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Decision Support System to Improve Employee Productivity Using the Simple Additive Weighting (SAW) Method Based on Java

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Abstract

This research aims to develop a decision support system (DSS) to enchane employee productivity using the Simple Additive Weighting (SAW) method based on Java. The system is designed to criteria such as age, attendance, performance, and targets. The research method used in the development of this system include data collection through observation and interviews with employess, followed by analysis using the SAW method. The SAW method was chosen for its ability to provide accurate and easily understandable results by summing the weights of each normalized criterion. The system implementation is carried out using Java Netbeans, known for its advantages in designing a system tha is easy to understand. The result of this research show that the system can accurately provide information related to the citeria used within the company through the specified calculations. The SAW method can consider four main criteria: age, attendance, performance, and targets, thus allowing the employee selection process at PT. XYZ Karawang to be performed with higher accuracy and precision. Additionaly, the data related to these criteria can be well summarized and neatly organized within the application database.

***Keywords**: Decision Support System (DSS), Simple Additive Weighting (SAW), Employee Productivity, Java.*

1. INTRODUCTION

The advancement of technology and information systems is currently needed by institutions, organizations, or agencies, especially information technology conducted through the internet (Fathansyah, 2018:11). The progress in information technology, particularly in the field of computers, is closely related to supporting human activities to facilitate problem-solving. A system is a unity consisting of parts called subsystems, which are interconnected to achieve goals (Baridwan, 2015). The use of computers and information systems is now widespread across all fields.

An interactive system known as a Decision Support System (DSS) aids in decision-making by providing options derived from information, data processing, and model design. To assist managers in making decisions, DSS is a model-based system that includes data processing techniques and their considerations (Aisyah 2019). Then, employing data and models, a decision support system is defined by (Nofriansyah & Defit, 2017:2) as computer-based information that generates several decision alternatives to assist management in resolving a variety of structured and unstructured challenges.

Employee productivity is an outcome of the work requirements that must be met by each employee. These requirements include the employee's willingness to work with enthusiasm and responsibility (Hasibuan, 2016). An employee who meets these work prerequisites is considered to have the necessary capabilities, good physical health, intelligence, certain education, and has acquired the skills to perform the job effectively, meeting satisfactory standards in both quality and quantity (Sutrisno, 2015).

This system is designed using the Java programming language and developed through NetBeans software, a popular tool used for developing other software, primarily for Java. It provides wizards and templates to assist in quickly and easily creating applications. The conclusion from the two statements above is that NetBeans is a software that can be operated on various platforms. This means the language can be used to develop programs on different operating systems (Linux, Windows, UNIX) (Afrizal, 2014).

Java has Java Language Specification which is a technical understanding of the Java programming language which contains the rules for writing Java syntax and semantics. In addition, the Application Programming Interface (API) is a layer that contains classes that have been interpreted and programming interfaces that will help application developers in designing an application (Widayanto, 2017).

Relevant Research

Table 1. Relevant Research

No	Research (Year)	Research Title	Method	Research Result
1	Rachman & Daru (2021)	Employee Assessment Decision	Simple Additive Weighting	The existence of this decision support system

		Support System Application at PT GA Tiga Belas		demonstrates that, as demonstrated by research testing, the simple additive weighting (SAW) approach has been successfully included into the system.
2	Sukiakhy & Jummi (2021)	A Decision Support System for PT. Cindyani Tiwi Lestari's Best Employee Selection	Simple Additive Weighting	The SAW technique is a useful and efficient way to determine recommendations based on the set priorities.

Source : Private Document (2024)

2. METHODS

This research was conducted at PT. XYZ Karawang. The research follows steps including problem formulation, decision study, data collection, problem-solving analysis, algorithm implementation, and conclusion. The algorithm used in this research is the Simple Additive Weighting (SAW) algorithm, which is a decision-making method that uses multiple criteria (Karnia ,et al, 2021).

3. RESULTS AND DISCUSSION

Algorithm Discussion

The algorithm used to determine employee productivity ratings at PT XYZ Kaarawang employs the SAW stands for Simple Additive Weighting. The steps to use the Simple Additive Weighting (SAW) method for calculations are as follows: to (Hafidz & Ma'mur, 2018) :

Table 2. Criteria Table

Var	**Criteria**	***Benefit/Cost***
C1	Age	*Cost*
C2	Attendance	*Benefit*
C3	*Performance*	*Benefit*
C4	Target	*Benefit*

Source : Private Document (2024)

The importance of a criterion in the decision-making process increases with its weight. A higher weight indicates that the criterion has a greater influence on the final result or evaluation compared to other criteria.

