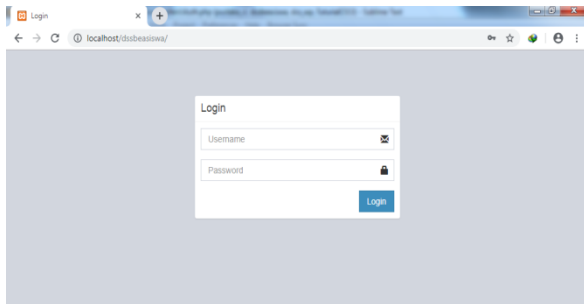


Figure 7. Login

Figure 7 above explains the user login to the system, where two users will log in to this system. The first user is the admin, and the second user is the vice-principal. After logging in if appropriate, it will go to the main page as below.

2) Dashboard

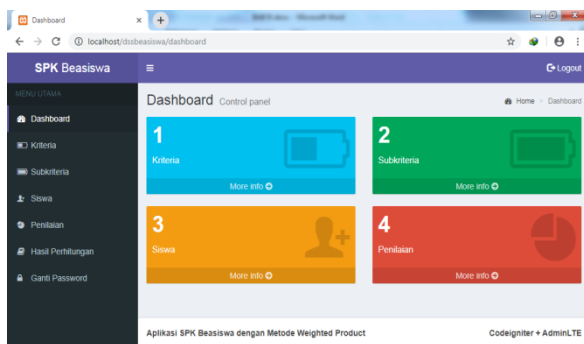


Figure 8. Dashboard

Figure 8 above is the main view where there are four links to choose. The four links are criteria, sub-criteria, students and assessment. Next on the left, there is a new calculation result menu and change the password.

3) Criteria

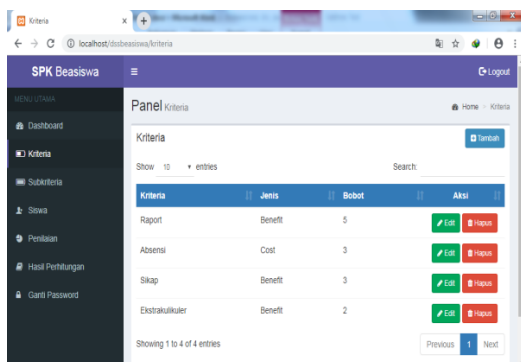


Figure 9. Criteria

Figure 9 above is a display of the form to determine the criteria and weight given. Criteria and weights that inputted, if there is an error, it can be changed by editing the menu. Alternatively, even if it does not use anymore, the criteria that have inputted can be deleted. Also, there are types of benefits or costs where it is crucial for the weighted product method.

4) Subcriteria

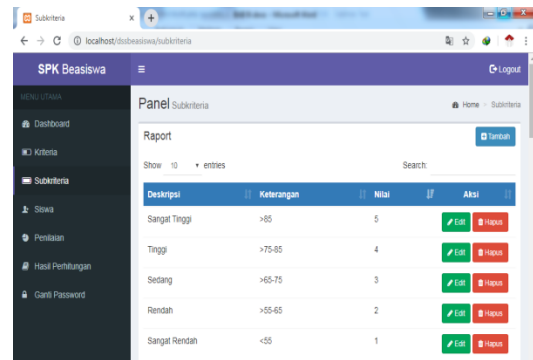


Figure 10. Subcriteria

Figure 10 sub-criteria above is a form that functions to input sub-criteria. The ability of the form can receive input, value and action. Student data

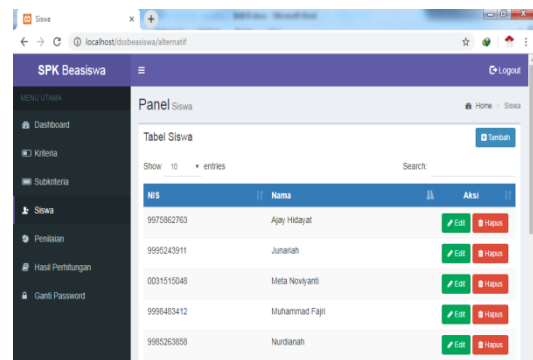


Figure 11. Student Data

The system data form above contains student data consisting of the Student Identification Number and the Last Name and column, namely action wherein this action there are two functions, namely, edit and delete.

5) Assessment

NIS	Nama	Report	Absensi	Sikap	Ekstrakurikuler	Aksi
003115048	Meta Noviyanti	3	3	4	4	[Edit]
9975862763	Ajly Hidayat	4	3	4	4	[Edit]
9962950059	Sudrana	3	4	4	4	[Edit]
9985263858	Nurdianah	4	2	4	4	[Edit]
9988769316	Siti Trisnani	3	2	4	4	[Edit]

Figure 12. Assessment

Figure 12 about the assessment serves to give the value of each student. Where besides, there are student data, there is a value input consisting of report cards, attendance, attitudes, extracurricular. Each point can give a maximum value of point 5.

6) Weight conversion

Kriteria	Jenis	Bobot	Nilai
Report	Benefit	5	0.38461538461538
Absensi	Cost	3	-0.23076923076923
Sikap	Benefit	3	0.23076923076923
Ekstrakurikuler	Benefit	2	0.15384615384615

Figure 13. Weight Conversion

Weight conversion image above functions to convert from numbers that have entered. The conversion process uses the formula that is in the weighted product. From the numbers 2 or 3 or 5 after conversion, the results obtained are 0,

7) The calculation results

NIS	Nama	Vektor S	Vektor V	Keterangan
9968483412	Muhammad Fajri	2.9543457122267	0.12519742119876	Berhasil
9995243911	Jurani	2.4754625706109	0.10669077176037	Berhasil
9965263858	Nurdianah	2.4754625706109	0.10669077176037	Berhasil
9988717851	Sahri Ramadhani	2.4754625706109	0.10669077176037	Berhasil
9992277931	Samsyah	2.4754625706109	0.10669077176037	Berhasil
9975862763	Ajly Hidayat	2.2543333333333	0.09716060159655	Gagal
9968769316	Siti Trisnani	2.2461607115227	0.05515421479433	Gagal
003115048	Meta Noviyanti	2.0161020803295	0.06680354733628	Gagal
9999265633	Siti Masriah	2.0102000032295	0.06680354733628	Gagal

Figure 14. The calculation results

Figure 14 above explains the final results after inputting the student's identity, criteria and weights, sub-criteria and weights, carried out the conversion and determined the limits of success or failure. The rightmost column gives a sequence of success or failure of the student in getting a scholarship.

4. Conclusion

From the results of research, the authors have concluded that the weight product method can use as one method in developing a decision support system for scholarship recipients at the MA Al-Falahiyah Al-Asytari, by inputting data from students who submit scholarships to calculating grades based on criteria which have specified. As the development of this system, it expected not only to be web-based but also mobile-based.

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