



Implementation of Profile Matching in the Decision Support System for Best Student Selection

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Abstract—The determination of outstanding students is carried out by schools, which provide scholarships to their students in order to provide motivation to improve their academic achievement. The selection of the best students is usually done by looking at the student's report card scores, followed by the homeroom meeting. This is considered not objective and requires a long time to select the best students. Through a decision-support system, the best students can be selected based on the best criteria and alternatives. In a decision support system, a method is needed to determine the best alternative. The profile matching method is considered to have a better level of objectivity because, to measure the value of each indicator, the valuation variable is derived again with sub-indicators and is weighted using assessment parameters. This study aims to solve the problem of selecting the best student through a decision-support system with the output in the form of a ranking using the profile matching method. Based on the calculation of profile matching, it shows that the results of calculating the final score of the best student 1 are a final score of 3.000, the best student 2 gets a final score of 2.955, and the best student 3 gets a final score of 2.693. From the final score, first place in the selection of the best student was Putri Nurlandari with a final score of 3.000.

Keywords: Best Student; Decision Support System; Profile Matching; Ranking; Selection

1. INTRODUCTION

The development of information technology in various fields is inseparable from its role in making, storing, conveying, and disseminating information [1]. The use of electronic devices such as televisions, computers, and smartphones has also made information technology increasingly needed by the wider community. In the field of education, the benefits of information technology come in many forms. From data processing with computers, e-learning, and IT-based task work [2]. The impact is even more pronounced during a pandemic like now, because teaching and learning activities cannot be done directly for a while, these activities now rely on devices such as laptops and smartphones for online teaching to collect assignments. Quality human beings are human resources who are comprehensive in thinking and always anticipate future demands, have a positive attitude, behave commendably, and have insight, and have abilities, skills, and expertise that are in accordance with the needs in various fields and sectors of development [3]. The high and low quality of human resources, among others, is characterized by the presence of elements of creativity and productivity that are realized by the results of good work or performance individually or in groups. Students are the nation's assets in continuing development and continuing the ideals of the nation's previous warriors. The determination of outstanding students is carried out by schools to provide scholarships to their students so that they can provide motivation to improve their academic achievement. The selection of the best students is usually done by looking at the student's report card scores. Then a teacher and homeroom teacher meeting were held to determine the best student. This is considered not objective and requires a long time to select the best students [4], [5]. Through a decision support system, the selection of the best students can be made based on the best criteria and alternatives. In a decision support system, a method is needed to determine the best alternative, the profile matching method is considered to be able to Profile Matching have a better level of objectivity because to measure the value of each indicator the valuation variable is derived again with sub-indicators and weighted using assessment parameters.

Decision Support Systems (DSS) are known as part of knowledge-based information systems and are used in assisting in decision making in companies and organizations [6]. SPK can also be interpreted as a system that provides information, recommends and provides direction to decision makers to determine the best alternative by making rational decisions based on data and facts [7]. In other words, decision support systems provide information, models, and data processing that supports decision making [8]. DSS aims to provide information, guide, recommend and provide direction to the best alternatives to decision makers in order to find the right decision, and can use it to make rational decisions based on the data and informed facts of the system [9]. The decision-making process through DSS begins with the stages of investigating and learning about certain circumstances that require someone to decide something. The next stage is planning, developing, and analyzing the direction of action carried out, including processes to identify problems, solve problems, and test whether or not problem solving is feasible. The next stage is to select, where someone will make the best alternative selection, so that a decision can be realized. The application of DSS will produce a computer-based interactive system, which is able to facilitate decision makers to use data and decision modeling in solving semi-structured and unstructured problems [10].

Research related to the selection of outstanding students through decision support systems has been conducted by several researchers. The first study was the assessment process for the best students at SMK Widya Patria 2 Jakarta

uses aspects, namely knowledge and skills. Decision making with the profile matching method will be faster, more accurate, effective and efficient to help the school in producing the best decisions[11]. The next research, profile matching method compares between aspects of knowledge and skills so that they have differences in competence (Gap). The results of the implementation of a decision support system using the profile matching method can help the school to determine outstanding students[12]. The next research, this decision support system can be used as a decision-making tool to determine the best students at SMPN 2 Kedungwaru Tulungagung. The results of calculating the best student scores are based on ranking scores that determine the highest total score and place them in the first place in the order of the best students [13]. The difference between this research and the previous research is that this study uses criteria for report card value, behavior, discipline, and extracurricular. This is because, the selection of the best students that was previously carried out only uses aspects of knowledge and skills. Then other criteria are needed in determining the best students, so that the criteria profile used will be matched with the criteria of the best prospective student candidates.

