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Implementation of Decision Support System for New Employee Selection at PT Triotech Solution Indonesia using SAW Method

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ABSTRACT

The new employee selection process is one of the important activities in human resource management at PT Triotech Solution Indonesia. The selection of the right candidate determines the quality and performance of the company in the future. This research aims to develop and implement a Decision Support System (SPK) that can assist in the selection process of new employees using the Simple Additive Weighting (SAW) method. The SAW method was chosen because it is able to integrate various assessment criteria by giving appropriate weights to each criterion, resulting in a final ranking of candidates that best suits the company's needs. The system is built by collecting candidate data, which includes criteria such as education, work experience, technical skills, and soft skills. The weight for each criterion is determined based on the priorities set by the company management. After that, the SAW method is applied to calculate the total score of each candidate, which is then used to determine the priority order of the best candidates.

Keywords: Decision Support System, Simple Additive Weighting (SAW)

INTRODUCTION

New employee selection is one of the vital activities in human resource management in every organization, including PT Triotech Solution Indonesia. This process aims to ensure that the company can obtain qualified human resources that meet the needs of the organization. Proper employee selection not only improves operational efficiency but also contributes to the long-term growth and success of the company. (Bonczek et al., 2014)

However, the process of selecting new employees is often challenging as it involves many assessment criteria that must be considered simultaneously. These criteria include education, work experience, technical skills, and personal characteristics such as communication and leadership skills. In practice, the assessment of these criteria is often done subjectively, which can lead to inconsistent and inaccurate decisions. To overcome these problems, the use of technology in the form of a Decision Support System (DSS) is an effective solution. SPK is a computer-based information system that helps the decision-making process by analyzing relevant data and information. One method that is widely used in SPK for employee selection is Simple Additive Weighting (SAW). (Kaliszewski & Podkopaev, 2016) The SAW method was chosen for its simplicity in integrating various assessment criteria by giving appropriate weights to each criterion, resulting in a final ranking of the most qualified candidates. (Vafaei et al., 2022)

This research aims to develop and implement a Decision Support System for new employee selection at PT Triotech Solution Indonesia using the Simple Additive Weighting (SAW) method. By adopting this method, it is expected that the selection process can be more objective, efficient, and transparent. The implementation of this Decision Support System will involve several stages, starting from the identification of assessment criteria, determining the weights for each criterion, collecting candidate data, to the calculation and final ranking using the Simple Additive Weighting method. (Situmeang et al., 2021)

The results of this study are expected to make a significant contribution to PT Triotech Solution

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Indonesia in improving the quality of the new employee selection process. In addition, this research is also expected to be a reference for other companies facing similar challenges in the recruitment process. (Nandes, 2021)

LITERATURE REVIEW

Research Approach

This research uses a quantitative approach with a case study design. This approach was chosen to obtain objective and measurable data in evaluating the implementation of a Decision Support System (SPK) using the Simple Additive Weighting (SAW) method in the new employee selection process at PT Triotech Solution Indonesia. (Sihombing et al., 2021)

Research Stages

Satisfaction is defined as a situation where the expectations of customers for a service are in accordance with the reality received about the services provided to each customer. If the service is far below consumer expectations, consumers will feel disappointed. Vice versa, if the service provided has met customer expectations, the customer will feel happy. Customers' expectations can be known from their own experiences when experiencing service, and information from other people or advertising media information. Satisfaction is a person's feeling of pleasure or disappointment that arises after comparing his perceptions and impressions of the performance or results of a product and his expectations. (Mughnyanti & Ginting, 2023)

This research was conducted through several stages, namely:

1. Identification of Assessment Criteria: (Wayahdi et al., 2021)
   a) Identifying relevant criteria for new employee selection based on company needs.
   b) Consultation with management and HR team to determine the criteria and their weights.
2. Candidate Data Collection: (Ginting et al., 2020)
   a) Collecting data on candidates who apply to PT Triotech Solution Indonesia.
   b) Data includes education, work experience, technical skills, and soft skills.
3. Implementation of Simple Additive Weighting Method: (Ginting, 2023)
   a) Normalizing candidate data for each criterion.
   b) Giving weight to each criterion based on consultation results.
   c) Calculating the total score for each candidate using the SAW method.
4. Evaluation of Results: (Hafiz et al., n.d.)
   a) Comparing candidate ranking results from the system with the results of manual selection conducted by the HR team.
   b) Evaluate the accuracy, efficiency, and objectivity of the system.

