Bidikmisi Scholarship Selection in
UIN Sunan Kalijaga Using Profile Matching Method

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Abstract—An objective process is needed in the selection of Bidikmisi Scholarship in UIN Sunan Kalijaga Yogyakarta, so the selected recipients are not misdirected and meet the established criteria. At present, the process is still manual so it requires a long time and triggers some errors. For this reason, a decision support system is needed to increase the efficiency and effectiveness of the ongoing selection process. The method used is Profile Matching. The method matches the profile of the new registrant with the ideal profile of the scholarship recipient. The matching results will provide recommendations for applicants who are eligible to award Bidikmisi Scholarships. There are 4 aspects used for calculations: parents, students, house and the interview. From these aspects, it will be divided into 28 criteria with a range of criteria according to the predetermined criteria. System testing is done by Alpha and Beta testing, the results show that the system can function properly as expected. The system provides results as recommendations for candidates through ranking from the final results of system calculations.

Keywords-Bidikmisi; Decision Support System; Profile Matching

I. INTRODUCTION

Bidikmisi Scholarship is an educational assistance program for high school or equivalent graduates who have good academic potential and are economically disadvantaged. Bidikmisi assistance is given for 4 years (8 semesters) [1]. The implementation of this scholarship at UIN Sunan Kalijaga is organized by the committee under the coordination of the Ministry of Religion Affairs of the Republic of Indonesia, as the funder. Selection criteria are determined based on the completeness of the requirements and the suitability of the criteria from several predetermined aspects.

At present the Bidikmisi selection process still uses manual methods so it takes a long time, and errors often occur. For this reason, a decision support system is needed that can provide consideration to determine applicants who are eligible for this Scholarships. The system contains criteria from several aspects that are used as references for selection assessment. The aspects that are taken into consideration are aspects of parents, students, home conditions and interviews.

The method used in this study is Profile Matching which is a method of decision making by comparing criteria data owned by the registrant to ideal criteria determined by the organizer. From the comparison process, it can be obtained the difference or gap. Then the results of the gap are processed into the final value for consideration in the acceptance of Scholarships.

II. THEORETICAL BASIS USE

A. Decision Support System

Decision Support System (DSS) is a computerized system which helps decision makers by utilizing data and models to solve a problem. This system is used in semi-structured situations and unstructured situations.[2] DSS is also adaptive and flexible which is able to adapt to various conditions and easy to update.

Key characteristics and capabilities of a DSS are support for decision making by including human assessment and computerized information. Support for decisions is independent and sequential. In the process of making a DSS, there are several components that must be fulfilled [3], namely:

1) Data Management: storage of relevant data for various situations and in management by Database Management Systems (DBMS).

2) Model Management: a software system in which there are various types of models, including financial, statistical, management science, or other quantitative models that provide the analytical capabilities and management software needed.

3) User Interface: users can communicate and give orders to the Decision Support System. The purpose of the interface includes all aspects of communication with the system.

4) Knowledge Management: it is about the availability of knowledge set to solve complex, unstructured and semi-structured problems. The knowledge is like expert systems or other intelligent systems.

B. Profile Matching

The Profile Matching Method is a decision-making mechanism by assuming that there is an ideal level of predictor variable must be owned by the registrant. It is not only fulfilling or passing the minimum level of a criterion, but also matching the criteria. This matching profile works by comparing the individual competencies with the competency requirements of the scholarship recipients so they can know the gap. The smaller the gap produced, the greater the weight of the value, which means that scholarship applicants have a great opportunity to get scholarships [2].

The initial stage of the Profile Matching method is to calculate the gap value for each criterion by using Formula (1):

$$Gap = Value\ criteria\ for\ registrants - Ideal\ criteria \qquad (1)$$

The second stage is the weighting of values according to the gap provisions as in Table I.

