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Decision Support System for Teacher Performance Assessment Using Weighted Product Method with Web Application

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ABSTRACT

This study aims to assess the performance of teachers in applying all competencies in the learning process, mentoring in school education and planning for continuous professional development for teachers. Where in the process of assessing teacher performance at the school, they still use manual applications with a simple addition method and the lack of speed in processing teacher performance assessments is increasing from year to year. To solve these problems, the Weighted Product method was chosen, this method helps teacher performance appraisal decisions so that they get the best results, then implements the method into an application decision support system to speed up the assessment process. Then the final result of this study with a calculation accuracy rate of 100% based on manual calculations and calculations on the application with the results agreeing to the decision support system made.

Keywords: *Teacher Performance Assessment; Weighted Product; Decision Support System.*

ABSTRAK

Penelitian ini memiliki tujuan untuk menilai kinerja guru dalam menerapkan semua kompetensi pada proses pembelajaran, pembimbingan dalam pendidikan sekolah serta perencanaan pengembangan keprofesian berkelanjutan bagi guru. Dimana dalam proses penilaian kinerja guru di sekolah tersebut masih menggunakan aplikasi manual dengan metode penjumlahan yang sederhana dan kurangnya kecepatan dalam memproses penilaian kinerja guru yang dari tahun ke tahun semakin bertambah. Untuk menyelesaikan permasalahan tersebut maka dipilih metode *Weighted Product*, metode tersebut membantu pengambilan keputusan penilaian kinerja guru sehingga mendapatkan hasil yang terbaik, kemudian mengimplementasikan metode tersebut kedalam sistem pendukung keputusan aplikasi untuk mempercepat proses penilaian. Kemudian hasil akhir dari penelitian ini dengan tingkat akurasi perhitungan 100% berdasarkan perhitungan manual dan perhitungan pada aplikasi dengan hasil sama akan sistem pendukung keputusan yang dibuat.

Keywords: *Penilaian Kinerja Guru; Metode Weighted Product; Sistem Pendukung Keputusan.*

INTRODUCTION

Budi Utomo Prambon Middle School in Sidoarjo city has teachers whose performance must be monitored regularly, as an effort to maintain the quality of the teachers to determine the best teachers. SMP Budi Utomo Prambon makes assessment criteria including pedagogic, personality, social, and professional. The results of this performance assessment will be used as an assessment

material to improve performance and each teacher who is selected with the best performance will be given an award. to assist the assessment process required by the system to be able to support teacher performance appraisal decisions. The weighted product method is to determine the weight of each criterion and will choose the best teacher scores who will have an assessment based on the criteria above [1]. In other cases DSS is used to determine the best students [2].

Decision making is carried out with a systematic approach to problems through the process of collecting data into information and adding the factors that need to be considered in decision making. Decision making is the process of selecting alternative actions to achieve certain goals or objectives. The author solves this problem by applying the method weighted product (WP). This method was chosen because this method has made a decision support system with several criteria from a total of 17 teachers. For this reason, in this study a decision support system was designed that was able to handle unlimited criteria determination. In the case of selecting the best employee, one of the companies uses the TOPSIS method [3], other cases decision support systems are also used to determine promotions for lecturers on a campus [4]. In the health sector, is used to support the policy of procuring medical devices in hospitals [5]. From examples of cases in the fields of industry, education and health, it is clear that the implementation of decision making can be implemented in many fields.

LITERATURE REVIEW

Decision Support System

DSS is part of a computer-based information system (including knowledge-based) that is used to support decision making in an organization or company [6]. DSS can also be regarded as a computer system that processes data into information in making decisions on specific semi-structured problems[7]. Decision making has four processes and sequential [1]. The four processes are : Intelligence, Design, Solution, Implementation [8].

Weight Product

At first this method was first published by bridgman in 1922. Miller and Starr also published articles on this WP method. The Weighted Product method is one solution to the decision support system. This method evaluates several alternatives against a set of attributes/criteria, where each attribute is independent of one another [9].

The Weight Product method is a simple method that can associating attribute levels through multiplication, where each level and each attribute must be ranked with the type of attribute being considered, which is called normalization [10]. The weight product method uses a multiplication technique to associate attribute ratings, where each attribute must be present placed first along with the weights of the attributes of interest [11].

