Decision Support System in Employee Admissions Using Simple Additive Weighting Algorithm in CV.Source of Shared Solutions

Syahrul Rofiq Abdillah Fadli[1*], Dwi Hartanti[2], Agustina Srirahayu[3]
Universitas Duta Bangsa Surakarta
E-mail: 202020034@mhs.udb.ac.id[1*] , dwihartanti@udb.ac.id[2] , agustina@udb.ac.id[3]

	ABSTRACT
Keywords: decision support systems; SAW; employee reception.	CV. Sumber Solusi Bersama, a software house company in Sukoharjo, faces challenges in the employee recruitment process that is still done manually. This research aims to develop a decision support system (SPK) for employee admission using the Simple Additive Weighting (SAW) algorithm. The SAW algorithm was chosen because of its ability to analyze and give weight to each criterion for the best decision-making. This research uses the waterfall system development method which is part of the System Development Life Cycle (SDLC). This system is expected to increase efficiency and accuracy in the employee selection process, as well as support fairer and more appropriate decision-making. Software feasibility testing conducted by CV. Implementation of SPK with SAW algorithm in CV. Sumber Solusi Bersama provides an alternative way to select employees that is more systematic and structured, so that it can help in achieving the company's strategic goals.

Introduction

The recruitment and selection process of employees is an important aspect of human resource management that affects operational performance and the achievement of company goals (Muryani et al., 2022). The selection of the right candidate not only affects operational performance, but also contributes to the achievement of the company's strategic goals. CV.Sumber Solusi Bersama as a growing company, faces the challenge of screening a large number of applicants to find individuals who best suit the needs and culture of the organization. The manual selection process is often time-consuming and prone to subjectivity, so a method is needed that can increase efficiency and accuracy in decision-making (Al Furat, 2023).

This Decision Support System (SCI) is a tool that can help managers make better and more accurate decisions based on data and analytical models (Ariantini et al., 2023). In the context of employee admission, SPK can be used to evaluate and compare prospective employees based on various relevant criteria. One of the effective methods in the application of SPK is the Simple Additive Weighting (SAW) algorithm (Rahayu,

Handani, & Ramadiani, 2022). The SAW algorithm is known for its simplicity and ability to process multi-criteria data by assigning weights to each criterion according to its level of importance (Anita, Wahyudi, & Susanto, 2020). The general definition of a decision support system is a system that can solve difficulties and communicate with semi-structured challenges (Umar, 2023).

This research aims to design and implement SPK in the process of accepting employees at CV.Sumber Solusi Bersama using the SAW algorithm. The study will also evaluate the effectiveness of the implementation of the SAW algorithm in the context of employee selection and identify the benefits and challenges faced in its implementation (Yunita, Wibowo, Rizky, & Wardah, 2023).

The determination of the decision support system using a simple additive weighting algorithm on CV. Sumber Solusi Bersama makes the selection process for employee admissions have an alternative way of selection where the director can have an employee admission decision with the existing system.

Research Methods

This research begins by formulating a problem and conducting a literature study. The problem-solving process requires data collected through observation and documentation methods (Apriliawati, 2020). After the data is collected, the next stage is development, this time the author uses the Rapid Application Development (RAD) method (Zakariah, Afriani, & Zakariah, 2020).

The RAD method was chosen because it has a high level of dynamism, short processing time, and has similar features to those of users, and can quickly meet the needs of the latest information. These are the steps of the research carried out:

a. This stage involves modeling business functions to identify the information that needs to be created, the party responsible for creating the information, the flow of information, and the processes involved. Researchers collect materials and make observations on system needs, then this business modeling stage will be visualized using a workflow diagram.

b. Data Modeling, this stage includes modeling the necessary data based on business modeling, as well as defining its attributes. At this stage, the researcher created a data model based on information about prospective employees and the criteria obtained by applying the Simple Additive Weighting method.

c. Process Modeling, a business function defined based on data modelling is practiced. The author uses Unified Modeling Language (UML) at this time to identify business processes, including drawing use case diagrams. In addition, the author creates a system interface consisting of input and output design.

Results and Discussion

1. Business Modeling

Admin and user access permissions are included in the basic definition of business modeling for employee hiring decision support systems. The following Picture 1 illustrates the workflow of the decision support system that is created:

Picture 1. Decision Support System Workflow

Picture 1 :

a. Admin as a data manager for prospective employees who register through the decision support system, assigns values and attribute weights for final calculations using the Simple Additive Weighting (SAW) method (Poornama, Putra, Adi, & Harthanti, 2022). This makes it easier for the director of CV. Sumber Solusi Bersama in selecting employee admissions according to needs.

b. Prospective employees can access the main page of the decision support system without logging in and seeing the list of names that have passed the selection, and on the main page there is already a page that is integrated into the data so that it can display the names of prospective employees.

