NASKAH PUBLIKASI *(MANUSCRIPT)*

SISTEM PENDUKUNG KEPUTUSAN PEMILIHAN DOKTER TERBAIK

DIRUMAH SAKIT UMUM DAERAH AHMAD BRAHIM DENGAN

MENGGUNAKAN METODE SIMPLE ADDITIVE WEIGHTING (SAW)

DECISION SUPPORT SYSTEM FOR SELECTION OF THE BEST DOCTOR

AT Ahmad BRAHIM HOSPITAL USING THE SIPLE ADDITIVE

WEIGHTING (SAW) METHOD

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SAMARINDA

2023

Naskah Publikasi *(Manuscript)*

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Decision Support System for Selection of The Best Doctor At Ahmad Brahim Hospital Using The Simple Additive Weighting (SAW) Method

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Abstract – *The selection of the best doctors at the ahmad brahim hospital was not only done once, but the selection of the best health workers at the ahmad brahim hospital was also carried out, but the selection of the best health workers was still done manually by the health department. Therefore, to help speed up the research process, a website-based decision support system was created to select the best doctors to provide rewards with several methods that can be used. One of the methods used in making decisions is simple additive weighting (SAW) which is done by weighting each of the criteria used.decision support website created using the PHP and MYSQL programming languanges for data storage. This study has criterion 3, namely absence, attitude and diligence then has 7 alternatives, the 7 alternatives have 4 ratings 1 where the average assessment is the same as the absence score 0.45, the attitude value is 0.35 and the diligence value is 0.12 with a total value of 1 so those who get the first rank score are dr.audi pirade, dr.kesatria putra abadi, dr. nurfitri rahmani awaliyah and dr.riska ruswanti. Then the second rank is dr. Christi angelia arung labi with an absence score of 0.45, an attitude value of 0.35 and an diligence value of 0.12 with a total of 0.92*

Keywords: 3-5 keywords; SAW method, Best Doctor, Decision Support System

1. Introduction

Based on statistical data, the Ahmad Brahim regional general hospital, Tana Tidung district, was founded in 2018 and is a regional hospital owned by the Tana Tidung district government. Ahmad Brahim District Hospital is led by a director, Dr. Budi Samroni is responsible to the regent of Tana Tidung Regency, in the Tana Tidung Regency area there is only one hospital until the current year, namely 2023.

Employees are one of the main supporters in serving the community. Being required to provide fast service in the service process must be known about ethics. Ethics is behavior that a person deserves to accept, be polite and respectful to each other.

According to Alimsyah (2019) a hospital is an organizational tool consisting of organized professional medical personnel and permanent medical facilities providing medical services, continuous nursing care, diagnosis and treatment of diseases suffered by patients.

According to Ardi, A (2020) Performance evaluation is a process of assessing employee performance which is carried out to see whether their work responsibilities are increasing or decreasing every day so that leaders can provide a supportive motivation to see the performance of the apparatus in the future.

According to Beti. I, Y (2019) Efforts to improve hospital services, by developing the performance of doctors at Ahmad Brahim Hospital. Doctors are very influential in providing good service to their patients. Doctors are human resources that are used as a driving force in a house. Doctors' performance is needed to increase the productivity of a hospital. To meet this quality, hospitals require an assessment of their doctors in order to obtain the best quality standards for doctors that have been determined based on the criteria that the hospital has. Therefore, the author wants to help create the best decision support system for doctors at Ahmad Brahim Hospital using the simple additive weighting (SAW) method.