In other cases the field of education is used to solve a problem, such as in the case of ranking student achievement. The results of the calculation of students' academic and non-academic scores become more flexible and structured, making the results of student achievement rankings more accurate and the process more effective and efficient [12].

METHOD

The research method used is quantitative research, using numerical data that is processed with formulas to obtain results based on calculations [13] . This research method is to describe the object to be tested, namely to provide a teacher performance index based on the results of the calculation of the weighted product method. Can be seen in the figure 1.

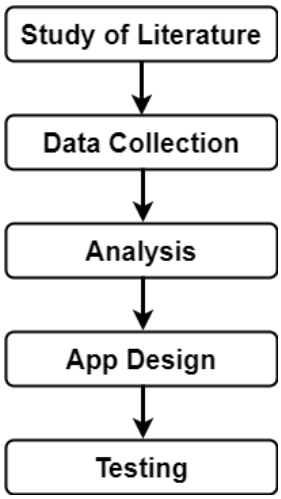

Figure 1. Research Flow Weight Product

- **Study of literature**

Based on the results of the literature study conducted, the research can write down several theories or literature related to the principles of the weighted product method proposed by experts both sourced from books and journals.

- **Data collection**

This research collects data including field research where case studies and library research. The data taken is the profile data of teachers, students, and staff. Question and answer interview with the principal to obtain teacher performance assessment data and teacher Statistics.

- **Analysis**

Processing data from the field using the Weight Product method, by performing calculations using Microsoft Excel before making the application web-based.

- **App Design**

Create an application that is specifically used to calculate and find the best teacher performance based on the data that has been obtained and display the results. This application can be used with internet browsers.

- **Testing**

Testing on applications that have been made by inputting, processing, and displaying the results of teacher performance rankings and comparing them with results using the Microsoft Excel.

RESULTS AND DISCUSSION

Previous research on decision making to determine the best teacher in junior high school, respondents were only taken from colleagues and leaders did not include students, so the results of the assessment were considered less valid, in this case all school members participated as assessors. And not many build web applications to collect assessment results directly using an online form and display the results quickly. In this study, all respondents who will provide assessments for teachers can directly input them via an online form using a web application and process the results using the weighted product method and display the results from the best to lowest teacher ranking lists in a few seconds and also display them in the form of bar graphs.

Stages of The Weighted Product

The criteria that have been inputted by the principal into the system will be calculated using the Weighted Product method [14]. At this stage of the Weighted Product method, it starts from the input process for the criteria value, after that the system will improve the weight value, calculate from several alternatives and criteria that have been determined by the principal [15]. The stages of the Weighted Product method can be seen in Figure 2.

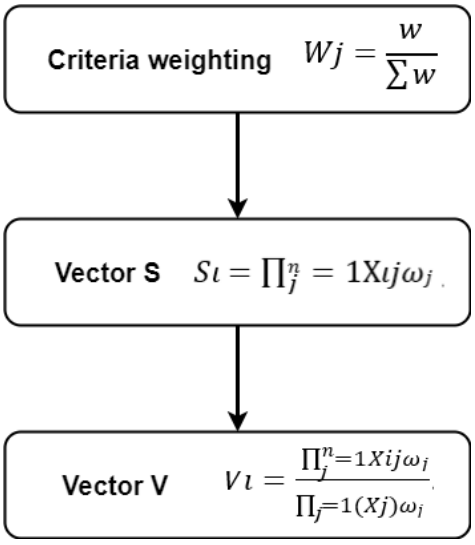

Figure 2. Stages of The Calculation Weighted Product

In assessing the performance of the highest-scoring teacher, the assessment provides input recommendations when suggesting performance improvements, rewards, or level increases. Even though the teacher's score is the lowest, the evaluator will provide suggestions to improve skills as a teacher. Good to get useful performance with guidance and consultation. When doing this calculation, criteria and weights are needed for generate alternative values, as shown in Table 1.

Table 1. Assesment Criteria

Code	Assesment	Description
C1	Pedagogy	The ability of each teacher in delivering subject matter to students.
C2	Personality	The attitude and behavior of the teacher on a daily basis, how the teacher responds to and responds to every behavior in the school environment.
C3	Social	A measure of how well a teacher relates to the school environment.
C4	Profession	Requires teachers to be objective towards students and other people in the school environment in accordance with their duties

Competencies are grouped into several criteria for assessing teacher performance which are then calculated to obtain the results of teacher performance assessments. The following is a teacher performance assesment or assesment alternative in table 2.

