Jurnal MIRTE
Manajemen, Informatika, Rekayasa Perangkat Lunak dan Teknologi Komunikasi
Vol. 3, No. 2, December 2024
E-ISSN : 2961-9467

Application of the Moora Method in Selection of the Best Teacher At SMK YAPIM Biru-Biru

Endra Ary Prasasty Marpaung[1], Dedi Candro Parulian Sinaga[2], Melia Mawaddah[3], Ira Mayang Sari[4]
[1,2,3,4] Teknologi Rekayasa Komputer Jaringan, STMIK Pelita Nusantara

*Corresponding author, e-mail: [1]indra_only85@ymail.com

Abstract

The teacher has the main task of educating, teaching, guiding, directing, training, assessing and evaluating his students at school. Teachers are considered achievers because teachers have the ability to carry out their duties at school, are successful in carrying out assignments, have personalities that are in accordance with the teaching profession and have educational insights. A decision support system or Decision Support System (DSS) is a system that assists in making a decision in an organization or companies by applying methods that are appropriate to the areas of decision taken, manual decision making without the help of SPK will result in unobjective and imprecise assessments. The Moora method is a method for making decisions that have many criteria by applying weights to each criterion. The system created can help the school to determine aspects of assessment based on criteria according to the needs of the school so that it is more flexible.

Keywords*: Decision Support System, MOORA, Best Teacher Selection*

1. Introduction

Based on the Regulation of the Minister of National Education Number 35 of 2010 states that Teachers are professional educators with the main task of educating, teaching, guiding, directing, training, assessing, and evaluating students in early childhood education through formal education, basic education, and secondary education " This system is a computer-based system designed to improve the ability of decision makers to solve semi-structured or unstructured problems.The most important part of a Decision Support System is the data warehouse, which is subject-oriented, integrated, time-variant, non- normalized, nonvolatile data collections that allow analyzing large amounts of data from multiple sources with fast results (Turban E, Aronson, & Liang, 2005).

The MOORA method was first introduced by Brauers and Zavadskas in 2006 as a multi-objective system, namely optimizing two or more conflicting attributes simultaneously (Brauers & Zavadskas, The MOORA method and its application to privatization in a transition, 2006). The MOORA method has a degree of flexibility and ease of understanding in separating the subjective part of an evaluation process into decision weight criteria with several decision-making attributes (Mandal, 2012).

It is hoped that the decisions taken are not subjective so that the quality obtained can be in accordance with expectations so that no party is harmed. The decision to determine whether the teacher's performance meets the acceptable quality or not is based on several

Article History: *Received :15-12-2024; Accepted :28-12-2024; Published : 30-12-2024*

criteria set by the school. To avoid the subjectivity of the resulting decisions, we need a decision support system (DSS) that can help assess teacher performance in deciding to be the best teacher. SPK is a system using a model that was built to help solve semi-structured problems.

The process of selecting the best teacher is still subjective. One of them is by improving the quality of teachers and giving aspirations to the best teachers. This is done with the aim that every teacher has the motivation and enthusiasm to become the best teacher. Several studies that have been conducted include: determining teacher achievement in improving competence requires an assessment of teacher performance. Therefore, to overcome the problem of choosing the best teacher, the authors created a decision support system for selecting the best teacher with the aim of helping determine the selection of the best teacher with the right calculations. SPK aims to present information, guide, provide predictions and direct users of information so they can make better decisions.

2. Methodology

The steps taken to solve the problem in the decision using the moora method are as follows:

Step 1 : Determine the purpose of identifying the evaluation attributes concerned and inputting the criterion value for an alternative where the value will be processed and the result will be a decision.