1. Research Methods

In this study, a simple additive weighting method was used to make it easier to select the best doctor according to the patient's needs. This method is the method that is best known and most widely used by people in dealing

Figure 1. Flouchart Metode SAW
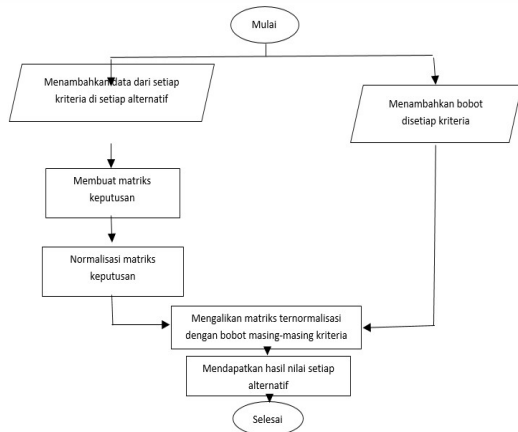
with Multi Attribute Decision Making (MADM) situations. This method requires the decision maker to determine the weight of each attribute. The rating for each attribute must be dimension-free in the sense that it has gone through a previous normalization process. The stages for completing the SAW method are as shown in Figure 1

The stages of completing the simple additive weight (SAW) method are:

1. Determine what criteria will be used as a reference in decision making.
2. Determine the suitability rating of each alternative for each criterion.
3. Create a decision matrix based on criteria, then normalize the matrix based on equations adjusted to the type of attribute (profit or cost attributes) to obtain a normalized matrix R.
4. The final result obtained from each ranking process is the sum of the multiplication of the normalized matrix R with the valto weights to obtain the largest value which is selected as the best alternative.
5. The final normalization results are then sorted from maximum value to minimum value

2. System Planning

Based on the Use Case diagram above, the director can only access a home page, alternative data, ranking data, reports and can print reports. Meanwhile the admin can manage all pages on the system starting from the home page, criteria data, alternative data, ranking data and reports.

Figure 2. Use Case Diagram Admin
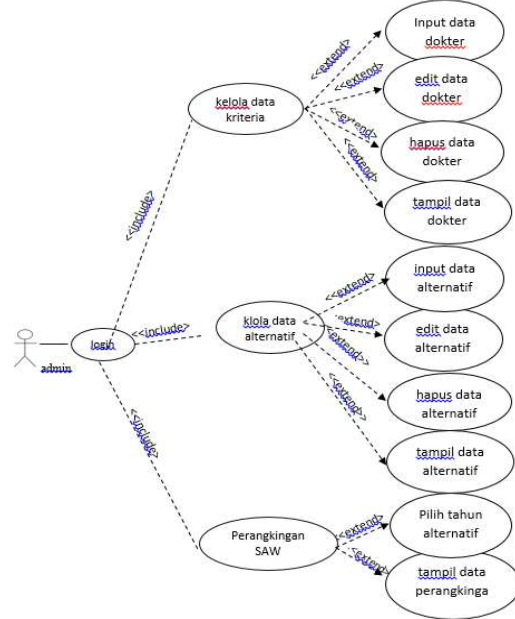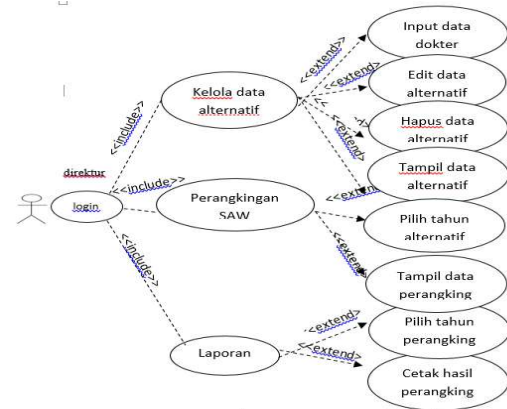
Entity relationship diagram (ERD) Database

Entity relationship diagram (ERD) describes the relationships between entities in the system to be built, which at the next stage can be implemented in the form of a relationship table. Relationships between relationships include one to one, one to many, one to many and many to many. The entity relationship diagram (ERD) decision support system for selecting the best doctor can be seen in Figure 3.2