Profile matching can be interpreted as an approach that determines decisions through the proposition that there are levels of reference variable predictors that must be achieved by the subjects to be selected, not based on the minimum level that can be met [14], [15]. The profile matching approach is one of several approaches used to determine scores from existing input data [16]. Furthermore, the scores will be ranked so that they can be used as a reference for data collection through the highest or lowest scores depending on what is needed. The stages for solving problems with profile matching are through calculating differences, weighting difference values, and grouping core factors and secondary factors, calculating all attribute values and determining rankings. At the decision-making stage using profile matching the focus is on a comparison between the actual data value on a particular alternative profile with the desired profile value then a gap or competency difference is obtained from the alternative, the fewer gaps obtained, the greater the weight of the value [17], [18]. Previous studies have shown that the profile matching method can assist in making good decisions [14], [19], [20]. Profile matching is considered capable of producing the best alternative ranking based on the gaps obtained [19].

Based on the previous presentation, this study aims to solve the problem of selecting the best students through a decision support system with outputs in the form of ranking using the profile matching method. The application of profile matching in this election will result in a comparison of the scores of all the best prospective student candidates from each class in each batch. So that through the decision support system developed can produce the best prospective students who fit the established criteria and for the selection process does not take a long time because the decision support system built is equipped with a web-based application that is used for the best student selection facilities.

2. RESEARCH METHODOLOGY

2.1 Research Stages

The methodology in this study is defined as a systematic approach to solving a research problem through data collection using various techniques, providing interpretation of the collected data and drawing conclusions about the research data. The stage in the research carried out is shown in Figure 1.

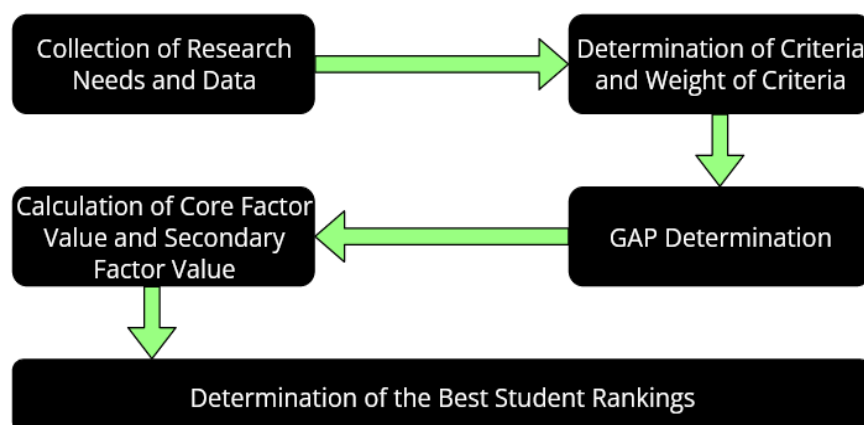


Figure 1. Research Stage

Based on Figure 1, there are several stages, namely the collection of needs is the determination of problems in the process of determining the best students, here is the explanation

a. Collection of Research Needs and Data

The collection of needs was carried out by interviewing at XYZ High School about the problem of determining the best students. The problem in determining the best students for each batch is that each homeroom teacher must provide the name of the student who will be the best student candidate, then the process of determining the best students from each class will be carried out for each batch. The research data collection process uses a



descriptive qualitative method, namely by taking data used by schools, namely the criteria for report card scores, behavior, discipline, and extracurriculars.

b. Determination of Criteria and Weight of Criteria

This stage determines each weight value from the 4 criteria used. The criteria used are report card scores, behavior, discipline, and extracurriculars.

c. GAP Determination

The competency GAP is the difference between the attributes present in the alternative and the expected attributes. GAP competence is obtained by the formula: $GAP = \text{Criterion Value} - \text{Minimum Value}$. After mapping the GAP has been carried out, the results will then be given a weighting of values adjusted to the reference to the gap value weighting table in Table 1.

