

Recommendation for Prospective Permanent Employees using the Simple Additive Weighting Method

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Abstract

The rapid development of technological progress has made the use of personal computer technology increase significantly, where this use has made computers into branches that can still be developed, one of which is creating a decision-making system. Decision Support System is a computer-based system that is intended to assist decision making by utilizing certain data and models to solve various semi-structured problems. The application of Decision Support Systems can be found in various fields, one of which is a decision support system for prospective employees. This study aims to design a system that can provide the best decision in determining permanent employees at J&T Express Kotanopan. The method used in this study is the SAW (Simple Additive Weighting) method, with a website-based decision support system that can be used without time and place constraints, it can help J&T Express in selecting permanent employees. The results of testing this method have an accuracy level of more than 90% based on the data tested. Based on the results of the highest value obtained using the SAW method, this study was successful in determining permanent employees at J&T Express Kotanopan.

Keywords : Decision Support System, Simple Additive Weighting, Employees, Accuracy.

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1. Introduction

The very rapid development of technological progress has made the use of personal computer technology increase significantly, where this use has made computers into branches that can still be developed, one of which is creating a decision-making system[1].

Decision Support System (DSS) is one of the computer-based information systems used to support decision making in a company or organization. DSS is also often referred to as a system that helps companies or organizations process data into information that can solve problems and provide the right decisions [2][3][4][5]. Employees are important resources in a company and are often referred to as the spearhead of achieving company goals [6][7]. Employees who have a strong desire and good ability in carrying out their work are very supportive in the company's operational activities [8].

In order to be able to select permanent warehouse employees, here the author will create a decision support system (DSS) that functions as a tool for companies in selecting permanent warehouse employees, so that companies need a method that can support decisions in selecting permanent employees, namely using the Simple Additive Weighting (SAW) method. The Simple Additive Weighting (SAW) method is one part of the decision-making method by determining the ranking of a number of simple alternatives [9].

J&T Express is one of the many transportation services that serve delivery of goods within the city and between provinces. Every delivery service must understand the duties, roles and responsibilities of employees, so it is necessary to select the best employees to then be appointed as permanent employees. J&T Express has a problem in determining permanent warehouse employees. Determination of warehouse employees for permanent employees at J&T Express has so far been carried out individually by the Supervisor of each J&T Express branch. Because J&T Express has a lot of warehouse employee data and still determines permanent warehouse employees manually.

Weighting (SAW) Method found that the alternative with the highest value can be used as consideration data to be selected. Alternative A5 (Prospective Employee) which has the highest value with a value of 6.03 so it can be used as consideration or supporting data to be selected as an employee at UPT Promos i Universitas Muhammadiyah Riau [10]. Other previous research on Smartphone Selection Decision Support System by Applying Simple Additive Weighting (SAW) Method produced a smartphone selection decision support system application that can help consumers choose smartphones according to their desires and needs based on predetermined criteria. So the 5 alternative values that have the highest value and can be selected are alternative A3 with a value of 77.5, alternative A8 with a value of 74.125, alternative A7 with a value of 73.5, alternative A9 with a value of

68.5, and alternative A6 with a value of 69.1 [11]. There are many other previous studies such as decision support systems for selecting computer science teachers [12], selecting the best employees [13][14], receiving scholarships[15], recipients of COVID-19 assistance[16], recipients of decent housing assistance[14], determining the best students[17], teacher performance assessments[18], and many other studies.

2. Research methodology

The research framework is a sequence of activities that will be carried out in a study. The research will be carried out by applying the Simple Addictive Weighting (SAW) method. The SAW method is used to facilitate flexible decision making and is widely used because of its simplicity in responding to the needs of decision making, in order to make decisions effectively and efficiently.

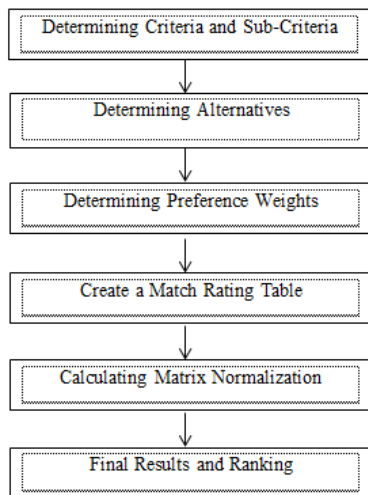


Figure 1. Research Framework

This method is the most well-known and widely used method in dealing with Multiple Attribute Decision Making (MADM) situations. This method requires the decision maker to assign a weight to each attribute. The total score for an alternative is obtained by summing all the results of the multiplication of the ratings that can be compared across attributes) weights and each attribute. The rating of each attribute has gone through a previous normalization process. The SAW method is known as the term weighted summation. The basic concept of the SAW method is to find the weighted summation of the performance ratings of each alternative on all attributes. The SAW method requires a process of normalizing the decision matrix (X) to a scale that can be compared with all existing alternative ratings. The formula for performing this normalization is as follows:

$$r_{ij} = \left\{ \frac{X_{ij}}{\text{Max } X_{ij}} \right\} \text{ if } j \text{ is a profit attribute}$$

$$r_{ij} = \left\{ \frac{\text{Min } X_{ij}}{X_{ij}} \right\} \text{ if } j \text{ is a cost attribute}$$