3. Results Of Data Collection

This research was conducted at the Ahmad Brahim regional general hospital which is located in North Kalimantan, Tana Tidung Regency. From 2018 to 2023, the hospital only had one building in Tana Tidung Regency and did not have many health workers. This research was carried out in Do this to find out the best doctor at Ahmad Brahim Hospital and then you can also give a reward or reward. The data taken from the

hospital is the criteria and weight data given directly from Ahmad Brahim Hospital, the weight of 40% absence is attendance which is calculated as being on time at 7:30 and leaving at 16:30 so it can be categorized as 40% presence. It can be seen in table 4.1

Tabel 4. 1 kriteria dan bobot

Code	Criteria	Weight	Information
C1	roll call	40%	cost
C2	craft	35%	benefit
C3	Seminar	25%	benefit

Each of the criteria above has a very important role, so that these criteria become central in the decision making process, also providing a code for each criterion to make it easier. The input requirements consist of determining several criteria for the best candidate for a doctor, which is the first step in the SAW method. The attendance data used is data for 1 month. After determining the criteria and weights, the next step is to provide a rating or alternative suitability value for the criteria as follows.

1. Determination of absentee ratings and preferences

Table 4. 2 attendance and preference values

Absensi ketidak Hadiran	keterangan	nilai	Kode
9-0 hari	sangat baik	5	C1
19-10 hari	baik	3	C2
30-20 hari	kurang baik	1	C3

2. Determining attitude ratings and preference values

Table 4. 3 attitudes and preference values

sikap	nilai
sangat baik	5
baik	3
kurang baik	1

3. Determination of craft ratings and preference values

Table 4. 4 crafts and preference values

kerajinan	nilai
sangat baik	5
baik	3
kurang baik	1

After matching the values for each alternative, the next stage the system will carry out calculations using the SAW method

A. Absence Criteria

Absence criteria for hospital doctors are the main requirements that are needed for decision making based on discipline and attending activities in community service since being appointed as a permanent doctor which can be seen in table 4.5

Table 4. 5 Absence Data

No	Alternatif	absensi			kode
		30 hari kerja	hadir	alpa	
1	dr. audi pirade	30	8	22	A1
2	dr. christi angelia arung labi	30	7	23	A2
3	dr. ksatria putra abadi kabakoran	30	10	20	A3
4	dr. muhammad mahmud ansora	30	13	17	A4
5	dr. nurfitri rahmani awaliyah	30	10	20	A5
6	dr. riska ruswanti	30	12	18	A6
7	dr. yehuda agus santoso	30	10	20	A7

B. Attitude Criteria

The doctor's attitude criteria is the third requirement needed for decision making based on attitude towards patients since being appointed as a permanent doctor which can be seen in table 4.6

Table 4. 6 Attitude Data

No	alternatif	Sikap		
		Sangat Baik	Baik	kurang baik
1	dr. audi pirade	14	7	0
2	dr. christi angelia arung labi	11	10	0
3	dr. ksatria putra abadi kabakoran	15	6	0
4	dr. muhammad mahmud ansora	12	8	1
5	dr. nurfitri rahmani awaliyah	13	8	0
6	dr. riska ruswanti	13	8	0
7	dr. yehuda agus santoso	13	8	0

C. Craft Criteria

The criteria for doctor's craft are the next requirements that are really needed for decision making because the quality of hospital services is measured based on the doctor's craft in providing services to patients which can be seen in table 4.7

Table 4. 7 Crafts

No	alternatif	kerajinan		
		Sangat Baik	Baik	kurang baik
1	dr. audi pirade	13	8	0
2	dr. christi angelia arung labi	11	9	1
3	dr. ksatria putra abadi kabakoran	15	6	0
4	dr. muhammad mahmud ansora	11	9	1

5	dr. nurfitri rahmani awaliyah	13	8	0
6	dr. riska ruswanti	14	7	0
7	dr. yehuda agus santoso	14	7	0