Table 1. Weighting Value

Difference	Weighting	Description
0	5	No difference (competence as required)
1	4,5	Competence over 1 level
-1	4	Competence less 1 level
2	3,5	Competence over 2 levels
-2	3	Competence less than 2 levels
3	2,5	Competence over 3 levels
-3	2	Competence less 3 levels
4	1,5	Competence over 4 levels
-4	1	Competence less than 4 levels

d. Calculation of Core Factor Value and Secondary Factor Value

If the GAP weighting process is obtained, then divide it into two groups, namely Core Factor and Secondary Factor. In order to get the core factor value, you can go through the following equation (1).

$$NCF = \frac{\sum NC}{\sum IC} \tag{1}$$

where,

- NCF : Average core factor value
- NC : Total number of core factor values
- IC : Number of core factor items

Furthermore, in order to get the Secondary Factor value, it is calculated through the following equation (2).

$$NSF = \frac{\sum SC}{\sum IS} \tag{2}$$

where,

- NSF : Average Secondary Factor Value
- NS : Total number of Secondary Factor values
- IS : Number of Secondary Factor items

e. Determination of the Best Student Rankings

After calculating the Core Factor and Secondary Factor values on each aspect, the next step is to calculate the total value on each aspect that is predicted to have an influence on performance for each profile. To calculate the Total Value can be through the following equation (3).

$$N = (X)\% NCF + (X)\% NSF \tag{3}$$

where,

- N : The total value of each attribute
- NCF : Average core factor value
- NSF : Average secondary factor value
- (X)% : Enter percentage value

After the Total Value is obtained, then proceed to find the highest to lowest Total Value so that it is composed of values from the results of profile matching calculations.

2.2 Implementation of the Method Profile Matching

The application of the profile matching method in the selection of the best students will use 4 criteria and the weight of the criteria to be used as shown in Table 2.

Table 2. Aspects of Criteria and Weight of Criteria

Code Criteria	Name Criteria	Weight Criteria (%)	Type
C1	Report Card Scores	50	Core Factor



C2	Behavior	25	Core Factor
C3	Discipline	15	Secondary Factor
C4	Extracurriculars	10	Secondary Factor

In Table 2, shows the weight of the criteria obtained from the decision maker. The decision maker in this case is the Principal. Based on the interview to determine the importance of the criteria, the weight for Report Card Scores has a weight of 50%, this is because the report card score is considered a very important criterion because academic achievement can be seen based on the report card value. The next criterion is Behavior by 25%, followed by Discipline by 15% and Extracurriculars by 10%. These criteria are additional criteria for assessing the best students. After the criteria and weight data are determined, then determine the factors of each criterion presented in Table 3.

Table 3. Criteria Factor and Value

Code Criteria	ID	Criteria Factor	Value	Target Score
C1	A1	Report Score 90-100	5	5
		Report Score 80-89	4	
		Report Score 70-79	3	
C2	A2	Excellent	5	3
		Enough	3	
		Less	1	
C3	A3	Excellent	5	4
		Enough	4	
		Less	3	
C4	A4	Active	5	5
		Not Active	3	

Table 3 shows the value of each factor that is calculated along with the value and target used as a reference in calculating profile matching for selecting the best students.

3. RESULT AND DISCUSSION

Implementation the profile matching approach in the case of selecting the best students through several stages. the following are the results and discussions for the application of profile matching in the selection of best students in the decision support system for the selection of best students through a website-based application.

3.1 Calculation of Profile Matching Best Student Selection

For case studies in determining the selection of the best students, 3 candidates from each grade 11 of SMA XYZ will be used, there are 5 sub-classes from grade 11 that are tested for assessment by the teacher. Data on prospective students as the best prospective student candidates is shown in Table 4.

Table 4. Aspects of Criteria and Weight of Criteria

Student Name	Class
Ahmad Aidil Fikri	7.1
Siti Amalia	7.1
Eka Wulandari	7.1
Nurlia Handayani	7.2
Septian Ferri Pratama	7.2
Sherlyn Eka	7.2
Peni Puji Lestari	7.3
Putri Nurlandari	7.3
Hidayatur Rohman	7.3
Tri Winarti	7.4
Rian Karisma	7.4
Kristina Damayanti	7.4
Ahmad Ridho	7.5
Zelika Ananda Putri	7.5
Beby Ayu Astina	7.5

After obtaining the data of the best prospective students, then conduct an assessment of the best students. The results of the assessment of the best students are shown in Table 5.

