

Decision support system for determining Bantuan Siswa Miskin (BSM) receivers with profile matching method

B H Situmorang*, E Pibriana, E T Tosida

Department of Computer Science, Faculty of Mathematic and Natural Sciences, Pakuan University, Indonesia.

*Corresponding author: boldson_skom@yahoo.com

Abstract. Bantuan Siswa Miskin (BSM) is a National Programs aimed at eliminating the barriers of poor students participating to school by helping poor students gain access to appropriate education services, prevent dropping out of school, attract poor students back to school, assist students in providing for learning activities, support the Nine Years Basic Education (and even up to senior high school) program, as well as helping to smooth the school programs [1]. Decision Support System is made by applying Profile Matching method to assist teachers or school operators in SMP PGRI Ciasmara in selecting prospective recipients of BSM program and providing recommendations in decision making. Profile Matching is used to compare the actual data value of a profile to be assessed by the expected profile value, so that it can be known the difference of competence (also called GAP). If the resulting value of GAP is smaller then the weight of value will be greater, which means it has a greater chance to be recommended as a potential recipient of the BSM program. Decision Support System for determining BSM receivers is only choosing the right alternatives to receive BSM according to the BSM quota given to SMP PGRI Ciasmara. The right alternatives to receive this BSM is the highest ranking alternatives.

Keyword: Bantuan Siswa Miskin (BSM), decision support system, profile matching

1. Introduction

The BSM program is a government program funded from the state budget as the responsibility of the government in order to improve access to better education, so that education can be reached by people with weak economy. SMP PGRI Ciasmara is one of the junior high schools to receive BSM program funding. In determining the students who are entitled to get BSM funds, SMP PGRI Ciasmara still use the conventional system that is by doing selection based on eligibility criteria. Implementation of this conventional system has resulted in the mistake of the wrong target on the determination of BSM fund candidates because the total value of each aspect is obtained by calculating the average value in each aspect and then followed by the calculation process to determine the ranking.

Decision Support System (DSS) to determine BSM fund recipients in SMP PGRI Ciasmara is needed to support efficient and accurate decision-making. The process of determining BSM fund recipients in the DSS uses Profile Matching method which aims to compare the actual data value of a profile to be assessed by the expected profile value, so as to know the difference of competence (also called GAP). If the resulting value of GAP is smaller then the weight of value will be greater, which means it has a greater chance to be recommended as a potential recipient of the BSM program.

The method of profile matching has been widely applied to previous studies. H. J. Pahk, J. S. Park, I. Yeo used the profile matching technique for the long guideways, which can be applied to most



straightness measurements for machine tools and measuring machines [1]. The implementing of profile-matching method in wireless fingerprinting [2] provides a more reliable solution especially in environments with sparse distributed access points and a more accurate initial position.

2. Material and Methods

Assessment criteria used to determine BSM candidates based on the principal decision letter of SMP PGRI Cismara number 380/III/5/O.2016 on the determination of BSM recipient students, including:

1. Economic Aspects (the weight value is 40%), reviewed by parent’s income (C1) and the number of parental dependents (C2).
2. Academic Aspects (the weight value is 35%), reviewed by average rate of raport (C3) and rank of students (C4).
3. Non-Academic Aspects (the weight value is 25%), reviewed based on Student Morals (C5), Student Personality (C6), Extra Curricular which includes Scouting (C7), Troop flag raiser (C8), and Sports (C9).

Sub-Criteria used in this study have been determined based on interviews with Principal SMP PGRI Ciasmara as shown in the table.

Table 1. The weight value of parent's income

Parent's Income (IDR)	Value	Weight
<= 500.000	5	Very Important
500.000–1.000.000	4	Important
1.000.000–2.000.000	3	Quite Important
2.000.000–3.000.000	2	Less Important
> =3.000.000	1	Not Important

Table 2. The weight value of parental dependents

The number of parental dependents	Value	Weight
>5	5	Very Important
4	4	Important
3	3	Quite Important
2	2	Less Important
1	1	Not Important

Table 3. The weight value of average rate of raport

Average rate of raport	Value	Weight
85 – 100	5	Very Important
75 – 84	4	Important
71 – 74	3	Quite Important
60 – 70	2	Less Important
<59	1	Not Important

Table 4. The weight value of rank of students

Rank of students	Value	Weight
1-3	5	Very Important
4-5	4	Important
6-8	3	Quite Important
9-10	2	Less Important
>10	1	Not Important

Table 5. The weight value of student morals

Student Morals	Value	Weight
A (Excellent)	5	Very Important
B (Good)	4	Important
C (Pass)	3	Quite Important
D (Poor)	2	Less Important
E (Bad)	1	Not Important

