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Decision Support System for Determining the Best Teacher at Private Ballerina Elementary School using the Simple Additive Weighting (SAW) Method

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ABSTRACT

At this time the utilization of science and technology is developing very quickly and producing new innovations that must be balanced with the ability to adapt to these technologies. One of these fields is a decision support system that can assist in decision-making. SDS Balerina is an educational institution in Medan. SDS Balerina has conducted assessment activities to determine the best teacher, but the assessment has not produced maximum results because all teachers are said to be good, all of them are equal, no one distinguishes their degrees, the results of the assessment are not announced to the teacher concerned, only the principal knows about it and does the assessment. However, what determines this decision-making is the decision-maker himself because the system is only an alternative decision. The final decision is still determined by the decision maker, namely the school principal.

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1. INTRODUCTION

At this time the utilization of science and technology is developing very quickly and producing new innovations that must be balanced with the ability to adapt to these technologies. One of these fields is decision support systems that can assist in decision making. Decision Support System as a set of integrated computer tools that allow a decision maker to interact directly with a computer, to create information that is useful in making semi-structured decisions and unanticipated structured decisions. The decisions taken are expected to be non-subjective so that the quality obtained can be in accordance with expectations so that no party is harmed. Decision making to determine whether the teacher's performance has met the accepted quality or not is based on several criteria set by the school. To avoid the subjectivity of the resulting decision, a decision support system (DSS) is needed that can help assess teacher performance in deciding to be the best teacher. DSS is a system using models built to help solve semi-structured problems. The Simple Additive Weighting method is often known as the 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. This method requires normalizing the decision matrix to a scale that can be compared with all existing alternative ratings. [1]

Balerina Private Elementary School is an educational institution in Medan. Balerina Private Elementary School has conducted assessment activities in determining the best teacher, but the assessment has not produced maximum results because all teachers are said to be good, all are equal, no one distinguishes their

degrees, the results of the assessment are not announced to the teacher concerned, only the principal knows about it and who conducts the assessment. Research on decision-making systems for determining the best teacher has been carried out, such as research by Duwiyanti, Fitri and Ardhiansyah, Maulana on the Best Teacher Selection Decision Support System at SMK Pustek Serpong. This research discusses the best teacher selection process carried out by the TOPSIS method so that it has several weaknesses and still raises several problems so that it requires a system to help the best teacher selection process using the Simple Additive Weighting (SAW) method to simplify and speed up the decision-making process by solving the problems that occur. [2]

From the description above, it is hoped that by using a decision support system (DSS) the problems faced by foundations or schools can be overcome, so that subjectivity in decision making can be reduced, so the author raises a research title entitled "Decision Support System for Determining the Best Teacher at Balerina Private Elementary School Using the Simple Additive Weighting (SAW) Method". However, what determines in this decision making is the decision maker itself because the system is only an alternative decision. While the final decision is still determined by the decision maker, namely the principal. [3]

2. METHOD

This method produces output in the form of statistical numbers, both in research that produces descriptive or inferential data output. [4]

Quantitative analysis is used if the researcher wants to discuss a topic by taking measurements, for example, the research that is being raised by the author, namely the decision support system for selecting the best teacher. This method is called quantitative because the research data is in the form of numbers and analysis using statistics. [5]

Quantitative Statistical Analysis is an analysis in which the data described will focus on numerical methods. This data analysis process is carried out after all the necessary data is collected from various sources, namely through observations and interviews in order to solve the problem under study. Data analysis in this study was carried out by calculating using the Simple Additive Weighting (SAW) method. [6]

The method used in this research is the Simple Additive Weighting (SAW) method. The Simple Additive Weighting (SAW) method is a method for summing weights by determining the weight value on the attribute and then performing a ranking process that becomes an alternative. [7] The SAW method helps in making decisions on a case or problem. In the Simple Additive Weighting (SAW) method, the results obtained are the greatest value that will be selected as the best alternative in decision making and the time required in this method is very short. The normalization process can be completed using the following equation as follows:

$$r_{ij} = \begin{cases} \dfrac{x_{ij}}{Max_i x_{ij}} & \text{If j is a benefit attribute} \\ \dfrac{Min_i x_{ij}}{x_{ij}} & \text{If j is a cost attribute} \end{cases}$$

