



Employee Assessment Decision Support System Using the MOORA Method at the National University

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ABSTRACT

The quality of human resources is one of the supporting factors to increase the productivity of employee assessment of an agency. So from that high competent human resources can support the existence of employee appraisals, it will be known the achievements achieved by each employee. Decision Support System Application (SPK) was made to assist study programs in employee appraisal. One method of decision support systems is Multi-Objective Optimization on the basis of Ratio Analysis (MOORA) which uses the calculation of criteria weights and the Analytical Hierarchy Process (AHP) method to assess employees. Currently the National University is still using the manual method in the process of employee performance appraisal by calculating the score of each criterion using Microsoft Excel. The manual assessment process is very likely to occur errors in calculating each criterion, and takes a long time in the calculation process. At present the National University does not yet have a specific application used for employee performance appraisal. Therefore, a decision support system is built using a web-based Multi-Objective Optimization (MOORA) method in order to facilitate the process of evaluating objective employee performance based on weights and assessment criteria that have been determined.

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1. Introduction

Along with the development of information technology that is developing very rapidly and the application can simplify human work from all aspects of life. In everyday life people often have problems in making decisions. The results of the decision are very influential on problems that arise both large and small scale problems. Decision Support System (SPK) is a system that can help determine the best alternative in a problem is a system developed by humans today.

One of the supporting factors to improve the productivity of a university's performance is seen from the quality of its human resources. As a consideration in determining the best employees of a faculty requires highly competent human resources and can support the level of performance, with the performance appraisal that can be seen the achievements of each employee.

Performance evaluation conducted by the National University of employees is still done manually and assessed by university officials with their respective visions. The closeness or familial factor with University officials functions influences the employee's assessment, if the performance is not as expected then it can be replaced at any time with a new one, and if it still has good performance then as usual working. The existence of a computer-based system that can help make decisions on employee performance appraisal as a basis for determining the continuation of employee work contracts, it is necessary to improve efficiency and effectiveness in decision making.

2. Theoretical basis

2.1 Decision Support System

Decision Support System In the book Turban, Ephraim, Rainer, R. Kelly, Jr.Potter (2006) stated that "Decision Support System (DSS) is a computer-based information system that combines models and data to



provide support for decision makers in solving semi structured or interdependent problems with extensive user involvement, or in Indonesian it can be interpreted as a Decision Support System (SPK) is a computer-based information system combining models and data to provide support to decision makers in solving semi-structural or dependent problems involving users deeply .

2.2 Employee Ratings

Employee performance evaluation is a process that must be done in evaluating employee performance. Performance appraisal can be done by various parties, namely by colleagues, direct superiors or by the employees themselves.

Performance evaluation according to Robbins (2002) has a number of benefits in organizing which include:

- 1) Management uses judgment to make personal decisions in general
- 2) The assessment provides an explanation of the training and development needed.
- 3) Performance appraisal can be used as a criterion for an approved selection and development program.
- 4) Performance appraisal also fulfills the purpose of feedback about existing to workers about how organizations perceive their performance.
- 5) Performance appraisal is used as a basis for allocating to determine rewards.

2.3 MOORA Method

The MOORA method is a method introduced by Brauers and Zavadkas (2006). This relatively new method was first used by Brauers (2003) in a multi-criteria retrieval. The MOORA method is widely applied in several fields such as management, building, contracting, road design, and economics. This method has a good level of selectivity in determining an alternative. The approach made by MOORA is defined as a process that is simultaneously used to optimize two or more conflicting constraints on several obstacles (Attri and Grover, 2013).

The MOORAA method has a degree of flexibility and ease of understanding in separating the subjective parts of an evaluation process into decision weight criteria with several attributes of decision making (Mandal and Sarkar, 2012). This method has a good level of selectivity because it can determine the objectives of conflicting criteria. Where the criteria can be beneficial (benefit) or not profitable (cost).

Steps to solve the problem using the MOORA method, including:

- 1) Matrix formation

$$x = \begin{bmatrix} x_{11} & x_{12} & \dots & x_{1n} \\ x_{21} & x_{22} & \dots & x_{2n} \\ \dots & \dots & \dots & \dots \\ x_{m1} & x_{m2} & \dots & x_{mn} \end{bmatrix} \quad (2.1)$$

where x_{ij} is the criterion value of each criterion represented as a matrix.

- 2) Determine the normalization matrix

$$\bar{x}_{ij} = \frac{x_{ij}}{\sqrt{\sum_{j=1}^m x_{ij}^2}} \quad (2.2)$$

The \bar{x}_{ij} ratio shows the i th measure of alternatives to the j th criterion, m indicates the number of alternatives and n indicates the number of criteria. Brauers et al. (2008) concludes that for the denominator, the best choice of square root is the sum of the squares of each alternative per criterion.

- 3) Determine the weighted normalization matrix

$$w_j \bar{x}_{ij} \quad (2.3)$$

In some cases, it is often observed that some criteria are more important than others. To indicate that a criterion is more important, it can be multiplied by the appropriate weight (Brauers et al. 2009). Where w_j is the weight of the j th criterion.