Step 2: Creating the MOORA Decision Matrix Represents all available information for each attribute in the form of a decision matrix. The data in equation (1) represents an Xmxn matrix. Where xij is the performance measurement of the ith alternative on the jth attribute, m is the number of alternatives and n is the number of attributes/criteria. Then a ratio system is developed in which each performance of an alternative on an attribute is compared with a denominator which is representative for all alternatives on that attribute.

$$X = \begin{bmatrix} x_{11} & \cdots & x_{1i} & \cdots & x_{1n} \\ \vdots & & \vdots & & \vdots \\ x_{j1} & \cdots & x_{ij} & \cdots & x_{jn} \\ \vdots & & \vdots & & \vdots \\ x_{m1} & \cdots & x_{mi} & \cdots & x_{mn} \end{bmatrix} \quad \ldots\ldots(1)$$

Keterangan :

xij	= respon alternative *j* pada kriteria *i*
i	= 1, 2, 3, 4,..... *n* adalah nomor urutan atribut atau criteria
j	= 1, 2, 3, 4,..... *m* adalah nomor urutan alternative
X	= Matriks Keputusan

Step 3. Moora Normalization Matrix

Brauers, W.K., concluded that for the denominator, the best choice is the square root of the sum of the squares of each alternative per attribute. This ratio can be expressed as follows:

$$X^*_{ij} = \frac{s_{ij}}{\sqrt{[\sum_{j=1}^{m} s_{ij}^2]}}$$

Keterangan :

X_{ij} = Matriks alternative *j* pada kriteria *i*

i = 1, 2, 3, 4,..... *n* adalah nomor urutan atribut atau kriteria .....(2)

j = 1, 2, 3, 4,..... *m* adalah nomor urutan alternatif

X^*_{ij} = Matriks Normalisasi alternatif *j* pada kriteria *i*

Step 4: Calculating MOORA's Multi-objective Optimization Value

a. If the attributes or criteria for each alternative are not given a weight value. The normalized size is added in the maximization case (for favorable attributes) and reduced in minimization (for unfavorable attributes) or in other words it reduces the maximum and minimum values for each row to get the ranking for each row, if it is formulated then:

$$y_j^* = \sum_{i=1}^{i=g} x_{ij}^* - \sum_{i=g+1}^{i=n} x_{ij}^*,$$

Keterangan :

i= *1, 2, ...* , g– kriteria/atribut dengan status maximized; .....(3)

i= *g+ 1, g+ 2, ...* , n– kriteria/atribut dengan status minimized;

*y*j* = Matriks Normalisasi max-min .

b. If the attributes or criteria for each alternative are assigned a weighted value of importance. Giving a weight value to the criteria, provided that the maximum criteria type weight value is greater than the minimum criteria type weight value. To indicate that an attribute is more important it can be multiplied by the appropriate weight (significant coefficient) (Brauers et al. 2009 in Ozcelik, 2014). The following is the formula for calculating MOORA Multi-objective Optimization values, Multiplication of Criteria Weight to Maximum Attribute Value Less Multiplication of Criteria Weight to Minimum Attribute Value, if it is formulated then:

Jurnal MIRTE
Manajemen, Informatika, Rekayasa Perangkat Lunak dan Teknologi Komunikasi
Vol. 3, No. 2, December 2024
E-ISSN : 2961-9467

$$y_i = \sum_{j=1}^{g} w_j x_{ij}^* - \sum_{j=g+1}^{n} w_j x_{ij}^*$$

$i = 1, 2, \ldots$, g– kriteria/atribut dengan status maximized;

$i = g+1, g+2, \ldots$, n– kriteria/atribut dengan status minimized;

W:= bobot terhadap i

$$X^*_{ij} = \frac{s_{ij}}{\sqrt{[\sum_{j=1}^{m} s_{ij}^2]}}$$ ut ….(4)

Keterangan :

X_{ij} = Matriks alternative *j* pada kriteria *i*

i = 1, 2, 3, 4,..... *n* adalah nomor urutan atribut atau kriteria

j = 1, 2, 3, 4,..... *m* adalah nomor urutan alternatif

X^*_{ij} = Matriks Normalisasi alternatif *j* pada kriteria *i*

Step 5: Determine the Ranking Value from the MOORA calculation results

The yi value can be positive or negative depending on the maximum total (favorable attribute) in the decision matrix. A ranking order of yi indicates the final choice. Thus the best alternative has the highest yi value while the worst alternative has the lowest yi value.

