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Teacher Performance Evaluation Decision Support System Using Simple Additive Weighting: Case Study Mentari Intercultural School

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ABSTRAK

Peranan guru sangatlah penting dalam proses pengembangan sumber daya di suatu negara. Dalam hal ini diperlukan usaha untuk mempertahankan kualitas guru-guru. Kualitas guru-guru ini dapat dipertahankan salah satu caranya adalah dengan melakukan evaluasi kinerja guru. Namun masih banyak proses evaluasi kinerja guru yang dilakukan dengan cara manual di sekolah-sekolah di Indonesia. Pada penelitian ini solusi atas permasalahan ini adalah pengembangan sistem evaluasi kinerja guru berbentuk prototipe Sistem Pendukung Keputusan yang berbasis web. menggunakan metode Simple Additive Weighting. Dalam penelitian ini, digunakan beberapa perangkat lunak seperti Java, Hypertext Markup Language, PHP, dan Cascading Style Sheets. Hasilnya, sistem ini membantu mempermudah proses evaluasi kinerja guru oleh HRD dan secara langsung dapat menghasilkan rangking penilaian kinerja guru.

Kata Kunci:

Sistem Penilaian Kinerja, Sistem Pendukung Keputusan, Simple Additive Weighting.

ABSTRACT

The role of the teacher is critical in the process of developing a country's resources. In this case, efforts are required to maintain teacher quality. Evaluating teacher performance is one method of maintaining the quality of these teachers. However, many teacher performance evaluation processes are still carried out manually in Indonesian schools. The solution to this problem in this study is the creation of a teacher performance evaluation system in the form of a web-based Decision Support System prototype by applying Simple Additive Weighting. Several pieces of software, including Java, Hypertext Markup Language, PHP, and Cascading Style Sheets, are used in this study. As a result, this system contributes to the simplification of the teacher evaluation process.

Keywords **:**

Performance Assessment System, Decision Support System, Simple Additive Weighting.

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INTRODUCTION

Education is one of the most important things in human life. Everyone has the right to education. Education gives meaning to everyone's life and education never ends. Education also plays an important role in the development of human resources in a country (Alpian et al., 2019). One important factor in efforts to develop human resources is the teacher (Juniantari and Sri, 2017). To carry out this role, highly qualified teachers are needed. To maintain the quality of a teacher, a teacher performance evaluation process is needed. The results of this teacher evaluation are used to review ongoing and sustainable efforts to control the quality of education in schools (Budihardjo, 2015).

What distinguishes this research from previous studies is the research object, namely the Mentari Intercultural School. This school is intended for preparation for university or vocational school. This school offers a complete academic education through dedicated service by professional staff. However, the results of an interview with the HRD (Human Resource Department) at Mentari Intercultural School revealed that this school had not used a system in the process of evaluating teacher performance. The process of evaluating teacher performance at Mentari Intercultural School begins by providing a form for the teacher to fill out. Then HRD collects the form for evaluation. Evaluation data is stored and processed using Microsoft Excel. However, such an evaluation process started to make it difficult for the HRD staff, considering that the school has a very large number of teachers, hundreds of teachers from elementary, middle, and high schools. Therefore, it is necessary to develop a decision support system (DSS) for teacher performance evaluation using the SAW method to speed up the teacher performance evaluation process. By creating a program through the website, the teacher performance evaluation process can be carried out online from home and the data will be more integrated.

RESEARCH METHODS

Research Object

Mentari Intercultural School is located in South Jakarta. This school is one of four schools managed by the Indonesian Child Development Foundation. Mentari Intercultural School Jakarta has several programs from grades 1 to 12 with more than 1,100 students, and more than 500 students enrolled in SMP and SMA

Data Collection Techniques

Data collection was carried out using two techniques, the first was an interview technique with HRD and data collection techniques from HRD. Interviews were conducted with the Mentari Intercultural School Jakarta HRD Manager to get to the problems that exist in Mentari Intercultural School Jakarta in terms of teacher performance evaluation. From the results of interviews, it is known that there is a need for the development of DSS. The second data collection technique is by collecting data - data stored by the school's HRD in the teacher performance evaluation section. The results obtained are in the form of criteria that have been used by HRD to evaluate teacher performance. Then these criteria will be used for the criteria in the DSS.

