

Article

Decision Support System For Selecting The Best Practical Work Students Using MOORA Method

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Abstract:

This research aims to solve the problem of selecting the best practical work students at the Politeknik Bisnis Indonesia. The current selection of the best practical work students at PBI does not yet use a decision support system approach. This problem is solved by building a Decision Support System using Multi-Objective Optimization based on Ratio Analysis (MOORA) method. The criteria used in this DSS consist of discipline, teamwork, skills, quality of work, and attendance. As for the results of data processing from this study, the three best alternative data were obtained, namely alternative Vivi (A6) as the 1st best Practical Work Students with a score of $Y_i = 36.5954$, Hafiz (A1) as the 2nd best Practical Work Students with a score of $Y_i = 34.5339$, Cahaya (A3) as the 3rd best PKL student with a score of $Y_i = 33.4767$. Through this decision support system that has been built, the selection of the best practical work students can be made quickly and effectively.

Keywords: DSS, MOORA, Students, Criteria, Field practice



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1. INTRODUCTION

Politeknik Bisnis Indonesia is a campus oriented towards the world of work. It is an education based on talents, interests, and skills to produce graduates who are competent in their fields. In its curriculum, in addition to organizing classroom learning, Politeknik Bisnis Indonesia also manages practical work students' programs. The practical work students program at the Politeknik Bisnis Indonesia is a form of organizing educational and training activities by working directly, systematically, and purposefully for students to apply the knowledge gained as well as being able to be practiced in the world of work, especially in a real work environment for students before the student enters the real world of work, so it is hoped that after the student graduates, he will not only master the knowledge of marketing in the real world well but be useful for himself and for the company where the student works later.

Politeknik Bisnis Indonesia, in carrying out the process of selecting the best practical work students, is only based on manual assessment of the student body, namely by selecting the values owned by each practical work students based on existing criteria without using a decision support system so that the assessment

process takes a long time to get results. Assessment using this manual method is less effective and often results in the slow selection, and those chosen tend to be subjective and not on target. In addition, the assessment results were not on target because there were students who felt entitled to the selection of the best practical work students but were not selected in the section of the best experimental work students. This will result in a lack of trust among practical work students in the results of the assessment conducted by the foundation.

In the current era of technological development, various technologies have been integrated to help solve problems in everyday life [1]–[9], [10]–[13]. One of them is computer-based decision support systems [14]–[21]. Decision support systems have been widely used to help support decision-making in solving various problems [35]–[37], both in the fields of education, health, and other public areas [22]–[27], [28], [29], to solve this problem, a decision support system is used to help decision-making to produce decisions objectively following the values possessed by each practical work student based on the criteria set. This will result in a lack of trust in practical work students in the results of the assessment carried out by the foundation.

In the decision support system, a method can be applied that can produce the best decision from several input alternatives, one of which is the MOORA method. The system created is a decision support system using the MOORA method because the MOORA method has been widely used in decision-making, such as: Application of the MOORA Method to the Chili Seed Selection System in Bandar Siantar village, Gunung Malela District [30]. Implementation of MOORA Method for Recommendations for Selecting the Best Motorcycle Type on a CV. Satu Hati Perkasa [31]. Applying the Moora Method in Making Decisions on the Selection of Yearbook Vendors for State High Schools 1 Cisarua [32]. Decision Support System for Selecting the Best Teachers and Employees Using the Moora Method [33]. Decision Support System for Determining the Surgical Feasibility of Poor Family Homes Using the Moora Method [34]. The MOORA method is applied to solve problems with complex mathematical calculations.

Based on the background, a Decision Support System was built to support the selection process of the best practical work students at the Politeknik Bisnis Indonesia with the MOORA method. By applying this MOORA method, the selection of the best practical work students based on predetermined criteria can be made easily and quickly.

2. RESEARCH METHOD

The steps in completing the DSS selection process of the best practical work students at the Politeknik Bisnis Indonesia with the MOORA method are carried out according to the stages as presented in Figure 1.