RESEARCH METHODS

Decision Support System (DSS)

Decision Support System (DSS) is a computer-based information system whose main purpose is to help decision makers utilize data and models to solve unstructured and semi-structured problems. According to Alter in the book, a decision support system is an interactive information system that provides information, modeling, and data manipulation where the system is used to assist decision making in semi-structured situations and unstructured situations. (Wang, 2020)

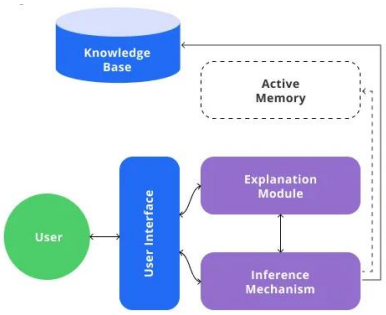

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Figure 1. Conceptual decision support system

Decision Support System Architecture

A decision support system application can consist of several subsystems, namely:

1. Data management subsystem. The data management subsystem includes a database that contains relevant data for a situation and is managed by software called a database management system (DBMS). The data management subsystem can be interconnected with the company's data warehouse, a repository for company data relevant to decision making. (Kahfi et al., 2021)
2. Capital management subsystem. A software package that incorporates financial, statistical, management science, or other quantitative models that provide appropriate analytic and management software capabilities. Modeling languages for building custom models are also included. (Khasanah et al., 2020)
3. User interface subsystem. Users communicate with and instruct the decision support system through these subsystems. Researchers assert that some of the unique contributions of decision support systems come from the intensive interaction between the computer and the decision maker.
4. Knowledge-based management subsystem.

It supports all other subsystems or acts directly as an independent component and is optional. In addition to providing intelligence to augment the decision maker's knowledge, it can be interconnected with the company's knowledge repository.

Simple Additive Weighting (SAW) Method

Simple Additive Weighting method is a weighted sum method. The basic concept of the Simple Additive Weighting method is to find the weighted sum of the performance ratings on each alternative on all attributes. The Simple Additive Weighting method requires the normalization process of the decision matrix (X) to a scale that can be compared with all alternative ratings.

If j is a benefit attribute (benetif) If j is a cost attribute:

Where :

rij = Normalized performance rating

Max = Maximum value of each row and column

Min = Minimum value of each row and column

Xij = Rows and columns of the matrix

$$r_{ij} = \begin{cases} \dfrac{x_{ij}}{Max_i(x_{ij})} \\ \dfrac{Min_i(x_{ij})}{x_{ij}} \end{cases} \qquad V_i = \sum_{j=1}^{n} W_j \, r_{ij}$$

Where r is the computerized performance rank of alternative Ai on attribute Cj; i = 1, 2,...,m and j = 1, 2,...,n The preference value for each alternative (Vi) is given as A larger value of Vi identifies that alternative Ai is preferred.

Steps in determining the Simple Additive Weighting method:

a. Determine the criteria that will be used as a reference in decision making, for example C1.
b. Determine the suitability rating of each alternative on each criterion
c. Create a decision matrix based on criteria (C1), then normalize the matrix based on equations that are adjusted to the type of attribute (profit attribute or cost attribute) so that the matrix is normalized R.
d. The final result is obtained from the ranking process, namely the sum of the multiplication of the normalized matrix R with the preference weight vector so that the largest value is selected as the best alternative, for example (A1).