Simple Additive Weighting (SAW)

The way the SAW method works is to add up the weight of the performance evaluation scores for each teacher per criterion. To calculate the weight of each criterion, this method also requires decision matrix normalization. The alternative total score is calculated from the number of multiplications between the assessment and the weight of each criterion. The criteria for SAW consist of two types, namely, benefit criteria and cost criteria. The benefit criterion is profitable, so the greater the value of this criterion, the greater the assessment. Meanwhile, the cost criterion applies vice versa, the greater the value of the cost criterion, the smaller the value of the assessment (Aprilian & Saputra, 2020). In this method, it is recommended to have cost criteria not only benefit criteria because if all the benefit criteria are, but it will also produce a higher rating value (Efendi, Kom, Satria, & Jambak, 2019). For example, in evaluating teacher performance, the attendance criterion is a benefit criterion because the higher the attendance score, the higher the teacher

performance assessment. The delay criterion is a cost criterion because the higher the value of a teacher's tardiness, the lower the evaluation of the teacher's performance. In the SAW method, the weight of each criterion is determined by the person who will make the decision and is also adjusted according to needs (Nurmalini & Rahim, 2017).

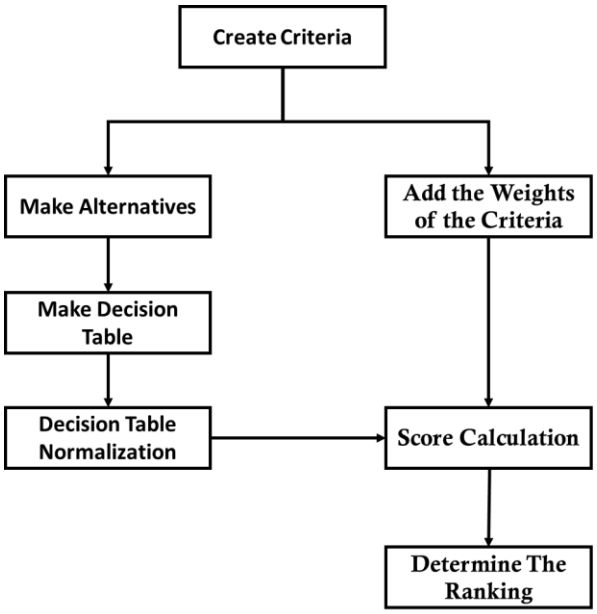

Figure 1. Tahapan SAW

The step-by-step SAW method is shown in Figure 1 as follows:

1. The first step is to create criteria $K = \{k_1, k_2, k_3, \dots, k_n\}$ where each criterion does not depend on other criteria.
2. The second step is to make alternatives $A = \{a_1, a_2, a_3, \dots, a_m\}$
3. The third step is to make a Decision Table where each alternative a_i will be assigned a score for each criterion c_i.
4. Then make a normalization of the decision table based on a formula that is adjusted to the type of criteria, namely benefit criteria or cost criteria which produces a normalized table R where

$$r_{ij} = \begin{cases} \frac{x_{ij}}{Max_i\ x_{ij}} & \text{if j is a benefit criterion} \end{cases} \quad (1)$$

$$r_{ij} = \begin{cases} \frac{Min_i\ x_{ij}}{x_{ij}} & \text{If j is a cost criterion} \end{cases} \quad (2)$$

5. The next step is to add the weights of the criteria B=$\{b_1, b_2, b_3, \dots, b_n\}$ which shows the relative importance of each criterion.
6. Then the score S=$\{s_1, s_2, s_3, \dots, s_n\}$ is calculated for each alternative where respectively s_i calculated by the following formula:

$$s_i = \sum_{j=1}^{n} b_j\ r_{ij} \quad (3)$$

7. The last step is to determine the ranking by sorting the alternative scores from the largest to the smallest. The alternative with the highest score is selected as the best alternative.

