Decision Support System for Exemplary Teacher Selection in Elementary School using Topsis Method

Rara Pramita Putri, M. Ilayaraja, K. Shankar, Wahidah Hashim, Irina N. Odarich, Andino Maseleno

Abstract*:Teacher is one of the most important components owned by school in sustaining life. It is a challenge for the management of educational institutions to be able to provide an appropriate, effective and efficient decision in data management in the competitive business world. It spurs schools to strive harder in improving the quality of the school. Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) is a method that has a concept where the best selected alternative not only has the shortest distance from a ideal positive solution. But also has the longest distance from a ideal negative solution. The criteria used in this system vary, according to the selection of the best teachers provided by the institution. The applicant's score data that has been entered into the system will be calculated using TOPSIS method, by finding the farthest and closest distance from the positive and ideal negative solutions. Applicants with the highest v score will occupy the top of this system. Based on the results of the sample case selection shows that the results of calculations using the same system with manual calculations. This system is able to provide the best teacher recommendations.

Keywords **: Best Teacher, DSS, TOPSIS.**

I. INTRODUCTION

A. Background of Problem

Decision support system is interactive information system that has provided information, modeling, and data manipulation. The system used has function to help decisions maker in semi-structured situation and unstructured situation, where nobody knows exactly how a decision must have been made. Decision support system usually made for finding a solution or some problem or to evaluate some opportunity. Decision support system doesn't intend to automate decision making, but gives interactive device that let decision maker do various analysis with using available models [7].

The role of a teacher in the progress of education process is very important. Teachers is one of the key factor for the creation of high quality future generations with the main task of educating, teaching, guiding, directing, and so on. Research that conducted with the title Decision Support System for Exemplary Teacher Selection at SDN 3 Pujojadi Using TOPSIS Method conducted to made a recommendation for exemplary teachers at SDN 3 Pujodadi [4].

Nowadays, the utilization of science and technology develops very quickly and produces new innovations that must be balanced with the ability to adapt to the technology. One of them is the decision support system for the exemplary teacher selection at SDN 3 Pujodadi. In the exemplary teacher selection we can do some research on the aspect of performance or its competence.

Exemplary teacher selection is expected for motivating teacher to be active in doing its activities and which is expected to have positive effect on its work to face challenges in this globalization era.

In conducting exemplary teacher selection we can organize professionally or objectively which means the selection is done competitively for their abilities and skills and work potential, not based on equitable opportunities for participate the example teacher's selection so that the selection process can be more structured, precise, and easy to do.

In addition, the process of monitoring the performance of teachers will be easier to do by the school and follow up with the evaluation process or other planning that related to the performance of the teacher. With the information system, monitoring and evaluation of teachers performance based on the assessment of the TOPSIS method will help the SDN 3 Pujodadi to implement more objective electoral process. [1]

B. Problem Formulation

In this formulation of problem how to make decision support system that can help to decide exemplary teacher selection:

- How to apply the criteria and abilityto determine exemplary teacher.
- How to apply the TOPSIS method on the decision support system todetermine the exemplary teacher at SDN 3 PUJODADI.
- How to design a decision support system application to determine exemplary teacher selection.

Revised Manuscript Received on December 16, 2019.

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C. Objectives

There are some objectives of research from exemplary teacher selection at SDN 3 Pujodadi as follows:

- Improving teacher motivation in carrying out their duties.
- Improving elementary school teacher competition in the selection of these exemplary teachers.
- Applying criteria and weight in exemplary teachers selection at SDN 3 PUJODADI.
- Creating a decision support system for the exemplary teachers selection with structured data that can be accessed quickly or accurately.

II. LITERATURE REVIEW

A. Decision Support System

According to [16], DSS is the process concluded that the decision is assisted using a computer to assist with the return of the decision by using some data.

DSS is an interactive system, helping decision-making through the use of data and decision models to solve problems that are semi-structured and unstructured [8].

DSS is a computer-based system that makes various alternative decisions to help various management in response to various problems that are structured or not with using data and models [12].

From the opinion given above, it can be concluded that the Decision Support System (DSS) is a computer-based system to help management in handling various problems structured or unstructured with using data and models. The criteria used in determining the exemplary teacher's selection is performance certificate, education level, work discipline, work quality, and length of work. The decision support system is a system that capable to provide problem solving capabilities and communication skills for problems with semi-structured and unstructured situations. This system is used to help decision making in situations semi-structured and unstructured situations, where no one knows exactly how the decision should have been made [17].

B. TOPSIS Method

TOPSIS is one of the multi criteria or alternative choice decision making methods which is an alternative that has the smallest distance from the ideal positive solution and the largest distance from the ideal negative solution from a geometric point of view with using a distance of Euclidean [11] – [14]. However, alternatives that have the smallest distance from an ideal positive solution, don't have to have the largest distance from the ideal negative solution. Therefore, TOPSIS consider both, the distance to ideal positive solution and the distance to the ideal negative solution simultaneously [15]. The optimal solution in the TOPSIS method is obtained by determining the relative proximity of an alternative to the ideal positive solution. TOPSIS will rank the alternative based on the relative proximity score priority of an alternative to the ideal positive solution. The alternatives that have been ranked are used as a reference for decision makers to choose the best solution that is desired. The TOPSIS method is one of the Fuzzy Multiple Attribute Decision Making (FMADM) Method which is a method used to find the optimal alternatives of a number of alternatives with certain criteria.

C. Teacher

Based on Republic Indonesia Law No 14 Year 2005, teachers are professional educators with the primary task of educating, teaching, guiding, directing, training, assessing, and evaluating students on early childhood education, formal education ways, primary education, and secondary education. The teacher is a professional educator because implicitly he has made himself accepted and assumed some of his educational responsibilities on the shoulders of the parents [7] [3], [8]–[10].