Table 6. The weight value of student personality

Student Personality	Value	Weight
A (Excellent)	5	Very Important
B (Good)	4	Important
C (Pass)	3	Quite Important
D (Poor)	2	Less Important
E (Bad)	1	Not Important

Table 7. The weight value of scouting

Scouting	Value	Weight
A (Excellent)	5	Very Important
B (Good)	4	Important
C (Pass)	3	Quite Important
D (Poor)	2	Less Important
E (Bad)	1	Not Important

Table 8. The weight value of troop flag raiser

Troop Flag Raiser	Value	Weight
A (Excellent)	5	Very Important
B (Good)	4	Important
C (Pass)	3	Quite Important
D (Poor)	2	Less Important
E (Bad)	1	Not Important

Table 9. The weight value of sports

Sports	Value	Weight
A (Excellent)	5	Very Important
B (Good)	4	Important
C (Pass)	3	Quite Important
D (Poor)	2	Less Important
E (Bad)	1	Not Important

Flowchart of the implementation process of the Profile Matching method shown in Figure 1.

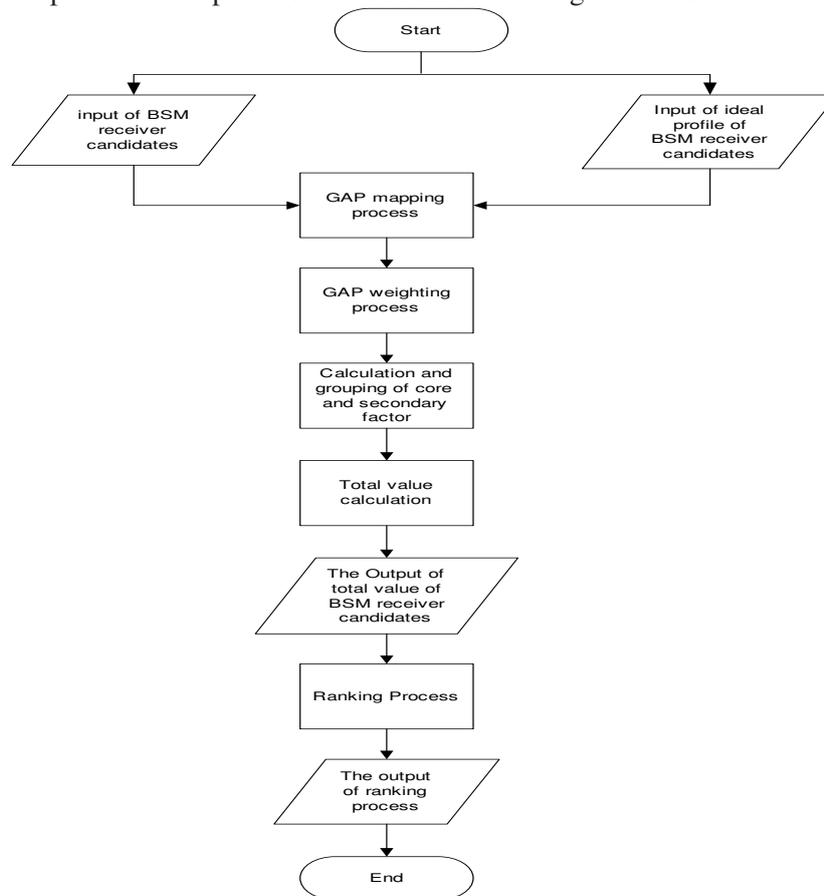


Figure 1. Flowchart of the implementation process of the Profile Matching method

The profile matching method is to compare the actual data value of a profile to be assessed by the expected profile value, so it can be known the difference of competence (called GAP).

$$GAP = Value\ Atribut - Value\ Target \dots \dots \dots (1)$$

If the GAP results are smaller then the value of the weight is greater, it means that there is a greater chance to be recommended as a potential recipient of BSM.

