Implementation of Simple Additive Weighting Method in Evaluating Employee Performance for Job Promotion Recommendations

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Abstract

The implementation of decision support system tools in providing decision support for management is absolutely necessary. In its application, this aims to make the decision effective so that the decisions produced can be objective. This research discusses employee performance appraisal by implementing a decision support system. Many methods of decision support systems that can be used to rank, but in this study, the authors use the ranking method known as Simple Additive Weighting (SAW). The SAW method works by summing the weighted attributes that are interrelated. This method is quite simple and is able to provide the right decisions for employees who have the best performance to be recommended in job promotions. In this research, assessment attributes are used, namely education, experience,

expertise, collaboration, work quality, and discipline. The final results show that employees on behalf of Ferdinal have the highest value with a value of 0.850.

Keywords

Position Promotion, Employee Performance, SAW.

Introduction

The need for evaluations of employee performance is really needed by the company, especially by the Human Resource Development (HRD). Many processes are carried out only to produce an assessment of the performance that has been carried out by employees. In the process, the company has also set a lot. Attributes as a requirement of the performance appraisal influence each other. Of course, this will bring its own problems to the HRD section in conducting an assessment. Assessments that are carried out without computer aids as data processing, will produce an assessment that tends not to be objective towards the employee being assessed, and this is not new, but the usual thing that happens when an assessment is carried out (Sihabudin, 2018; Widana et al., 2020). That the assessment tends to be good because of the factors of closeness, relationships, acquaintances, or others. This is what makes the assessment not objective so that the results obtained are placement/rewards for undue performance results. Employees who are performing well will get good rewards too. However, with an error in the provision of these rewards, causing a decrease in work motivation from employees. To avoid this, the Human Resource Development (HRD) section is expected to have an assessment system with the help of computers as a tool for data processing. Support from computer-based information systems for decisions issued by HRD is an absolute necessity.

Until now the application of computers in providing such support has developed, for example in recipients of work incentives (Mesran et al., 2019), recipients of credit using decision support systems (Supriyanto et al., 2019). Supriyanto et al., (2019) conducted a study that resulted that the application of a decision support system was able to produce the right decision for recipients in granting credit. Not only in the banking sector, but also in the field of sales, especially in providing support for the decision to determine the location of sales (Sutarno et al., 2019), determining the location of used laptop marketing (S.H. Sahir et al., 2018). S.H. Sahir et al., (2018) produced research for rewarding the best employees (Sahir et al., 2017; Candradewi & Dewi, 2019; Diliantari & Dewi, 2019), even in the selection of the best tablet computer products (Syafrida Hafni Sahir et al., 2018). In the religious field, it also requires the adoption of a decision support system, for example

in the decision to elect the Vikar (Dharma Hardi et al., 2018), graduation from sidi learning (Parrangan et al., 2018; Kustina et al., 2019; Putra & Dewi, 2019).

The application of computer-based information systems, known as decision support systems, is not new at this time. Decision support systems are computer-based systems that are capable of resolving problems with unstructured or semi-structured decisions (Efraim Turban and Jay E. Aronson, 2001; Limbong et al., 2020; Nofriansyah and Defit, 2018). Several methods are used to help decision-makers so that the decisions made in terms of ranking can provide the best decisions that are considered appropriate later will be a decision issued by the HRD. The methods used in the ranking process include Simple Additive Weighting (SAW), Weighted Products, WASPAS, MOORA, VIKOR (Chakraborty, 2011; Chakraborty et al., 2015; Siregar et al., 2018; Yanie et al., 2018).

From the explanation above, here the authors are interested in conducting a study with the help of a decision support system, to assess employee performance. The assessment results obtained are used as recommendations in the HRD section for the leader in promoting the position of the selected employees who have the best performance.

Methodology

In this study, the authors used the Simple Additive Weighting (SAW) method to rank a number of employees. The results of the study are the value of recommendations for the promotion of positions set by the Human Resource Development (HRD). The SAW method is a fairly simple method in the ranking process. The SAW method is known as the weighted sum method (Kusumadewi et al., 2006; Limbong et al., 2020; Nofriansyah, 2015; Sahir et al., 2017).