Rij is the normalized performance rating of alternative Ai on attributes Cj; i=1 ,2 ,...,m and j=1,2,...,n.

Information:

- Rij=normalized performance rating value
- Xij = attribute value for each criterion
- Maxxij = the largest value of each criterion
- Minxij = the smallest value of each criterion
- benefit = if the largest value is the best criterion
- cost= if the smallest value is the best criterion

Where rij is the normalized performance rating 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:

$$V_i = \sum_{j=1}^n w_j r_{ij}$$

Information:

- Vi = ranking for each alternative
- wj = weight value of each criterion
- rij = normalized performance rating value
- larger Vi value indicates that alternative Ai is more preferred.

After the Vi value is obtained, ranking is carried out to determine the best alternative that will be used as a guideline for decision making .

3. Results and Discussion

System analysis can be interpreted as an activity carried out with the aim of analyzing, identifying, and evaluating problems that exist in a system by changing it into several subsystems. System analysis is carried out to determine how far the system can run and to determine the weaknesses of the current system so that it can be used as a comparison between the old system and the system to be built.

3.1. Analysis of the Running System

Based on the findings obtained through observations and interviews conducted by the author at J&T Express, it can be explained that the system currently running at J&T Express Kotanopan is as follows:

1. Personnel staff checks and completes employee data to be assessed. Employee data that has been checked by Personnel staff is then submitted to the Supervisor.
2. The supervisor conducts an assessment of permanent employees based on predetermined

criteria. After the supervisor finds the results of the permanent employee selection, the assessment data is announced to prospective permanent employees.

3.2. Analysis of the simple additive weighting (SAW) method

The determination of the required criteria and the assessment of its weight and value has been determined by J&T Express. The criteria can be seen in Table 1 below.

Table 1. Criteria and Weight Table

No	Criteria	Weight	Type
1	Performance (C1)	30	Benefits
2	Discipline (C2)	25	Benefits
3	Loyalty (C3)	20	Benefits
4	Work Experience (C4)	15	Benefits
5	Education Level (C5)	10	Benefits

After determine Criteria Which will used in evaluation employee still on J&T Express City of Pan Then will given weighting Which has determined. As for sub criteria Which required can be seen in Table 2 below.

Table 2. Sub criteria table

Criteria Code	Criteria	Sub Criteria	Mark
C1	Performance	Good	100
		Enough	75
		Not enough	50
C2	Discipline	Good	100
		Enough	75
		Not enough	50
		Very less	25
C3	Loyalty	Good	100
		Enough	75
		Not enough	50
		Very less	25
C4	Work experience	>2 Years	100
		>1 Year	75
		1 year	50
		<1 Year	25
C5	Level of education	S2	100
		S1	75
		D3	50
		SENIOR HIGH SCHOOL	25

3.3. Implementation Method simple additive weighting(SAW) Manually

Following will explained in a way Details How method Simple Additive Weighting (PBUH) accommodate in a way mathematical between criteria Which There is with alternative Which There is. Every candidate employee still will given Supervisor assessment, More detailed assessment can be seen on Table 3.

Table 3. Employee Input Values

Alternative Code	C1	C2	C3	C4	C5
K1	100	75	50	100	25
K2	100	50	50	75	75
K3	75	50	100	75	75

Alternative Code	C1	C2	C3	C4	C5
K4	50	75	75	75	75
K5	75	50	25	75	50
K6	100	75	50	75	75
K7	75	50	50	100	50
K8	75	50	75	50	75
K9	75	75	50	100	75
K10	100	50	75	100	75