TABLE I. VALUE AND WEIGHT OF GAP

Gap	Information	Weight
0	Individual competencies are relevant to needs	5
1	Individual competencies are over 1 level	4.5
-1	Individual competencies lack 1 level	4
2	Individual competencies are over 2 levels	3.5
-2	Individual competencies lack 2 levels	3
3	Individual competencies are over 3 levels	2.5
-3	Individual competencies lack 3 levels	2
4	Individual competencies are over 4 levels	1.5
-4	Individual competencies lack 4 levels	1
5	Individual competencies are over 5 levels	0.5
-5	Individual competencies lack 5 levels	0

The third step is calculating and grouping core factors (main factors) and secondary factors (supporting factors). Core factors are the criteria most needed in determining eligible applicants. While secondary factors are supporting factors for core factors [4]. The formula for calculating core factors as in Formula (2):

$$NFC = \frac{\sum NC}{\sum IC} \qquad (2)$$

Information:
NCF : Average value of core factor aspects
NC : The total number of core factor values in an aspect
IC : Number of core factor items in an aspect

The formula for calculating secondary factors is as in Formula (3):

$$NSF = \frac{\sum NS}{\sum IS} \qquad (3)$$

Information:
NSF : Average value of the secondary factor
NS : Total number of secondary factor values in an aspect

IS   : Number of items secondary factor in an aspect

The fourth step of the Profile Matching method is the calculation of the total value of each aspect. The formula for calculating this total value is as in Formula (4):

$$NT = (x)\%NCF + (x)\%NSF \qquad (4)$$

Information:
NT   : Total aspect value
NCF : Average core factor value
NSF : Average value of secondary factors
(x)% : Percent value for each factor class

The final step of the Matching Profile is the determination of the final value or ranking of each prospective scholarship recipient to get a scholarship. The calculation formula as in Formula (5):

$$\textit{Final Value} = (x)\%*NT(1) + (x)\%*NT(2)…+ (x)\%*NT(n) \qquad (5)$$

Information:
NA   : Final selection value
NT   : The total value of each aspect
(x)% : Percentage ranking

III. METHOD

A. Data Collection

Data collection for this study uses several methods, namely: observation, interviews, and literature. Observation is carried out by observing directly the object to be examined, namely the selection process that is being carried out in the Field of Student Affairs at UIN Sunan Kalijaga. Interviews were carried out on the Bidikmisi Assistance Program Committee, to determine the problems faced as an introduction to the object to be studied. Literacy of this research comes from books, previous research, magazines, newspapers or websites. The data sought is related to the problem, design, and implementation of the system.

B. System Development Methodology

From the results of data collection, then the system is developed using the waterfall method of the System Development Life Cycle (SDLC) model. This method consists of stages that provide convenience if at one stage is not appropriate or has an error it can return to the previous stage. The stages of this waterfall method are Planning, Analysis, Design, Implementation, and Testing.[5]

IV. ANALYSIS

This stage of analysis aims to find out and identify problems and tools are needed in the system development process. from this stage, it is also mapped about what systems will be developed. The results of the analysis are as follows:

A. System user analysis

The decision support system that will be made has three types of users with different access rights. The three users are students/registrants, admin/committee, and interviewer/deputy dean.

B. Analysis of Functional Requirements

Functional requirements obtained from problem analysis are as follows:

1) The system is able to store data on Bidikmisi scholarship applicants conducted by students with online registration.

2) Admin can manage master data criteria, aspects, gaps, interviewers, periods, and quotas.

3) The interviewer can input the value as a result of the interview test

4) The system is able to provide registrant recommendations in accordance with the ranking of the final calculation with the Profile Matching.

5) Admin can get a report on the results of the selection process.

C. Analysis of Non-Functional Requirements

Non-Functional Needs are needs beyond the functional requirements of the system, including:

1) Operations, systems that are made based on the Web so that they can be accessed anywhere.

2) Convenience, in this system users, can easily understand the features that exist because the system is made with a simple and attractive appearance.

3) Security, in order to be able to use this system user, is required to log in first in accordance with different access rights.