2. Data Modeling

The information used in this study is data on prospective employees who are running for CV. With 8 criteria for each prospective employee. The data on the criteria for prospective employees to be used is displayed in Table 1.

Table 1 Table of Codes and Criteria for Selecting Prospective Employees

It	Criterion	Symbol	Benefit	Cost
1	Skill	K1	✓	-
2	Experience	K2	✓	-
3	Certification	K3	✓	-
4	Interview	K4	✓	-
5	Sikap	K5	✓	-
6	Knowledge	K6	✓	-
7	Test Scores	K7	✓	-
8	Troubleshooting	K8	-	✓

a. Weight table

Equation (3) is used to calculate the preference weight (W) (Sukaryati & Voutama, 2022) in the following way:

$$Wj = \frac{Wlamaj}{\Sigma Wlamaj}$$

Information:

Wj   = preference weight

Wlamaj = nonot value in the To column j

$\Sigma Wlama$j = Total overall weight value

Based on the equation that has been explained as shown in Table 2.

Table 2 Weight Table

No	Criteria Symbol	Weight
1	K1	14
2	K2	12
3	K3	12
4	K4	10
5	K5	15
6	K6	12
7	K7	12
8	K8	13

b. Criterion matrix

After the director of CV.Sumber Solusi Bersama completed the questionnaire data table, the values were constructed in the form of a matrix as follows.

$$X = \begin{pmatrix} 3 & 4 & 2 & 5 & 4 & 3 & 4 & 3 \\ 3 & 4 & 3 & 3 & 2 & 5 & 3 & 4 \\ 4 & 4 & 4 & 3 & 4 & 5 & 5 & 2 \\ 5 & 5 & 2 & 3 & 3 & 4 & 4 & 2 \\ 5 & 4 & 3 & 4 & 4 & 4 & 3 & 2 \\ 4 & 5 & 3 & 5 & 3 & 3 & 3 & 4 \\ 3 & 2 & 2 & 3 & 3 & 4 & 5 & 4 \\ 5 & 3 & 4 & 5 & 3 & 3 & 2 & 5 \end{pmatrix}$$

c. Normalization of the R Matrix

To generate the normalization matrix R, the equation of the normalization matrix can be modified according to the type of attribute (profit or cost). Utilizing Equation (1), obtain the value of R. For each alternative (i), the normalization on K1 (j) is listed in the following order:

$$R11 = = 0{,}6 \frac{3}{\max (3,3,4,5,5,4,3,5)} = \frac{3}{5}$$

So the values of R_{11}, R_{21}, and R71 have a value of 0.6. While R_{31}, and R61 have a value of 0.8 and the values of R41, R51, and R81 have the same value, namely 1.

The R matrix is obtained as follows based on the same formula used to obtain the matrix normalization equation:

$$R = \begin{bmatrix} 0{,}6 & 0{,}8 & 0{,}5 & 1 & 1 & 0{,}6 & 0{,}8 & 0{,}6 \\ 0{,}6 & 0{,}8 & 0{,}75 & 0{,}6 & 0{,}5 & 1 & 0{,}6 & 0{,}8 \\ 0{,}8 & 0{,}8 & 1 & 0{,}6 & 1 & 1 & 1 & 0{,}4 \\ 1 & 1 & 0{,}5 & 0{,}6 & 0{,}75 & 0{,}8 & 0{,}8 & 0{,}4 \\ 1 & 0{,}8 & 0{,}75 & 0{,}8 & 1 & 0{,}8 & 0{,}6 & 0{,}4 \\ 0{,}8 & 1 & 0{,}75 & 2 & 0{,}75 & 0{,}6 & 0{,}6 & 0{,}8 \\ 0{,}6 & 0{,}4 & 0{,}5 & 0{,}6 & 0{,}75 & 0{,}8 & 1 & 0{,}8 \\ 1 & 0{,}6 & 1 & 2 & 0{,}75 & 0{,}6 & 0{,}4 & 1 \end{bmatrix}$$

d. Ranking Determination

Find out the value of each option or potential employee who submitted a resume. Unify Source Solutions. Here's how to calculate the value of V1 for each of the eight choices using equation (2):

V1 = (0,6 x 0,14) + (0,8 x 0,12) + (0,5 x 0,12) + (1 x 0,10) + (1 x 0,15) + (0,6 x 0,12) + (0,8 x 0,12) + (0,6 x 0,13)

$$= 0{,}084 + 0{,}096 + 0{,}06 + 0{,}1 + 0{,}16 + 0{,}072 + 0{,}096 + 0{,}078$$
$$= 0.746$$

Targeting the results of the calculation of the Vi value for each prospective employee who is an alternative in determining the acceptance of employees in CV.sumber solusi bersama using the same formula, the ranking table can be compiled as seen in Table 3.