3. Results and Discussion

3.1 Data Analysis

Table 1. Sub Criteria

Kriteria	Keterangan	Nilai Sub Kriteria
C1	Jabatan Guru	Sangat Baik, Baik, Cukup, Buruk
C2	Sertifikasi Guru	Sangat Baik, Baik, Cukup, Buruk
C3	Lama Mengajar	Sangat Baik, Baik, Cukup, Buruk
C4	Absensi	Sangat Baik, Baik, Cukup, Buruk
C5	Disiplin	Sangat Baik, Baik, Cukup, Buruk

3.2 Alternative Data

Where is the alternative data needed to be determined to be the best teacher after going through the MOORA Method calculation process as follows:

Table 2. Alternative Data

Alternatif	Nama Guru
A1	Marisna Situmoran
A2	Milia Hutajulu
A3	Dewi Manurung
A4	Ika Kurniawan
A5	Heri Santoso
A6	Dwi Novita

3.3 The weight value of each criterion

Table. 3 Criteria

Kriteria	Keterangan	Bobot	Jenis
C1	Jabatan Guru	0.25	Benefit
C2	Sertifikasi Guru	0.25	Benefit
C3	Lama Mengajar	0.15	Benefit
C4	Absensi	0.15	Benefit
C5	Disiplin	0.20	Benefit

Table 4: Discussing weighting using criteria for teacher position (C1)

Table 4 : Weighting criteria for Teacher's Position (C1)

Jabatan Guru	Keterangan	Bobot
90	Sangat Baik	15
80	Baik	7
60	Cukup	3
0	Buruk	0

Table 5: Discussing weighting using the criteria for Teacher Certification (C2).

Table 5. Weighting criteria for Teacher Certification (C2)

Sertifikasi Guru	Keterangan	Bobot
90	Sangat Baik	15
80	Baik	7
60	Cukup	3
0	Buruk	0

Table 6: Discussing weighting using the length of teaching criteria (C3).

Table 6. Weighting of the Length of Teaching Criteria (C3)

Lama Mengajar	Keterangan	Bobot

90	Sangat Baik	15
80	Baik	7
60	Cukup	3
0	Buruk	0

Table 7: Discussing weighting using the absence criteria (C4).

Table 7. Weighting of absence criteria (C4)

Absensi	**Keterangan**	**Bobot**
90	Sangat Baik	8
80	Baik	5
60	Cukup	2
0	Buruk	0

Table 8: Discussing weighting using Discipline criteria (C5).

Table 8. Discipline criteria weighting (C5)

Disiplin	**Keterangan**	**Bobot**
90	Sangat Baik	9
80	Baik	7
60	Cukup	4
0	Buruk	0

Table 9 is the value obtained from the suitability rating between alternatives and criteria

Table 9. Alternative suitability ratings and criteria

Alternatif	**C1**	**C2**	**C3**	**C4**	**C5**
A1	70	75	75	80	80
A2	70	75	75	80	85
A3	90	75	60	80	60
A4	75	75	70	60	70
A5	60	80	75	80	80
A6	70	80	80	90	90

3.4 Implementation

Furthermore, to determine the selection of the best teacher, it must be calculated and determined who is the best teacher, where the leadership/principal has difficulty determining the selection of the best teacher so far. So based on these problems it is necessary to implement ways to solve the problems experienced by the school

leadership/principal. This decision support system uses the moora method (multi-objective optimization on the basis of ratio analysis) for calculations in solving problems. The following is the implementation of the MOORA calculation.

1. Make a decision matrix X taken from table 9

$$X = \begin{matrix} 70 & 75 & 75 & 80 & 80 \\ 70 & 75 & 75 & 80 & 85 \\ 90 & 75 & 60 & 80 & 60 \\ 75 & 75 & 70 & 60 & 70 \\ 60 & 80 & 75 & 80 & 80 \\ 70 & 80 & 80 & 90 & 90 \end{matrix}$$

2. The next step is to normalize the X matrix using the 2nd equation. For Performance Criteria (C1).

$$X^*_{1,1} = \frac{70}{\sqrt{70^2 + 70^2 + 90^2 + 75^2 + 60^2 + 70^2}} = 0{,}3912$$

$$X^*_{2,1} = \frac{70}{\sqrt{70^2 + 70^2 + 90^2 + 75^2 + 60^2 + 70^2}} = 0{,}3912$$

$$X^*_{3,1} = \frac{90}{\sqrt{70^2 + 70^2 + 90^2 + 75^2 + 60^2 + 70^2}} = 0{,}5029$$

$$X^*_{4,1} = \frac{75}{\sqrt{70^2 + 70^2 + 90^2 + 75^2 + 60^2 + 70^2}} = 0{,}4191$$

$$X^*_{5,1} = \frac{60}{\sqrt{70^2 + 70^2 + 90^2 + 75^2 + 60^2 + 70^2}} = 0{,}3353$$

$$X^*_{6,1} = \frac{70}{\sqrt{70^2 + 70^2 + 90^2 + 75^2 + 60^2 + 70^2}} = 0{,}3912$$