RESULTS AND DISCUSSIONS

System Design

The Unified Modeling Language (UML) is a diagramming standard for modeling system development projects from the analysis phase to the end of deployment (Wibowo, 2019). UML is useful for visualizing, defining, building, and documenting system functions. UML is a very expressive language for creating views for developing and implementing systems. UML provides several visual diagrams that represent aspects of the system. The purpose of these diagrams is to provide a more accurate description of the information system to be built (Fitriana, 2020). A use case diagram is a UML diagram that is used to model the behavior of a system, subsystem, or class so that it can be accessed and understood by providing an external view of how these elements can be used in context (Rumbaugh, Booch, & Jacobson, 1999).

Figure 2 displays a use case diagram that explains and provides an overview of how the teacher performance appraisal system works using one actor, namely HRD. The first HRD must register with the admin to log in. After HRD logs in, you can access the page for managing teacher data, managing criteria and sub-criteria, displaying the results of performance appraisal rating data, and the admin page for managing admin data.

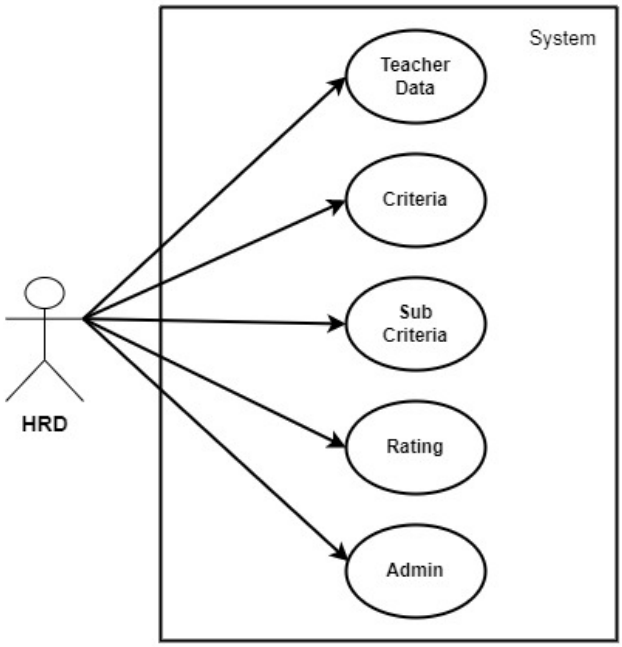

Figure 2. Use Case Diagram

SAW Calculation

The teacher performance appraisal system created in this study applies the DSS using the SAW method. The following is an example of a SAW calculation using teacher data provided by the Mentari Intercultural School Jakarta HRD. The first step is to add criteria. The criteria given include:

1. K_1 = Personal Quality, showing the characteristics of the teacher and how the teacher can bring the class according to the nature and characteristics of the teacher.

2. K_2 = Material Mastery is the level of teacher knowledge about the subjects taught to students.
3. K_3 = Strategies & Techniques show the strategies and techniques used by teachers so that the teaching and learning process can run smoothly and under control.
4. K_4 = Classroom Management is a way for teachers to manage the teaching and learning process in class so that the class remains disciplined.
5. K_5 = Presence which is Teacher attendance records.
6. K_6 = Lateness which is the Teacher's late entry into class records.

The second step is to determine alternatives that should be carried out using probability sampling so that each alternative has the same probability of being selected (Rahman et. al, 2020). In this study, an alternative was chosen by random sampling of 4 teachers by the HRD Manager of Mentari Intercultural School. Some of the teachers selected were Anita Rima (AR), Apriyani (AY), Siti Atikah (SA), and Bella J.G (BJG).

