Journal of Artificial Intelligence and Engineering Applications

Website: https://ioinformatic.org/

15th October 2022. Vol. 2. No. 1

Decision Support System For The Determination Of Field Work Practice Results In Students Using The Moora Method (Case Study : Pt. Telekomunikasi Binjai)

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Abstract

PT. Telekomunikasi Indonesia Binjai Branch is an information and communication company as well as a complete telecommunications service and network provider in Indonesia. Acceptance of students to carry out Field Work Practices (PKL) is one of the important goals for companies to introduce the world of telecommunications in Binjai City. Street vendors are student activities directly in professional work activities at an institution, company or institution within a certain period of time in accordance with the curriculum. And to overcome these problems we need a method that can predict the number of new installations. After carrying out the Field Work Practice (PKL) in the company, students are entitled to get the results of the activities that have been carried out during the PKL. The number of students who carry out PKL in the company makes it difficult for office employees to provide PKL results from each of the existing students. Based on the results of research that has been done at PT. Telekomunikasi Indonesia Binjai Branch, the process of assigning value to the results of street vendors activities is done manually. In this study a Decision Support System (DSS) will be built using the Multi-Objective Optimization On The Basis Of Ratio Analysis (MOORA) method which is a method that has a calculation with a minimum and very simple calculation. The system is designed with the PHP programming language and MySQL database, after processing the 15 inputted data, it is found that A15 (Wiratana Sanjaya) is in the first rank. With these results it was also concluded that A15 became a student with the best Field Work Practice results at PT. Telekomunikasi Indonesia Binjai Branch.

Keywords: MOORA, DSS, Result_ FWP.

1. Introduction

Quick and accurate decision making is the key in facing global competition. The amount of information possessed coupled with the ability to process that information quickly becomes an alternative in decision making is the key to success in competition. Before making a decision from the various available information, a criterion is also needed, where the criterion is able to answer an important question about how well an alternative can solve the problem at hand.

PT. Telekomunikasi Indonesia Binjai Branch which is located at Jl. Soekarno-Hatta No.11, Tanah Tinggi, Kec. East Binjai, Binjai City is an information and communication company as well as a complete telecommunications service and network provider in Indonesia. Acceptance of students to carry out Field Work Practices (PKL) is one of the important goals for companies to introduce the world of telecommunications in Binjai City. Street vendors are student activities directly in professional work activities at an institution, company or institution within a certain period of time in accordance with the curriculum.

After carrying out the Field Work Practice (PKL) in the company, students are entitled to get the results of the activities that have been carried out during the PKL. The number of students who carry out PKL in the company makes it difficult for office employees to provide PKL results from each of the existing students. This is because the activities carried out by each student are different, so that the results of the activities carried out are also different. As for students who are often absent at the company, employees must be objective in providing value for the results of street vendors' activities.

Based on the results of research that has been done at PT. Telekomunikasi Indonesia Binjai Branch, the process of scoring the results of street vendors activities is done manually, this can slow down the results of the decisions given and the results obtained are not effective and efficient because the values given are not based on the circumstances and activities carried out by students. To overcome this problem, it is necessary to build a system to streamline the process of determining the value of street vendors for students who have been computerized properly by utilizing the process of the Decision Support System (SPK).

In this study a Decision Support System (DSS) will be built using the Multi-Objective Optimization On The Basis Of Ratio Analysis (MOORA) method which is a method that has a calculation with a minimum and very simple calculation. This method has a good level of selectivity in determining an alternative. With the construction of a computer-based system for decision making, it is hoped that it can produce a decision in determining the right results of the Field Work Practice (PKL) for students at PT. Telekomunikasi Indonesia Binjai Branch.

2. Research Methodology

According to (Pahwi et al., 2017), Decision Support Systems (DSS)/Decision Support Systems (DSS) are part of a computer-based information system including a price base system or price management that is used to make decisions within an organization or company. It can also be said as a computer system that processes data into information to make decisions on specific semi-structured problems.

According to (Pinem et al., 2020), the Decision Support System, which we will briefly describe in this thesis as DSS, is generally defined as a system capable of providing the ability to support decisions in problem solving. Specifically, DSS is defined as a system that supports the work of a manager or a group of managers in solving semi-structured problems by providing information or suggestions towards certain decisions.

MOORA was introduced by Brauers and Zavadskas in 2006, applied to solve many economic, managerial and construction problems by calculating mathematical formulas with precise results. Initially this method was introduced by Brauers in 2004 as "Multi-Objective Optimization" which can be used to solve various complex decision-making problems in a factory environment.