D. Characteristic of Exemplary Teacher

- The teacher must have a clean Aqidah from the things that contradict with that.
- Be able to regulate time well, so that there is no time to miss without get the benefit of worldly and Ukhrawi
- The teacher must be an example of the students in all words, deeds and attitudes.
- Teachers must always be honest, fair, say good things, and give advice and guide to thestudents.

E. SD Negeri 3 Pujojadi

Public elementary School (SDN) 3 Pujodadi is one of basic level of formal education in Indonesia. In determining the teacher performance criteria in SD Negeri 3 Pujodadi still use manual way. SD Negeri 3 Pujodadi is an elementary school organized by both government and private sector. The management of Public elementary School (SDN) which is previously under the Education Office, especially at the Pujodadi district of Pringsewu. SD Negeri 3 Pujodadi was established in 1980 by the government.

F. Elementary School Teacher

Teacher is an educator, who is a role model, in the identification for the students and the environment. The teacher also has many tasks, both bound by the office and outside the service, in the form of devotion. Therefore, in determining the exemplary teacher selection at SDN 3 Pujodadi using the TOPSIS method to the needs of the criteria and weights to conduct the assessment so that it will be easy to do the election.

III. THE METHOD OF RESEARCH

A. Data Collection

In this method, writer used data collection method that would be used to fulfill need of application. Method that used in data collection as follows:

Interview Method

It is a conversation between researchers and informers, researchers here are hoping to get the interview information done directly to the teachers related to the electoral system.

Observation Method

It is a research method where researchers observe all the activities found in the field, in order to support the interview data with the intention to provide solutions through the information system to be built so that it is easier to do an observation.

Literature Method

Literature method is a data collection technique by studying the reference of documents or files and the collection of data on legislation, research

journals through literature review conducted a study of legislation that related with management of regional potential. Data need that reveals about the indicators used.

B. TOPSIS Method

TOPSIS is one of the multi criteria or alternative choice decision making methods which is an alternative that has the smallest distance from the ideal positive solution and the largest distance from the ideal negative solution from a geometric point of view with using a distance of Euclidean [11] – [14]. However, alternatives that have the smallest distance from an ideal positive solution don't have to have the largest distance from the ideal negative solution. Therefore, TOPSIS consider both, the distance to ideal positive solution and the distance to the ideal negative solution simultaneously [15]. The optimal solution in the TOPSIS method is obtained by determining the relative proximity of an alternative to the ideal positive solution. TOPSIS will rank the alternative based on the relative proximity score priority of an alternative to the ideal positive solution. The alternatives that have been ranked are used as a reference for decision makers to choose the best solution that is desired. The TOPSIS method is one of the Fuzzy Multiple Attribute Decision Making Method (FMADM) which is a method used to find the optimal alternatives of a number of alternatives with certain criteria.

Some of TOPSIS procedures are:

- Create a normalized decision matrix
- Create a weighted, normalized decision matrix
- Determine the ideal matrix of positive solutions and the ideal matrix of negative solutions
- Determine the distance between alternative scores with the matrix of the ideal positive solution and matrix of very negative solutions
- Determine the preference score for each alternative

TOPSIS requires the performance rating of each AI alternative in each of the normalizedCJ criteria:

$$r_{ij}=\frac{x_{ij}}{\Sigma_{i}^{m}=1x_{ij}^{2}} \quad (1)$$

Where:

r_{ij}=the result of normalizing thedecision matrix R

I=1,2....,m

J=1,2….,n

Ideal positive solutionA^{+} and ideal negative solution A^{-}can be determined with normalized weight rating (y_{ij}) as follows:

$$y_{ij}= W_i 1_{ij} ; \quad (2)$$

With 1 = 1,2….m, and j = 1,2…n

$$A^{+} = (y_1^{+} \; . \; y_2^{+} \; \ldots\ldots y_n^{+}). \quad (3)$$

$$A^{-} = (y_1^{-} \; . \; y_2^{-} \; \ldots\ldots y_n^{-}). \quad (4)$$

The steps of this TOPSIS method are as follows:

1. TOPSIS begins by building a decision matrix, the X decision matrix refers to the malternative which will be evaluated based on the criteria.

$$x = \begin{cases} A_1X_{11}X_{12}X_{13} \ldots . X_{1n} \\ A_2X_{11}X_{22}X_{23} \ldots . X_{2n} \\ A_3X_{31}X_{32}X_{33} \ldots . X_{3n} \\ A_mX_{m1}X_{m3}X_{m3} \ldots . X_{mm} \end{cases}$$

Where Ai (i=1,2,3, ….m) is the possible alternative, Xj (j=1,2,3,….n) is attribute where an alternate performance is measured, Xij is an alternate Ai performance with the reference to the Xj attribute.

2. Create a normalized decision matrix.

$$rij = \frac{xij}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}}$$

with i = 1,2,…,m

j = 1,2,…,n

where :

r_{ij} = normalized matrix [i][j]

X_{ij}= decision matrix[i][j]

3. Create normalized, weighted matrix decision

$$V_{ij} = w_i r_{ij} ;$$

with i= 1,2,…,m; and j = 1,2,…,n

Where :

Vij = Elements of a weighted normalized decision matrix V

wi = jth criteria weight

rij = Normalized decision matrix elements R

4. Ideal positive solution A+ and ideal negative solution A- can be determined based on normalized weight rating (yij) as:

$A^{+} = (y_1^{+} , y_2^{+} , ..., y_n^{+})$;

$A^{-} = (y_1^{-} , y_2^{-} , ..., y_n^{-})$;

Where :

V_j^{+} = max Y_{ij} j is benefit attribute

Min Yij if j is cost attribute

V_j^{-}= min yij, if j is benefit attribute

max yij, if j is cost attribute

5. DistanceAi alternative with ideal positive solutions:

$$D_i^{+} = \sqrt{\sum_{i-1}^{n}(Y_i^{+} - Y_{ij})}^{2}$$

Where :

D_i^{+} = Distance Ai alternative with ideal positive solutions

Y_j^{+}= Ideal positive solutions [i]

Yij = normalized matrix [i][j]

6. Distance between Ai alternative and ideal negative solution

$$D_i^{-} = \sqrt{\sum_{i-1}^{n}(Y_{ij} - Y_i^{-})}^{2}$$

i = 1,2,…m

Where :

D_i^{-} = Distance Ai alternative with ideal negative solutions

Y_j^{-}= ideal negative solution [i]

Yij = normalized matrix [i][j]

7. The preference score for each alternative (Vi) is given as:

$$V_i = \frac{D_i^-}{D_i^- + D_i^+}$$

i = 1,2,…m

Vi = Proximity of each alternative to the ideal solution

D_i^+ = Distance between Ai alternative and ideal positive solutions

D_i^- = Distance between Ai alternativeand ideal negative solutions

A larger score of Vi indicates that an alternative Ai was preferred.