After the weight of the gap value of all aspects is determined in the same way, each aspect is subdivided into two groups: the Core Factor group (the main factor) and the Secondary Factor (supporting factors). The core factor calculation is shown in equation (2) and the secondary factor calculation is shown in equation (3).

$$ACF = \frac{\sum VC}{\sum CI} \dots \dots \dots (2)$$

ACF: The average value of core factor
 VC: total value of core factor
 CI: Number of core factor items

$$ASF = \frac{\sum VS}{\sum SI} \dots \dots \dots (3)$$

ASF: The average value of secondary factor
 VS: Total value of secondary factor values

SI: Number of secondary factor items

After the average value of core factor and secondary factor are obtained, then the total percentage value of core factor and secondary factor will be calculated based on equation (4).

$$T = (x)\% ACF + (y)\% ASF \dots \dots \dots (4)$$

T: The total value of each aspect

ACF: The average value of core factor

ASF: The average value of secondary factor

(x)%: Inputed percent value

(y)%: Inputed percent value

The final process of the implementation of Profile Matching method is the ranking of recipient of BSM recipient candidates. Ranking process is calculated based on equation (5).

$$FR = (x)\% EA + (y)\% AA + (z)\% NAA \dots \dots \dots (5)$$

FR: Final Result

EA: Value of Economic Aspects

AA: Value of Academic Aspect

NAA: Value of Non-Academic Aspect

(x)%: Inputed percent value

(y)%: Inputed percent value

(z)%: Inputed percent value

DSS is made through the System Development Life Cycle (SDLC) method as shown in Figure 2.

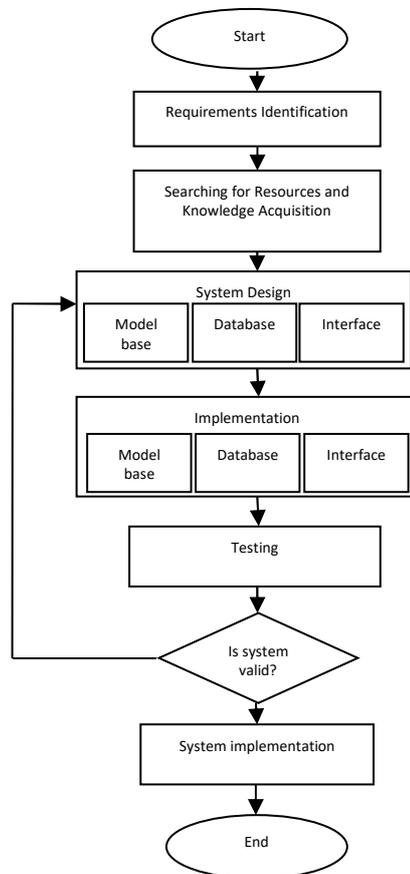


Figure 2. System Development Life Cycle [3]

3. Result & Discussion

Decision Support System for determining BSM recipients is made using PHP and MySQL programming languages. The user interface on Decision Support System to determine the BSM recipient candidates includes login page and main page in which there is an optional menu of student data, assessment criteria, sub criteria, change password, and exit.

Testing are performed after a Decision Support System is completed to ensure that the system meets the needs of users. Test case is done by entering data of BSM candidates from SMP PGRI Ciasmara into the Decision Support System application and the resulting output is the list of candidates receiving BSM rankings as shown in Table 10.

Table 10. The list of candidates receiving BSM rankings

#	ID	Name	Class	Result	Ranking
1	151607150	<u>Triatna</u>	7.D	4.61833	1
2	151607057	<u>Rizky Jaenudin</u>	7.B	4.54	2
3	151607034	<u>Wika Destia. D</u>	7.A	4.52	3
4	151607092	<u>Muhammad Jandan</u>	7.C	4.45833	4
5	151607043	<u>Liska Juniar</u>	7.B	4.45333	5
6	151607078	<u>Ernawati</u>	7.C	4.40667	6
7	151607151	<u>Unih</u>	7.D	4.40333	7
8	131407026	<u>Rahmat Gunawa</u>	9.D	4.32333	8
9	131407082	<u>Ririn Rahmayanti</u>	9.D	4.31	9
10	151607028	<u>Rosdiyana</u>	7.A	4.29333	10

The comparison between the ranking results of BSM recipient candidates in Decision Support System application using the profile matching method with conventional system implemented by SMP PGRI Ciasmara is shown by Table 11.

Table 11. The comparison between the ranking results in Decision Support System application with conventional system implemented by SMP PGRI Ciasmara

#	ID	Name	Sex	Class	The Result of DSS Application	The Ranking Result of DSS Application	The Result of The System Implemented by SMP PGRI Ciasmara	The Ranking Result of The System Implemented by SMP PGRI Ciasmara
1	151607150	TRIATNA	F	7.D	4.61833	1	4.65	1
2	151607057	RIZKY JAENUDIN	M	7.B	4.54	2	4.425	3
3	151607034	WIKA DESTIA DANTIYANTI	F	7.A	4.52	3	4.4	4
4	151607092	MUHAMAD JANDAN	M	7.C	4.45833	4	4.45	2
5	151607043	LISKA JUNIAR	F	7.B	4.45333	5	4.3	7
6	151607078	ERNAWATI	F	7.C	4.40667	6	4.35	5
7	151607151	UNIH	F	7.D	4.40333	7	4.425	3
8	131407026	RAHMAT GUNAWAN	M	9.D	4.32333	8	4.325	6
9	131407082	RIRIN RAHMAYANTI	F	9.D	4.31	9	4.3	7
10	151607018	MUHAMMAD IKBAL L	M	7.A	4.29333	10	4.1	9