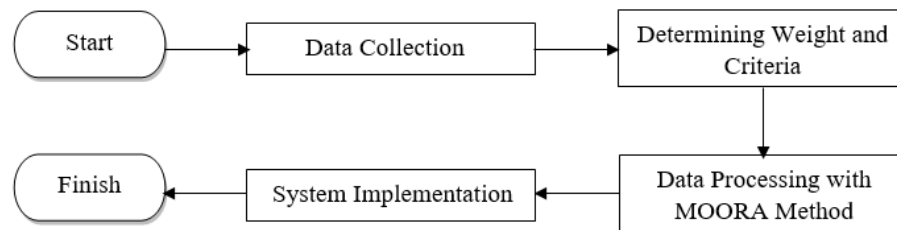


Fig 1. Research Framework

The criteria data required in the DSS selection process of the best practical work students at the Politeknik Bisnis Indonesia with the MOORA method consists of Discipline (C1), Teamwork (C2), Skill (C3), Work Quality (C4), Attendance (C5). Criteria data and weights for each criterion can be seen in table 1.

Table 1. Criteria data and weights

Criterion	Information	Weight	Weight
C1	Discipline	20	Benefits
C2	Teamwork	25	Benefits
C3	Skills	25	Benefits
C4	Working Quality	20	Benefits
C5	Attendance	10	Cost

Moreover, in this study, table 2 presents data for each alternative and the value of each criterion

Table 2. Alternative match ratings and criteria

Alternatives	Alternatives Name	C1	C2	C3	C4	C5
A1	Hafiz	80	70	90	70	80
A2	Lewi	80	70	80	70	80
A3	Cahaya	70	70	90	75	90
A4	Mesak	60	60	60	70	60
A5	Bobby	60	60	60	75	60
A6	Vivi	90	80	90	70	90

3. RESULT AND ANALYZE

After obtaining alternative values to be processed, a decision-making process is carried out using the MOORA method. Data analysis using the MOORA method consists of the following steps:

1. Matricing decision x is taken from Table 2.

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

2. Then perform the normalization of the matrix X using the 1st equation

$$C1 = \sqrt{80^2 + 80^2 + 70^2 + 60^2 + 60^2 + 90^2} = 181,6590$$

$$A11 = 80/181,6590 = 0,4404$$

$$A12 = 80/181,6590 = 0,4404$$

$$A13 = 70/181,6590 = 0,3853$$

$$A14 = 60/181,6590 = 0,3303$$

$$A15 = 60/181,6590 = 0,3303$$

$$A16 = 90/181,6590 = 0,4954$$

$$C2 = \sqrt{70^2 + 70^2 + 70^2 + 60^2 + 60^2 + 80^2} = 168,2260$$

$$A21 = 70/168,2260 = 0,4161$$

$$A22 = 70/168,2260 = 0,4161$$

$$A23 = 70/168,2260 = 0,4161$$

$$A24 = 60/168,2260 = 0,3567$$

$$A25 = 60/168,2260 = 0,3567$$

$$A26 = 80/168,2260 = 0,4756$$

$$C3 = \sqrt{90^2 + 80^2 + 90^2 + 60^2 + 60^2 + 90^2} = 194,6792$$

$$A11 = 90/190,2630 = 0,4623$$

$$A12 = 80/190,2630 = 0,4205$$

$$A13 = 90/190,2630 = 0,4730$$

$$A14 = 60/190,2630 = 0,3154$$

$$A15 = 60/190,2630 = 0,3154$$

$$A16 = 90/190,2630 = 0,4730$$

$$C4 = \sqrt{70^2 + 70^2 + 75^2 + 70^2 + 75^2 + 70^2} = 175,6417$$

$$A11 = 70/175,6417 = 0,3985$$

$$A12 = 70/175,6417 = 0,3985$$

$$A13 = 75/175,6417 = 0,4270$$

$$A14 = 70/175,6417 = 0,3985$$

$$A15 = 75/175,6417 = 0,4270$$

$$A16 = 70/175,6417 = 0,3985$$

$$C5 = \sqrt{80^2 + 80^2 + 90^2 + 60^2 + 60^2 + 90^2} = 190,2630$$

$$A11 = 80/190,2630 = 0,4205$$

$$A12 = 80/190,2630 = 0,4205$$

$$A13 = 90/190,2630 = 0,4730$$

$$A14 = 60/190,2630 = 0,3154$$

$$A15 = 60/190,2630 = 0,3154$$

$$A16 = 90/190,2630 = 0,4730$$

The result of the normalization of the matrix X obtained the matrix X^*_{ij} below:

$$X^*_{ij} \begin{pmatrix} 0,4404 & 0,4161 & 0,4623 & 0,3985 & 0,4205 \\ 0,4404 & 0,4161 & 0,4205 & 0,3985 & 0,4205 \\ 0,3853 & 0,4161 & 0,4730 & 0,4270 & 0,4730 \\ 0,3303 & 0,3567 & 0,3154 & 0,3985 & 0,3154 \\ 0,3303 & 0,3567 & 0,3154 & 0,4270 & 0,3154 \\ 0,4954 & 0,4756 & 0,4730 & 0,3985 & 0,4730 \end{pmatrix}$$

