

Decision Support System of Recruitment using Simple Additive Weighting Method

Yeni Rokhayati¹ , Rolly Hidayat², Sartikha³

^{1,2,3}Department of Informatics Engineering, Politeknik Negeri Batam
yeni@polibatam.ac.id, rollyid1246@gmail.com, tikha@polibatam.ac.id

ABSTRACT. Assisting the human resources department to choose easily and quickly the suitable employee among of so many candidates, a decision support system is needed. The decision support system is designed with unified modeling language (UML) and developed using PHP programming and database MySQL. This system uses a simple additive weighting (SAW) method which considering four criterias; those are written test, interview test, work experience, and age. The user enter the name and the data of applicants, and then the system will display a graph which describe the score of each applicant. The applicant with the higher score will be selected as suitable and competent employee.

KEYWORDS: [decision support system; ranking; recruitment; SAW method]

1 INTRODUCTION

Batam is one of industrial area in Indonesia that is near from Malaysia and Singapore. Since the increase of minimum salary in Batam, many companies would not hold their employees to be permanent, that is because the company will spend more money for their salary. Therefore, many companies prefer to discharge the old employess and recruit the new more often than before. In the recruitment processes, there will be always so many applicants, which have almost similar competence, with the result that the human resources department feel hard to select some of them.

Recruitment is a series of activities and look for job applicants with motivation, abilities, skills, and knowledge needed to cover the shortfall identified in the planning of employees (Henry Simamora, 1997). In order to help the human resources department to choose easily and quickly the suitable employee among of so many candidates, a decision support system is needed.

Simple additive weighting (SAW) is one of methods often used in making decision based on some criterias. It uses a simple calculation to score and then rank all of the candidates. The concept of this method is finding the weighted sum of the rating performance of each candidates based on all criterias (Fishburn, 1967). The criterias using in this decision making are the usually used by the companies to choose their operators, that are written test, interview test, work experience, and age.

This web-based system is developed using PHP 5 programming which is object oriented, so that the Unified Modeling Language (UML) is suitable for the design of this system. As for the accompanying of PHP 5 programming, MySQL database is used.

Simply, this research is using simple additive weighting method in making decision of recruitment. Then, a decision support system is designed and developed for the implementation.

2 SIMPLE ADDITIVE WEIGHTING METHOD

Simple additive weighting (SAW) method is finding the weighted sum of the rating performance of each candidates based on all criterias. The steps of this method are:

- 1) Decide all criterias which influence the decision making.
- 2) Set the weight of each criteria based on the importance to the decision making. The sum of all the weight should be 1.
- 3) Make the function of each criteria, where the value range from 0 to 1.
- 4) Arrange a normalization matrix which describe all the values of the criteria.
- 5) Multiply each criteria's value with the weight.
- 6) Sum the values of each candidate which have multiplied by the weight.
- 7) Rank all the candidates. The candidate with the higher score will be ranked to the top.

The system recruitment is done after administrative process, therefore the criterias considered are written test, interview test, work experience, and age.

The following equation 1 and Figure 1 is the function of the written test criteria. This function describe that if the written test is lower than 50, the value will be 0; and if it is 100 and higher, it is valued by 1.

$$\mu(\text{written test}) = \begin{cases} 0 & , \text{written test} \leq 50 \\ \frac{\text{written test} - 50}{50} & , 50 < \text{written test} < 100 \\ 1 & , \text{written test} \geq 100 \end{cases} \quad (1)$$