3. The next step is to normalize the X matrix using the 2nd equation. For Performance Criteria (C2).

$$X^*_{1,2} = \frac{75}{\sqrt{75^2 + 75^2 + 75^2 + 75^2 + 80^2 + 80^2}} = 0{,}3912$$

$$X^*_{2,2} = \frac{75}{\sqrt{75^2 + 75^2 + 75^2 + 75^2 + 80^2 + 80^2}} = 0{,}3912$$

$$X^*_{3,2} = \frac{75}{\sqrt{75^2 + 75^2 + 75^2 + 75^2 + 80^2 + 80^2}} = 0{,}3912$$

$$X^*_{4,2} = \frac{75}{\sqrt{75^2 + 75^2 + 75^2 + 75^2 + 80^2 + 80^2}} = 0{,}3912$$

$$X^*_{5,2} = \frac{80}{\sqrt{75^2 + 75^2 + 75^2 + 75^2 + 80^2 + 80^2}} = 0{,}4258$$

$$X^*_{6,2} = \frac{80}{\sqrt{75^2 + 75^2 + 75^2 + 75^2 + 80^2 + 80^2}} = 0{,}4258$$

4. The next step is to normalize the X matrix using the 2nd equation. For Performance Criteria (C3).

$$X^*_{1,3} = \frac{75}{\sqrt{75^2 + 75^2 + 60^2 + 70^2 + 75^2 + 80^2}} = 0{,}4207$$

$$X^*_{2,3} = \frac{75}{\sqrt{75^2 + 75^2 + 75^2 + 75^2 + 80^2 + 80^2}} = 0{,}4207$$

$$X^*_{3,3} = \frac{60}{\sqrt{75^2 + 75^2 + 60^2 + 70^2 + 75^2 + 80^2}} = 0{,}3366$$

$$X^*_{4,3} = \frac{70}{\sqrt{75^2 + 75^2 + 60^2 + 70^2 + 75^2 + 80^2}} = 0{,}3927$$

$$X^*_{5,3} = \frac{75}{\sqrt{75^2 + 75^2 + 60^2 + 70^2 + 75^2 + 80^2}} = 0{,}4207$$

$$X^*_{6,3} = \frac{80}{\sqrt{75^2 + 75^2 + 60^2 + 70^2 + 75^2 + 80^2}} = 0{,}4488$$

5. The next step is to normalize the X matrix using the 2nd equation. For Performance Criteria (C4).

$$X^*_{1,3} = \frac{80}{\sqrt{80^2 + 80^2 + 80^2 + 60^2 + 80^2 + 90^2}} = 0{,}4142$$

$$X^*_{2,3} = \frac{80}{\sqrt{80^2 + 80^2 + 80^2 + 60^2 + 80^2 + 90^2}} = 0{,}4142$$

$$X^*_{3,3} = \frac{80}{\sqrt{80^2 + 80^2 + 80^2 + 60^2 + 80^2 + 90^2}} = 0{,}4142$$

$$X^*_{4,3} = \frac{60}{\sqrt{80^2 + 80^2 + 80^2 + 60^2 + 80^2 + 90^2}} = 0{,}3107$$

$$X^*_{5,3} = \frac{80}{\sqrt{80^2 + 80^2 + 80^2 + 60^2 + 80^2 + 90^2}} = 0{,}4142$$

$$X^*_{6,3} = \frac{90}{\sqrt{80^2 + 80^2 + 80^2 + 60^2 + 80^2 + 90^2}} = 0{,}4660$$

