

Application of Decision Support System for the Best Teacher Selection with the Simple Additive Weighting Method

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Abstract

Selection of the best teachers at SMK is carried out once a month in order to provide motivation for teachers in teaching and learning activities, in decision making is still done manually and also subjectively. So that the results of the decisions are inaccurate and cause social jealousy among teachers. Therefore, in assessing the best teachers, a decision support system is needed in order to obtain accurate results. The Decision Support System method used for problem solving in this study is the Simple Additive Weighting (SAW) method. The criteria used are present on time, responsibility, dress neatly and politely, participate and contribute, be active and productive, and help fellow teachers. The result of this research is to produce the selected alternative with the greatest value.

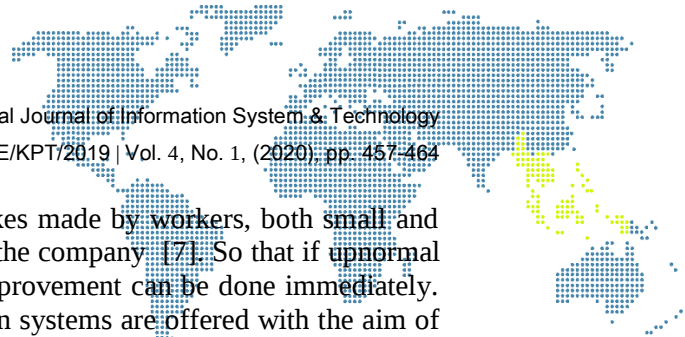
Keywords: Decision Support System, Simple Additive Weighting, Selection of the Best Teacher

1. Introduction

The development of an information system is carried out with the aim of changing the manual process to computerization so as to improve performance and make it easier to manage [1] and to obtain realtime information on the distribution process [2]. PT Andhana Kirana Yasa (AKY) is a company engaged in the installation of car accessories, in collaboration with PT. Toyota Astra Motor (TAM) as a business partner. And PT. Toyota Astra Motor itself is the sole agent company for the brand holder (ATPM) of TOYOTA vehicles which makes a part related to the procurement and installation of accessory parts, namely the Port Installation Option (PIO) part. It is in this PIO section that PT. Andhana Kirana Yasa carries out production to install Toyota car accessories.

With a web-based information system, the company can get information more quickly so that project work can be completed according to project work targets [3] and it is hoped that this information system can help in making decisions and supervising the project being carried out. If there are errors and delays when calculating, processing values that take a lot of time and require a lot of energy can be minimized. To solve the above problems, we need a system that has the ability to manage value calculations that can be accessed online via the internet network [4]. With the application of the Web-based Production Process Monitoring Information System application, it is hoped that it can provide facilities for users to streamline time and costs in their duties as monitoring activities that occur [5]. The monitoring system is a system designed to provide feedback when the program is running its function. Feedback is intended to provide information on the state of the system at that time [6].

Lead time data or processing time is data on the total production time of the unit (car) starting from the Receiving Post, installing accessories in the Production Line until the time of leaving the unit at the Final Inspection Post. If the unit is immediately declared ok at the Final Inspection, the recording of the production lead time has ended, but if the status of the unit is repaired, the unit will be sent to Stall Repair and the recording of the production lead time will continue until the unit repair process ends and has been declared



as an ok unit. Irregular work patterns lead to mistakes made by workers, both small and large scale mistakes, so that they have an impact on the company [7]. So that if upnormal or non-standard data is found, an evaluation and improvement can be done immediately. In the field of management, management information systems are offered with the aim of facilitating the management of assets so as to produce reliable, relevant, timely, tested and understandable information [8].

In the business world, to be able to survive the competition that comes not only from domestic companies but also from abroad, companies are increasingly required to be able to cultivate a product that has strong competitiveness to survive and dominate the market [9]. Advances in computer technology have had a tremendous impact on all aspects of business activities. The advantages that can be seen clearly from using this computer are speed, accuracy, and ease in processing data into information [10]. By using the usecase diagram method, the PHP programming language, with the MySQL server, in order to achieve an effective, efficient activity in supporting the activities of this company [11].