C. Method Criteria

In this research there are criteria for determine teacher's performance assessment

Table-I: Criteria

Code	*Description*
C1	Performance certificate
C2	Education level
C3	Work discipline
C4	Work quality
C5	Length of work

D. Criteria weight score

This weight score determined based on the importance of these criteria

Table-II: Criteria weight score

code	*Description*	*Weight score*
C1	Performance certificate	15%
C2	Education level	25%
C3	Work discipline	20%
C4	Work quality	20%
C5	Length of work	20%

E. Manual Test

Table-III: Certificate (C1)

Performance Certificate	*Score*
Good enough	1
Good	3
Vey Good	5

Table-IV: Education level (C2)

Compliance criteria	*Score*
SMP	1
SMA	2
D-III	4
S1/S2	5

Table-V: Work Discipline (C3)

Discipline Criteria	*Score*
Very good	5
Good	3

Table-VI: Work Quality(C4)

Work quality criteria	*Score*
Good enough	2
Good	3
Very good	5

Table-VII: Length of work (C5)

Length of work criteria	*Score*
20 – 25 years	5
10 – 15 years	4
5 – 9 years	2
0 – 6 years	1

F. Flowchart

The process in TOPSIS is the input of cadres performance weight per criterion

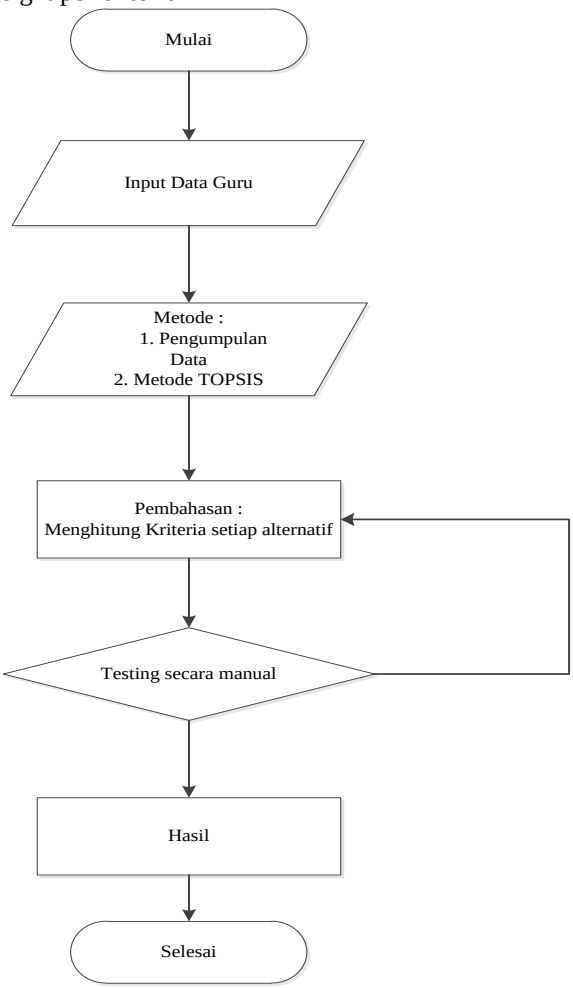

Fig. 1. Flowchart

Description:

1. In this research, data collection conducted so it will be easily understood
2. Determine criteria suitable with our research title used TOPSIS method
3. To make it easier for us to do the research, we collected the data according to what we research
4. At this stage we hadentered in the discussion to calculate, determining the criteria to alternatively perform calculations manually prefixed with the counters via Ms. Excel to make it easier and the result is the same as we manually calculated.

IV. NUMERICAL EXAMPLE

A. Alternative Table

Alternative table for all criteria:

Table-VIII: Decision Matrix

Alternative	*C1*	*C2*	*C3*	*C4*	*C5*
A1	1	1	3	3	5
A2	3	2	5	2	4
A3	5	4	3	3	2
A4	1	5	3	5	1
A5	2	3	2	1	5
A6	3	3	5	1	2
A7	2	2	4	3	4
A8	1	2	4	3	2
A9	2	1	5	2	1
A10	2	3	3	5	2

$|C_1| = \sqrt{1^2 + 3^2 + 5^2 + 1^2 + 2^2 + 3^2 + 2^2 + 1^2 + 2^2 + 2^2}$
$= \sqrt{62} = 7.87400787$
$r_{11} = \frac{X_{11}}{X_1} = \frac{1}{7.87400787} = 0.127000127$
$r_{21} = \frac{X_{21}}{X_1} = \frac{3}{7.87400787} = 0.381000381$
$r_{31} = \frac{X_{31}}{X_1} = \frac{5}{7.87400787} = 0.635000635$
$r_{41} = \frac{X_{41}}{X_1} = \frac{1}{7.87400787} = 0.127000127$
$r_{51} = \frac{X_{51}}{X_1} = \frac{2}{7.87400787} = 0.254000254$
$r_{61} = \frac{X_{61}}{X_1} = \frac{3}{7.87400787} = 0.381000381$
$r_{71} = \frac{X_{71}}{X_1} = \frac{2}{7.87400787} = 0.254000254$
$r_{81} = \frac{X_{81}}{X_1} = \frac{1}{7.87400787} = 0.127000127$
$r_{91} = \frac{X_{91}}{X_1} = \frac{2}{7.87400787} = 0.254000254$
$r_{10} = \frac{X_{10}}{X_1} = \frac{2}{7.87400787} = 0.254000254$