The next step is to optimize attributes by including normalized search weights

$$X_{wj} \begin{pmatrix} 0,4404 & 0,4161 & 0,4623 & 0,3985 & 0,4205 \\ 0,4404 & 0,4161 & 0,4205 & 0,3985 & 0,4205 \\ 0,3853 & 0,4161 & 0,4730 & 0,4270 & 0,4730 \\ 0,3303 & 0,3567 & 0,3154 & 0,3985 & 0,3154 \\ 0,3303 & 0,3567 & 0,3154 & 0,4270 & 0,3154 \\ 0,4954 & 0,4756 & 0,4730 & 0,3985 & 0,4730 \end{pmatrix} \times (20 \quad 25 \quad 25 \quad 20 \quad 10)$$

The result of multiplication by the weight of the criteria is:

$$X = \begin{pmatrix} 8,8077 & 10,4027 & 11,5575 & 7,9708 & 4,2047 \\ 8,8077 & 10,4027 & 10,5118 & 7,9708 & 4,2047 \\ 7,7067 & 10,4027 & 11,8257 & 8,5401 & 4,7303 \\ 6,6058 & 8,9166 & 7,8838 & 7,9708 & 3,1535 \\ 6,6058 & 8,9166 & 7,8838 & 8,5501 & 3,1535 \\ 9,9087 & 11,8888 & 11,8257 & 7,9708 & 4,7303 \end{pmatrix}$$

Moreover, using the 3rd equation, the Y_i value can be calculated, as seen in Table 3.

Table 3. Yi List

Alternative	Maximum (C1+C2+C3+C4)	Minimum (C5)	Yi=Max-Min
A1	38,7386	4,2047	34,5339
A2	37,4545	4,2047	33,2498
A3	38,2070	4,7303	33,4767
A4	31,1981	3,1535	28,0446
A5	31,7675	3,1535	28,6139
A6	41,3257	4,7303	36,5954

From the table 2 results, it can be seen the ranking of each alternative from the calculation of criteria for students in table 4.

Table 4. Ranking Results

Alternative	Result	Ranking
A1	34,5339	2
A2	33,2498	4
A3	33,4767	3
A4	28,0446	6
A5	28,6139	5
A6	36,5954	1

Then the alternative A6 (Vivi) was selected as the best practical work student.

4. CONCLUSIONS

Based on the discussion of the decision support systems selection process of the best practical work students at the Politeknik Bisnis Indonesia with the MOORA method, conclusions were drawn: [1]The determination of weights greatly affects the assessment of each alternative to be calculated. [2] The selection of the best Practical Work Students using the Multi-Objective Optimization based on the Ratio Analysis (MOORA) method can help companies to get more effective results. [3] The results of the study stated that the MOORA method could be applied in selecting students. Students use five assessment criteria for the best practical work: discipline, teamwork, skill, quality of work, and attendance. [4] The results obtained from the research conducted showed that the MOORA (Multi-Objective Optimization based on Ratio Analysis) method could select alternatives and perform rankings in choosing the best Practical Work Students based on predetermined criteria, where alternative Vivi (A6) as the 1st best Practical Work Students with a score of $Y_i = 36.5954$, Hafiz (A1) as the 2nd best Practical Work Students with a score of $Y_i = 34.5339$, Cahaya (A3) as the 3rd best PKL student with a score of $Y_i = 33.4767$.

AUTHOR CONTRIBUTIONS

Conceptualization; Victor Marudut Mulia Siregar [V.M.M.S], M. Ali Hanafiah [M.A.H], Nancy Florida Siagian [N.F.S], methodology; [V.M.M.S],[M.A.H]; validation; [V.M.M.S],[M.A.H], formal analysis; [V.M.M.S],[M.A.H], investigation; [V.M.M.S],[M.A.H], data curation; [V.M.M.S],[M.A.H], writing—original draft preparation; [V.M.M.S],[M.A.H]; writing—review and editing; [V.M.M.S],[M.A.H], visualization; [V.M.M.S],[M.A.H], supervision [V.M.M.S],[M.A.H], project administration; [V.M.M.S],[M.A.H], funding acquisition; [V.M.M.S],[M.A.H], have read and agreed to the published version of the manuscript.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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