Table 3. Ranking Determination

Alternative / kriteria	Vi	Rangking
Dita Adiguna, Amd	0,762	V
Wibisana Budi Iswara, S.Kom	0,727	VII
Nooryadi, S.Kom	0,836	I
Wisno Ajisudrajat, AMD	0,751	VI
Rizki Priakasa Setiaji, S.Kom	0,791	IV
Dhea kalingga, S.Kom	0,817	III
Rangga Waspada, S.Kom	0,709	VIII
Ahmad Kurniawan, S.Kom	0,798	II

3. Process Modeling

Unified Modeling Language, or UML, is used to model the design process in research Ini. In industry, UML is used for design, analysis, and definition of needs. A use case diagram that illustrates the relationship between actors and systems is one of the UML diagrams generated (Setiyani & Setiawan, 2021). Two actors are involved in the modeling of the recommendation system process: the admin and the user. Administrators have the ability to add criteria, assign weights, manage prospective employee data, run system operations, and view the results of prospective employee decisions taken in the system. Picture 3 shows the process of designing this recommendation system in the form of a use case diagram.

Picture 2. Use Case Diagram

The interface architecture of the decision-making system as a decision-maker in selecting prospective employees is as follows, based on the results of the process modeling in Picture 2:

a. System interface modeling

The main page of this system has a login page that can be used by the director of CV.Sumber Solusi Bersama to enter the system, and there is also a page to display the final results of the data for the names of prospective employees according to the ranking set by the employee admission decision-making system, the interface can be observed in Picture 4.

b. Modeling of potential employee data interfaces

This page is used to record prospective employees and brief identities about each prospective employee, this decision-making system records each prospective employee according to an attachment containing the place of birth, photo, experience, and skills possessed. The interface of the prospective employee data page is as seen in Picture 5.

c. Modeling the tpa results master data interface

This result page is used by the Director of CV Sumber Solusi Bersama to display the score data of each assessment test criteria. The interface of the results page of this decision support system is as seen in Picture 6.

d. Modeling the master data setting interface

The results page of this decision support system is used to display the weight data that has been determined by the director of CV.Sumber Solusi Bersama, which later this weight value data will be used to process employee data and the scores of each criterion in order to get the ranking results used as a reference for employee admissions. The interface is as seen in Picture 7.

e. Modeling of the process interface of the decision support system

The decision support system results page is used to display the final results based on the value of each prospective employee that can be seen and exit the ranking results according to the assessment of the decision support system and the weight data that has been entered by the director of CV.Sumber Solusi Bersama. The interface can be as seen in Picture 8.

4. Software testing

Software testing is the process of running and assessing software known as software testing.

1. Software Test Case Design

Blackbox Testing includes the evaluation of the suitability, usability, and output of the process with respect to the tasks performed by administrators in the decision support system to select prospective employees.

2. Implementation.

Based on the software testing design described earlier, the following individuals directly test the best employee selection decision support system: 1) the author, who is responsible for testing the software functionality, testing the suitability of the system process, and testing the correctness of the algorithm; 2) The Head of the General and Press Subdivision who is in charge of testing the feasibility of the system and the accuracy of the results. Here's a summary of the exam.

a. Blackbox testing

Blackbox testing is intended to test system functionality and compatibility between input and output has been carried out on Tuesday, June 18, 2024. This test went well, where the output produced by the system was in line with expectations.

b. White box testing

This test was carried out by the authors themselves according to the white box test design, which seeks to evaluate the feasibility of implementing procedures and

algorithms in the decision support system to select the best prospective employees. The following are the results of the algorithmic testing of the employee selection decision support system:

It	Algorithm name	Information
1	Setting up a rating matrix	Succeed
2	Normalizing the matrix	Succeed
3	Set the weight matrix	Succeed
4	Multiplication of the weight matrix by the normalized maatric	Succeed

c. Testing the accuracy and feasibility of the system

On Tuesday, June 18, 2024, the accuracy and feasibility testing of the system implementation has been completed. This test was carried out by a company represented by the Director of CV Sumber Solusi Bersama. The test results show that the system operates efficiently. Because system calculations and manual calculations are compatible with each other. In addition, it was decided that a decision support system for selecting the best personnel could be implemented. Software testing, which includes Whitebox (algorithm correctness validation), Blackbox (functional and process conformity validation), and System Accuracy and Feasibility testing, has been successfully implemented. All test cases are found to be appropriate through functionality and process compliance testing, which indicates that administrators should handle this task. All algorithms have been implemented correctly, as evidenced by algorithm accuracy testing. Furthermore, the accuracy test of the system's computing output shows that the SAW calculations performed by the system are in accordance with the calculations performed manually (Gunawan, Ariany, & Novriyadi, 2023). Based on the feasibility test of the CV.Sumber Solusi Bersama software, CV can implement an employee admission decision support system in CV.Sumber Solusi Bersama.