$|C_2| = \sqrt{1^2 + 2^2 + 4^2 + 5^2 + 3^2 + 3^2 + 2^2 + 2^2 + 1^2 + 3^2}$
$= \sqrt{82} = 9.05538514$
$r_{21} = \frac{X_{11}}{X_1} = \frac{1}{9.05538514} = 0.110431526$
$r_{22} = \frac{X_{21}}{X_1} = \frac{2}{9.05538514} = 0.220863052$
$r_{23} = \frac{X_{31}}{X_1} = \frac{4}{9.05538514} = 0.441726104$
$r_{24} = \frac{X_{41}}{X_1} = \frac{5}{9.05538514} = 0.55215763$
$r_{25} = \frac{X_{51}}{X_1} = \frac{3}{9.05538514} = 0.331294578$
$r_{26} = \frac{X_{61}}{X_1} = \frac{3}{9.05538514} = 0.331294578$
$r_{27} = \frac{X_{71}}{X_1} = \frac{2}{9.05538514} = 0.220863052$
$r_{28} = \frac{X_{81}}{X_1} = \frac{2}{9.05538514} = 0.220863052$
$r_{29} = \frac{X_{91}}{X_1} = \frac{1}{9.05538514} = 0.110431526$
$r_{30} = \frac{X_{101}}{X_1} = \frac{3}{9.05538514} = 0.331294578$

$|C_3| = \sqrt{3^2 + 5^2 + 3^2 + 3^2 + 2^2 + 5^2 + 4^2 + 4^2 + 5^2 + 3^2}$
$= \sqrt{147} = 12.1243557$
$r_{31} = \frac{X_{11}}{X_1} = \frac{3}{12.1243557} = 0.247435839$
$r_{32} = \frac{X_{21}}{X_1} = \frac{5}{12.1243557} = 0.412393048$
$r_{33} = \frac{X_{31}}{X_1} = \frac{3}{12.1243557} = 0.247435839$
$r_{34} = \frac{X_{41}}{X_1} = \frac{3}{12.1243557} = 0.247435839$
$r_{35} = \frac{X_{51}}{X_1} = \frac{2}{12.1243557} = 0.164957219$
$r_{36} = \frac{X_{61}}{X_1} = \frac{5}{12.1243557} = 0.412393048$
$r_{37} = \frac{X_{71}}{X_1} = \frac{4}{12.1243557} = 0.329914438$
$r_{38} = \frac{X_{81}}{X_1} = \frac{4}{12.1243557} = 0.329914438$
$r_{39} = \frac{X_{91}}{X_1} = \frac{5}{12.1243557} = 0.412393048$
$r_{40} = \frac{X_{101}}{X_1} = \frac{3}{12.1243557} = 0.247435839$

$|C_4| = \sqrt{3^2 + 2^2 + 3^2 + 5^2 + 1^2 + 1^2 + 3^2 + 3^2 + 2^2 + 5^2}$
$= \sqrt{96} = 9.79795897$
$r_{41} = \frac{X_{11}}{X_1} = \frac{3}{9.79795897} = 0.306186218$
$r_{42} = \frac{X_{21}}{X_1} = \frac{2}{9.79795897} = 0.204124145$
$r_{43} = \frac{X_{31}}{X_1} = \frac{3}{9.79795897} = 0.306186218$
$r_{44} = \frac{X_{41}}{X_1} = \frac{5}{9.79795897} = 0.510310363$
$r_{45} = \frac{X_{51}}{X_1} = \frac{1}{9.79795897} = 0.102062073$
$r_{46} = \frac{X_{61}}{X_1} = \frac{1}{9.79795897} = 0.102062073$
$r_{47} = \frac{X_{71}}{X_1} = \frac{3}{9.79795897} = 0.306186218$
$r_{48} = \frac{X_{81}}{X_1} = \frac{3}{9.79795897} = 0.306186218$
$r_{49} = \frac{X_{91}}{X_1} = \frac{2}{9.79795897} = 0.204124145$
$r_{50} = \frac{X_{101}}{X_1} = \frac{5}{9.79795897} = 0.510310363$

$|C_5| = \sqrt{5^2 + 4^2 + 2^2 + 1^2 + 5^2 + 2^2 + 4^2 + 2^2 + 1^2 + 2^2}$
$= \sqrt{100} = 10$
$r_{51} = \frac{X_{11}}{X_1} = \frac{5}{10} = 0.5$
$r_{52} = \frac{X_{21}}{X_1} = \frac{4}{10} = 0.4$
$r_{53} = \frac{X_{31}}{X_1} = \frac{2}{10} = 0.2$
$r_{54} = \frac{X_{41}}{X_1} = \frac{1}{10} = 0.1$
$r_{55} = \frac{X_{51}}{X_1} = \frac{5}{10} = 0.5$
$r_{56} = \frac{X_{61}}{X_1} = \frac{2}{10} = 0.2$
$r_{57} = \frac{X_{71}}{X_1} = \frac{4}{10} = 0.4$
$r_{58} = \frac{X_{81}}{X_1} = \frac{2}{10} = 0.2$
$r_{59} = \frac{X_{91}}{X_1} = \frac{1}{10} = 0.1$
$r_{60} = \frac{X_{101}}{X_1} = \frac{2}{10} = 0.2$