2. Research and Methodology

The stages of the research method used are as follows:

- a). Problem Identification
Identification of problems that will be used as the subject of discussion, namely determining the existing criteria in SMK to determine the best teacher.
- b). Study literature
This is done by studying and understanding the theories of decision support systems, Simple Additive Weighing by collecting literature, national journals, browsing the internet and reading related topics in the form of textbooks or papers.
- c). Data Collection
Data collection was carried out in two (2) ways as follows:
 1. Observation
Conduct direct observations at SMK on the flow of determining outstanding teachers.
 2. Interview
The author conducted a question and answer session with the Principal of SMK to find out the flow of these outstanding teachers.
- d). Research Data
The data obtained is in the form of information about the criteria and weight of outstanding teachers obtained from the principal of SMK schools such as being present on time, responsible, dressed neatly and politely, participating and contributing, being active and productive and helping fellow teachers.
- e). Data Analysis
In this study using the SAW method, which is done by collecting data and analysis results to obtain information that must be concluded.
- f). Data Analysis Results Using the Simple Additive Weighting (SAW) Method After the data analysis stage of selecting outstanding teachers, an analysis result is produced which is the result of a research process carried out.

3. Results and Discussion

3.1 Data Analysis

In data analysis using the Simple Additive Weighting (SAW) method, the weighting classification was carried out for each criterion. Where in the selection of the best teacher, the criteria and weightings are obtained. The criteria used for the assessment are as follows:

Table 1. Criteria

No.	Criteria
1	Be on time

No.	Criteria
2	Responsible
3	Dress neatly and politely
4	Participate and contribute
5	Active and productive
6	Helping fellow teachers

The alternative sample used in this study was 20 teachers in SMK as follows:

Table 2. Teacher Data

No.	Teacher name	Alternative (Teacher name)
1	Abdul Odih	A1
2	Adhimas Cahyo Kuncoro	A2
3	Agus Darsono	A3
4	Bias Fajar Baskoro	A4
5	Budi Kriswana	A5
6	Dedy Heryadi	A6
7	Devi Tresna Senjaya	A7
8	Dian Eko	A8
9	Fatmawati	A9
10	H. Didih Suwardi	A10
11	Irpan Sumartono	A11
12	Mohammad Faruq	A12
13	Muhamad Atib	A13
14	Nana Permana	A14
15	Nur Irfah	A15
16	Putriah	A16
17	Rinal Yahya	A17
18	Riny Setyoningrum	A18
19	Sugeng Ariady	A19
20	Yeny Despiana	A20

3.2. Problem Solving Using the Simple Additive Weighting (SAW) Method

There are several steps or steps for calculating data in determining the best teacher using the Simple Additive Weighting (SAW) method, as follows:

- 1) First define the criteria that will be used as benchmarks for solving the problem.
- a) The first stage is determining alternatives. Namely A_i . The following is alternative data that will be used in the calculation.

Table 3. Alternative Data

No.	Name	Disciplinary Aspects			Cooperation Aspects		
		C_1	C_2	C_3	C_4	C_5	C_6
1	Abdul Odih	90	80	80	70	60	70
2	Adhimas Cahyo Kuncoro	100	80	75	80	70	80
3	Agus Darsono	100	80	80	70	70	70
4	Bias Fajar Baskoro	90	80	70	70	80	70
5	Budi Kriswana	80	90	90	60	80	60
6	Dedy Heryadi	80	70	90	70	75	60
7	Devi Tresna Senjaya	100	90	70	80	70	70
8	Dian Eko	70	70	80	70	70	70
9	Fatmawati	90	90	75	70	65	70
10	H. Didih Suwardi	90	90	85	70	70	60
11	Irpan Sumartono	80	80	90	85	70	65
12	Mohammad Faruq	90	75	90	70	70	70
13	Muhamad Atib	100	80	75	90	80	70
14	Nana Permana	100	90	80	70	70	80

No.	Name	Disciplinary Aspects			Cooperation Aspects		
		C ₁	C ₂	C ₃	C ₄	C ₅	C ₆
15	Nur Irfah	100	90	85	75	70	70
16	Putriah	90	75	70	70	70	80
17	Rinal Yahya	90	85	70	70	70	80
18	Riny Setyoningrum	70	90	80	80	70	70
19	Sugeng Ariady	75	80	75	60	70	70
20	Yeny Despriansa	100	80	75	70	70	70

- b) Determine the criteria that will be used as a reference in making decisions, namely C

Table 4. Criteria

Criteria (C)	explanation
C ₁	Be on time
C ₂	Responsible
C ₃	Dress neatly and politely
C ₄	Participate and contribute
C ₅	Active and productive
C ₆	Helping fellow teachers

- c) Provide value and weight for each alternative on each predetermined criterion

Table 5. Scale Values and Weights

Written Value	explanation	Value Criteria
0-19	Very low	1
20-39	Low	2
40-59	Enough	3
60-79	High	4
80-100	Very high	5

- 2) Normalize each alternative value for each attribute by calculating the performance rating value In this stage, determine the suitability rating of each alternative on each of the criteria that has been determined above, the following is the suitability rating table.