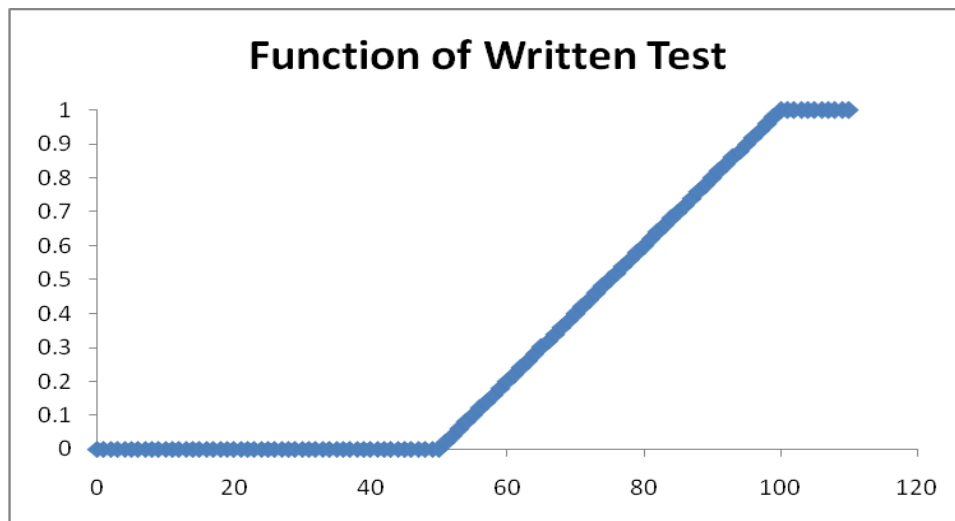


Figure 1: Function of Written Test Criteria

While the value of interview test is shown in Table 1. The interview test divide into 4, that are excellent, good, enough, and bad.

Interview Test	Value
Excellent	1
Good	0.75
Enough	0.5
Bad	0.25

Table 2 shows the value of work experience and then the function is described in the Figure 2. This criteria divided into three group, that are if the work experience less than 1 year, 1 – 2 year, and more than 2 year.

Work Experience	Value
<1	0
1-2	0.5
>2	1

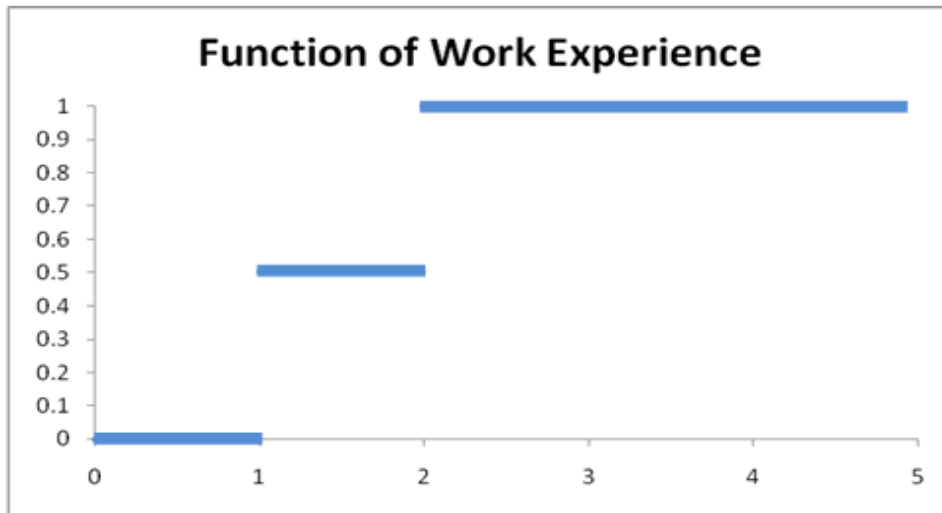


Figure 2: Function of Work Experience Criteria

The Figure 3 below describes the function of age criteria. If the age lower than 17 and higher than 26, the value will be 0; while if the age is 20 to 22, it is valued by 1. The complete function can be calculated using the following equation 2.

$$\mu(\text{age}) = \begin{cases} 0 & , \text{age} \leq 17 \text{ and } \text{age} \geq 26 \\ \frac{\text{age} - 17}{3} & , 17 < \text{age} < 20 \\ 1 & , 20 \leq \text{age} \leq 22 \\ \frac{26 - \text{age}}{4} & , 22 < \text{age} < 26 \end{cases} \quad (1)$$

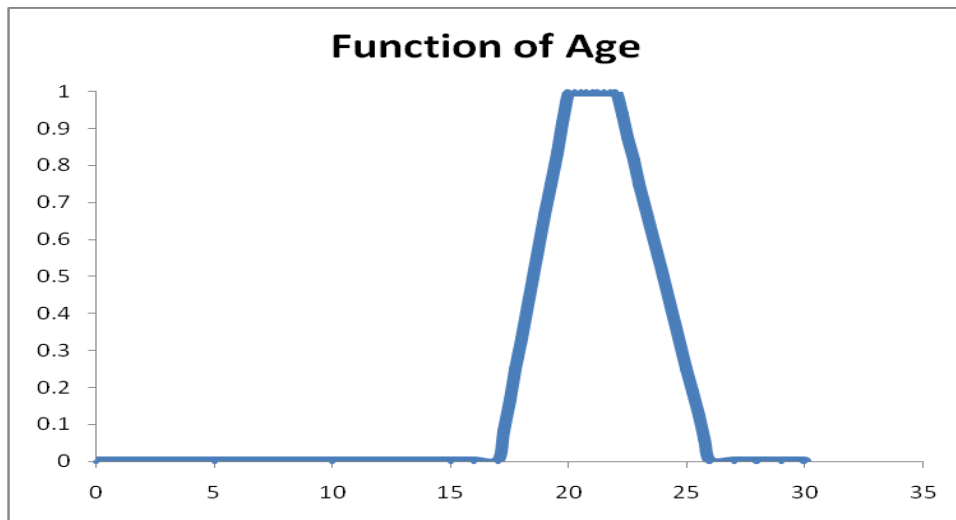


Figure 3: Function of Age Criteria

After deciding all criterias and the function, the next step is setting the weight of each criteria as shown in Table 3 below.