From the above calculation is obtained by the normalized matrix (R):

$$R = \begin{bmatrix} 0.127000 & 0.110432 & 0.247436 & 0.306186 & 0.5 \\ 0.381000 & 0.220863 & 0.412393 & 0.204124 & 0.4 \\ 0.635001 & 0.441726 & 0.247436 & 0.306186 & 0.2 \\ 0.127000 & 0.552158 & 0.247436 & 0.51031 & 0.1 \\ 0.254000 & 0.331295 & 0.164957 & 0.102062 & 0.5 \\ 0.381000 & 0.331295 & 0.412393 & 0.102062 & 0.2 \\ 0.254000 & 0.220863 & 0.329914 & 0.306186 & 0.4 \\ 0.127000 & 0.220863 & 0.329914 & 0.306186 & 0.2 \\ 0.254000 & 0.110432 & 0.412393 & 0.204124 & 0.1 \\ 0.254000 & 0.331295 & 0.247436 & 0.51031 & 0.2 \end{bmatrix}$$

After obtained the normalized matrix (R), then look for matrix V based on the equation:

$V_{ij} = W_j X_{ij}$
$V_1 = W_1 r_{11} = (0{,}15)(0{,}127000)$
$= 0{,}01905$
$V_{12} = W_2 r_{12} =$
$(0{,}25)(0{,}110432)$

$= 0{,}027608$

$V_{13} = W_3 r_{13} = (0{,}20)(0{,}247436)$
$= 0{,}049487$

$V_{14} = W_4 r_{14} = (0{,}20)(0{,}306186)$
$= 0{,}061237$

$V_{15} = W_5 r_{15} = (0{,}20)(0{,}5)$
$= 0{,}1$

$V_{21} = W_1 r_{21} = (0{,}15)(0{,}381000)$
$= 0{,}05715$

$V_{22} = W_2 r_{22} = (0{,}25)(0{,}220863)$
$= 0{,}055216$

$V_{23} = W_3 r_{23} = (0{,}20)(0{,}412393)$
$= 0{,}082479$

$V_{24} = W_4 r_{24} = (0{,}20)(0{,}204124)$
$= 0{,}040825$

$V_{25} = W_5 r_{25} = (0{,}20)(0{,}4)$
$= 0{,}08$

$V_{31} = W_1 r_{31} = (0{,}15)(0{,}635001)$
$= 0{,}09525$

$V_{32} = W_2 r_{32} = (0{,}25)(0{,}441726)$
$= 0{,}110432$

$V_{33} = W_3 r_{33} = (0{,}20)(0{,}247436)$
$= 0{,}049487$

$V_{34} = W_4 r_{34} = (0{,}20)(0{,}306186)$
$= 0{,}061237$

$V_{35} = W_5 r_{35} = (0{,}20)(0{,}2)$
$= 0{,}04$

$V_{41} = W_1 r_{41} = (0{,}15)(0{,}127000)$
$= 0{,}01905$

$V_{42} = W_2 r_{42} = (0{,}25)(0{,}552158)$
$= 0{,}138039$

$V_{43} = W_3 r_{43} = (0{,}20)(0{,}247436)$
$= 0{,}049487$

$V_{44} = W_4 r_{44} = (0{,}20)(0{,}51031)$
$= 0{,}102062$

$V_{45} = W_5 r_{45} = (0{,}20)(0{,}1)$
$= 0{,}02$

$V_{51} = W_1 r_{51} = (0{,}15)(0{,}254000)$
$= 0{,}0381$

$V_{52} = W_2 r_{52} = (0{,}25)(0{,}331295)$
$= 0{,}082824$

$V_{53} = W_3 r_{53} = (0{,}20)(0{,}164957)$
$= 0{,}032991$

$V_{54} = W_4 r_{54} = (0{,}20)(0{,}102062)$
$= 0{,}020412$

$V_{55} = W_5 r_{55} = (0{,}20)(0{,}5)$
$= 0{,}1$

$V_{61} = W_1 r_{61} = (0{,}15)(0{,}381000)$
$= 0{,}05715$

$V_{62} = W_2 r_{62} = (0{,}25)(0{,}331295)$
$= 0{,}082824$

$V_{63} = W_3 r_{63} = (0{,}20)(0{,}412393)$
$= 0{,}082479$

$V_{64} = W_4 r_{64} = (0{,}20)(0{,}102062)$
$= 0{,}020412$

$V_{65} = W_5 r_{65} = (0{,}20)(0{,}2)$
$= 0{,}04$

$V_{71} = W_1 r_{71} = (0{,}15)(0{,}254000)$
$= 0{,}0381$

$V_{72} = W_2 r_{72} = (0{,}25)(0{,}220863)$
$= 0{,}055216$

$V_{73} = W_3 r_{73} = (0{,}20)(0{,}329914)$
$= 0{,}065983$

$V_{74} = W_4 r_{74} = (0{,}20)(0{,}306186)$
$= 0{,}061237$

$V_{75} = W_5 r_{75} = (0{,}20)(0{,}4)$
$= 0{,}08$

$V_{81} = W_1 r_{81} = (0{,}15)(0{,}127000)$
$= 0{,}01905$

$V_{82} = W_2 r_{82} = (0{,}25)(0{,}220863)$
$= 0{,}055216$

$V_{83} = W_3 r_{83} = (0{,}20)(0{,}339914)$
$= 0{,}067983$

$V_{84} = W_4 r_{84} = (0{,}20)(0{,}306186)$
$= 0{,}061237$

$V_{85} = W_5 r_{85} = (0{,}20)(0{,}2)$
$= 0{,}04$

$V_{91} = W_1 r_{91} = (0{,}15)(0{,}254000)$
$= 0{,}0381$

$V_{92} = W_2 r_{92} = (0{,}25)(0{,}110432)$
$= 0{,}027608$

$V_{93} = W_3 r_{93} = (0{,}20)(0{,}412393)$
$= 0{,}082479$

$V_{94} = W_4 r_{94} = (0{,}20)(0{,}204124)$
$= 0{,}040825$

$V_{95} = W_5 r_{95} = (0{,}20)(0{,}1)$
$= 0{,}02$

$V_{101} = W_1 r_{101} = (0{,}15)(0{,}254000)$
$= 0{,}0381$

$V_{102} = W_2 r_{102} = (0{,}25)(0{,}331295)$
$= 0{,}082824$

$V_{103} = W_3 r_{103} = (0{,}20)(0{,}247436)$
$= 0{,}049487$

$V_{104} = W_4 r_{104} = (0{,}20)(0{,}51031)$
$= 0{,}102062$

$V_{105} = W_5 r_{105} = (0{,}20)(0{,}2)$
$= 0{,}04$

From the calculation above, obtained matrix Y:

$$Y = \begin{bmatrix} 0.01905 & 0.027608 & 0.049487 & 0.061237 & 0.1 \\ 0.05715 & 0.055216 & 0.082479 & 0.040825 & 0.08 \\ 0.09525 & 0.110432 & 0.049487 & 0.061237 & 0.04 \\ 0.01905 & 0.138039 & 0.049487 & 0.102062 & 0.02 \\ 0.0381 & 0.082824 & 0.032991 & 0.020412 & 0.1 \\ 0.05715 & 0.082824 & 0.082479 & 0.020412 & 0.04 \\ 0.0381 & 0.055216 & 0.065983 & 0.061237 & 0.08 \\ 0.01905 & 0.055216 & 0.067983 & 0.061237 & 0.04 \\ 0.0381 & 0.027608 & 0.082479 & 0.040825 & 0.02 \\ 0.0381 & 0.082824 & 0.049487 & 0.102062 & 0.04 \end{bmatrix}$$

Ideal positive solution calculated based on equation:

$A^+ = (y_1^+ y_2^+ \dots y_n^+)$

$y_1^+ = \max\{0.01905;\ 0.05715;\ 0.09525;\ 0.01905;\ 0.0381;\ 0.05715;\ 0.0381;\ 0.01905;\ 0.0381;\ 0.0381;\}$
$= 0.09525$

$y_2^+ = \max\{0.027608;\ 0.055216;\ 0.110432;\ 0.138039;\ 0.082824;\ 0.082824;\ 0.055216;\ 0.055216;\ 0.027608;\ 0.082824;\}$
$= 0.138039$

$y_3^+ = \max\{0.049487;\ 0.082479;\ 0.049487;\ 0.049487;\ 0.032991;\ 0.082479;\ 0.065983;\ 0.067983;\ 0.082479;\ 0.049487;\}$
$= 0.082479$

$y_4^+ = \max\{0.061237;\ 0.040825;\ 0.061237;\ 0.102062;\ 0.020412;\ 0.020412;\ 0.061237;\ 0.061237;\ 0.040825;\ 0.102062;\}$
$= 0.102062$

$y_5^+ = \max\{0.1; 0.08; 0.04; 0.02; 0.1; 0.04; 0.08; 0.04; 0.02; 0.04;\}$
$= 0.1$
$A^+ = \{0.09525; 0.138039; 0.082479; 0.102062; 0.1;\}$
Ideal negative solution calculated based on equation:
$A^- = (y_1^- y_2^- \dots y_n^-)$
$y_1^- = \min\{0.01905; 0.05715; 0.09525; 0.01905; 0.0381; 0.05715; 0.0381; 0.01905; 0.0381; 0.0381;\}$
$= 0.0381$
$y_2^- = \min\{0.027608; 0.055216; 0.110432; 0.138039; 0.082824; 0.082824; 0.055216; 0.055216; 0.027608; 0.082824;\}$
$= 0.027608$
$y_3^- = \min\{0.049487; 0.082479; 0.049487; 0.049487; 0.032991; 0.082479; 0.065983; 0.067983; 0.082479; 0.049487;\} = 0.032991$
$y_4^- = \min\{0.061237; 0.040825; 0.061237; 0.102062; 0.020412; 0.020412; 0.061237; 0.061237; 0.040825; 0.102062;\}$
$= 0.020412$
$y_5^- = \min\{0.1; 0.08; 0.04; 0.02; 0.1; 0.04; 0.08; 0.04; 0.02; 0.04;\}$
$= 0.02$
$A^- = \{0.0381; 0.027608; 0.032991; 0.020412; 0.02;\}$

The distance between the weighted score of each alternative to the ideal positive solution is calculated based on equation :

$$D_i^+ = \sqrt{\sum_{i=1}^{n}\left(Y_i^+ - Y_{ij}\right)^2}$$

$$D_1^+ = \sqrt{(0.01905-0.09525)^2 + (0.02760-0.13801)^2 + (0.049487-0.082479)^2 + (0.061237-0.102062)^2 + (0.1-0.1)^2}$$
$$= \sqrt{0.35474} = 0.59560$$

$$D_2^+ = \sqrt{(0.05715-0.09525)^2 + (0.05521-0.13801)^2 + (0.08247-0.49487)^2 + (0.04082-0.10206)^2 + (0.08-0.1)^2}$$
$$= \sqrt{0.34705} = 0.58910$$

$$D_3^+ = \sqrt{(0.09525-0.09525)^2 + (0.11043-0.13801)^2 + (0.049487-0.49487)^2 + (0.06123-0.10206)^2 + (0.04-0.1)^2}$$
$$= \sqrt{0.45376} = 0.67361$$

$$D_4^+ = \sqrt{(0.01905-0.09525)^2 + (0.13803-0.13801)^2 + (0.04948-0.49487)^2 + (0.010206-0.10206)^2 + (0.02-0.1)^2}$$
$$= \sqrt{0.33457} = 0.57842$$

$$D_5^+ = \sqrt{(0.0381-0.09525)^2 + (0.08282-0.13801)^2 + (0.03299-0.49487)^2 + (0.02041-0.10206)^2 + (0.1-0.1)^2}$$
$$= \sqrt{0.40468} = 0.63614$$