The third step is to make a Decision Table where each alternative is assessed using a value from 1 to 4, where for each criterion the value 1 = very poor, 2 = poor, 3 = good, and 4 = very good applies to each criterion. The results can be seen in Table 1. Scores 1 to 4 are determined by the Mentari Intercultural School HRD Manager.

Table 1. Decision Table

Teacher Name	Personal Quality	Material Mastery	Strategies& Techniques	Classroom Management	Presence	Lateness
AR	**3**	**3**	**3**	**3**	**2**	**3**
AY	**2**	**3**	**2**	**2**	**2**	**2**
SA	**3**	**4**	**3**	**4**	**3**	**3**
BJG	**3**	**4**	**4**	**4**	**3**	**3**

After making the Decision Table, proceed with the normalization process. The SAW normalization calculation for the benefit criteria is the score divided by the highest score for each criterion and the cost criteria, the score is divided by the lowest score for each criterion. Personal Quality, Material Mastery, Strategy & Techniques, Class Management, and Attendance are benefits while tardiness is the only cost criterion. Complete normalization results are shown in Table 2.

Table 2. Decision Table Normalization

Teacher Name	Personal Quality	Material Mastery	Strategies& Techniques	Classroom Management	Presence	Lateness
AR	**1,00**	**0,75**	**0,75**	**0,75**	**0,67**	**0,67**
AY	**0,67**	**0,75**	**0,50**	**0,50**	**0,67**	**1,00**
SA	**1,00**	**1,00**	**0,75**	**1,00**	**1,00**	**0,67**
BJG	**1,00**	**1,00**	**1,00**	**1,00**	**1,00**	**0,67**

The next step is the weighting of each criterion by HRD Mentari Intercultural School Jakarta. For personal quality criteria 20%, material mastery 30%, strategies & techniques 20%, class management 15%, attendance 10%, and tardiness 5%. The total weight is 100%. After normalization, a score calculation for each alternative is made from the sum of the multiplication results of the normalized R table with the criterion weights. The score calculation results are as follows:

S_{AR} = (1,00 x 20%) + (0,75x30%) + (0,75 x 20%) + (0,75 x 30%) + (0,67 x 10%) + (0,67 x 5%) = 0,7875 or 78.75%

S_{AY} = (0,67 x 20%) + (0,75 x 30%) + (0,50 x 20%) + (0,50 x 30%) + (0,67 x 10%) + (1,00 x 5%) = 0.65 or 65%

S_{SA} = (1,00 x 20%) + (1,00 x 30%) + (0,75 x 20%) + (1,00 x 30%) + (1,00 x 10%) + (0,67 x 5%) = 0.9333 or 93.33%

S_{BJG} = (1,00 x 20%) + (1,00 x 30%) + (1,00 x 20%) + (1,00 x 30%) + (1,00 x 10%) + (0,67 x 5%) = 0.9833 or 98.33%.

Based on the calculation above, the teacher's performance ranking from highest to lowest is BJG, SA, AR, dan AY.

Decision Support System

DSS was built in the form of a website-based teacher performance evaluation system prototype using the Java programming language, Hypertext Markup Language (HTML), PHP, and Cascading Style Sheets (CSS). Some of the features of the results of the DSS development for evaluating teacher performance at Mentari Intercultural Schools can be seen in Table 3.

Table 3. Decision Support System Features

Features	Description
Login	To access the system, it is necessary to enter the ID and password according to the admin registration, if it is not registered in the database then the user cannot enter the main page of the teacher performance appraisal system.
Home	the main page has several menus that will help in the teacher performance evaluation process.
Admin	Page to set system user with username and password. There are features for adding, changing and deleting admins.
Teacher Data	A page for teacher data which is an alternative assessment. There are features for adding, changing and deleting teacher data.
Criteria	Pages for criteria data including criteria code, criteria name, criteria description (benefit or cost), and criteria weight. There is a feature for adding, changing and deleting criteria.
Sub Criteria	Pages for data values 1 to 5 of each criterion. There is a feature for adding, changing, and deleting sub-criteria.
Rating	this page displays the results of SAW calculations which are teacher ratings based on data that has been entered on the previous teacher assessment data page. There is an export feature of SAW results to Microsoft Excel.
Logout	Exit the system