Table 6. Alternative Match Ratings

No.	Alternative (Teacher name)	Criteria					
		Disciplinary Aspects			Cooperation Aspects		
		C ₁	C ₂	C ₃	C ₄	C ₅	C ₆
1	A1	5	5	5	4	4	4
2	A2	5	5	4	5	4	5
3	A3	5	5	5	4	4	4
4	A4	5	5	4	4	5	4
5	A5	5	5	5	4	5	4
6	A6	5	4	5	4	4	4
7	A7	5	5	4	5	4	4
8	A8	4	4	5	4	4	4
9	A9	5	5	4	4	4	4
10	A10	5	5	5	4	4	4
11	A11	5	5	5	5	4	4
12	A12	5	4	5	4	4	4
13	A13	5	5	4	5	5	4
14	A14	5	5	5	4	4	5
15	A15	5	5	5	4	4	4
16	A16	5	4	4	4	4	5
17	A17	5	5	4	4	4	5
18	A18	4	5	5	5	4	4

No.	Alternative (Teacher name)	Criteria					
		Disciplinary Aspects			Cooperation Aspects		
		C ₁	C ₂	C ₃	C ₄	C ₅	C ₆
19	A19	4	5	4	4	4	4
20	A20	5	5	4	4	4	4

3). Calculating the Preference Weight Value (W) for each alternative

Determine the weight of preference or level of importance (W). The weight of the criteria used in determining the best teacher at SMK is as follows:

Table 7. Criteria weights

Criteria (C)	Range (%)	weights
C ₁	25 %	0,25
C ₂	25 %	0,25
C ₃	10 %	0,1
C ₄	15 %	0,15
C ₅	15 %	0,15
C ₆	10 %	0,1

a) Decision Matrix

After this, the alternative suitability rating for each criterion has been determined, then the fifth stage will be followed. namely making a decision matrix (X) which is formed from the Alternative suitability rating table on each criterion. The X value of each alternative (A_i) on the predetermined criterion (C_j). As follows:

	5	5	5	4	4	4
	5	5	4	5	4	5
	5	5	5	4	4	4
	5	5	4	4	5	4
	5	5	5	4	5	4
	5	4	5	4	4	4
	5	5	4	5	4	4
	4	4	5	4	4	4
	5	5	4	4	4	4
W=	5	5	5	4	4	4
	5	5	5	5	4	4
	5	4	5	4	4	4
	5	5	4	5	5	4
	5	5	5	4	4	5
	5	5	5	4	4	4
	5	4	4	4	4	5
	5	5	4	4	4	5
	4	5	5	5	4	4
	4	5	4	4	4	4
	5	5	4	4	4	4

b) Decision Matrix Normalization (X)

This sixth stage carries out the process of normalizing the decision matrix (X) to a scale that can be compared with all existing alternative ratings.

$$R_{ij} = \frac{x_{ij}}{\max x_{ij}} \quad (1)$$

Alternative1

$$r_{11} = \frac{5}{5} = 1$$

$$r_{12} = \frac{5}{5} = 1$$

Alternative2

$$r_{21} = \frac{5}{5} = 1$$

$$r_{22} = \frac{5}{5} = 1$$

Alternative3

$$r_{31} = \frac{5}{5} = 1$$

$$r_{32} = \frac{5}{5} = 1$$



$$\begin{aligned} r_{13} &= \frac{5}{5} = 1 \\ r_{14} &= \frac{4}{5} = 0,8 \\ r_{15} &= \frac{4}{5} = 0,8 \\ r_{16} &= \frac{4}{5} = 0,8 \end{aligned}$$

$$\begin{aligned} r_{23} &= \frac{4}{5} = 0,8 \\ r_{24} &= \frac{5}{5} = 1 \\ r_{25} &= \frac{4}{5} = 0,8 \\ r_{26} &= \frac{5}{5} = 1 \end{aligned}$$

$$\begin{aligned} r_{33} &= \frac{5}{5} = 1 \\ r_{34} &= \frac{4}{5} = 0,8 \\ r_{35} &= \frac{4}{5} = 0,8 \\ r_{36} &= \frac{4}{5} = 0,8 \end{aligned}$$

c) Normalized Matrix (R)

The results of the normalized matrix (R_{ij}) form a normalized matrix (R)