D. Form a matrix from the alternative table to the criteria table

After collecting data to determine the best doctor, value data for each criterion was obtained in table 4.8

Table 4. 8 values for each criterion

sistem pendukung keputusan pemilihan dokter terbaik menggunakan metode SAW			
alternatif	absen	sikap	kerajinan
	cost	benefit	benefit
dr. audi pirade	1	5	5
dr. christi angelia arung labi	1	5	3
dr. ksatria putra abadi kabakoran	1	5	5
dr. muhammad mahmud ansora	3	5	3
dr. nurfitri rahmani awaliyah	1	5	5
dr. riska ruswanti	1	5	5
dr. yehuda agus santoso	3	5	5

The alternative values that have been entered will be calculated using Simple Additive Whaiting and using the normalized decision matrix formula. In determining the suitability rating, the value of each criterion is entered into the suitability rating table which has been adjusted to the value from the criteria table.

4. Criteria based decision matrix

$$X = \begin{bmatrix} 1 & 5 & 5 \\ 1 & 5 & 3 \\ 1 & 5 & 5 \\ 3 & 5 & 3 \\ 1 & 5 & 5 \\ 1 & 5 & 5 \\ 3 & 5 & 5 \end{bmatrix}$$

The normalization results of the criteria data decision matrix are:

A. absen (Cost)

$$r11 = \frac{\min\{1;1;1;3;1;1;3\}}{1} = \frac{1}{1} = 1$$

$$r21 = \frac{\min\{1;1;1;3;1;1;3\}}{1} = \frac{1}{1} = 1$$

$$r31 = \frac{\min\{1;1;1;3;1;1;3\}}{1} = \frac{1}{1} = 1$$

$$r41 = \frac{\min\{1;1;1;3;1;1;3\}}{3} = \frac{1}{3} = 0,33$$

$$r51 = \frac{\min\{1;1;1;3;1;1;3\}}{1} = \frac{1}{1} = 1$$

$$r61 = \frac{\min\{1;1;1;3;1;1;3\}}{1} = \frac{1}{1} = 1$$

$$r71 = \frac{\min\{1;1;1;3;1;1;3\}}{3} = \frac{1}{3} = 0,33$$

B. sikap (Benefit)

$$r12 = \frac{5}{\max\{5;5;5;5;5;5;5\}} = \frac{5}{5} = 1$$

$$r22 = \frac{5}{\max\{5;5;5;5;5;5;5\}} = \frac{5}{5} = 1$$

$$r23 = \frac{5}{\max\{5;5;5;5;5;5;5\}} = \frac{5}{5} = 1$$

$$r24 = \frac{5}{\max\{5;5;5;5;5;5;5\}} = \frac{5}{5} = 1$$

$$r25 = \frac{5}{\max\{5;5;5;5;5;5;5\}} = \frac{5}{5} = 1$$

$$r26 = \frac{5}{\max\{5;5;5;5;5;5;5\}} = \frac{5}{5} = 1$$

$$r27 = \frac{5}{\max\{5;5;5;5;5;5;5\}} = \frac{5}{5} = 1$$

C. kerajinan (Benefit)

$$r13 = \frac{5}{\max\{5;3;5;3;5;5;5\}} = \frac{5}{5} = 1$$

$$r23 = \frac{3}{\max\{5;5;5;5;5;5;5\}} = \frac{3}{5} = 0,6$$

$$r33 = \frac{5}{\max\{5;5;5;5;5;5;5\}} = \frac{5}{5} = 1$$

$$r43 = \frac{3}{\max\{5;5;5;5;5;5;5\}} = \frac{3}{5} = 0,6$$

$$r53 = \frac{5}{\max\{5;5;5;5;5;5;5\}} = \frac{5}{5} = 1$$

$$r63 = \frac{5}{\max\{5;5;5;5;5;5;5\}} = \frac{5}{5} = 1$$

$$r73 = \frac{5}{\max\{5;5;5;5;5;5;5\}} = \frac{5}{5} = 1$$

So the normalized table can be seen in table 4.9

1. Normalization

Table 4. 9 Normalization

normalisasi			
data alternatif	C1	C2	C3
	40%	35%	25%
A1	1	1	1
A2	1	1	0,6
A3	1	1	1
A4	0,3	1	0,6
A5	1	1	1
A6	1	1	1
A7	0,3	1	1