The stages in the SAW method (Chen et al., 1992; Podvezko, 2011) can be seen in the following steps:

Stage 1: Prepare a decision matrix

$$x_{ij} = \begin{bmatrix} X_{11} & X_{12} & - & X_{1n} \\ X_{21} & X_{22} & - & X_{2n} \\ - & - & - & - \\ X_{m1} & X_{m2} & - & X_{mn} \end{bmatrix} \quad (1)$$

Stage 2: Normalizing the decision matrix

$$r_{ij} = \begin{cases} \dfrac{X_{ij}}{\max\limits_{i} x_{ij}} & \text{if j is benefit criteria (2)} \\ \dfrac{\min\limits_{i} x_{ij}}{X_{ij}} & \text{if j is cost criteria (3)} \end{cases}$$

description:

r_{ij} = Normalized matrix
$\max\limits_{i} x_{ij}$ = The highest value in the j[th] column
$\min\limits_{i} x_{ij}$ = The lowest value in the j[th] column
x_{ij} = Decision matrix

Stage 3: Calculate Preference Values

$$V_i = \sum_{j=1}^{n} w_j . r_{ij} \qquad (4)$$

The calculation phase of the preference value will produce the final value (vi). The largest value of vi indicates that the chosen alternative is the best.

Result and Discussion

Assessment of employee performance conducted by the HRD, is a work process with the aim of giving rewards to employees. Some types of employee rewards can be used for management in providing incentives, selecting the best employees, terminating employment contracts or as a promotion of new positions. Of course determining the results in data processing must not be wrong in decision making. Errors in data retrieval will result in ineffective decisions that are generated. One of the uses of computer-based information system tools in this case is aimed at making decisions effective for management (Supriyanto et al., 2019).

In this study the authors used a total of 15 sample data as alternatives used as a test of the application of decision support systems. Besides these alternatives, attributes are also needed as criteria for employee performance appraisal. One of the advantages of using a decision support system is that it facilitates multi-attribute based assessments (Alinezhad and Khalili, 2019; Tzeng and Huang, 2014). For alternatives needed in evaluating employee performance can be seen in table 1.

Table 1 Employee Alternative

Alternative	Education (C_1)	Experience (C_2)	Expertise (C_3)	Collaboration (C_4)	Quality of Work (C_5)	Discipline (C_6)
Arif (A_1)	Master	3 years	Good	Pretty Good	Good	Pretty Good
Heriyanto (A_2)	Strata I	1 years	Poorly	Good	Good	Good
Dermawan (A_3)	Master	1 years	Good	Poorly	Good	Good
Sholeh (A_4)	Diploma	3 years	Poorly	Poorly	Pretty Good	Pretty Good
Mesran (A_5)	Strata I	2 years	Pretty Good	Good	Good	Good
Priyanto (A_6)	Strata I	2 years	Good	Pretty Good	Poorly	Good
Shinta (A_7)	Diploma	4 years	Pretty Good	Very Good	Good	Very Good
Nasution (A_8)	Master	3 years	Poorly	Good	Poorly	Pretty Good
Irawan (A_9)	Diploma	1 years	Good	Pretty Good	Good	Good
Ferdinal (A_{10})	Master	3 years	Very Good	Pretty Good	Pretty Good	Very Good
Rahayu (A_{11})	Strata I	2 years	Good	Good	Pretty Good	Good
Sastri (A_{12})	Strata I	3 years	Good	Poorly	Pretty Good	Very Good
Basri (A_{13})	Master	1 years	Poorly	Poorly	Good	Poorly
Roni (A_{14})	Strata I	4 years	Very Good	Poorly	Good	Poorly
Niza (A_{15})	Strata I	1 years	Poorly	Good	Very Good	Poorly

Seen from the table above, the attributes used in evaluating employee performance consist of education, experience, expertise, collaboration, work quality, and discipline. These 6 attributes are the basis of employee performance appraisal and the types are profit attributes. In evaluating employee performance based on decision support systems, weights are needed for each attribute included. This weight aims to state the importance of each criterion. The assessment of the weight is obtained from management as the final decision-maker. The weight values of each attribute can be seen in table 2.

Table 2 Criteria and Weighted

Criteria	Weighted
Education (C_1)	0.25
Experience (C_2)	0.20
Expertise (C_3)	0.20
Collaboration (C_4)	0.15
Quality of Work (C_5)	0.10
Discipline (C_6)	0.10

In alternative data, employees have Very Good, Good, Pretty Good, Poorly, and Not Good values, therefore it is necessary to assign a category of values to the value of the criteria. Here are the assessment categories for grades on linguistic criteria.

Table 3 Weighting of linguistic values

Description	Value
Very Good	5
Good	4
Pretty Good	3
Poorly	2
Not Good	1

In the educational criteria, there are criteria values including, Master, Strata I, and Diploma. This is a linguistic value, so it is necessary to weight the linguistic values as shown in table 4.