RESULTS AND DISCUSSION

PT Triotech Solution Indonesia is one of the well-known companies in the IT field which is currently in the process of recruiting new employees every year has increased, so it cannot accommodate all prospective employees who register. Selection of prospective employees is determined based on 4 (four) criteria, including:

a. Ethical values
b. Discipline value
c. Honest
d. Hardworking

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Table 1. Preference weights

Criteria name	Weight value	Description
Ethical values	30	C1
Discipline value	25	C2
Honest	20	C3
Hardworking	25	C4

Simple Additive Weighting Calculation for Selection

The following is a manual calculation based on a case example. Three samples of prospective employees are taken with the following data:

a. Student Candidate Score Sample

Table 2. Candidate's sample score

Alternative	Criteria			
	Ethical values (C1)	Discipline value (C2)	Honest (C3)	Hardworking (C4)
Roy	95	70	50	70
Suyanto	80	70	85	80
Andre	80	60	80	80
Samuel	70	40	80	78

b. Suitability rating of each alternative on each criterion

Table 3. Suitability Rating of each alternative on each criterion

Alternative	Criteria			
	(C1)	(C2)	(C3)	(C4)
Roy	95	70	50	70
Suyanto	80	70	85	80
Andre	80	60	80	80
Samuel	70	40	80	78

c. Decision matrix of the rating table

The suitability of each alternative on each criterion. Decision makers give alternative values, based on the level of importance of each criterion required as follows: The weight vector [W]={30,25,20,25} makes the decision matrix X, made from the match table as follows:

X= 95 70 50 70
80 70 85 80
80 60 80 80
70 40 80 78

d. Normalization of the decision matrix Normalize the matrix by calculating the normalized employee rating value (rij) of the alternative Ai attribute Cj based on an equation that is adjusted to the type of attribute (benefit attribute = MAXIMUM or cost attribute = MINIMUM). If it is a benefit attribute, the crisp value (Xij) of each attribute column is divided by the MAX crisp value (MAX Xij) of each column, while for the cost attribute the MIN crisp value (Xij) of each column. By calculating the value of the normalized employee assessment rating (rij) based on equations that are adjusted to the type of criteria. For all these criteria using the benefit criteria.

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1. Prospective employee Roy

$$R11 = x11\frac{x11}{maxi(x11,x21,x31)} = \frac{95}{maxi(95,80,80,70)} = \frac{95}{95} = 1{,}00$$
$$R12 = x12\frac{x12}{maxi(x12,x22,x32)} = \frac{80}{maxi(80,70,60,40)} = \frac{80}{80} = 1{,}00$$
$$R13 = x13\frac{x13}{maxi(x13,x23,x33)} = \frac{50}{maxi(50,85,80,80)} = \frac{50}{85} = 0{,}58$$
$$R14 = x14\frac{x14}{maxi(x14,x24,x34)} = \frac{70}{maxi(70,80,80,78)} = \frac{70}{80} = 0{,}87$$

2. Prospective employee Suyanto

$$R11 = x11\frac{x11}{maxi(x11,x21,x31)} = \frac{80}{maxi(95,80,80,70)} = \frac{80}{95} = 0{,}84$$
$$R12 = x12\frac{x12}{maxi(x12,x22,x32)} = \frac{70}{maxi(80,70,60,40)} = \frac{70}{80} = 0{,}87$$
$$R13 = x13\frac{x13}{maxi(x13,x23,x33)} = \frac{85}{maxi(50,85,80,80)} = \frac{85}{85} = 1{,}00$$
$$R14 = x14\frac{x14}{maxi(x14,x24,x34)} = \frac{80}{maxi(70,80,80,78)} = \frac{80}{80} = 1{,}00$$