2. Ranking

This stage is the final process to look for the best alternative before making a decision. Data that has been normalized in the previous stage, then multiply the normalized attribute results by the predetermined weight. Ranking Calculation.

A1 = (1x40%)+(1x35%)+(1x25%) = 1

A2 = (1X40%)+(1X35%)+(0,6X25%) = 0,92

A3 = (1x40%)+(1x35%)+(1x25%) = 1

A4 = (0,3x40%)+(1x35%)+(0,6x25%) = 0,62

A5 = (1x40%)+(1x35%)+(1x25%) = 1

A6 = (1x40%)+(1x35%)+(1x25%) = 1

A7 = (0,3x40%)+(1x35%)+(1x25%) = 0,7

Table 4. 10 Rankings

menghitung nilai preferensi					
alternatif	C1	C2	C3	hasil	rangking
A1	0,4	0,35	0,25	1	1
A2	0,4	0,35	0,12	0,92	5
A3	0,4	0,35	0,25	1	1
A4	0,13	0,35	0,12	0,62	7
A5	0,4	0,35	0,25	1	1
A6	0,4	0,35	0,25	1	1
A7	0,13	0,35	0,25	0,73	6

Class Diagrams

Class diagrams consist of three classes, namely criteria, alternatives and ranking, their function is to combine one table to another.
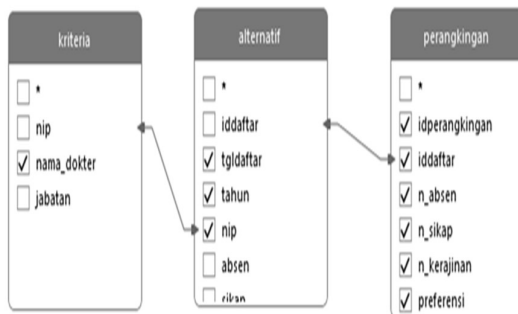
5. System Implementation

The following is the implementation of the system for calculating the SAW method from the decision support system for selecting the best doctor that has been developed:

1. Login Page

The Login page displays the username and password which are only used by the admin.

2. Main/Home page

The Main/Home page displays decision support system information which has five menus including the Home menu, Users, Criteria, Alternatives, Ranking Report and Logout.
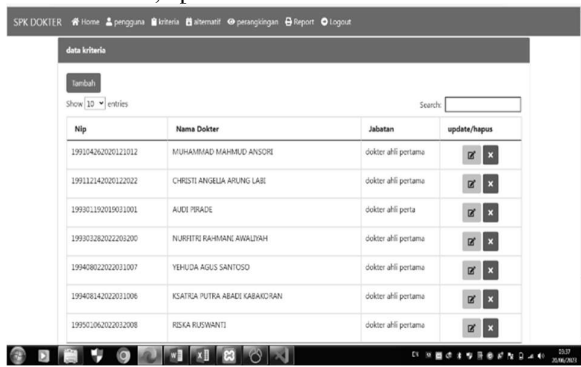