Criteria Which used including criteria benefits so that normalization mark use formula 1 For criteria benefits And cost. From Table 3 shows that C1 has the Benefit value and the value the maximum is "100" so that For normalization C1 as following :

$$R1 = 100/100 = 1$$

$$R2 = 75/75 = 1$$

$$R3 = 50/100 = 0.5$$

$$R4 = 100/100 = 1$$

$$R5 = 25/75 = 0.3$$

From column C2 Mark the maximum is " 100", so the employee's value is divided by the employee's value maximum. so that for normalization C2 as following :

$$R1 = 100/100 = 1$$

$$R2 = 50/75 = 0.67$$

$$R3 = 50/100 = 0.5$$

$$R4 = 75/100 = 0.75$$

$$R5 = 75/75 = 1$$

For normalization C3 until C8 use formula workmanship Which The same , so that results matrix normalized (R) can seen in the Table 4

Table 4. Normalized Matrix

Alternative Code	C1	C2	C3	C4	C5
K1	1	1	0.5	1	0.3
K2	1	0.67	0.5	0.75	1
K3	0.75	0.67	1	0.75	1
K4	0.5	1	0.75	0.75	1
K5	0.75	0.67	0.25	0.75	0.67
K6	1	1	0.5	0.75	1
K7	0.75	0.67	0.5	1	0.67
K8	0.75	0.67	0.75	0.5	1
K9	0.75	1	0.5	1	1
K10	1	0.67	0.75	1	1

Then determine weight from each criteria. The criteria weights (W) can be seen in Table 5 .

Table 6. Criteria Weight Table

C1	C2	C3	C4	C5
30	25	20	15	10

After getting the normalized value from the input values and criteria weights. Next For get results, mark in every column will multiplied with weight in accordance with formula (2) Which Already explained previously. The calculation is as following :

$$v1 = (30 \times 1) + (25 \times 1) + (20 \times 0.5) + (15 \times 1) + (10 \times 0.3) = 30 + 25 + 10 + 15 + 3 = 83$$

$$v2 = (30 \times 1) + (25 \times 0.67) + (20 \times 0.5) + (15 \times 0.75) + (10 \times 1) = 30 + 16.75 + 10 + 11.25 + 10 = 78$$

For Results calculation mark (Vi) in a way The whole thing can be seen in the table 7 under This:

Table 7. Table of Vi Value Calculation Results

Alternative Code	Vi Value
K1	83
K2	78
K3	80
K4	76
K5	62
K6	86
K7	70
K8	71
K9	82
K10	87

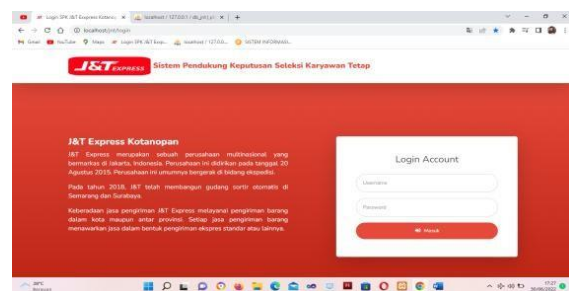
Results calculation every candidate employee compared to so that got employee still with mark highest. Mark employee the will be grouped and given an acceptable statement or rejected return based on division from every employee. Determination ranking the can seen in the Table 8.

Table 7. Table of Vi Value Calculation Results

Employee Code	Name Employee	Vi Value	Rank	Information
K10	Nanda Coal	83	1	Passed
K6	The Greatest	78	2	Passed
K1	Mauli Zikri	80	3	Passed
K9	English: The Author	76	4	Passed
K3	Young Endar	62	5	Passed
K2	Milky Wahyudi	86	6	No
K4	Burhansyah Nasution	70	7	No
K8	Alamsyah Ramadhan	71	8	No
K7	Zulkam Riadi	82	9	No
K5	Muhammad Arpan	87	10	No

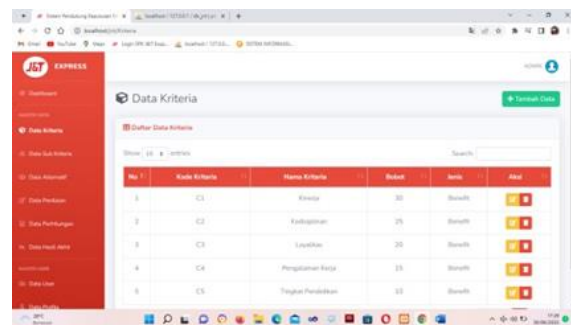
Implementation And Testing

Implementation system is A stage installation or implementation of the system has been designed in the system design process. After do process implementation system, The next step is to do testing. reception system to data Which There is in the field in term time certain And done together with user. Testing to system done Forknow so far where system information Which designed can overcome problem, as well as For know connection between component system. View program that is is sub chapter Which explain about process in the program, fix it *input* program and also execution *output* from program Which run, following the display of the program that has been built included there is a user login page which is the initial display when website accessed, on page appearance There are two forms for this employee username And password like Picture 2.