Table 5. Best Student Assessment Data

Student Name	Code Criteria			
	C1	C2	C3	C4
Ahmad Aidil Fikri	5	5	3	5
Siti Amalia	5	3	3	5
Eka Wulandari	5	3	4	5
Nurlia Handayani	4	5	5	5
Septian Ferri	5	1	4	5
Sherlyn Eka	4	5	3	5
Peni Puji Lestari	4	3	5	5
Putri Nurlandari	5	3	4	5
Hidayatur Rohman	5	5	3	5
Tri Winarti	5	3	4	5
Rian Karisma	4	3	3	5
Kristina Maya	5	1	4	5
Ahmad Ridho	4	5	3	5
Zelika Ananda	5	3	3	5
Beby Ayu Astina	5	3	3	5

Based on the assessment results in Table 5, for completion with the profile matching method, it begins with calculating the gap value of the assessment results. The assessment results of the best students then calculate the gap scores of each of the best student assessments that have been obtained. The results of the calculation of the gap scores of the best students are presented in Table 6.

Table 6. Gap Value Best Student

Student Name	Code Criteria				Target Score Criteria				Gap Value			
	C1	C2	C3	C4	C1	C2	C3	C4	C1	C2	C3	C4
Ahmad Aidil Fikri	5	5	3	5					0	2	-1	0
Siti Amalia	5	3	3	5					0	0	-1	0
Eka Wulandari	5	3	4	5					0	0	0	0
Nurlia Handayani	4	5	5	5					-1	2	1	0
Septian Ferri	5	1	4	5					0	-2	0	0
Sherlyn Eka	4	5	3	5					-1	2	-1	0
Peni Puji Lestari	4	3	5	5					-1	0	1	0
Putri Nurlandari	5	3	4	5	5	3	4	5	0	0	0	0
Hidayatur Rohman	5	5	3	5					0	2	-1	0
Tri Winarti	5	3	4	5					0	0	0	0
Rian Karisma	4	3	3	5					-1	0	-1	0
Kristina Maya	5	1	4	5					0	-2	0	0
Ahmad Ridho	4	5	3	5					-1	2	-1	0
Zelika Ananda	5	3	3	5					0	0	-1	0
Beby Ayu Astina	5	3	3	5					0	0	-1	0

The results of each candidate's gap value shown in Table 6 will then determine the weight of the gap value and will be processed to calculate the core factor value and secondary factor of the gap weighting value that has been obtained. The criteria C1 and C2 are core factors, which will be multiplied by the weight of the core factor, which is 70%, while C3 and C4 are secondary factors, multiplied by the weight of the secondary factor, which is 30%. The results of the calculation of core factors and secondary factor values are presented in Table 7.

Table 7. Core Factor and Secondary Factor Candidate Values

Student Name	Gap Value				Gap Value Weights				Criteria Value Results			
	C1	C2	C3	C4	C1	C2	C3	C4	C1	C2	C3	C4
Ahmad Aidil Fikri	0	2	-1	0	5	3.5	4	5	3.50	2.45	1.20	1.50
Siti Amalia	0	0	-1	0	5	5	4	5	3.50	3.50	1.20	1.50
Eka Wulandari	0	0	0	0	5	5	5	5	3.50	3.50	1.50	1.50
Nurlia Handayani	-1	2	1	0	4	3.5	4.5	5	2.80	2.45	1.35	1.50
Septian Ferri	0	-2	0	0	5	3	5	5	3.50	2.10	1.50	1.50
Sherlyn Eka	-1	2	-1	0	4	3.5	4	5	2.80	2.45	1.20	1.50
Peni Puji Lestari	-1	0	1	0	4	5	4.5	5	2.80	3.50	1.35	1.50
Putri Nurlandari	0	0	0	0	5	5	5	5	3.50	3.50	1.50	1.50
Hidayatur Rohman	0	2	-1	0	5	3.5	4	5	3.50	2.45	1.20	1.50

Tri Winarti	0	0	0	0	5	5	5	5	3.50	3.50	1.50	1.50
Rian Karisma	-1	0	-1	0	4	5	4	5	2.80	3.50	1.20	1.50
Kristina Maya	0	-2	0	0	5	3	5	5	3.50	2.10	1.50	1.50
Ahmad Ridho	-1	2	-1	0	4	3.5	4	5	2.80	2.45	1.20	1.50
Zelika Ananda	0	0	-1	0	5	5	4	5	3.50	3.50	1.20	1.50
Beby Ayu Astina	0	0	-1	0	5	5	4	5	3.50	3.50	1.20	1.50

The results of the calculation of the total value criteria are based on the assessment of the best students in Table 7, then calculate the final score and determine the ranking based on the final results that have been obtained. The calculation of the final value of the criteria and the ranking of candidates can be seen in Table 8.