Table 3. Criteria Weight Table

Var	**Criteria**	**Score**

C1	Age	10
C2	Attendance	15
C3	*Performance*	25
C4	Target	50
TOTAL SCORE		100

Source : Private Document (2024)

From the weight determination process above, the following are the weight result for each alternative according to the criteria that have been established.

a. Criteria *C1*

Criteria *C1* is the age of workers with different weight ranges at each age stage. The following is the age range that has been converted into the table :

Table 4. Criteria *C1*. Age

Age (*X*)	Score	Explanation
21-25 years old	100	ST (Very High)
26-30 years old	80	T (High)
31-35 years old	60	CT (High Enough)
36-40 years old	40	S (Moderate)
41 years old or more	20	R (Low)

Souerce: Private Document (2024)

b. Criteria *C2*

Criterion C2 is a table containing criteria data and the weight of attendance. The following criteria and attendance weights are converted in the table below:

Table 5. Criteria *C2*. Presence

Attendace (*X*)	Score	Explanation
Attendace <= 10 days	20	ST (Very High)
Attendace => 10 - 15	40	T (High)
Attendace => 15 - 17	60	CT (High Enough)
Attendace => 17 - 20	80	S (Moderate)
Attendace => 20 - 24	100	R (Low)

Souerce: Private Document (2024)

c. Criteria *C3*

Criterion C3 is a table containing data on performance criteria and sub-performance criteria. The following performance and sub-performance criteria are converted into the table below:

Table 6. Criteria *C3*. Performance

Criteria	Sub Criteria
Performance	Pencapaian Target Kualitas kerja Inovasi Kerja Sama Tim Kedisiplinan Kemampuam Memecahkan Masalah Pengambangan Diri Pelayanan Terhadap Klien Manajemen Waktu Kepemimpinan

Source: Private Document (2024)

The following is a table of C3 sub-criteria:

Table 7. Sub-Criteria *C3*. Performance

Kriteria	Bobot	Keterangan
1-2 jenis	20	R (Rendah)
3-4 jenis	40	S (Sedang)
5-6 jenis	60	CT (Cukup Tinggi)
7-8 jenis	80	T (Tinggi)
9-10 jenis	100	ST (Sangat Tinggi)

Source : Private Document (2024)

d. Criteria *C4*

Criterion *C4* is a table containing achievement target data in producing the best results. The following criteria and target weights are converted in the table below:

Table 8. Criteria *C4*. Target

Target	Bobot	Keterangan
Target <= Rp. 30.000.000	20	R (Rendah)
Target => Rp. 30.000.000 - Rp.50.000.000	40	S (Sedang)
Target => Rp. 50.000.000 – Rp. 70.000.000	60	CT (Cukup Tinggi)
Target => Rp. 70.000.000 – Rp. 100.000.000	80	T (Tinggi)
Target => Rp. 100.000.000	100	ST (Sangat Tinggi)

Source : Private Document (2024)

d. Alternative Weighting for Each Criteria

Alternative weighting for each criterion is the process of determining a weight value for each criterion in evaluating alternatives or options. This helps in determining

how much influence each criterion has on the final decision. The following is a weighting table for each alternative :

Tabel 9. Suitability Rating of Each Alternative

Alternatif	Kriteria			
	C1	*C2*	*C3*	*C4*
A1	100	60	20	20
A2	100	60	60	20
A3	80	40	80	40
A4	40	20	40	60
A5	100	100	80	20
A6	20	60	40	40
A7	80	40	20	20
A8	40	80	40	40
A9	100	80	60	40
A10	100	60	40	20

Source : Private Document (2024)

e. Normalization Stage

Based on the normalization stage of the decision matrix X above, the following is the calculation of the normalization stage :

Based on the normalization results above, the resulting matrix is as follows :

Table 10. Normalization Results

Alternatif	Kriteria			
	C1	*C2*	*C3*	*C4*
A1	1,0	0,6	0,25	0,33
A2	1,0	0,6	0,75	0,33
A3	0,8	0,4	1,0	0,66
A4	1,0	0,8	1,0	1,0
A5	1,0	1,0	1,0	0,33
A6	0,2	0,6	0,5	0,66
A7	0,8	0,4	0,25	0,33
A8	0,4	0,8	0,5	0,66
A9	0,4	0,2	0,5	1,0
A10	1,0	0,6	0,5	0,33

Source : Private Document (2024)

f. Ranking Stage

In the rangking stage, each row of the normalized value matrix will be multiplied by the criteria weight, resulting in the following rangking :

$$Vi = \sum_{j}^{n} = 1 W_j r_{ij}$$

Vi = The final value of the alternative

Wj = Predetermined weight

rij = Matrix normalization

Table 11. Rangking Results

Var	Nama Alternatif	Total	Rangking
V1	SABDA ALAM PRATAMA	121,66	9
V2	ALIM RAZAQ	151,66	5
V3	AKMAL	169,33	4
V4	**RIVALDI AZIZ SUDRAJAT**	**240**	**1**
V5	IQBAL PRATAMA PUTRA	206,66	2
V6	BIMA UTAMA PUTRA	147,33	6
V7	APRI AMSYAH	97,66	10
V8	SHELLY TRIA ANANDA	171,33	3
V9	HANDIKO RYZKY	138	7
V10	REZA AMBARWATI	136,66	8

Source : Private Document (2024)

From the matrix rangking results above, *A4* (Rivaldi Aziz Sudrajat), *A5* (Iqbal Pratama Putra), *A8* (Shelly Tria Ananda), *A3* (Akmal), *A2* (Alim Razaq) received the highest alternative assessment from the ten other alternatives and from all criteria contained in the previous data. Therefore, *A4* (Rivaldi Aziz Sudrajat), *A5* (Iqbal Pratama Putra), *A8* (Shelly Tria Ananda), *A3* (Akmal), *A2* (Alim Razaq) are the five alternatives chosen as the best alternative in the decision support system to increase productivity employee work at PT. XYZ Karawang is produced using the Simple Additive Weighting (SAW) method.