Design is the process of planning everything in advance before making a visual form resulting from planned creative forms. The first step in design starts from irregular things in the form of ideas or ideas then through the process of cultivation and management will produce organized things, so that things that are already organized can fulfill their functions and uses properly. Design is the depiction, planning, sketching of several separate elements into a unified whole and function. CodeIgniter is a framework created using the PHP programming language which aims to make it easier for web programmers to create or develop web-based applications". The conclusion from this understanding is that CodeIgniter is a PHP Framework in which there are complete features of web applications that have been packaged into one. PHP stands for Perl Hypertext Preprocessor which is an open source server-side web programming language. PHP is a script that integrates with HTML and resides on the server (server side HTML embedded scripting). PHP is a script used to create dynamic web pages. Dynamic means that the page to be displayed is created when the page is requested by the client. This mechanism causes the information received by the client to always be up to date. All PHP scripts are executed on the server where the script is run. [8]

This research uses a framework for system design. Framework is a framework or a set of files that have been included, in which there are program code commands and basic functions to perform certain tasks ". The definition of the framework can be concluded that the Framework is a collection of functions that can help programmers in dealing with problems in programming such as one example of a connection to a database. The database used is MySQL. MySQL is one of the most popular database servers. Its popularity is due to its free nature (you don't need to pay to use it) on various platforms (except on Windows, which is software or you need to pay after evaluating and deciding to use it for production purposes. Based on this explanation, it can be concluded that MySQL is a DBMS application that performs data processing functions to build a web application. [9]

The following is the formula for the Simple Additive Weighting method:

$$r_{ij} = \begin{cases} \frac{x_{ij}}{Max_i x_{ij}} & \text{If j is a benefit attribute} \\ \frac{Min_i x_{ij}}{x_{ij}} & \text{If j is a cost attribute} \end{cases}$$

Max = largest value
Min = smallest value
Benefit = if the largest value is best
Cost = if the smallest value is the best
Where Rij is the normalized performance rating of alternative A, on attribute Ci' i = 1,2,...,m and j = 1,2,900,n
The preference value for each alternative (vi) is given as follows:
Vi = ∑nj = 1 wj rij
Description:
Vi = Ranking for each alternative
Wj = Weight value of each criterion
Rij = Normalized work branch value

Here are the calculation steps with the Simple Additive Weighting (SAW) method:
1. Determining Alternatives.

Table.1 Best Teacher Alternative

Code	Alternative
A1	Devi
A2	Teti
A3	Putri
A4	Novi
A5	Tono
A6	Tia
A7	Tiono
A8	Dina
A9	Fitri
A10	Ningsih

2. Determine the criteria that will be used as a reference in decision making

Table .2 Best Teacher Criteria

Code	Criteria
C1	Able to Explain the Material
C2	Attendance
C3	Achievements
C4	Responsibility
C5	Discipline

3. Determine the weight of each criterion.

Table 3 Criteria Weighting

Criteria	Weight	Compatibility
C1	0,2	Benefit
C2	0,2	Benefit
C3	0,1	Benefit
C4	0,2	Benefit
C5	0,3	Benefit

3. RESULTS AND DISCUSSION

The analysis and design of the system carried out in this study is to use the development of the Waterfall system method, the waterfall model provides a sequential or ordered software lifeflow approach starting from analysis, design, coding, testing, and implementation and maintenance stages. [10]