3. User Page

Displays user data containing username, password and level. In this user menu you can also delete, update and add users.
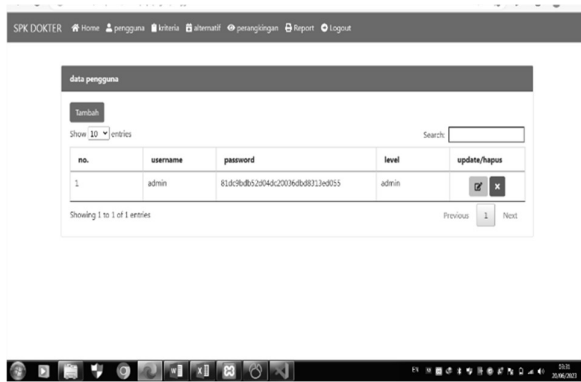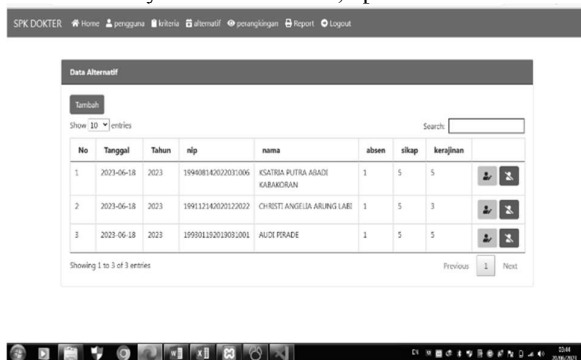
4. Alternative Pages

This alternative page displays criteria data containing NIP, Doctor's Name, Position. In this criteria menu you can also delete, update and add.


5. Criteria Page

This page displays criteria data containing date, year, ID, name, and criteria for absence, attitude, craft. In this criteria menu you can also delete, update and add.
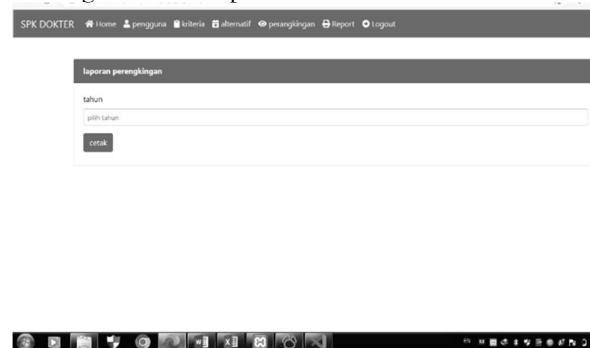

6. Ranking Page

This page displays the ranking where in this ranking only enter the year then the results of the SAW calculation appear. Because this data is combined with alternative data, the SAW calculation is automatic in the ranking menu.
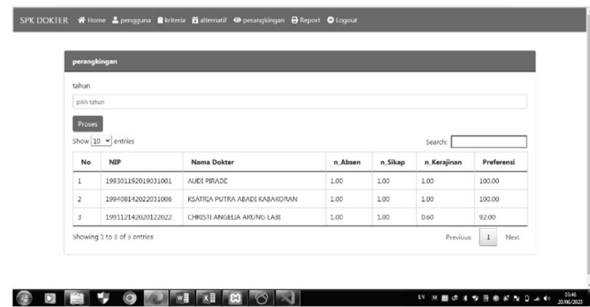
7. Report page

This page displays a ranking report that can be printed by entering the annual report.

8. Log out

When you click the logout menu, you will exit and return to login

6. Discussion

From the calculation results of the simple additive weighting method in determining the best doctors at the Ahmad Brahim regional general hospital, it was found that (Dr. Audi Pirade, Dr. Knight Putra Abadi Kabakoran, Dr. Nurfitri Rahmani Awaliyah and Dr. Riska Russwanti) were the first best doctors in because the criteria values for the 4 doctors are the same, those who get absenteeism 0.45, attitude 0.35 and diligence 0.2, therefore there are 4 doctors in first place. The second rank is (Dr. Christi Angelia Arung Labi) who has an absence score of 0.45, an attitude score of 0.35 and a craft score of 0.12, therefore the doctor, Dr. Christi Angelia Arung Labi got second place.