- 4) Determine the preference value

$$y_i = \sum_{j=1}^g w_j \bar{x}_{ij} - \sum_{j=g+1}^n w_j \bar{x}_{ij} \quad (2.4)$$

For multi-objective optimization, the result of normalization is the sum in terms of maximization (of beneficial attributes) and reduction in terms of minimization (of attributes that do not lead). Where g is the

number of attributes that will be maximized. y_i is the value of the alternative normalization assessment i to all criteria. The value of y_i can be positive or negative depending on the maximum amount (criteria of benefit or benefit) and minimum (criteria of disadvantage or cost) in the decision matrix. A feature that shows the final preference. Thus, the best alternative has the highest value of y_i , while the worst alternative has the lowest value of y_i

2.4 Flow chart

Understanding Flowchart (Flow Chart) According to Indra (2011: 22), Flowchart is a graphical depiction of the steps in the sequence and procedure of a program, usually influencing the resolution of problems that especially need to be studied and evaluated further. Flowcharts are divided into 5 types of flowcharts, including system flowchart, document flowchart, schematic flowchart, program flowchart, process flowchart, each type of flowchart will be explained below:

a. System Flowchart

System Flowchart can be defined as a chart that shows the overall work flow of the system. This chart explains the sequence of procedures that exist in the system. System flowchart shows what is done on the system.

b. Document Flowchart

A document flowchart or also called a form flowchart or paperwork flowchart is a flowchart showing the flow of reports and forms including copies.

c. Schematic Flowchart

Schematic flowchart (schematic flowchart) is a flowchart similar to a system flowchart, which is to describe the procedures in the system. the difference is, schematic flowchart in addition to using system flowchart symbols, also using computer drawings and other equipment used by users of these images is to facilitate communication to. People who do not understand the flow chart symbols. The use of these images is easy to understand, but difficult and long to draw.

3. Research Methods

3.1. Calculation of the Moora Method

a) **Employee Assessment Criteria**

Code	Criteria	Weight	Information	Score	Type
C1	Job Achievement	30%	Bad	1	Benefit
			Very good	2	
			Less	3	
			Enough	4	
			Good	5	
			Very good	6	
C2	Honesty of Employees	30%	Bad	1	Benefit
			Very good	2	
			Less	3	
			Enough	4	
			Good	5	
			Very good	6	
C3	Attitude	20%	Bad	1	Benefit
			Very good	2	
			Less	3	
			Enough	4	
			Good	5	
			Very good	6	
C4	Responsible	15%	Bad	1	Benefit
			Very good	2	
			Less	3	
			Enough	4	
			Good	5	
			Very good	6	
C5	Presence	5%	Bad	1	Cost
			Very good	2	
			Less	3	
			Enough	4	
			Good	5	
			Very good	6	



b) Employee Assessment Alternatives

Alternative	Employee name
A1	Henry Hermawan
A2	Dadang Nugroho
A3	Slamet Juniarto
A4	Sri Haryati
A5	Nunung Darwanti

c) Employee Rating Matrix

Alternative	Criteria				
	C1	C2	C3	C4	C5
	+	+	+	+	-
A1	5	6	5	6	5
A2	4	5	5	6	5
A3	6	5	5	4	6
A4	5	4	5	6	5
A5	6	5	5	6	5

$$X = \begin{bmatrix} 5 & 6 & 5 & 6 & 5 \\ 4 & 5 & 5 & 6 & 5 \\ 6 & 5 & 5 & 4 & 6 \\ 5 & 4 & 5 & 6 & 5 \\ 6 & 5 & 5 & 6 & 5 \end{bmatrix}$$

d) Normalization Result

Formula:

Normalisasi Matriks(1,1) - baris 1 kolom 1

$$x_{1,1}^* = \frac{x_{1,1}}{\sqrt{\frac{x_{1,1}^2 + x_{2,1}^2 + x_{3,1}^2 + x_{4,1}^2 + x_{5,1}^2 + x_{6,1}^2 + x_{7,1}^2 + x_{8,1}^2}{50}}}$$

$$x_{1,1}^* = \frac{50}{\sqrt{50^2 + 30^2 + 30^2 + 40^2 + 20^2 + 40^2 + 20^2 + 40^2}}$$

$$x_{1,1}^* = \frac{50}{\sqrt{9900}}$$

$$x_{1,1}^* = \frac{50}{99.498743710662}$$

$$x_{1,1}^* = 0.50251890762961$$

Normalisasi Matriks(2,1) - baris 2 kolom 1

$$x_{2,1}^* = \frac{x_{2,1}}{\sqrt{\frac{x_{1,1}^2 + x_{2,1}^2 + x_{3,1}^2 + x_{4,1}^2 + x_{5,1}^2 + x_{6,1}^2 + x_{7,1}^2 + x_{8,1}^2}{30}}}$$

$$x_{2,1}^* = \frac{30}{\sqrt{50^2 + 30^2 + 30^2 + 40^2 + 20^2 + 40^2 + 20^2 + 40^2}}$$