3. Prospective employee Andre

$$R11 = x11\frac{x11}{maxi(x11,x21,x31)} = \frac{80}{maxi(95,80,80,70)} = \frac{80}{95} = 0{,}84$$
$$R12 = x12\frac{x12}{maxi(x12,x22,x32)} = \frac{60}{maxi(80,70,60,40)} = \frac{60}{80} = 0{,}75$$
$$R13 = x13\frac{x13}{maxi(x13,x23,x33)} = \frac{80}{maxi(50,85,80,80)} = \frac{80}{85} = 0{,}94$$
$$R14 = x14\frac{x14}{maxi(x14,x24,x34)} = \frac{80}{maxi(70,80,80,78)} = \frac{80}{80} = 1{,}00$$

4. Prospective employee Samuel

$$R11 = x11\frac{x11}{maxi(x11,x21,x31)} = \frac{70}{maxi(95,80,80,70)} = \frac{70}{95} = 0{,}73$$
$$R12 = x12\frac{x12}{maxi(x12,x22,x32)} = \frac{40}{maxi(80,70,60,40)} = \frac{40}{80} = 0{,}50$$
$$R13 = x13\frac{x13}{maxi(x13,x23,x33)} = \frac{80}{maxi(50,85,80,80)} = \frac{80}{85} = 0{,}94$$
$$R14 = x14\frac{x14}{maxi(x14,x24,x34)} = \frac{78}{maxi(70,80,80,78)} = \frac{78}{80} = 0{,}97$$

e. Normalized matrix

The result of the normalized performance rating value will form a normalized matrix.

R =1.001.00 0,58 0.87
0,84 0,87 1.00 1.00
0,84 0,75 0,94 1,00
0,73 0,50 0,94 0,97

f. Preference value

In the preference value obtained from each alternative (Vi) is summed up with the product of the normalized matrix (R) with the weight value (W). The preference value of each alternative employee candidate is as follows:

V1 = (1.00).(30)+(1.00).(25)+(0.58).(20)+(0.87).(25)} = 88,33
V2 = (0,84).(30)+(0,87).(25)+(1.00).(20)+(1.00).(25)} = 91.95
V3 = (0,84).(30)+(0.75).(25)+(0.94).(20)+(1.00).(25)} = 87.25
V4 = (0,73).(30)+(0,50).(25)+(0.94).(20)+(0.97).(25)} = 77,45

The selected values in V1,V2,V3 are alternative recommendations that are selected as the best alternative if the employee quota is 3, if the employee data quota is 2, the selected data is V1 and V2 only, the data is prepared based on the needs of the system. And thus the failed employee data will be immediately directed to another company.

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CONCLUSIONS

This research aims to develop and implement a Decision Support System (SPK) using the Simple Additive Weighting (SAW) method to help the selection process of new employees at PT Triotech Solution Indonesia. Based on the results of research and data analysis, it can be concluded as follows:

1. Effectiveness of SAW Method:

The implementation of SAW method in SPK proved to be effective in helping the selection process of new employees. This method is able to integrate various assessment criteria objectively and produce more accurate candidate rankings. By normalizing and weighting the criteria, the system can provide a total score that reflects the quality of each candidate based on predetermined criteria.

2. Increased Objectivity:

SPK with SAW method increases objectivity in the selection process. The system reduces subjectivity that often occurs in manual selection methods. By using structured data and weighted criteria, the resulting decision is more transparent and accountable.

3. Time and Cost Efficiency:

The implementation of SPK with SAW method shows an increase in efficiency in terms of time and cost required for the selection process. This system simplifies and accelerates the candidate evaluation process, so that the HR team can save time and resources in making selections.

4. Candidate Suitability:

The candidate ranking results generated by the system show suitability to the company's needs. Candidates selected through this system have qualifications that are more suitable for the position offered, so that they can support the company's strategic goals in the long run.

5. System Validity:

Validation conducted by comparing the manual selection results and the selection results using the SPK showed a high level of conformity. The system is able to produce decisions that are consistent and in line with the manual assessment conducted by the HR team.

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