6. The next step is to normalize the X matrix using the 2nd equation. For Performance Criteria (C5).

$$X^*_{1,3} = \frac{80}{\sqrt{80^2 + 85^2 + 60^2 + 70^2 + 80^2 + 90^2}} = 0{,}4180$$

$$X^*_{2,3} = \frac{85}{\sqrt{80^2 + 85^2 + 60^2 + 70^2 + 80^2 + 90^2}} = 0{,}4442$$

$$X^*_{3,3} = \frac{60}{\sqrt{80^2 + 85^2 + 60^2 + 70^2 + 80^2 + 90^2}} = 0{,}3135$$

$$X^*_{4,3} = \frac{70}{\sqrt{80^2 + 85^2 + 60^2 + 70^2 + 80^2 + 90^2}} = 0{,}3658$$

$$X^*_{5,3} = \frac{80}{} = 0{,}4180$$

$$X^*_{6,3} = \frac{\sqrt{80^2 + 85^2 + 60^2 + 70^2 + 80^2 + 90^2}}{\frac{90}{\sqrt{80^2 + 85^2 + 60^2 + 70^2 + 80^2 + 90^2}}} = 0{,}4703$$

Then get the results of the normalization of the X matrix obtained by the matrix X*i,j below:

	0,3912	**0,3992**	**0,4207**	**0,4142**	**0,4180**
	0,3912	0,3992	0,4207	0,4142	0,4442
	0,5029	0,3992	0,3366	0,4142	0,3135
$\mathbf{X^*_{i,j}}$	0,4191	0,3992	0,3927	0,3107	0,3658
	0,3353	0,4258	0,4207	0,4142	0,4180
	0,3912	0,4258	0,4488	0,4660	0,4703

7. Calculating the Optimization Value

Y*1 = (0.25*0,3912)+(0.25*03992)+(0.15*0,4207)+(0.15*0,4142)+(0.20*0,4180) = 0,4064
Y*2 = (0.25*0,3912)+(0.25*03992)+(0.15*0,4207)+(0.15*0,4142)+(0.20*0,4442) = 0,4117
Y*3 = (0.25*0,5029)+(0.25*03992)+(0.15*0,3366)+(0.15*0,4142)+(0.20*0,3135) = 0,4009
Y*4 = (0.25*0,4191)+(0.25*03992)+(0.15*0,3927)+(0.15*0,3107)+(0.20*0,3658) = 0,3832
Y*5 = (0.25*0,3353)+(0.25*0,4258)+(0.15*0,4207)+(0.15*0,4142)+(0.20*0,4180) = 0,3991
Y*6 = (0.25*0,3912)+(0.25*0,4258)+(0.15*0,4488)+(0.15*0,4660)+(0.20*0,4703) = 0,4355

8. Determining Ranking Value from Ranking Results

Then from the results of calculating the Optimization Value, we can see the ranking of each alternative from calculating the criteria for each teacher:

Table 10 : Ranking Results

Alternatif	Nama Guru	Nilai	Rangking
A1	Marisna Situmoran	0,4064	3
A2	Milia Hutajulu	0,4117	2
A3	Dewi Manurung	0,4009	4
A4	Ika Kurniawan	0,3832	6
A5	Heri Santoso	0,3991	5
A6	Dwi Novita	0,4355	1

It can be seen from Table 10. The results of the ranking show that the best teacher was found, namely Alternative A6 with the name Jumianto with a value of 0.4355, which is the best teacher in rank 1.

4. Conclusion

From the results of the research in determining the selection of the best teacher at YAPIM Biru-Biru Vocational School based on 6 existing criteria, that the application of the MOORA method can produce the best alternative, namely ranking 1 of each available alternative. With the application of the MOORA method, it can assist school leaders/principals in making a decision in determining the best teacher in the school.

Acknowledgements

The author would like to thank LPPM STMIK Pelita Nusantara for supporting the implementation of this research..

References

Brauers, W.K.M. and Zavadskas E.K. (2006) The MOORA Method and Its Applications to Privatization in a Transition Economy. Control and Cybernetics, 35, 445-469.

B. Sen, P. Bhattacharjee, and U. K. Mandal, "A comparative study of some prominent multi criteria decision making methods for connecting rod material selection," *Perspect. Sci.*, 2016.