Table 3: Weight of Criterias

Criteria	Weight
Written Test (C1)	0.325
Interview Test (C2)	0.325
Work Experience (C3)	0.25
Age (C4)	0.1

The following example is the decision making that calculated manually. Ten candidates are considered. The data of each candidate has shown in Table 4 below.

Table 4: Data of Candidates

Candidate	Written Test (C1)	Interview Test (C2)	Work Experience (C3)	Age (C4)
Rani	80	Good	6	22
Yuli	70	Good	1	20
Desi	80	Enough	3	23
Beni	65	Bad	2	20
Agus	50	Good	3	18
Surya	90	Excellent	0	19
Dewi	95	Good	1	22
Mery	75	Enough	3	29
Suzana	60	Good	2	26
Kino	65	Bad	2	25

While the following Table 5 is the normalization matrix, and then each value is multiplied by the weight and sum in the last.

Table 5: Ranking of Candidates

Candidate	C1	C2	C3	C4	Sum	Ranking
	0.325	0.325	0.25	0.1		
Rani	0.6	0.75	1	1.00	0.7888	1
Yuli	0.4	0.75	0.5	1.00	0.5988	5
Desi	0.6	0.5	1	0.75	0.6825	3
Beni	0.3	0.25	0.5	1.00	0.4038	9
Agus	0	0.75	1	0.33	0.5271	7
Surya	0.8	1	0	0.67	0.6517	4
Dewi	0.9	0.75	0.5	1.00	0.7613	2
Mery	0.5	0.5	1	0.00	0.5750	6
Suzana	0.2	0.75	0.5	0.00	0.4338	8
Kino	0.3	0.25	0.5	0.25	0.3288	10

If the company needs 3 employees, then the candidates should be recommended are Rani, Dewi, and Desi.

3 DECISION SUPPORT SYSTEM

The functional requirements of the system described in the use case diagram below. The user of this system is staff of human resources department.

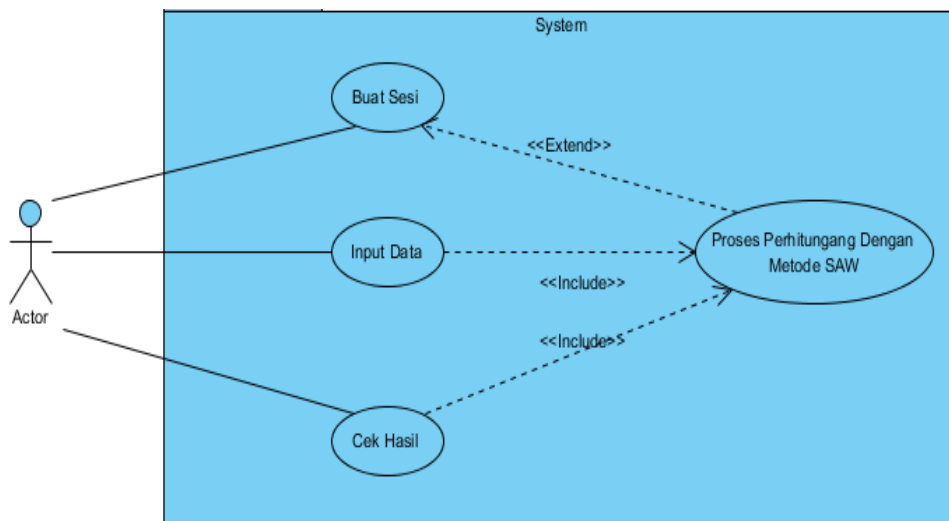


Figure 4: Use Case Diagram

Some interfaces implementation of this system are shown in Figure 5 to 9.