In this assessment, it can be seen that the C1 (absence) criteria is neglected by many doctors, therefore this research is looking for the criteria for absences that are the least neglected. Because it is looking for a little alpha, it is said to be cost. Then in criterion C2 (Attitude) the attitude values of alternatives A1 to A7 are the same because the attitude value has an average of 5. In criterion C3 (Crafts) the values obtained from alternatives A1 to A7 are almost the same on average, only 2 alternatives are different.

The criteria in this calculation greatly influence the calculation of the SAW method because it only uses 3 criteria which produces the same number of values for each alternative.

7. Results

Testing is carried out in 2 ways, namely inappropriate testing and appropriate testing in the Doctor Selection Decision Support system. Testing is usually carried out twice, which is attempted by the admin from the health service and the director of the Ahmad Brahim Hospital section who works in the Tutorial field using Black Box in the table below.

Table 4. 11 Inappropriate tests on directors

No	Pengujian	Detail pengujian	Hasil pengujian	kesimpulan
1	Menguji pada Login direktur	Mengisi username dan password dengan acak/sembarangan	Sistem menolak akses login. Login gagal	Sesuai harapan (valid)
2	Menguji menu perangkingan	Memproses perangkingan yang belum mempunyai data pada sistem.	Data tidak ditemukan	Sesuai harapan (valid)
3	Menguji search yang ada pada semua menu	Mencari nama yang tidak ada pada database	Tidak di temukan	Sesuai harapan (valid)

Table 4. 12 appropriate tests on directors

No	Pengujian	Detail pengujian	Hasil pengujian	kesimpulan
1	Menguji pada Login direktur	Mengisi username dan password yang sudah di registrasi	Berhasil login	Sesuai harapan (valid)
2	Menambah data pada menu alternative dan kriteria	Menampilkan tampilan tambah data	Berhasil menambah data alternatife dan kriteria	Sesuai harapan (valid)
3	Menguji search yang ada pada semua menu	Mencari nama yang suda ada pada database	Muncul tampilan hasil yang di cari	Sesuai harapan (valid)
4	Menguji delate dan update	Mengahapus dan menambahkan data	Muncul tampilan hapus dan dapat mengupdate data	Sesuai harapan (valid)

Table 4. 13 Inappropriate tests in admin

No	Pengujian	Detail pengujian	Hasil pengujian	kesimpulan
1	Menguji pada Login admin	Mengisi username dan password dengan acak/sembarangan	Sistem menolak akses login. Login gagal	Sesuai harapan (valid)
2	Menguji menu perangkingan	Memproses perangkingan yang belum mempunyai data pada sistem.	Data tidak ditemukan	Sesuai harapan (valid)
3	Menguji search yang ada pada semua menu	Mencari nama yang tidak ada pada database	Tidak di temukan	Sesuai harapan (valid)

Table 4. 14 appropriate tests on admin

No	Pengujian	Detail pengujian	Hasil pengujian	kesimpulan
1	Menguji pada Login admin	Mengisi username dan password yang sudah di registrasi	Berhasil login	Sesuai harapan (valid)
2	Menambah data pada menu alternative dan kriteria	Menampilkan tampilan tambah data	Berhasil menambah data alternatife dan kriteria	Sesuai harapan (valid)
3	Menguji search yang ada pada semua menu	Mencari nama yang suda ada pada database	Muncul tampilan hasil yang di cari	Sesuai harapan (valid)
4	Menguji delate dan update	Mengahapus dan menambahkan data	Muncul tampilan hapus dan dapat mengupdate data	Sesuai harapan (valid)

Conclusion

Based on this research that has been carried out, it can be concluded that the best doctor at the Ahmad Brahim Hospital, determines the best doctor using a decision support system using the simple additive wighting method to make it easier to select the best doctor with 3 appropriate criteria, namely attendance criteria, attitude

and crafts also used 7 alternatives in this research. Then in the research above there were 4 who got first place. Using the best doctor's decision support system can also be used to select other hospital employees with appropriate criteria.

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