Table 2. Assesment Alternative

Alternative	Criteria			
	Pedagogy	Personality	Social	Profession
A1	88	86	88	87
A2	86	86	86	84
A3	84	85	87	84
A4	84	86	84	86
A5	86	84	88	84
A6	84	86	84	85
A7	85	85	84	86
A8	86	86	86	83
A9	83	84	84	86
A10	88	85	85	83
A11	87	84	86	86
A12	84	83	83	85
A13	88	85	86	86
A14	84	84	83	84
A15	84	85	86	85
A16	86	86	85	84
A17	84	83	86	85
A18	85	85	84	86
A19	86	84	85	84
A20	83	86	84	85
A21	86	84	83	84
A22	83	85	85	83
A23	86	83	84	85
A24	87	84	85	84
A25	88	86	86	85

The following is a table of the rating scale used to determine the results of the assessment based on the criteria, which can be seen in table 3 [6].

Table 3. Criteria Scoring Scale

Scale	**Description**	**Criteria Weight**
0-20	Strongly Disagree	1
25-40	Disagree	2
45-60	Neutral	3
65-80	Agree	4
85-100	Strongly Agree	5

The steps to calculate the Weighted Product are :

1. First, the weighting of each existing criterion, the weighting value used can be derived from the preference value of the results of discussions with many teachers, in order to determine the ideal teacher performance value according to the needs of teacher performance assessment.
2. After determining the criteria and weights, then look for which criteria are feasible and useful. If it is profitable, then the attribute value is positive if in the form of costs it is changed to a negative value. In this case study all attributes are positive.

3. The value of the weight of each criterion, then correction of the weight of the initial weight value.

$$Wj = \frac{w}{\sum w} \quad (1)$$

$$\boldsymbol{W1} = \frac{\mathbf{4}}{\mathbf{4+2+4+3}} = \mathbf{0.307}$$

$$\boldsymbol{W2} = \frac{\mathbf{2}}{\mathbf{4+2+4+3}} = \mathbf{0.153}$$

$$\boldsymbol{W3} = \frac{\mathbf{4}}{\mathbf{4+2+4+3}} = \mathbf{0.307}$$

$$\boldsymbol{W4} = \frac{\mathbf{3}}{\mathbf{4+2+4+3}} = \mathbf{0.237}$$

4. After weighting, perform vector (S) calculations. Another method is the teacher's data representation, which will be transformed into variables A1,A2,…An.
5. After getting the vector value (S), then determine the vector value (V).
6. Completing all steps, look for the maximum value, because the best value calculated based on the weighted product method is the maximum value of all alternatives which are the results of teacher performance assessments, which can be seen in table 4.

Table 4. Ranking Result Teacher Performance Assesmen

Alternative	Name	Vector (V)	Rangking
A1	Dra. Indyah Kartini	0.0294334	1
A5	Abu Aly, S.Ag	0.0288803	2
A11	Hj. Saraswati Dyah	0.0289400	3
A13	Arum Lelyana, S.Pd	0.0290943	4
A25	Elis Dyah Palupi, S.Pd	0.0290658	5

Application Flow

Explains about how the stages of the system process of applying the weighted product method in analyzing the results of the evaluation of teacher criteria and alternatives. In the first, the admin performs an alternative input process according to the alternative desired by the principal. If you have done an alternative process, then the admin performs the criteria input process, the system will carry out the calculation process using the weighted product method, then the calculated data will produce data on the recommendations of teachers according to the desired criteria. The flow implementation can be seen in Figure 3.

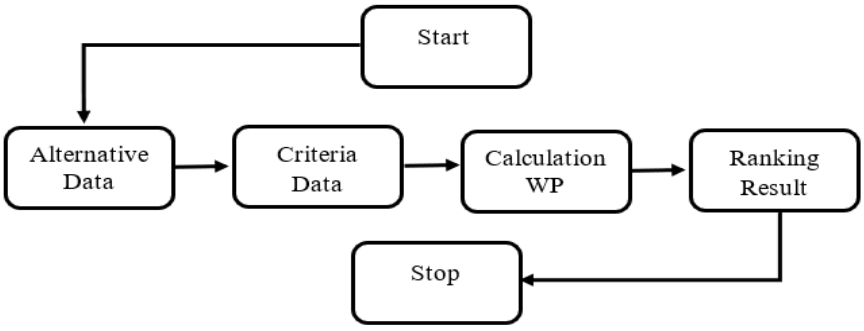

Figure 3. Application Flow

The following are the results of implementing a decision support system application, the first of which can be seen in figure x (a). The next view is a page for adding, editing, and deleting teacher data which can be seen in figure x (b), shows teacher data that will be assessed by students based on the teacher having taught in class. For the display in figure X (C) is an assessment form that will be