Table 8. Final Grades and Candidate Rankings

Student Name	Criteria Value Results				Students' Final Grades	Final Value	Rank
	C1	C2	C3	C4			
Ahmad Aidil Fikri	3.50	2.45	1.20	1.50	$(50\% * 3.50) + (25\% * 2.45) + (15\% * 1.20) + (10\% * 1.50)$	2.693	3
Siti Amalia	3.50	3.50	1.20	1.50	$(50\% * 3.50) + (25\% * 3.50) + (15\% * 1.20) + (10\% * 1.50)$	2.955	2
Eka Wulandari	3.50	3.50	1.50	1.50	$(50\% * 3.50) + (25\% * 3.50) + (15\% * 1.50) + (10\% * 1.50)$	2.650	4
Nurlia Handayani	2.80	2.45	1.35	1.50	$(50\% * 2.80) + (25\% * 2.45) + (15\% * 1.35) + (10\% * 1.50)$	2.365	7
Septian Ferri	3.50	2.10	1.50	1.50	$(50\% * 3.50) + (25\% * 2.10) + (15\% * 1.50) + (10\% * 1.50)$	2.650	4
Sherlyn Eka	2.80	2.45	1.20	1.50	$(50\% * 2.80) + (25\% * 2.45) + (15\% * 1.20) + (10\% * 1.50)$	2.343	8
Peni Puji Lestari	2.80	3.50	1.35	1.50	$(50\% * 2.80) + (25\% * 3.50) + (15\% * 1.35) + (10\% * 1.50)$	2.628	5
Putri Nurlandari	3.50	3.50	1.50	1.50	$(50\% * 3.50) + (25\% * 3.50) + (15\% * 1.50) + (10\% * 1.50)$	3.000	1
Hidayatur Rohman	3.50	2.45	1.20	1.50	$(50\% * 3.50) + (25\% * 2.45) + (15\% * 1.20) + (10\% * 1.50)$	2.693	3
Tri Winarti	3.50	3.50	1.50	1.50	$(50\% * 3.50) + (25\% * 3.50) + (15\% * 1.50) + (10\% * 1.50)$	2.650	4
Rian Karisma	2.80	3.50	1.20	1.50	$(50\% * 2.80) + (25\% * 3.50) + (15\% * 1.20) + (10\% * 1.50)$	2.605	6
Kristina Maya	3.50	2.10	1.50	1.50	$(50\% * 3.50) + (25\% * 2.10) + (15\% * 1.50) + (10\% * 1.50)$	2.650	4
Ahmad Ridho	2.80	2.45	1.20	1.50	$(50\% * 2.80) + (25\% * 2.45) + (15\% * 1.20) + (10\% * 1.50)$	2.343	8
Zelika Ananda	3.50	3.50	1.20	1.50	$(50\% * 3.50) + (25\% * 3.50) + (15\% * 1.20) + (10\% * 1.50)$	2.955	2
Beby Ayu Astina	3.50	3.50	1.20	1.50	$(50\% * 3.50) + (25\% * 3.50) + (15\% * 1.20) + (10\% * 1.50)$	2.955	2

Based on Table 8, it shows that the calculation results of the final score of the best student 1 get the final score of 3.000, the best student 2 gets the final score of 2.955, and the best student 3 with the final score of 2.693. From the final score, the 1st rank for the selection of the best students was obtained by Putri Nurlandari with a final score of 3.000.