According to (Ulandari et al., 2020), MOORA is a method for analyzing alternatives based on the output of the total benefit criteria and cost criteria. The MOORA method performs the process of simultaneously optimizing two or more conflicting criteria (targets) by maximizing benefit criteria and minimizing cost criteria. MOORA considers favorable and unfavorable objectives (criteria) for ranking or selecting one or more alternatives from a set of available options.

The MOORA method has a level of flexibility and ease of understanding in separating the subjective part of an evaluation process into decision weight criteria with several decision-making attributes. This method has a good level of selectivity because it can determine the purpose of conflicting criteria. Where the criteria can be profitable (benefit) or unfavorable (cost).

3. Research Result

In the analysis of testing the decision support system method used in determining the results of the Field Work Practice (PKL) is the Multi-Objective Optimization On The Basis Of Ratio Analysis (MOORA) method.

To further analyze the Multi-Objective Optimization On The Basis Of Ratio Analysis (MOORA) method, follow these steps:

1. Determine Criteria and Criteria Weight

The following are the decision criteria and the weight of the decision criteria used by the authors in this study:

Table 1 : Critieria Values

No	Criteria Code	Criteria	Description	Criterion Weight
1	K1	Adaptation	The criteria that assess how students can adapt to street vendors so that students are able to carry out street vendors activities well.	30
2	K2	Discipline	Criteria that assess how disciplined students are while carrying out street vendors in companies, such as attendance and work discipline.	25

3	K3	Initiative	Criteria that assess student initiative in carrying out activities to help employees work with their own wishes.	20
4	K4	Cooperation	The criteria that assess collaboration between students in conducting street vendors activities in companies	15
5	K5	Responsibility	Criteria that assess the responsibility of students for the work or assignments given.	10
Total Bobot				100

2. Determine the Suitability Rating of Each Criterion

Next is the suitability rating of each criterion used in this study, which is as follows:

Table 2 : Criteria Match Rating

No	Match Rating	Rating Weight
1	Very good	5
2	Well	4
3	Enough	3
4	Not enough	2
5	Very less	1

3. Criteria Weight Normalization

Normalization of criterion weights using the equation $\mathrm{wi} = \frac{\mathrm{w}ri}{\sum_{j=1}^{m} \mathrm{wj}}$ can be seen in the following table:

Table 3 : Criteria Weight Normalization Table

No	Criteria Code	Criteria	Weight	Proces	Normalization Result
1	K1	Adaptation	30	$\frac{30}{100}$	0,30
2	K2	Discipline	25	$\frac{25}{100}$	0,25
3	K3	Initiative	20	$\frac{20}{100}$	0,20
4	K4	Cooperation	15	$\frac{15}{100}$	0,15
5	K5	Responsibility	10	$\frac{10}{100}$	0,10

4. Alternate Table Transformation With Matching Value Rating of Criteria

The transformation of research alternative data can be seen in the following table:

Table 4 : Alternative Transformation of Student Data

No	Alternative	Criteria				
		K1	K2	K3	K4	K5
1	A1	4	4	5	4	5
2	A2	5	4	4	4	4
3	A3	5	4	4	5	3
4	A4	3	4	4	4	3
5	A5	4	3	3	2	1

5. Create a Decision Matrix

The decision matrix is denoted by X, the matrix can be seen as follows:

$$X = \begin{bmatrix} 4 & 4 & 5 & 4 & 5 \\ 5 & 4 & 4 & 4 & 4 \\ 5 & 4 & 4 & 5 & 3 \\ 3 & 4 & 4 & 4 & 3 \\ 4 & 3 & 3 & 2 & 1 \\ 4 & 4 & 3 & 4 & 4 \\ 4 & 4 & 4 & 4 & 4 \\ 4 & 3 & 3 & 3 & 3 \\ 4 & 4 & 4 & 3 & 4 \\ 4 & 4 & 4 & 4 & 3 \\ 2 & 3 & 3 & 4 & 1 \\ 2 & 3 & 2 & 1 & 4 \\ 4 & 4 & 5 & 4 & 5 \\ 5 & 4 & 4 & 4 & 4 \\ 5 & 4 & 4 & 5 & 3 \end{bmatrix}$$

6. Create a normalization matrix

The next step, according to the equation $X * ij = \frac{xij}{\sqrt{\left[\sum_{j=1}^{m} x_{ij}^2\right]}}$ is to determine the normalization value for each criterion of each alternative, and make it a Normalization matrix. The detailed calculations for each criterion and alternative are as follows:

- Normalization of Column 1 (K1) :

$$X *_{1,1} = \frac{x_{1,1}}{\sqrt{\begin{matrix} X_{1,1}^2 + X_{2,1}^2 + X_{3,1}^2 + X_{4,1}^2 + X_{5,1}^2 + X_{6,1}^2 + X_{7,1}^2 \\ + X_{8,1}^2 + X_{9,1}^2 + X_{10,1}^2 + X_{11,1}^2 + X_{12,1}^2 + X_{13,1}^2 + X_{14,1}^2 + X_{15,1}^2 \end{matrix}}}$$

$$= \frac{4}{\sqrt{\begin{matrix} 4^2 + 5^2 + 5^2 + 3^2 + 4^2 + 4^2 + 4^2 \\ + 4^2 + 4^2 + 4^2 + 2^2 + 2^2 + 4^2 + 4^2 + 4^2 \end{matrix}}}$$

$$= \frac{4}{\sqrt{\begin{matrix} 16 + 25 + 25 + 9 + 16 + 16 + 16 \\ + 16 + 16 + 16 + 4 + 4 + 16 + 16 + 16 \end{matrix}}}$$

$$= \frac{4}{\sqrt{227}} = \frac{4}{15{,}067} = 0{,}265$$

$$X*_{2,1} = \frac{x_{3,1}}{\sqrt{\begin{matrix} X_{1,1}^2 + X_{2,1}^2 + X_{3,1}^2 + X_{4,1}^2 + X_{5,1}^2 + X_{6,1}^2 + X_{7,1}^2 \\ +X_{8,1}^2 + X_{9,1}^2 + X_{10,1}^2 + X_{11,1}^2 + X_{12,1}^2 + X_{13,1}^2 + X_{14,1}^2 + X_{15,1}^2 \end{matrix}}}$$

$$= \frac{5}{\sqrt{\begin{matrix} 4^2 + 5^2 + 5^2 + 3^2 + 4^2 + 4^2 + 4^2 \\ +4^2 + 4^2 + 4^2 + 2^2 + 2^2 + 4^2 + 4^2 + 4^2 \end{matrix}}}$$

$$= \frac{5}{\sqrt{\begin{matrix} 16 + 25 + 25 + 9 + 16 + 16 + 16 \\ +16 + 16 + 16 + 4 + 4 + 16 + 16 + 16 \end{matrix}}}$$

$$= \frac{5}{\sqrt{227}} = \frac{5}{15{,}067} = 0{,}332$$

From the calculation of the normalization value above, the normalization value matrix (X*) is obtained as follows

$$\mathbf{X^*} = \begin{bmatrix} 0{,}265 & 0{,}269 & 0{,}337 & 0{,}270 & 0{,}369 \\ 0{,}332 & 0{,}269 & 0{,}270 & 0{,}270 & 0{,}295 \\ 0{,}332 & 0{,}269 & 0{,}270 & 0{,}338 & 0{,}221 \\ 0{,}199 & 0{,}269 & 0{,}270 & 0{,}270 & 0{,}221 \\ 0{,}265 & 0{,}202 & 0{,}202 & 0{,}135 & 0{,}074 \\ 0{,}265 & 0{,}269 & 0{,}202 & 0{,}270 & 0{,}295 \\ 0{,}265 & 0{,}269 & 0{,}270 & 0{,}270 & 0{,}295 \\ 0{,}265 & 0{,}202 & 0{,}202 & 0{,}203 & 0{,}221 \\ 0{,}265 & 0{,}269 & 0{,}270 & 0{,}203 & 0{,}295 \\ 0{,}265 & 0{,}269 & 0{,}270 & 0{,}270 & 0{,}221 \\ 0{,}133 & 0{,}202 & 0{,}202 & 0{,}270 & 0{,}074 \\ 0{,}133 & 0{,}202 & 0{,}135 & 0{,}068 & 0{,}295 \\ 0{,}265 & 0{,}269 & 0{,}202 & 0{,}203 & 0{,}221 \\ 0{,}265 & 0{,}269 & 0{,}337 & 0{,}338 & 0{,}295 \\ 0{,}265 & 0{,}336 & 0{,}337 & 0{,}338 & 0{,}295 \end{bmatrix}$$

Calculating Weighted Normalized Value

The calculation of the weighted normalized value with the equation X*ij(wj)=Xij*wj, the calculation is as follows:

Wj = Bobot : w1 = 0,30; w2 = 0,25; w3 = 0,20; w4 = 0,15 dan w5 = 0,10

The results of the above calculations can be seen in the following table:

Table 5 : Weighted Value Normalization

No	Alternative	Criteria				
		K1	**K2**	**K3**	**K4**	**K5**
1	A1	0,080	0,067	0,067	0,041	0,037
2	A2	0,100	0,067	0,054	0,041	0,029
3	A3	0,100	0,067	0,054	0,051	0,022
4	A4	0,060	0,067	0,054	0,041	0,022
5	A5	0,080	0,050	0,040	0,020	0,007

Calculating Optimization Value

The calculation of the MOORA Multiobject Optimization Value (max-min) in this case example refers to the equation $y * j = \sum_{j=1}^{g} x * ij(wj) - \sum_{j=g+1}^{n} x * ij\,(wj)$ because each criterion has its own weight (W). The calculation of the optimization value is shown as in the following calculation:

A1 = 0,080 + 0,067 + 0,067 + 0,041 + 0,037 = 0,292

A2 = 0,100 + 0,067 + 0,054 + 0,041 + 0,029 = 0,291

A3 = 0,100 + 0,067 + 0,054 + 0,051 + 0,022 = 0,294

A4 = 0,060 + 0,067 + 0,054 + 0,041 + 0,022 = 0,244

A5 = 0,080 + 0,050 + 0,040 + 0,020 + 0,007 = 0,198

The results of the above calculations can be seen in the following table:

Table 6 : Optimization Value Calculation Results

No	Alternative	Optimation Result
1	A1	0,292
2	A2	0,291
3	A3	0,294
4	A4	0,244
5	A5	0,198

9. Ranking

The results of the calculation of the optimization value are then sorted from the largest to the smallest value, the alternative with the largest optimization value indicates the best alternative. The final score ranking results are as follows:

Table 7 : Optimization Value Ranking Results

No	Alternative	Optimation Result	Rating
1	A15	0,311	1
2	A14	0,295	2
3	A3	0,294	3
4	A1	0,292	4
5	A2	0,291	5

Based on the ranking results in the table above, it was found that A15 (Wiratana Sanjaya) was ranked first. With these results it was also concluded that A15 became a student with the best Field Work Practice results at PT. Telekomunikasi Indonesia Binjai Branch with the results of the application of the MOORA method from 15 student data calculated in this study.

4. Implementation

1. System Main Page

Fig 1 : System Main Page

2. Login Display

Fig 2 : Login Display

3. MOORA Method Process Page Display

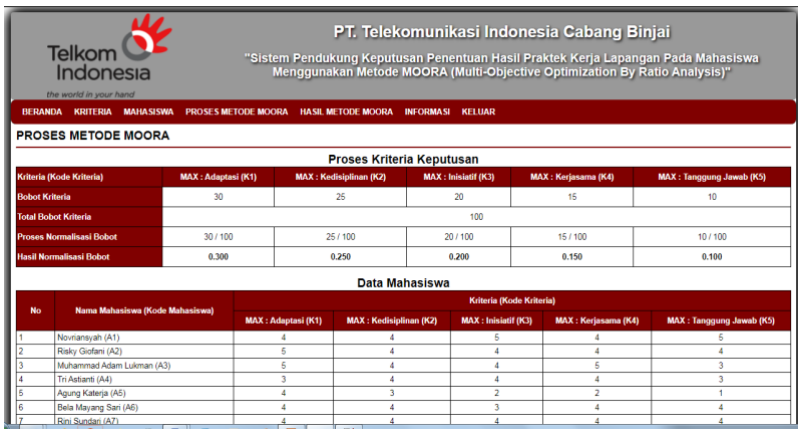

Fig 3 : MOORA Method Process Page Display

4. MOORA Method Result Page Display

Fig 4 : MOORA Method Result Page Display

5. Conclusion

After discussing and describing the previous chapters, the author provides several conclusions. The following are the conclusions that the author wrote in this study related to the Decision Support System for determining the results of Student Field Work Practices using the Multi - Objective Optimization On The Basis Of Ratio Analysis (MOORA) method at PT. Telekomunikasi Indonesia Binjai Branch, namely:

1. The design of the system that has been built using the PHP programming language with a MySQL database has succeeded in determining the results of the Student Field Work Practice by implementing the MOORA method in decision support on the system. In the system that was built the right criteria to be used in supporting the final results of the decisions that were successfully analyzed and applied to the system were adaptation, discipline, initiative, cooperation and responsibility.
2. Implementation of the Multi-Objective Optimization On The Basis Of Ratio Analysis (MOORA) method on the system that has been built to determine the results of the Field Work Practice utilizing 15 student data as analysis and applied to the system, from the results of the implementation with the implementation it was found that A15 (Wiratana Sanjaya) is in first place with a MOORA multi-objective optimization value of 0.312; it can be stated that A15 became the best student implementing the Field Work Practice.

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