Conclusion

Based on the results and discussion, it can be concluded that the decision support system to select prospective employees is able to implement the Simple Additive Weighting method well. In addition, the calculations made by the decision support system for staff recruitment are proven to be in accordance with the calculations made manually, thus demonstrating the accuracy and reliability of the system in assisting the selection process of prospective employees.

Bibliography

Al Furat, Sultan Rafi. (2023). *Sistem Pendukung Keputusan Rekrutmen Karyawan Pada PT Bhandawa Metafora Warsoyo Menggunakan Gabungan Metode Ahp dan Saw Studi Kasus: Pt. Bhandawa Metafora Warsoyo*. Fakultas Sains dan Teknologi UIN Syarif Hidayatullah Jakarta.

Anita, Komang, Wahyudi, Agung Deni, & Susanto, Erliyan Redy. (2020). Aplikasi Lowongan Pekerjaan Berbasis Web Pada Smk Cahaya Kartika. *Jurnal Teknologi Dan Sistem Informasi*, *1*(1), 75–80.

Apriliawati, Denisa. (2020). Diary study sebagai metode pengumpulan data pada riset kuantitatif: Sebuah literature review. *Journal of Psychological Perspective*, *2*(2), 79–89.

Ariantini, Made Suci, Belferik, Ronald, Sari, Ovi Hamidah, Munizu, Musran, Ginting, Erika Fahmi, & Mardeni, Mardeni. (2023). *Sistem Pendukung Keputusan: Konsep, Metode, dan Implementasi*. PT. Sonpedia Publishing Indonesia.

Gunawan, Rakhmat Dedi, Ariany, Fenty, & Novriyadi, Novriyadi. (2023). Implementasi Metode SAW Dalam Sistem Pendukung Keputusan Pemilihan Plano Kertas. *Journal of Artificial Intelligence and Technology Information*, *1*(1), 29–38.

Muryani, Endang, Sulistiarini, Emma Budi, Prihatiningsih, Titi Savitri, Ramadhana, Maulana Rezi, Heriteluna, Marselinus, Maghfur, Ifdlolul, Hastuti, Puji, Ahdiyat, Madya, Desembrianita, Eva, & Purnomo, Agung. (2022). *Manajemen sumber daya manusia*. Unisma Press.

Purnama, Joel Adikurnia, Putra, Wahyu Cahya Adi, Adi, Ahmad Khairul, & Hartanti, Dwi. (2022). Sistem Pendukung Keputusan Pemilihan Tempat Kuliner Terbaik Di Kota Surakarta Dengan Metode Simple Additive Weighting. *Komputa: Jurnal Ilmiah Komputer Dan Informatika*, *11*(2), 68–77.

Rahayu, Sri, Hamdani, Hamdani, & Ramadiani, Ramadiani. (2022). Pemilihan Lokasi Budidaya Rumput Laut Menggunakan Metode Analytical Hierarchy Process (AHP) dan Simple Additive Weighting (SAW). *JISKA (Jurnal Informatika Sunan Kalijaga)*, *7*(2), 122–133.

Setiyani, Lila, & Setiawan, Benny. (2021). Analisis Dan Design Manajemen Control Produksi Menggunakan Business Process Improvement Dan Unified Modelling Language (Studi Kasus: Pt. Multistrada). *Jurnal Interkom: Jurnal Publikasi Ilmiah Bidang Teknologi Informasi Dan Komunikasi*, *16*(1), 27–37.

Sukaryati, Lilis Nurjanah, & Voutama, Apriade. (2022). Penerapan metode Simple Additive Weighting pada sistem pendukung keputusan untuk memilih karyawan terbaik. *Jurnal Ilmiah MATRIK*, *24*(3), 260–267.

Umar, Najirah. (2023). *Sistem Pendukung Keputusan*.

Syahrul Rofiq Abdillah Fadli, Dwi Hartanti, Agustina Srirahayu

Yunita, Ayu Mira, Wibowo, Andrianto Heri, Rizky, Robby, & Wardah, Neli Nailul. (2023). Implementasi Metode SAW Untuk Menentukan Program Bantuan Bedah Rumah Di Kabupaten Pandeglang. *Jurnal Teknologi Dan Sistem Informasi Bisnis*, *5*(3), 197–202.

Zakariah, M. Askari, Afriani, Vivi, & Zakariah, K. H. M. (2020). *Metodologi Penelitian Kualitatif, Kuantitatif, Action Research, Research And Development (R n D)*. Yayasan Pondok Pesantren Al Mawaddah Warrahmah Kolaka.