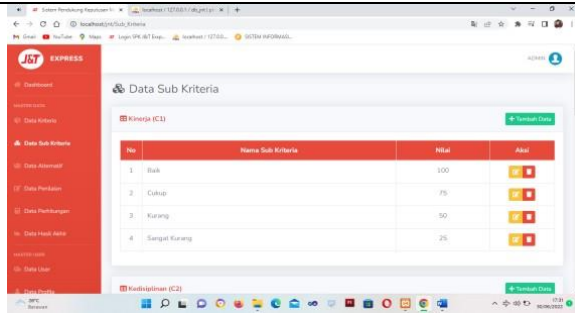
Picture 2. Page Login Admin

Page data criteria display data criteria Which used as criteria in assessment using the SAW method on system support decision This like Which seen in the picture 3.



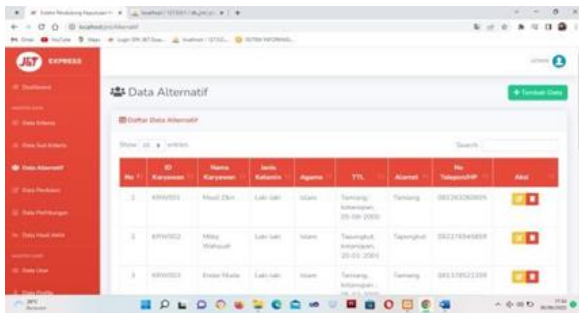
Picture 3. Page Appearance Data Criteria

Page data sub criteria display sub criteria of the criteria used as evaluation in system support decision with this SAW method as seen in Picture 4.



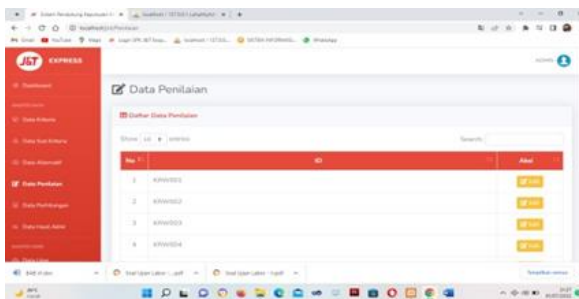
Picture 4. Page Data Sub Criteria

The alternative data page displays the names prospective recipients of subsidized food with use method SAW on system support for this decision as seen in Figure 5.



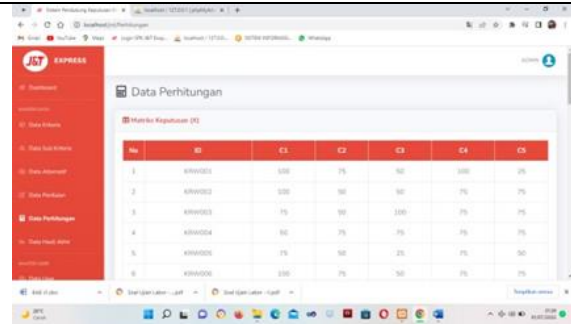
Picture 5. Page Alternative Data

Page data evaluation is page place to input assessments of alternatives existing alternatives according to the criteria Which has determined previously like Which seen in the picture 6.



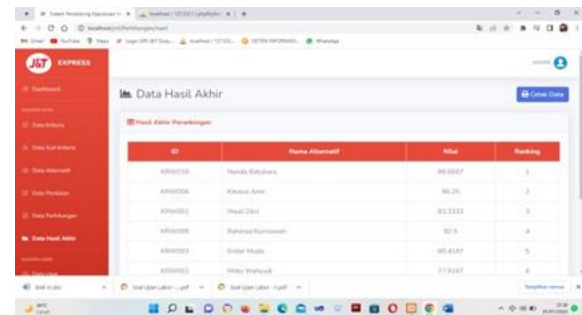
Picture 6. Page Data Evaluation

Page data calculation display process calculation method SAW in a way overall to alternative And criteria Which has predetermined as seen in Figure 7.



Picture 7. Appearance Data Page Calculation

Page data results end display results ranking based on evaluation Which has done to alternatives Which There is as well as used For print report results ranking the like Which seen on Picture 8



Picture 8. Final Data Results Display

4. Conclusion

Based on the activities carried out by the author during the design to implementation of this permanent employee selection support system, it can be concluded that the website-based permanent employee selection decision support system at J&T Express Kotanopan using the SAW method can help J&T Express Kotanopan in storing data for making permanent employee selection reports. Then the system provides permanent employee recommendation solutions to users according to the criteria and weights determined at the beginning before the calculation. The system can help J&T Express Kotanopan Supervisors in describing the performance of each existing employee.

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