Based on comparison of alternative ranking result as many as 119 students can be concluded that the result of ranking between conventional system implemented by SMP PGRI Ciasmara with system that use method matching profile reaching valid level 1% only because SMP PGRI Ciasmara only use calculation in equation 6.

$$\text{Total} = (\text{Economic Aspects}/2) * 40\% + (\text{Academic Aspects}/2) * 35\% + (\text{Non - Academic Aspects})/5 * 25\% \dots \dots (6)$$

The correlation test was conducted to measure the closeness of the relationship between the calculation result using the profile matching method and the calculation result implemented by SMP PGRI Ciasmara. The level of closeness of the relationship between these two methods is in perfect correlation and the relationship belongs to a positive linear correlation because its correlation value is 0.986267. The correlation test is shown in the graph in Figure 3.

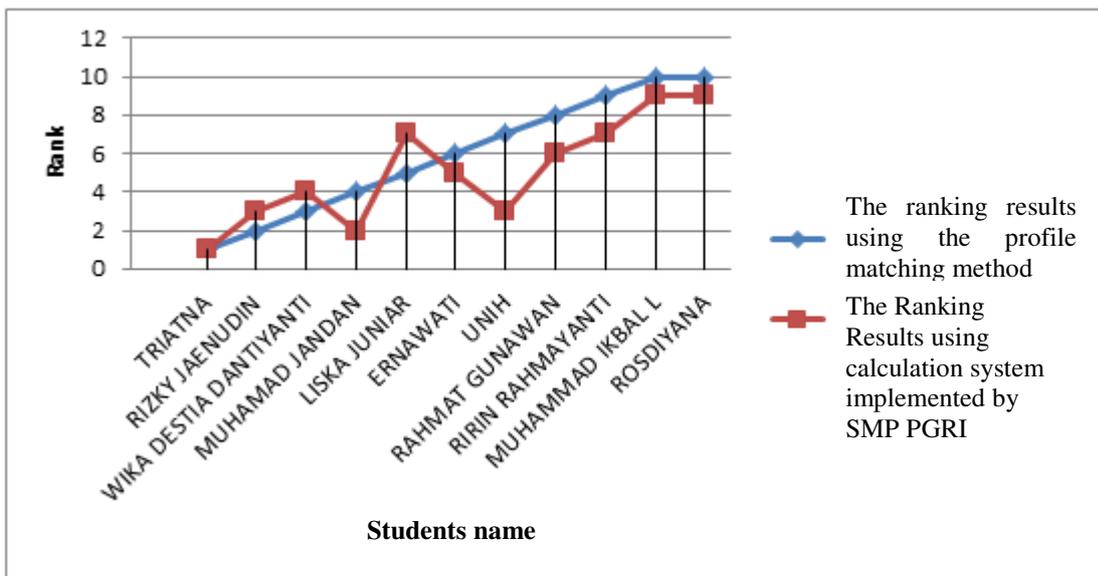


Figure 3. Graph of the correlation test

4. Conclusion

Decision support system for determining BSM recipients is made using PHP and MySQL programming language by applying Profile Matching method. Based on comparison of alternative ranking result as many as 119 students can be concluded that the result of ranking between conventional system implemented by SMP PGRI Ciasmara with system that use method matching profile reaching valid level 1% only because SMP PGRI Ciasmara does not do GAP mapping process, weighting GAP and grouping core factor and secondary factor but only calculate the mean value in every aspect. The level of closeness of the relationship between these two methods is in perfect correlation and the relationship belongs to a positive linear correlation because its correlation value is 0.986267.

References

- [1] H J Pahk, J S Park, I Yeo . 2015. Development of straightness measurement technique using the profile matching method. *International Journal of Machine Tools and Manufacture (Elsevier)* vol. 37 p. 135.
- [2] Li Y, Zhuang Y, Lan H, Niu X, El-Sheimy N. 2016. A profile-matching method for wireless positioning. *IEEE communications letters* vol. 20, p. 2514-2517.
- [3] Grzybowska H, Barceló J. 2012. Decision support system for real-time urban freight management. *Procedia-social and behavioral sciences (Elsevier)* vol. 39 p. 712.