D. C. P. Sinaga, B. Sianipar, And P. Marpaung, "Pemilihan Calon Manager Dari Pegawai Berprestasi Menggunakan Metode Profile Matching Pada Cv . Glofacia Oceanic," Vol. 4, No. September, Pp. 643–656, 2020

D.C.P. Sinaga, B. Sianipar "Application Of The Weighted Product Method For The Selection Of Candidates For The National Science Olympiad At SMK YAPIM Biru -Biru" JURNAL INFOKUM, Volume 10, No.1, Desember,2021

S. Manurung, "sistem pendukung keputusan pemilihan guru dan pegawai terbaik Menggunakan Metode Moora," *Simetris J. Tek. Mesin, Elektro dan Ilmu Komput.*, 2018.

Efraim Turban, Jay E.Aronson dan Ting Peng Liang: Decision Support Systems and Intelligent Systems, Edisi 7, Jilid 1, New Jersey: Pearson, Education, Inc , 2005, hal.19.

Efraim Turban, Jay E.Aronson dan Ting Peng Liang: Decision Support Systems and Intelligent Systems, Edisi 7, Jilid 1,New Jersey: Pearson Education, Inc , 2005, hal.143-145.

H. Nopriandi and N. W. Al Hafiz, "Sistem Pendukung Keputusan Pemilihan Dosen Berprestasi Di Lingkungan Fakultas Tarbiyah Dan Keguruan Menggunakan Fuzzy Multiple Attribut Decision Making (Fmadm)," *J.Teknol. DAN OPEN SOURCE*, 2019.

Mandal, U. K., & Sarkar, B. (2012). Selection of Best Intelligent Manufacturing System (IMS) Under Fuzzy Moora Conflicting MCDM Environment. International Journal of Emerging Technology and Advanced Engineering, 2(9), 301–310. www.ijetae.com

M. Syahrizal, M. Hartami, S. Fajarika, S. Hardiyanti, and S. Suginam, "Sistem Pendukung Keputusan Menentukan Guru Yang Mutasi Menggunakan Metode MOORA," *Semin. Nas. Sains dan Teknol. Inf.*, 2018.

M. Moradian, V. Modanloo, and S. Aghaiee, "Comparative analysis of multi criteria

decision making techniques for material selection of brake booster valve body," *J. Traffic Transp. Eng. (English Ed.*, vol. 6, no. 5, pp. 526–534, 2019.

N. W. A. Ulandari, "Implementasi Metode MOORA pada Proses Seleksi Beasiswa Bidikmisi di Institut Teknologi dan Bisnis STIKOM Bali," *J. Eksplora Inform.*, 2020.

N. W. Al-Hafiz, Mesran, and Suginam, "Sistem Pendukung Keputusan Penentukan Kredit Pemilikan Rumah Menerapkan Multi-Objective Optimization on the Basis of Ratio Analysis (Moora)," *KOMIK (Konferensi Nas. Teknol. Inf. dan Komputer)*, 2017.

P. Karande and S. Chakraborty, "Application of multi-objective optimization on the basis of ratio analysis (MOORA) method for materials selection," *Mater. Des.*, 2012.

P. Marpaung, D. C. P. Sinaga. B. Sianipar, M. Laia. "Penerapan Metode Moora Dalam Menentukan Perumahan Subsidi Terbaik Di Daerah Sei Mencirim" Jurnal Teknik Informatika Kaputama (JTIK) Vol.6, No. 2, Juli, 2022

R. Z. Hasibuan, A. Prahutama, and D. Ispriyanti, "Perbandingan Metode Moora Dan Topsis Dalam Penentuan Penerimaan Siswa Baru Dengan Pembobotan Roc Menggunakan Gui Matlab," *J. Gaussian*, 2019.

R. Sanjaya, "Sistem Pengambilan Keputusan Untuk Menentukan Perumahan Terbaik Berdasarkan Kondisi dan Lokasi Menggunakan Metode ENTROPHY dan ARAS," *Semin. Nas. Teknol. Komput. Sains SAINTEKS 2020*, 2020.

R. P. Ghozali, H. Saputra, M. Apriadin Nuriawan, Suharjito, D. N. Utama, and A. Nugroho, "Systematic literature review on decision-making of requirement engineering from agile software development," in *Procedia Computer Science*, 2019.