D. Analysis of Profile Matching Calculation

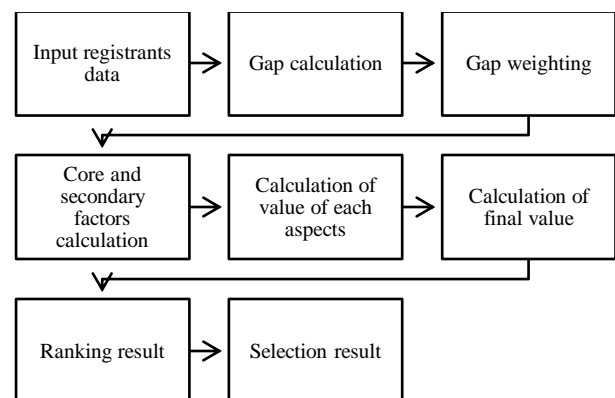The stages in the profile matching method are described in the following diagram (figure 1):

Figure 1.   Profile Matching Calculation Workflow

Figure 1 is known that First stage is input data criteria for the registrant and comparing with the ideal criteria. The

difference from the comparison is called the gap, where the smaller the gap has the higher the weight value. The second stage is the weighting of the gap value. This step is done by replacing the gap value that has been obtained with the weight of the value set by the admin. The third step is the calculation and grouping of core factors and secondary factors.

Before the calculation is done, admin first determines the criteria included whether the core factor or secondary factor and determines the ideal value of each criterion. In this study, the criteria and ideal values are determined for core factors and secondary factors as in Table II.

TABLE II. CRITERIA OF EVALUATION

Aspect	Type of Criteria	% factor	Criteria	Ideal value
Parent	*Core Factor*	80%	Parent income	4
			Parent education	3
			Parent occupations	4
	Secondary Factor	20%	Number of family dependents	2
student	*Core Factor*	80%	National exam average value	4
			Average of graduation score	4
			Achievement Academic	4
	Secondary Factor	20%	Non-academic achievements	3
House Condition	*Core Factor*	70%	Tax payment/year	4
			Electricity bill/month	4
			House area	4
			Surface area	4
			Homeownership	3
			Distance to city	4
			Water bill/month	4
	Secondary Factor	30%	Wall	4
			Floor	4
			Electricity owner	2
			Water sources	3
Interview	*Core factor*	100%	Knowledge about department	4
			Persistence	4
			Organizational experiences	4
			Idealism	4
			Nationalism	4
			Confidence	4
			Internal factors (independence, etc)	4
			External factors (Family condition etc.)	4
			Fluency in language English / Foreign	4

The fourth step of the Profile Matching method is the calculation of the total value of each aspect performed on file selection and final selection by considering the percentage of each aspect. There are 2 times that Profile Matching is processed, so there are also 2 final values. In the final selection, the final value used as a ranking is the average number of the two final values. It is shown in Formula (6):