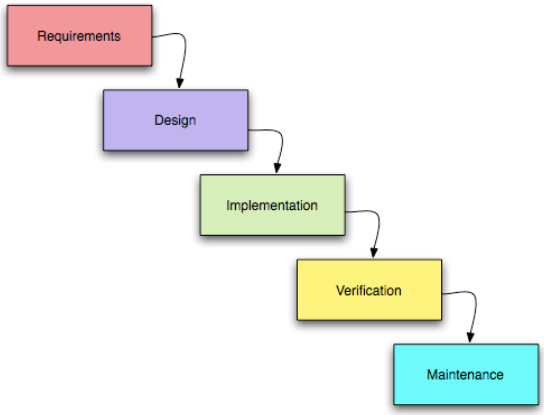

Figure 1. Waterfall method

The system analysis process is a step for system development. System analysis is carried out to find out the advantages and disadvantages of the system that has been run by the school and understand the information obtained and issued by the system itself. To find out the advantages and disadvantages of the system, it is necessary to know how the system is running at the school. The results of the analysis of the survey conducted on the problems faced are: [11]

a.The selection of the Best Teacher is done in a simple way, is still physical and requires a long time process.
b.The selection is still subjective in decision making.

The final result is obtained from the ranking process, namely the sum of the multiplication of the normalized matrix R with the weight vector so that the largest value is selected as the best alternative as a solution. [12]

A1 = (1*2) + (0,69*1) + (0,6*3) + (1*2) + (1*1) + (1*1) = 8,09
A2 = (0,8*2) + (1*1) + (1*3) + (1*2) + (1*1) + (1*1) = 9,6
A3 = (0,6*2) + (0,85*1) + (0,6*3) + (0,3*2) + (0,4*1) + (0,6*1) = 5,51

Now from the comparison of the final scores, the following scores are obtained : [13]

A1 = 8,09
A2 = 9,6
A3 = 5,51

Then the alternative that has the highest value and can be selected is alternative A3 with a value of 9.6.

The main page is the page that will appear first when the application is run. The main menu display can be seen in the figure below:

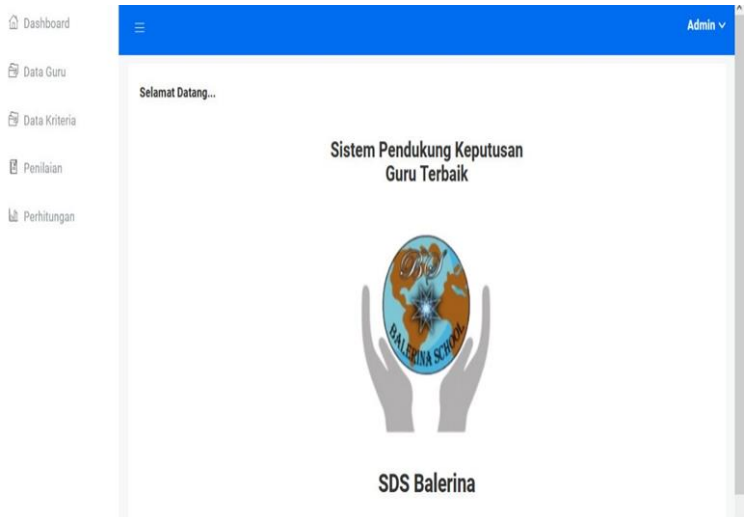

Figure 2 Main Page Display

The next display is the teacher data menu. This teacher data menu serves to enter alternative data. This teacher data display can be seen in the figure below : [14]

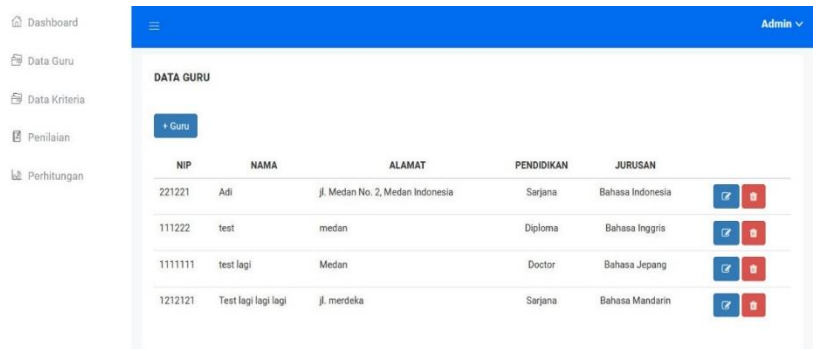

Figure 3 Teacher Data Menu Display

The next display is the Calculation Menu. This calculation menu displays the results of calculations and decisions for determining the best teacher : [15]