3.2 Implementation of the Profile Matching Best Student Selection System

Furthermore, the programming of the profile matching method is implemented into the PHP language and the Visual Studio Code text editor as well as for the database using MySQL to build the SPK for selecting the best students. The system was developed first with the Login Menu, where the user to be able to access the system is required to log into the system by entering the username and password that was previously created on the system. If the user has entered the system, the Main Menu will appear. After successfully entering the main interface menu, there are features that exist on the system. These features include: Data Criteria, Data Factors, Weight Data, Alternative Data and Profile Matching Process. The implementation of the criteria page contains information about the criteria name data, criteria weights, core factor weights, and core secondary factor weights. Implementation of the criteria page can be seen in Figure 2.

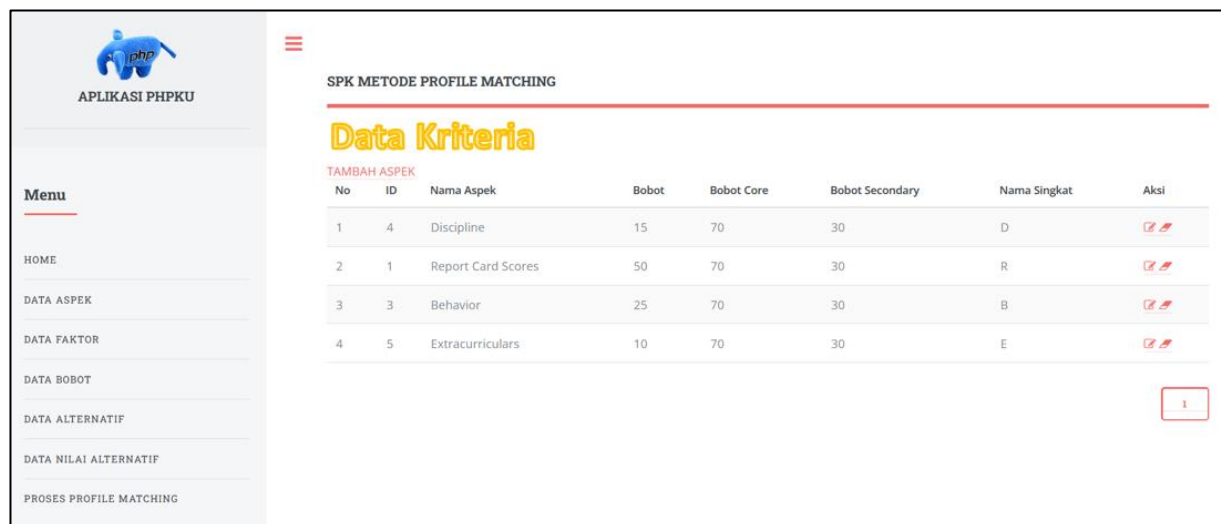
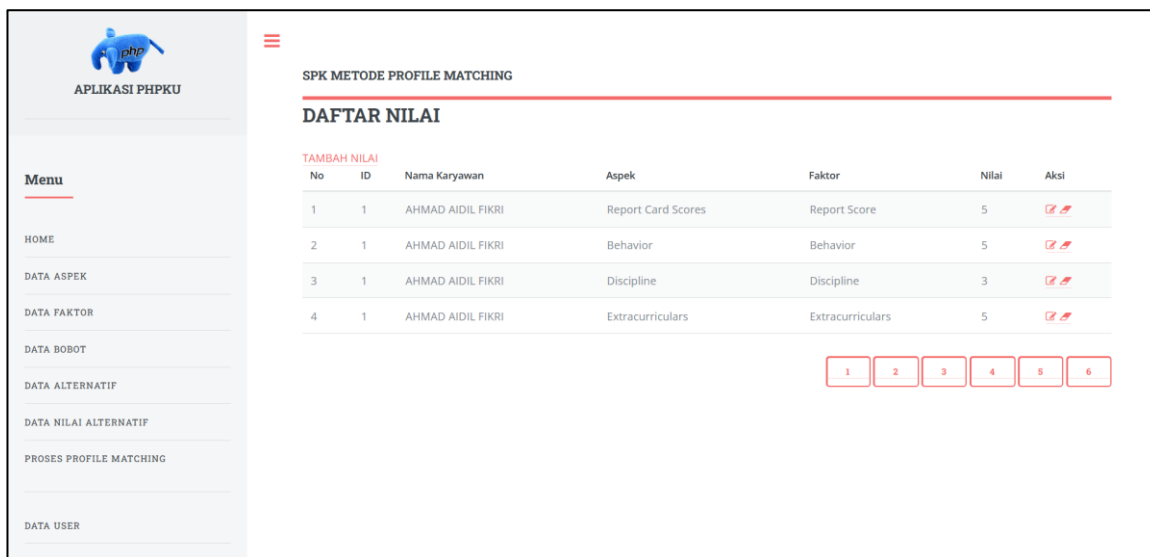