$$NA\ Final\ Result = \frac{NA\ File\ Selection + NA\ Interview}{2} \quad (6)$$

V. DESIGN

System design is compiled from the results of system requirements analysis. The design of this system is designed using a use case diagram. This diagram describes the interaction between the system and the environment outside the system. In other words, the use case visualizes who the system user is and how the user interacts with the system. The use case diagram of this system is described in Figure 2.
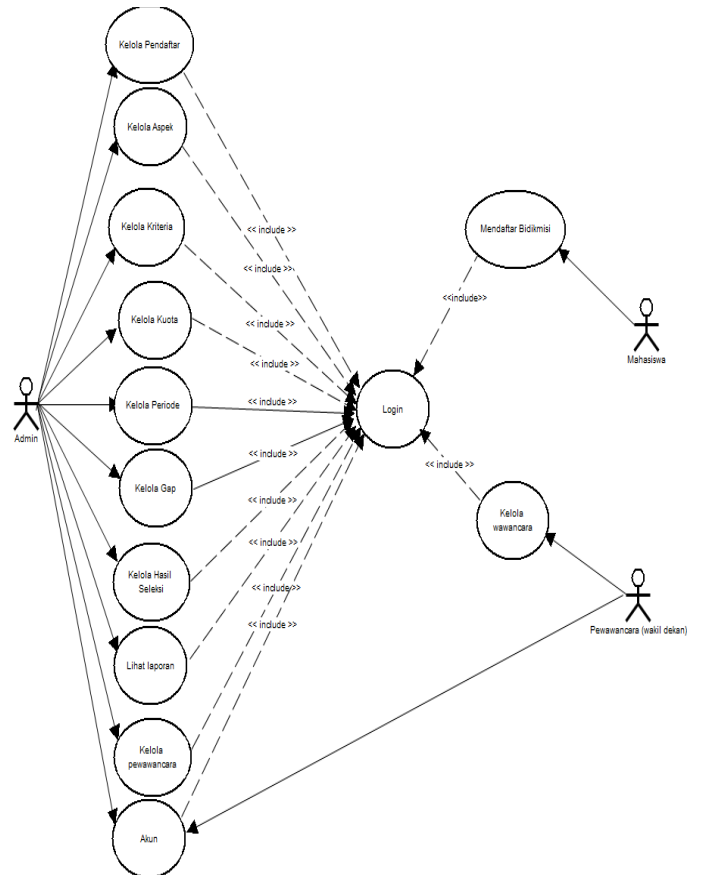

Figure 2. Use Case diagram of the system

Figure 2 describes that students can register Bidikmisi Scholarships, by filling in the registration data. An interviewer can manage each registrant's interview which includes input and updates interview scores and can manage accounts. An admin can manage registrant data, manage aspects, manage criteria, manage quotas, manage period, manage gaps, manage selection, view reports, manage interviewer data and can manage the account. All processes related to the users require a login process.

VI. IMPLEMENTATION AND TESTING

Implementation is a stage of translation of the results of designing a DSS application in the form of lines of program

code. In its implementation, several applications used are as follows:

    programming language : PHP (Laravel framework)
    Database   : MySQL
    User Interface Design : HTML, CSS, and JavaScript

The implementation of the system produces an interface as a means for users to access information systems. Some of these interfaces are: Home page is a page that can only be accessed by users who have successfully logged in. On this home page, users can perform or carry out system functions in accordance with their respective access rights. Implementation of the home page as shown in Figure 3 and Figure 4.
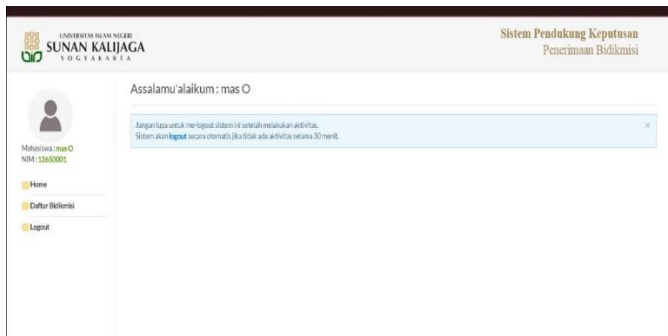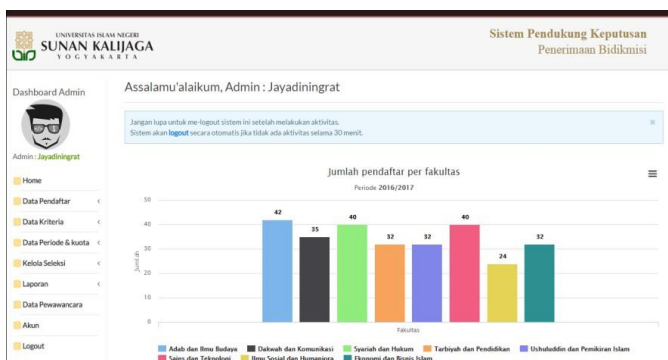

Figure 3.   The home page of Student

Figure 4.   The home page of Admin

After completion, a case trial is conducted to determine whether the assessment carried out by DSS for Bidikmisi Acceptance is in accordance with manual calculations using the Profile Matching method. The scenario performed is as follows:

1)   There are 10 data for Bidikmisi Scholarship applicants.