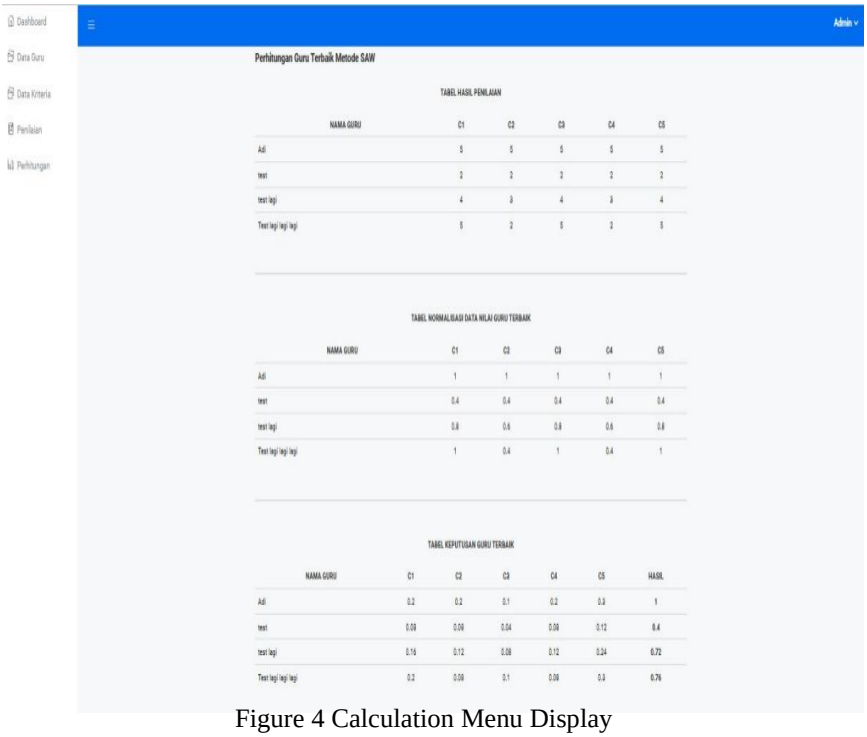

Figure 4 Calculation Menu Display

4. CONCLUSION

This research has successfully developed and implemented a decision support system (DSS) to determine the best teacher at Balerina Private Elementary School using the Simple Additive Weighting (SAW) method. The conclusions of this research can be summarized as follows:

Effectiveness of SAW Method:

1. The SAW method is proven to be effective in assisting the decision-making process by providing an objective assessment based on various predetermined criteria. This method combines the values of criteria that have certain weights to produce a final score that is used as the basis for determining the best teacher.
2. Relevant Assessment Criteria: The criteria used in this system cover important aspects such as professional competence, dedication, academic achievement, communication skills, and contribution to the school. The selection of these criteria is based on the needs and values of Balerina Private Primary School.
3. Easy System Usage: The developed system has a user-friendly interface and is easy to use by the school management. This ensures that the process of evaluating and determining the best teachers can be done efficiently and without the need for in-depth technical training.

4. Increased Transparency and Accountability: By using SAW-based CBMS, the teacher evaluation process becomes more transparent and accountable. All decisions are based on clear data and calculations, reducing the potential for bias and subjectivity in the assessment.
5. Benefits for Teacher Development: The assessment results generated by this system can be used as a basis for providing constructive feedback to teachers. This helps in the professional development of teachers by identifying areas for improvement and providing appreciation for good performance.
6. Potential for Further Implementation: This system has the potential to be applied in other schools with adjustments to the criteria and weights that suit the needs of each school. The SAW method can also be used for performance appraisal in other contexts, such as student appraisal or employee appraisal in non-educational organizations.