System Evaluation

Furthermore, to test whether the system features are running correctly or not, the User Acceptance Test (UAT) was used which was carried out together with the HRD Manager, Mr. Paryoto Aryo. The HRD manager immediately tried using a website-based teacher performance

appraisal system via his computer. The following is a table of assessment weights that will be used in the UAT process. After the user tries the teacher's performance appraisal system. Functionally the system has been running smoothly and has fulfilled the feature requirements needed in the teacher performance assessment process. Using the weights according to Table 4 is the result of the UAT that has been carried out. Based on the UAT results, all system features are running 100% according to user expectations.

Table 4. User Acceptance Test

Feature	Description	Result
Login	Login goes well	pass
Home	The Home UI is already attractive	pass
Admin	Adding Admin went well	pass
	Admin changes went well	pass
	Admin delete went well	pass
Teacher Data	The addition of Teacher Data is going well	pass
	Teacher data changes are going well	pass
	Master Data Wipe went well	pass
Criteria	The addition of Criteria went well	pass
	The Criteria change went well	pass
	Criterion Deletion went well	pass
Sub Criteria	The addition of Sub Criteria went well	pass
	Changes to Sub Criteria went well	pass
	Elimination of Sub Criteria goes well	pass
Rating	Master's rating is correct	pass
	Export of Teacher Rankings to Excel went well	pass
Logout	Logout goes well	pass

At the time of checking Teacher Ratings, a comparison of the results of SAW calculations was carried out manually and by the system. The results are the same as the SAW calculation results. Bella J.G (BJG) was ranked first with a score of 98.3333, followed by Siti Atikah (SA) with a score of 93.3333. While in third place was Anita Rima (AR) with a score of 78.75 and last place was occupied by Apriyani (AP) with a score of 65.

The Difference Before and After using a Decision Support System

After that, together with Mentari Intercultural School HRD, a comparative evaluation was carried out before and after the use of the DSS. Evaluation is carried out in several categories which include integration, data security, logging, and ranking. The results can be seen in Table 5, wherein in all categories with the DSS, the process of assessing teacher performance is better when compared to without the DSS.

Table 5. The Difference Before and After using a Decision Support System

Category	Before Using DSS	After Using DSS

Integration	The teacher performance assessment process uses Excel data so that the data is not integrated and the delivery of documents uses various media	The teacher performance appraisal process and database can be used and accessed through the website.
Data Security	Vulnerable to the spread of sensitive data on the distribution of documents through various media.	Reducing the spread of sensitive data because accessing the website requires a username and password
Recording	All recordings and calculations use Excel and Word for teacher performance assessment reports.	The recording is done on a teacher performance appraisal system that is created and then the data entered is entered into the database
Rating	The ranking results are based on calculating using the total value obtained by the teacher	The rating is based on the results of SAW calculations using percentage weights on each criterion.

CONCLUSION AND SUGGESTION

Conclusion

The website-based prototype DSS for Teacher Performance Assessment for Mentari Intercultural School Jakarta was successfully built using the programming language Java, HTML, PHP, and CSS. Based on the UAT results carried out with the HRD Manager, the DSS that has been made 100% can run well. DSS using the SAW method can assist in the process of assessing teacher performance. Based on the evaluation results with the HRD Manager, the process of assessing teacher performance is better, namely integrated through the website, safer because it can prevent the spread of sensitive data, better recording because it is stored in a database, the resulting ranking is more accurate free from manual calculation errors.

Suggestion

Some suggestions that can be given for the development of a teacher performance appraisal system:

1. The Teacher Performance Assessment DSS can still be developed further so that the performance appraisal process is not only for teachers but also for other school staff.
2. Requires training for new users in the implementation of DSS that has been made.

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