Figure 2. Implementation of Criteria Data Page

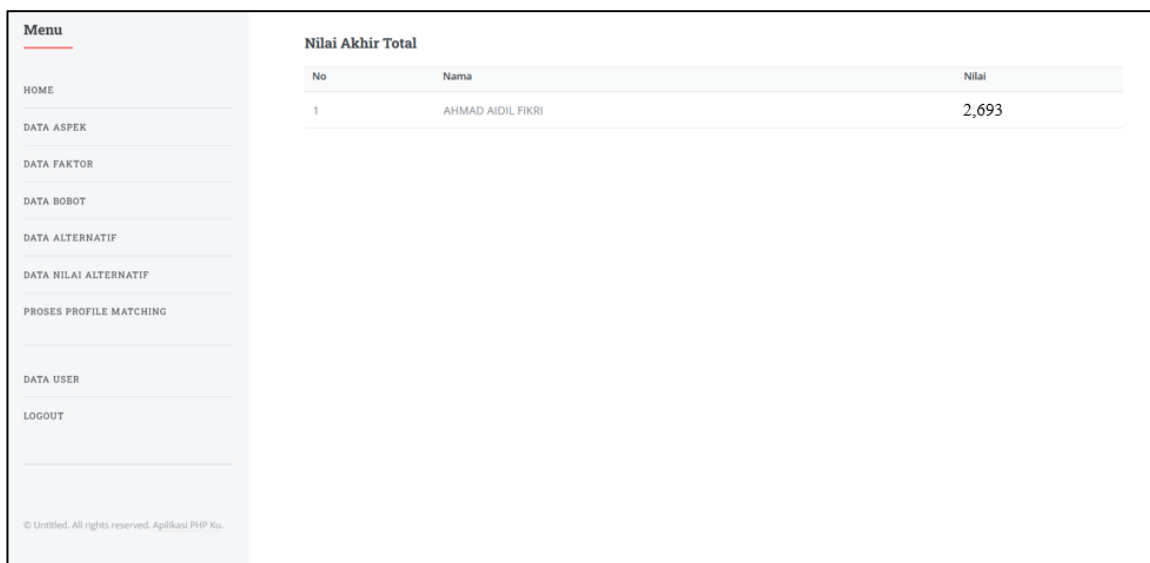
The implementation page of the outstanding student assessment contains information about the results of the outstanding student scores. The implementation of the assessment of outstanding students can be seen in Figure 3.



No	ID	Nama Karyawan	Aspek	Faktor	Nilai	Aksi
1	1	AHMAD AIDIL FIKRI	Report Card Scores	Report Score	5	
2	1	AHMAD AIDIL FIKRI	Behavior	Behavior	5	
3	1	AHMAD AIDIL FIKRI	Discipline	Discipline	3	
4	1	AHMAD AIDIL FIKRI	Extracurriculars	Extracurriculars	5	

Figure 3. Implementation Assessment of Outstanding Students

The implementation page for the results of the assessment of outstanding students contains information about the results of the assessment of outstanding students using profile matching. The implementation of the student achievement assessment results page can be seen in Figure 4.



No	Nama	Nilai
1	AHMAD AIDIL FIKRI	2,693

Figure 4. Implementation Assessment of Outstanding Students Using Profile Matching

In Figure 4, the results of the calculation of the profile matching method obtained by the system show the same value as the manual calculation. Thus, the implementation of the profile matching method on the DSS for selecting the best students developed can be said to be valid.

4. CONCLUSION

The application of profile matching in this election will result in a comparison of the scores of all the best prospective students from each class in each batch. So that through the developed decision support system it can produce the best prospective students according to predetermined criteria and the selection process does not take long because the built decision support system is equipped with a web-based application that is used for selecting the best students. The calculation of student selection using profile matching shows that the results of the calculation of the final score of the best student 1 get the final score of 3.00, the best student 2 gets the final score of 2.955, and the best student 3 with the final score of 2.693. From the final score, the 1st rank for the selection of the best students was obtained by Putri Nurlandari with a final score of 3.000.



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