2)   The registrant's data is then weighted according to the criteria for each aspect.

3)   From these weights, then looked for gaps for each registrant using Formula (1), ie the criteria weight for each registrant is reduced by the ideal criteria, then a gap is obtained for each registrant.

4)   From the gap value obtained, then weighting the gap value based on Table I

5)   From the weight of the gap, the core factors & secondary factors of each aspect are calculated using Formula (2) and Formula (3)

6)   The value of core factor & secondary factor is used to calculate the total value of each aspect by using Formula (4) which produces a total value.

7)   After obtaining the total value of each aspect, the next is to calculate the final score on file selection and the final value of the interview test based on the percentage in table II In calculating the final value using Formula (5).

8)   If the final score on file selection and the final value of the interview test have been obtained, then calculate the final value for the final selection that determines the applicant is accepted not based on Formula (6)

9)   The final step is ranking the final value of the final selection from the highest to the lowest as shown in Table III.

TABLE III.   FINAL RANGKING OF TRIAL PROCESS

Ranking	Id Student	Parent Value	Student Value	House Value	File Value	Interview Value	Final Value
1	16110002	5.00	4.47	4.28	4.67	4.56	4.61
2	16110009	4.27	4.73	4.05	4.39	4.67	4.53
3	16110003	4.33	4.33	4.08	4.28	4.72	4.50
4	16110004	4.40	3.80	4.08	4.19	4.78	4.48
5	16110008	4.33	3.80	3.98	4.08	4.89	4.48
6	16110001	4.00	4.33	3.98	4.11	4.67	4.39
7	16110005	3.93	4.73	3.98	4.22	4.56	4.39
8	16110007	4.47	3.33	4.08	3.99	4.72	4.36
9	16110010	4.27	3.87	4.18	4.11	4.56	4.33
10	16110006	3.73	3.80	4.53	3.92	4.72	4.32

A manual calculation (Table III) gets the same results with the results of calculations using the system built. So that it can be concluded that the system is made feasible to use and successfully applies the Profile Matching method.

System testing is the last stage of this study. The purpose of this test is to ensure that the elements of the system function as expected and in accordance with the design of the system that has been made.

The functional testing system is a test of several functions contained in the system built. This test is conducted to find out whether the functions contained in the system have been running as expected or not. Questions are given with the type yes/no. In addition, usability testing is also done to test the ease of use of the system. Some parts of the system are tested to find out how easy it can be for system users. The criteria used are scale 1-5 to strongly agree to strongly disagree.

Testing in this system involved 10 respondents. The list of system testers can be seen in Table VI.

TABLE IV.   LIST OF RESPONDENTS

No	Occupation	Background	Amount
1	Developer	IT	1
2	Employees	Student affairs	2
3	ICT Trainer	Training	3

4	Students	IT	4
	Total		**10**

Testing is done on system functionality and system reusability. The results of testing the system functionality show that 100% of respondents stated that the system functionality was running well and 0% of respondents said the system functionality did not work well.

Based on the usability testing of the system, it was concluded that the majority of respondents agreed with the system made. Data from the interface testing results state that 65.71% of respondents strongly agree, 31.43% of respondents agree, 2.86% of respondents are neutral, 0% of respondents disagree, and 0% of respondents strongly disagree.

VII. Conclusion

A DSS applying profile matching method has been successfully established for the selection of Bidikmisi Scholarship. This system is able to provide recommendations for eligible applicants with a ranking of the final scores of registrants. Based on the usability testing of the system, it was concluded that the majority of respondents agreed with the system made, stating that 65.71% of respondents strongly agreed, 31.43% of respondents agreed, 2.86% of respondents were neutral, 0% of respondents disagreed, and 0% of respondents strongly disagree.

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