DAFTAR SESI PENERIMAAN
Berikut daftar sesi penerimaan yang sudah ada | Total Sesi: 5 Sesi

NO	JUDUL SESI	TANGGAL SESI	TOTAL PESERTA	ACTION
1.	SESI PENERIMAAN KARYAWAN KE- 5 November	08/11/2015	10 Orang	Cek Grafik
2.	SESI PENERIMAAN KARYAWAN KE- 4 Sesi 4	08/11/2015	3 Orang	Cek Grafik
3.	SESI PENERIMAAN KARYAWAN KE- 3 dan	11/01/2015	0 Orang	Input Data
4.	SESI PENERIMAAN KARYAWAN KE- 2 Penerimaan calon administrasi	11/01/2015	1 Orang	Cek Grafik
5.	SESI PENERIMAAN KARYAWAN KE- 1 Penerimaan Karyawan Adm	18/12/2014	6 Orang	Cek Grafik

DASHBOARD ANDA

- Home
- Buat Sesi Baru
- Halaman Sebelumnya

PETUNJUK

1. Untuk memulai silahkan tambah sesi baru.
2. Input Data Hasil Tes, Pastikan data yang dimasukkan benar dan lengkap.
3. Pastikan nama tidak ada yang sama, jika ada buatlah perbedaan agar tidak keiru.
4. Isi Data pada form dengan benar, jangan sampai ada yang kosong.
5. Untuk Nilai harus dengan bilangan bulat, tidak dibenarkan pakai koma.
6. Pastikan anda sudah input semua data sebelum Cek Grafik.
7. Cek Grafik per Sesi.

Figure 5: Home Interface

The home interface shows all the recruitment sessions, and the dashboard on the right consist of all menus and the instruction of using.

INPUT DATA HASIL TES

Nama Lengkap:

Tes Tertulis:

Tes Interview :
- Pilih -

Pengalaman Kerja:

Umur:

DASHBOARD ANDA

- Home
- Buat Sesi Baru
- Halaman Sebelumnya

PETUNJUK

1. Untuk memulai silahkan tambah sesi baru.
2. Input Data Hasil Tes, Pastikan data yang dimasukkan benar dan lengkap.
3. Pastikan nama tidak ada yang sama, jika ada buatlah perbedaan agar tidak keiru.
4. Isi Data pada form dengan benar, jangan sampai ada yang kosong.
5. Untuk Nilai harus dengan bilangan bulat, tidak dibenarkan pakai koma.
6. Pastikan anda sudah input semua data sebelum Cek Grafik.
7. Cek Grafik per Sesi.

Figure 6: Form of Input Data

The data should be input by the user consist of name, the result written test, the result of interview test, the year of work experience, and the age of the candidate.

SESI PENERIMAAN KARYAWAN KE- 5 | INPUT DATA

NO	NAMA CALON KARYAWAN	TES TULIS	TES INTERVIEW	PENGALAMAN KERJA	UMUR	ACTION
1.	Rani	80	Baik	>2 Tahun	22 Tahun	Ubah
2.	Yuli	70	Baik	1-2 Tahun	20 Tahun	Ubah
3.	Desi	80	Cukup	>2 Tahun	23 Tahun	Ubah
4.	Beni	65	Buruk	1-2 Tahun	20 Tahun	Ubah
5.	Agus	50	Baik	>2 Tahun	18 Tahun	Ubah
6.	Sarye	90	Istimewa	<1 Tahun	19 Tahun	Ubah
7.	Devi	95	Baik	1-2 Tahun	22 Tahun	Ubah
8.	Mery	75	Cukup	>2 Tahun	29 Tahun	Ubah
9.	Suzana	60	Baik	1-2 Tahun	26 Tahun	Ubah
10.	Kino	65	Buruk	1-2 Tahun	25 Tahun	Ubah

DASHBOARD ANDA

- Cek Hasil
- Home
- Buat Sesi Baru
- Halaman Sebelumnya

PETUNJUK

1. Untuk memulai silahkan tambah sesi baru.
2. Input Data Hasil Tes, Pastikan data yang dimasukkan benar dan lengkap.
3. Pastikan nama tidak ada yang sama, jika ada buatlah perbedaan agar tidak keiru.
4. Isi Data pada form dengan benar, jangan sampai ada yang kosong.
5. Untuk Nilai harus dengan bilangan bulat, tidak dibenarkan pakai koma.
6. Pastikan anda sudah input semua data sebelum Cek Grafik.
7. Cek Grafik per Sesi.

Figure 7: Data of Candidates

After the data of all candidates has been input, the user of the system can see the result in a bar chart graphic as shown in Figure 8 below. The candidate with higher bar has the higher score, that mean he/she will be recommended as the employee.