REFERENCES

[1] Z. Zhai, J. F. Mart\'\inez, V. Beltran, and N. L. Mart\'\inez, "Decision support systems for agriculture 4.0: Survey and challenges," *Comput. Electron. Agric.*, vol. 170, p. 105256, 2020.

[2] R. T. Sutton, D. Pincock, D. C. Baumgart, D. C. Sadowski, R. N. Fedorak, and K. I. Kroeker, "An overview of clinical decision support systems: benefits, risks, and strategies for success," *NPJ Digit. Med.*, vol. 3, no. 1, p. 17, 2020.

[3] N. Vafaei, R. A. Ribeiro, and L. M. Camarinha-Matos, "Assessing normalization techniques for simple additive weighting method," *Procedia Comput. Sci.*, vol. 199, pp. 1229–1236, 2022.

[4] I. J. T. Situmeang, S. Hummairoh, S. M. Harahap, and M. Mesran, "Application of SAW (simple additive weighting) for the selection of campus ambassadors," *IJICS (International J. Informatics Comput. Sci.*, vol. 5, no. 1, pp. 21–28, 2021.

[5] Y. Irawan, "Decision support system for employee bonus determination with web-based simple additive weighting (SAW) method in PT. Mayatama Solusindo," *J. Appl. Eng. Technol. Sci.*, vol. 2, no. 1, pp. 7–13, 2020.

[6] R. N. Ramdhani and H. Haryati, "THE SIMPLE ADDITIVE WEIGHTING (SAW) METHOD TO DETERMINE THE RECIPIENT OF THE PATIENT ASSISTANCE FUND," *J. Inov. Ilmu Komput.*, vol. 1, no. 1, pp. 68–78, 2022.

[7] D. Pamucar, M. Žižović, S. Biswas, and D. Božanić, "A new logarithm methodology of additive weights (LMAW) for multi-criteria decision-making: Application in logistics," 2021.

[8] M. R. Wayahdi, S. H. N. Ginting, and D. Syahputra, "Greedy, A-Star, and Dijkstra's algorithms in finding shortest path," *Int. J. Adv. Data Inf. Syst.*, vol. 2, no. 1, pp. 45–52, 2021.

[9] S. H. N. Ginting, "The Utilization Of The Simple Multi Attribute Rating Exploiting Ranks Can Enhance The Performance Of The Aco Algorithm," *J. Minfo Polgan*, vol. 12, p. 1325, 2023, doi: doi.org/10.33395/jmp.v12i1.12743.

[10] S. H. N. Ginting and N. Sridewi, "Implementation of Decision Support System for New Employee Selection at PT Triotech Solution Indonesia using SAW Method," *J. Minfo Polgan*, vol. 13, no. 1, pp. 856–862, 2024.

[11] F. Ruziq and M. R. Wayahdi, "Sistem Pendukung Keputusan Seleksi Karyawan Baru dengan Simple Additive Weighting pada PT. Technology Laboratories Indonesia," *J. Minfo Polgan*, vol. 11, no. 2, pp. 153–159, 2022.

[12] M. R. Wayahdi and F. Ruziq, "KNN and XGBoost Algorithms for Lung Cancer Prediction," *J. Sci. Technol.*, vol. 4, no. 1, pp. 179–186, 2022.

[13] V. M. M. Siregar *et al.*, "Decision support system for selection of food aid recipients using SAW method," in *AIP Conference Proceedings*, 2022, vol. 2453, no. 1.

[14] D. Kurniawati, F. N. Lenti, and R. W. Nugroho, "Implementation of AHP and SAW methods for optimization of decision recommendations," in *Journal of International Conference Proceedings*, 2021, vol. 4, no. 1, pp. 254–265.

[15] R. D. Gunawan, F. Ariany, and N. Novriyadi, "Implementasi Metode SAW Dalam Sistem Pendukung Keputusan Pemilihan Plano Kertas," *J. Artif. Intell. Technol. Inf.*, vol. 1, no. 1, pp. 29–38, 2023.