$$D_6^+ = \sqrt{(0.05715-0.09525)^2 + (0.08282-0.13801)^2 + (0.08247-0.49487)^2 + (0.02041-0.10206)^2 + (0.04-0.1)^2}$$
$$= \sqrt{0.31425} = 0.56058$$

$$D_7^+ = \sqrt{(0.0381-0.09525)^2 + (0.05521-0.13801)^2 + (0.06598-0.49487)^2 + (0.06123-0.10206)^2 + (0.08-0.1)^2}$$
$$= \sqrt{0.3649} = 0.60406$$

$$D_8^+ = \sqrt{(0.01905-0.09525)^2 + (0.05521-0.13801)^2 + (0.06798-0.49487^2) + (0.06123-0.10206)^2 + (0.04-0.1)^2}$$
$$= \sqrt{0.30385} = 0.55122$$

$$D_9^+ = \sqrt{(0.0381-0.09525)^2 + (0.02760-0.13801)^2 + (0.08247-0.49487)^2 + (0.04082-0.10206)^2 + (0.02-0.1)^2}$$
$$= \sqrt{0.24039} = 0.49029$$

$$D_{10}^+ = \sqrt{(0.03675-0.09525)^2 + (0.08282-0.13801)^2 + (0.04948-0.49487)^2 + (0.010206-0.10206)^2 + (0.04-0.1)^2}$$
$$= \sqrt{0.31706} = 0.56308$$

The distance between the weighted score of each alternative to the ideal negative solution is calculated based on equation:

$$D_i^+ = \sqrt{\sum_{i=1}^{n}\left(Y_i^+ - Y_{ij}\right)^2}$$

$$D_1^- = \sqrt{(0.01905-0.0381)^2 + (0.02760-0.02760)^2 + (0.04948-0.03299)^2 + (0.06123-0.02041)^2 + (0.1-0.02)^2}$$
$$= \sqrt{0.23782} = 0.48766$$

$$D_2^- = \sqrt{(0.05715-0.0381)^2 + (0.05521-0.02760)^2 + (0.08247-0.03299)^2 + (0.04082-0.02041)^2 + (0.08-0.02)^2}$$
$$= \sqrt{0.34961} = 0.59127$$

$$D_3^- = \sqrt{(0.09525-0.0381)^2 + (0.11043-0.02760)^2 + (0.049487-0.03299)^2 + (0.06123-0.02041)^2 + (0.04-0.02)^2}$$
$$= \sqrt{0.35225} = 0.59350$$

$$D_4^- = \sqrt{(0.01905-0.0381)^2 + (0.13803-0.02760)^2 + (0.04948-0.03299)^2 + (0.010206-0.02041)^2 + (0.02-0.02)^2}$$
$$= \sqrt{0.25262} = 0.50261$$

$$D_5^- = \sqrt{(0.0381-0.0381)^2 + (0.08282-0.02760)^2 + (0.03299-0.03299)^2 + (0.02041-0.02041)^2 + (0.1-0.02)^2}$$
$$= \sqrt{0.27018} = 0.51978$$

$$D_6^- = \sqrt{(0.05715-0.0381)^2 + (0.08282-0.02760)^2 + (0.08247-0.03299)^2 + (0.02041-0.02041)^2 + (0.04-0.02)^2}$$
$$= \sqrt{0.27871} = 0.52792$$

$$D_7^- = \sqrt{(0.0381-0.0381)^2 + (0.05521-0.02760)^2 + (0.06598-0.03299)^2 + (0.06123-0.02041)^2 + (0.08-0.02)^2}$$
$$= \sqrt{0.29638} = 0.54440$$

$$D_8^- = \sqrt{(0.01905-0.0381)^2 + (0.05521-0.02760)^2 + (0.06798-0.03299)^2 + (0.06123-0.02041)^2 + (0.04-0.02)^2}$$
$$= \sqrt{0.23933} = 0.48921$$

$$D_9^- = \sqrt{\begin{matrix}(0.0381-0.0381)^2 + (0.02760-0.02760)^2 \\ +(0.08247-0.03299)^2 + (0.04082-0.02041)^2 \\ +(0.02-0.02)^2\end{matrix}}$$

$$= \sqrt{0.20485} = 0.45260$$

$$D_{10}^- = \sqrt{\begin{matrix}(0.03675-0.0381)^2 + (0.08282-0.02760)^2 \\ +(0.04948-0.03299)^2 + (0.010206-0.02041)^2 \\ +(0.04-0.02)^2\end{matrix}}$$

$$= \sqrt{0.21511} = 0.46379$$

The proximity of each alternative to the ideal solution is calculated based on equations:

$$V_i = \frac{D_I^-}{D_I^- + D_I^+}$$

$$V_1 = \frac{0.48766}{0.59560+0.48766} = \frac{0.48766}{1.08326} = 0.45017$$

$$V_2 = \frac{0.59127}{0.58910+0.59127} = \frac{0.59127}{1.18037} = 0.50091$$

$$V_3 = \frac{0.59350}{0.67361+0.59350} = \frac{0.59350}{1.26711} = 0.46838$$

$$V_4 = \frac{0.50261}{0.57842+0.50261} = \frac{0.50261}{1.08103} = 0.46493$$

$$V_5 = \frac{0.51978}{0.63614+0.51978} = \frac{0.51978}{1.15592} = 0.44966$$

$$V_6 = \frac{0.52792}{0.56058+0.52792} = \frac{0.52792}{1.12352} = 0.469880$$

$$V_7 = \frac{0.54440}{0.60406+0.54440} = \frac{0.54440}{1.14846} = 0.47402$$

$$V_8 = \frac{0.48921}{0.55122+0.48921} = \frac{0.48921}{1.04043} = 0.47019$$

$$V_9 = \frac{0.45260}{0.49029+0.45260} = \frac{0.45260}{0.94289} = 0.48001$$

$$V_{10} = \frac{0.46379}{0.56308+0.46379} = \frac{0.46379}{1.02687} = 0.45165$$

From the score of V obtained the score of V5 = 0.44966 has the smallest score and V6 = 0.469880 has the greatest score as the best teacher performance.