Screen Display

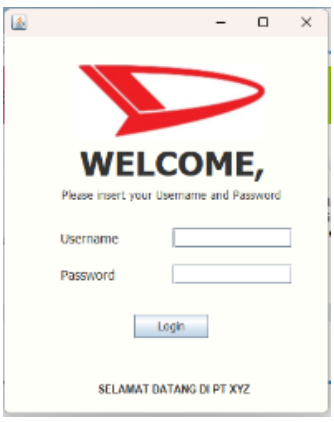

Figure 1. Login Form Screen Display

The login form screen displays the initial program display. The login form itself is used as the main page of this application.

Figure 2. Menu Form Screen Display

On the screen, the menu form is the page after the login form. In the menu form there are features in the decision support system application to increase employee work productivity at PT. XYZ Karawang.

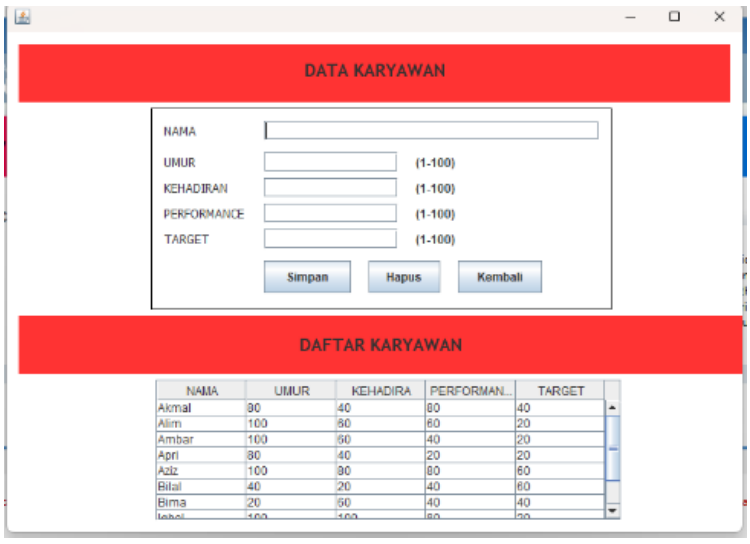

Figure 3. Employee Data Screen Display

This employee data screen display is a form used to input employee data at PT. XYZ Karawang.

Figure 4. Calculation Screen Display

In the display above there are several tables, namely the employee list table, normalization table, and rangking table. The display in the application that is used to process data and report data.

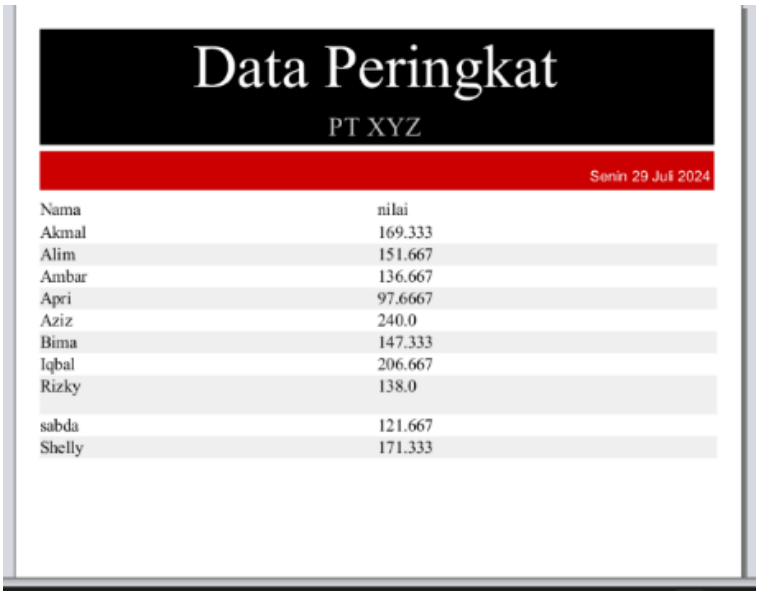

Figure 5. Data Report Display

This display displays data reports in the decision support system to increase employee work productivity at PT. XYZ Karawang.

4. CONCLUSION

In this research it can be concluded that designing a decision support system to increase employee work productivity at PT. XYZ Karawang can provide benefits according to the company's expectations. This system is able to manage data related to age, attendance, performance and targets. Apart from that, using the Java Netbeans based application can make it easier for authors to design support system. By applying the Simple Additive Weighting (SAW) method to increase employee work productivity, taking into account 4 main criteria, namely, age, attendance, performance and targets. The process of managing this data can be done with a higher level of accuracy and precision. Apart from that, data related to these criteria can be summarized well and well organized in the application database.

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