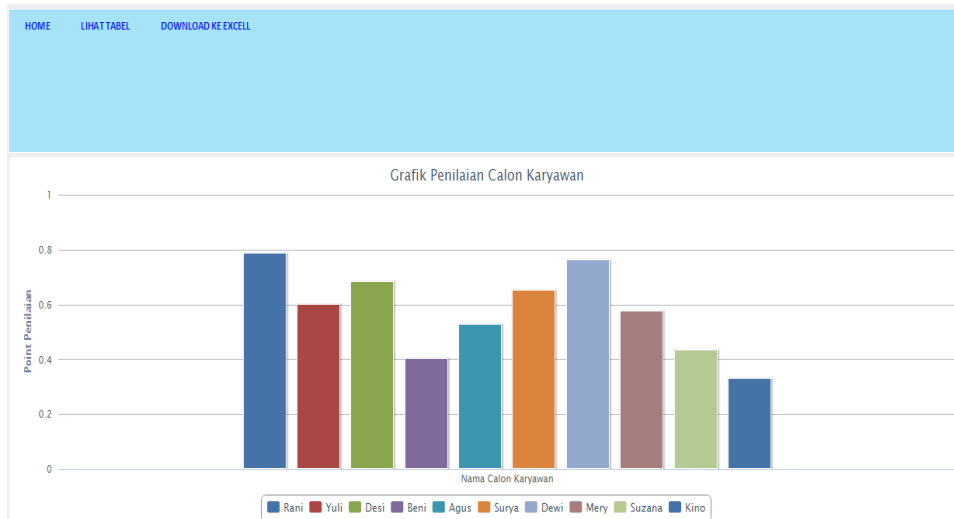


Figure 8: Graph of Result

Beside using graph, the result can be seen in a table too. The table completely show us each score of the candidates as seen in the Figure 9 below.

SESI PENERIMAAN KARYAWAN KE- 5						
NO	NAMA CALON KARYAWAN	TES TULIS	TES INTERVIEW 1	PENGALAMAN KERJA	UMUR	TOTAL NILAI
1.	RANI	80	BAIK	>2 TAHUN	22 TAHUN	0.78875
2.	DEWI	95	BAIK	1-2 TAHUN	22 TAHUN	0.76125
3.	DESI	80	CUKUP	>2 TAHUN	23 TAHUN	0.6825
4.	SURYA	90	ISTIMEWA	<1 TAHUN	19 TAHUN	0.651667
5.	YULI	70	BAIK	1-2 TAHUN	20 TAHUN	0.59875
6.	MERY	75	CUKUP	>2 TAHUN	29 TAHUN	0.575
7.	AGUS	50	BAIK	>2 TAHUN	18 TAHUN	0.527083
8.	SUZANA	60	BAIK	1-2 TAHUN	26 TAHUN	0.43375
9.	BENI	65	BURUK	1-2 TAHUN	20 TAHUN	0.40375
10.	KINO	65	BURUK	1-2 TAHUN	25 TAHUN	0.32875

Figure 9: Table of Result

4 CONCLUSION

A decision support system has been designed and developed. The system assist the staff of human resources department to make a decision in choosing some candidates to be employed. The result in this system which is the implementation of simple additive weighting calculation are displayed both in a graph and a complete table. The candidate with a higher score will be considered as the employee. For further development of this system, it would be better if the criterias used are more than 4, because it can make the decision wisely. Beside it, input the candidates data will be easier if the user doesn't input one by one, but it can upload the data directly and completely from the ready database.

REFERENCES

- Fishburn, P.C. (1967). *Additive Utilities with Incomplete Product Set: Applications to Priorities and Assignments*. Operations Research Society of America (ORSA), Baltimore, MD, U.S.A.
- Fitri, R., & Sari, W.S. (2013). *Sistem Pendukung Keputusan Pemilihan Jurusan Tingkat Lanjut dengan Metode SAW* (Unpublished Diploma's Thesis). Politeknik Negeri Batam.
- Kadir, A. (2008). *Belajar Database Menggunakan MySQL*. Yogyakarta: Andi Publisher.
- Saaty, T.L. (1993). *Pengambilan Keputusan Bagi Para Pemimpin Proses Hirarki Analitik untuk Pengambilan Keputusan Dalam Situasi Yang Kompleks*. Jakarta: Pustaka Binama Pressido.
- Saaty, T.L. (2001). *Decision Making For Leaders* (4th ed). University of Pittsburgh: RWS Publication.
- Sakur, S.B. (2010). *PHP 5 Pemograman Berorientasi Object*. Yogyakarta: Andi Publisher.
- Simamora, H. (1997). *Manajemen Sumber Daya Manusia*. Yogyakarta: STIE YKPN.