carried out by students to assess according to the criteria, and the result of teacher performance scores consisting of Pedagogy (C1), Personality (C2), Social (C3), and Profession (C4) competencies. Figure x (d) is the result of an ordered ranking from the highest to the lowest of the Vector (V) values.

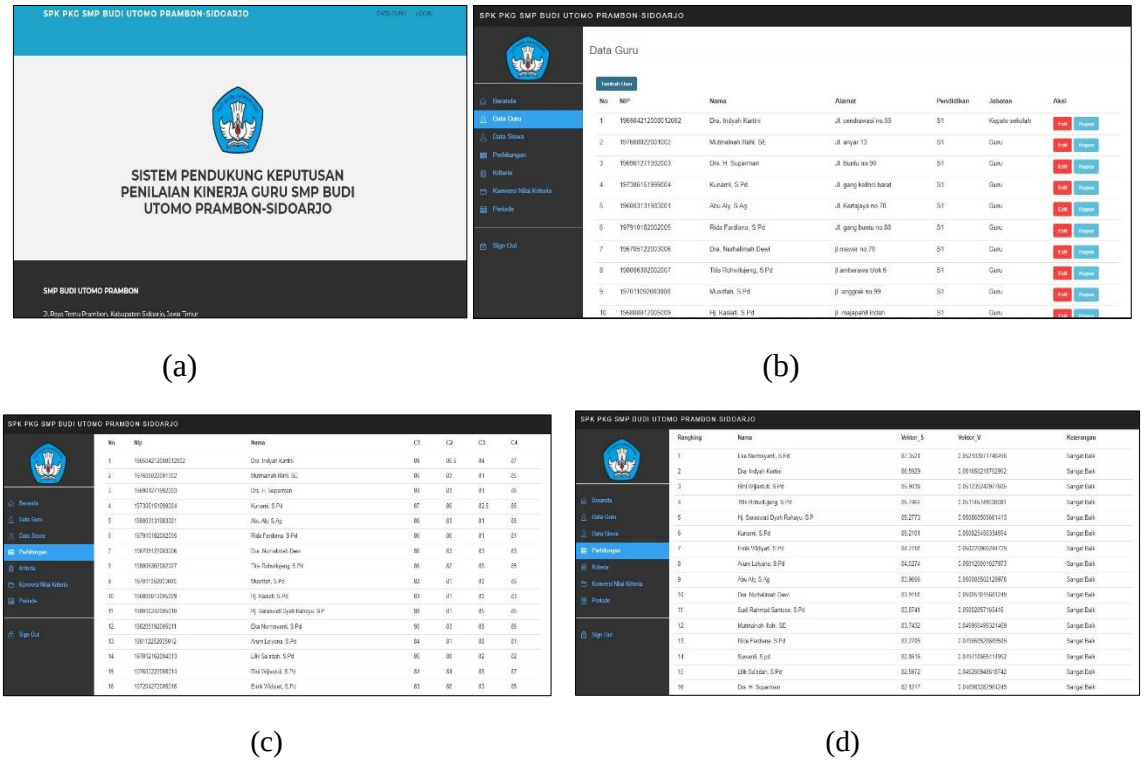

Figure 4. a) Homepage, b) Teacher Data, c) Score Assesment, d) Rangking Result

The last step is to test the application by matching the calculation results with Microsoft Excel compared to the results in the application. From the comparison results, the level of similarity or output to the program is 100% the same. Testing by comparing the output of the Vector (V) according to the formula from the weight product method which is calculated manually and the web application.

CONCLUSION

Based on the results of system analysis and design, implementation and testing of decision support system programs to determine the best teacher performance using the weighted product method, it can be concluded that:

- This decision support system uses the weighted product method to facilitate the user in making decisions on the selection of the best teacher.
- Based on the results of the accuracy of testing on the system, it can be concluded that the decision support system to determine the best teacher performance by using the weighted product method is 100%, that this system is running well and according to the design described previously.

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