Table 4 Weighting of educational values

Description	Value
Master	3
Strata I	2
Diploma	1

Table 5 is the match rating value. Match rating is the value that is owned by each alternative on each criterion. This value is obtained from table 1 which is an alternative employee data that has been weighted based on table 3, and table 4. The following is the suitability rating data

Table 5 Match Rating Data

Alternative	C_1	C_2	C_3	C_4	C_5	C_6
Arif (A_1)	3	3	4	3	4	3
Heriyanto (A_2)	2	1	2	4	4	4
Dermawan (A_3)	3	1	4	2	4	4
Sholeh (A_4)	1	3	2	2	3	3
Mesran (A_5)	2	2	3	4	4	4
Priyanto (A_6)	2	2	4	3	2	4
Shinta (A_7)	1	4	3	5	4	5
Nasution (A_8)	3	3	2	4	2	3
Irawan (A_9)	1	1	4	3	4	4
Ferdinal (A_{10})	3	3	5	3	3	5
Rahayu (A_{11})	2	2	4	4	3	4
Sastri (A_{12})	2	3	4	2	3	5
Basri (A_{13})	3	1	2	2	4	2
Roni (A_{14})	2	4	5	2	4	2
Niza (A_{15})	2	1	2	4	5	2

The Implementation of the SAW method to a decision support system has 3 stages, namely:

1. Prepare the Decision Matrix

Table 6 Decision Matrix

	3	3	4	3	4	3
	2	1	2	4	4	4
	3	1	4	2	4	4
	1	3	2	2	3	3
	2	2	3	4	4	4
	2	2	4	3	2	4
	1	4	3	5	4	5
x_{ij}=	3	3	2	4	2	3
	1	1	4	3	4	4
	3	3	5	3	3	5
	2	2	4	4	3	4
	2	3	4	2	3	5
	3	1	2	2	4	2
	2	4	5	2	4	2
	2	1	2	4	5	2

2. Calculating the Normalization Matrix

To get the results from the normalized matrix use equation 2.

Table 7 Normalized Matrix (r_{ij})

	1.000	0.750	0.800	0.600	0.800	0.600
	0.667	0.250	0.400	0.800	0.800	0.800
	1.000	0.250	0.800	0.400	0.800	0.800
	0.333	0.750	0.400	0.400	0.600	0.600
	0.667	0.500	0.600	0.800	0.800	0.800
	0.667	0.500	0.800	0.600	0.400	0.800
	0.333	1.000	0.600	1.000	0.800	1.000
r_{ij}=	1.000	0.750	0.400	0.800	0.400	0.600
	0.333	0.250	0.800	0.600	0.800	0.800
	1.000	0.750	1.000	0.600	0.600	1.000
	0.667	0.500	0.800	0.800	0.600	0.800
	0.667	0.750	0.800	0.400	0.600	1.000
	1.000	0.250	0.400	0.400	0.800	0.400
	0.667	1.000	1.000	0.400	0.800	0.400
	0.667	0.250	0.400	0.800	1.000	0.400

3. Calculating Preferences

To get the value of the final preference is obtained using equation 2. The final preference value is also ranked, so it will be sorted from highest to lowest. The preference value can be seen in table 8.

Table 8 Preference Results

Alternative	Vi	Rank
Ferdinal (A_{10})	0.850	1
Arif (A_1)	0.790	2
Roni (A_{14})	0.747	3
Shinta (A_7)	0.733	4
Nasution (A_8)	0.700	5
Sastri (A_{12})	0.697	6
Rahayu (A_{11})	0.687	7
Dermawan (A_3)	0.680	8
Mesran (A_5)	0.667	9
Priyanto (A_6)	0.637	10
Heriyanto (A_2)	0.577	11
Basri (A_{13})	0.560	12
Niza (A_{15})	0.557	13
Irawan (A_9)	0.543	14
Sholeh (A_4)	0.493	15

From table 8 above we can see the rank of each employee, the best value is the highest value, namely on the employee on behalf of Ferdinal (A_{10}) with a value of 0.850, followed by Arif (A_1) with a value of 0.790, and rank 3 on behalf of Roni (A_{14}) with a value of 0.747. From the results shown in table 8 can be used as a recommendation that employees who can be recommended for promotion are the highest rated employee, Ferdinal (A_{10}).

Conclusion

The ranking is generated using the Simple Additive Weighting (SAW) method in the decision support system to see employee performance producing the highest value on behalf of Ferdinal employees (A10). Ranking results can be used as a basis for the promotion of employees who have the best performance values. In this study, the weight value is obtained from management and will give different results if the weighting is obtained from a separate weighting method. Decision support systems provide effective results on employee performance appraisal as a basis for job promotion recommendations.

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