1	1	1	0,8	0,8	0,8
1	1	0,8	1	0,8	1
1	1	1	0,8	0,8	0,8
1	1	0,8	0,8	1	0,8
1	1	1	0,8	1	0,8
1	0,8	1	0,8	0,8	0,8
1	1	0,8	1	0,8	0,8
0,8	0,8	1	0,8	0,8	0,8
1	1	0,8	0,8	0,8	0,8
1	1	1	0,8	0,8	0,8
1	1	1	1	0,8	0,8
1	0,8	1	0,8	0,8	0,8
1	1	0,8	1	1	0,8
1	1	1	0,8	0,8	1
1	1	1	0,8	0,8	0,8
1	0,8	0,8	0,8	0,8	1
1	1	0,8	0,8	0,8	1
0,8	1	1	1	0,8	0,8
0,8	1	0,8	0,8	0,8	0,8
1	1	0,8	0,8	0,8	0,8

d) Preference Value (V_i)

This eighth stage calculates the final result of the preference value (V_i) obtained from the sum of the multiplication of the normalized matrix row elements (R) with the preference weights corresponding to the matrix column elements (R).

$$V_i = \sum_{j=1}^n w_j r_{ij} \quad (2)$$

Preference Weights: 25, 25, 10, 15, 15, 10

$$\begin{aligned} V_1 &= [(0,25 \times 1) + (0,25 \times 1) + (0,1 \times 1) + (0,15 \times 0,8) + (0,15 \times 0,8) + (0,1 \times 0,8)] \\ &= 0,25 + 0,25 + 0,1 + 0,12 + 0,12 + 0,08 \\ &= 0,92 \end{aligned}$$

$$\begin{aligned} V_2 &= [(0,25 \times 1) + (0,25 \times 1) + (0,1 \times 0,8) + (0,15 \times 1) + (0,15 \times 0,8) + (0,1 \times 1)] \\ &= 0,25 + 0,25 + 0,08 + 0,15 + 0,12 + 0,1 \\ &= 0,95 \end{aligned}$$

$$\begin{aligned} V_3 &= [(0,25 \times 1) + (0,25 \times 1) + (0,1 \times 1) + (0,15 \times 0,8) + (0,15 \times 0,8) + (0,1 \times 0,8)] \\ &= 0,25 + 0,25 + 0,1 + 0,12 + 0,12 + 0,08 \\ &= 0,92 \end{aligned}$$

e) Perform Ranking

The value of ranking calculations based on the Simple Additive Weighting (SAW) method for each alternative with a V_i value can be seen in the table as follows:

Table 8. The Results of Ranking the Simple Additive Weighting (SAW) Method

Teacher Name Data	Criteria						Result
	Disciplinary Aspects			Cooperation Aspects			
	Be on Time	Responsi ble	Dress neatly and politely	Participate and Contribute	Active and Productive	Helping Fellow Teachers	
Abdul Odih	90	80	80	70	60	70	0,92
Adhimas Cahyo Kuncoro	100	80	75	80	70	80	0,95
Agus Darsono	100	80	80	70	70	70	0,92
Bias Fajar Baskoro	90	80	70	70	80	70	0,93
Budi Kriswana	80	90	90	60	80	60	0,95
Dedy Heryadi	80	70	90	70	75	60	0,87
Devi Tresna Senjaya	100	90	70	80	70	70	0,93
Dian Eko	70	70	80	70	70	70	0,82
Fatmawati	90	90	75	70	65	70	0,9
H. Didih Suwardi	90	90	85	70	70	60	0,92
Irfan Sumartono	80	80	90	85	70	65	0,95
Mohammad Faruq	90	75	90	70	70	70	0,87
Muhamad Atib	100	80	75	90	80	70	0,96
Nana Permana	100	90	80	70	70	80	0,94
Nur Irfah	100	90	85	75	70	70	0,92
Putriah	90	75	70	70	70	80	0,87
Rinal Yahya	90	85	70	70	70	80	0,92
Riny Setyoningrum	70	90	80	80	70	70	0,9
Sugeng Ariady	75	80	75	60	70	70	0,85
Yeny Despriana	100	80	75	70	70	70	0,9

4. Conclusion

Based on the research results it can be concluded that the calculation method using the Simple Additive Weighting (SAW) method above can be seen that providing alternative decisions in making decisions to determine the best teacher at SMK, based on each predetermined criterion, namely present on time, responsibility, dress neat and polite, participating and contributing, active and productive, and helping fellow teachers. The results obtained have the greatest value and become the best teacher, namely Muhamad Atib.

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