B. Implementation

Decision support system application determined exemplary teacher performance by using Microsoft Excel as follows:

1. Alternatives and criteria of the running system.

Table-IX: Alternative and criteria

	C1	C2	C3	C4	C5	ROOT
A1	1	1	3	3	5	2
A2	3	2	5	2	4	2
A3	5	4	3	3	2	2
A4	1	5	3	5	1	2
A5	2	3	2	1	5	2
A6	3	3	5	1	2	2
A7	2	2	4	3	4	2
A8	1	2	4	3	2	2
A9	2	1	5	2	1	2
A10	2	3	3	5	2	2

2. Calculated the normalized decision matrix (R)

Table-X: Matrix Process

	C1	C2	C3	C4	C5	ROOT
A1	1	1	3	3	5	2
A2	3	2	5	2	4	2
A3	5	4	3	3	2	2
A4	1	5	3	5	1	2
A5	2	3	2	1	5	2
A6	3	3	5	1	2	2
A7	2	2	4	3	4	2
A8	1	2	4	3	2	2
A9	2	1	5	2	1	2
A10	2	3	3	5	2	2
KUADRAT	62	82	147	96	100	
AKAR	7.874008	9.055385	12.12436	9.797959	10	

3. Normalized matrix results

Table-XI: Normalized Matrix

	X1	X2	X3	X4	X5
X1	0.127	0.110432	0.247436	0.306186	0.5
X2	0.381	0.220863	0.412393	0.204124	0.4
X3	0.635001	0.441726	0.247436	0.306186	0.2
X4	0.127	0.552158	0.247436	0.51031	0.1
X5	0.254	0.331295	0.164957	0.102062	0.5
X6	0.381	0.331295	0.412393	0.102062	0.2
X7	0.254	0.220863	0.329914	0.306186	0.4
X8	0.127	0.220863	0.329914	0.306186	0.2
X9	0.254	0.110432	0.412393	0.204124	0.1
X10	0.254	0.331295	0.247436	0.51031	0.2

4. Score% for every criteria

Table-XII: Percentage

0.15	0.25	0.2	0.2	0.2

5. Score for Matrix Y

Table-XIII: Score of Matrix Y

0.01905	0.027608	0.049487	0.061237	0.1
0.05715	0.055216	0.082479	0.040825	0.08
0.09525	0.110432	0.049487	0.061237	0.04
0.01905	0.138039	0.049487	0.102062	0.02
0.0381	0.082824	0.032991	0.020412	0.1
0.05715	0.082824	0.082479	0.020412	0.04
0.0381	0.055216	0.065983	0.061237	0.08
0.01905	0.055216	0.065983	0.061237	0.04
0.0381	0.027608	0.082479	0.040825	0.02
0.0381	0.082824	0.049487	0.102062	0.04

6. Calculated distance ideal positive solution (D+) and negative (D-)

Table-XIV: Ideal positive solution (D+) and Negative (D-)

D	POSITIVE	NEGATIVE	ROOT +	ROOT -
D1	0.020757	0.017324	0.144072	0.131621
D2	0.012461	0.021184	0.111631	0.145548
D3	0.007117	0.029067	0.084364	0.17049
D4	0.013295	0.032683	0.115303	0.180786

D5	0.015431	0.019816	0.12422	0.140771
D6	0.014767	0.018945	0.12152	0.137642
D7	0.012465	0.019004	0.111645	0.137855
D8	0.018205	0.013115	0.134926	0.114523
D9	0.025611	0.011083	0.160035	0.105277
D10	0.011003	0.022777	0.104897	0.150921

7. Calculated preference score for every alternative

Table-XV: Alternative preference

D	*POSITIVE*	*NEGATIVE*	*ROOT +*	*ROOT -*	*(+)+(-)*	*Result*
D1	0.020757	0.017324	0.144072	0.131621	0.275693	0.477419
D2	0.012461	0.021184	0.111631	0.145548	0.257179	0.565942
D3	0.007117	0.029067	0.084364	0.17049	0.254854	0.66897
D4	0.013295	0.032683	0.115303	0.180786	0.296089	0.610578
D5	0.015431	0.019816	0.12422	0.140771	0.264991	0.53123
D6	0.014767	0.018945	0.12152	0.137642	0.259162	0.531104
D7	0.012465	0.019004	0.111645	0.137855	0.249501	0.552525
D8	0.018205	0.013115	0.134926	0.114523	0.249448	0.459103
D9	0.025611	0.011083	0.160035	0.105277	0.265312	0.396804
D10	0.011003	0.022777	0.104897	0.150921	0.255817	0.589954

8. Ideal Matrix Score Max, Min

Table-XVI: Max, Min ideal

MAX	0.095255	0.138039	0.082479	0.102062	0.1
MIN	0.0381	0.027608	0.032991	0.020412	0.02
KUADRAT	2	2	2	2	2

C. Analysis of Research Results

Test results applied the TOPSIS method with the calculation manually. Made rank every criteria weight so can be obtained alternative 6 selected as best exemplary teacher performance with score of V6=0.469880.

V. CONCLUSION

Based on the explanation above, the conclusion of this research is that the teacher's performance assessment with the teacher's performance criteria, education level, work discipline, work quality, length of work and obtained result was alternative 6 with score of 0.469880 stating teachers with good performance.

The author gives some suggestions that may be helpful in the development of this journal:

1. Need to be added more the other criteria so that the data obtained is more accurate.
2. TOPSIS can be used for teacher assessment, but until this time the author utilizes this method the author has not been able to implement it. So it is hoped that this research can continues to accelerate the assessment process.
3. As has been told in the previous chapter where the search method is the main cause in which the results of this research get the results as mentioned. Expected in next research about this method can find a better research method so as to be better.

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