$$x_{2,1}^* = \frac{30}{\sqrt{9900}}$$

$$x_{2,1}^* = \frac{30}{99.498743710662}$$

$$x_{2,1}^* = 0.30151134457776$$

Alternative	Criteria				
	C1	C2	C3	C4	C5
	+	+	+	+	-
A1	0.4256	0.5324	0.4472	0.4472	0.4287
A2	0.3405	0.4436	0.4472	0.4472	0.4287
A3	0.5107	0.4436	0.4472	0.2981	0.5144
A4	0.4256	0.3549	0.4472	0.4472	0.4287
A5	0.5107	0.4436	0.4472	0.4472	0.4287

e) Weighted Normalization Matrix

Basic formula: $W_j = \text{weight} * C (C1, C2, C3, C4, C5)$

$$W_{j1,1} = 0.30 * 0.4256 = 0.1276$$

$$W_{j2,1} = 0.30 * 0.3405 = 0.1021$$

$$W_{j3,1} = 0.30 * 0.5107 = 0.1532$$

$$\begin{aligned}
 W_{j4,1} &= 0.30 * 0.4256 = 0.1276 \\
 W_{j5,1} &= 0.30 * 0.5107 = 0.1532 \\
 W_{j1,2} &= 0.30 * 0.5324 = 0.1597 \\
 W_{j2,2} &= 0.30 * 0.4436 = 0.1330 \\
 W_{j3,2} &= 0.30 * 0.4436 = 0.1330 \\
 W_{j4,2} &= 0.30 * 0.3549 = 0.1064 \\
 W_{j5,2} &= 0.30 * 0.4436 = 0.1330 \\
 W_{j1,3} &= 0.30 * 0.4472 = 0.1341 \\
 W_{j2,3} &= 0.30 * 0.4472 = 0.1341 \\
 W_{j3,3} &= 0.30 * 0.4472 = 0.1341 \\
 W_{j4,3} &= 0.30 * 0.4472 = 0.1341 \\
 W_{j5,3} &= 0.30 * 0.4472 = 0.1341 \\
 W_{j1,4} &= 0.05 * 0.4472 = 0.0223 \\
 W_{j2,4} &= 0.05 * 0.4472 = 0.0223 \\
 W_{j3,4} &= 0.05 * 0.2981 = 0.0149 \\
 W_{j4,4} &= 0.05 * 0.4472 = 0.0223 \\
 W_{j5,4} &= 0.05 * 0.4472 = 0.0223 \\
 W_{j1,5} &= 0.05 * 0.4287 = 0.0214 \\
 W_{j2,5} &= 0.05 * 0.4287 = 0.0214 \\
 W_{j3,5} &= 0.05 * 0.5144 = 0.0257 \\
 W_{j4,5} &= 0.05 * 0.4287 = 0.0214 \\
 W_{j5,5} &= 0.05 * 0.4287 = 0.0214
 \end{aligned}$$

$$W_j = \begin{bmatrix} 0,1276 & 0,1597 & 0,1341 & 0,0223 & 0,0214 \\ 0,1021 & 0,1330 & 0,1341 & 0,0223 & 0,0214 \\ 0,1532 & 0,1330 & 0,1341 & 0,0149 & 0,0257 \\ 0,1276 & 0,1064 & 0,1341 & 0,0223 & 0,0214 \\ 0,1532 & 0,1330 & 0,1341 & 0,0223 & 0,0214 \end{bmatrix}$$

Alternative	Maximum C1 + C2 + C3 + C4	C5 minimum	Yi = Max Min
A1	0.4437	0.0214	0.4223
A2	0.3915	0.0214	0.3701
A3	0.4352	0.0257	0.4095
A4	0.3904	0.0214	0.3690
A5	0.4426	0.0214	0.4212

f) **Ranking Results**

Alternative	Yi	Ranking
A1	0.4223	1
A2	0.3701	4
A3	0.4095	3
A4	0.3690	5
A5	0.4212	2

4. Results and Discussion

4.1. System planning

a) **Use Case Diagrams**

In the system design, a usecase diagram is made which is used as an illustration of the flow of processes and application features accessed by the admin.



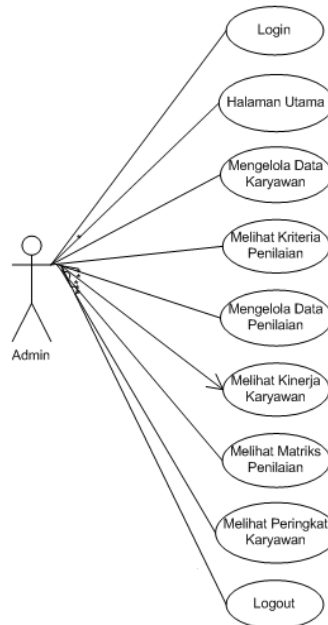


Fig 1. Usecase Diagram

The usecase diagram shows that the system only has one access, that is only an admin. Admin has all access to the application from login.

b) Activity Diagram

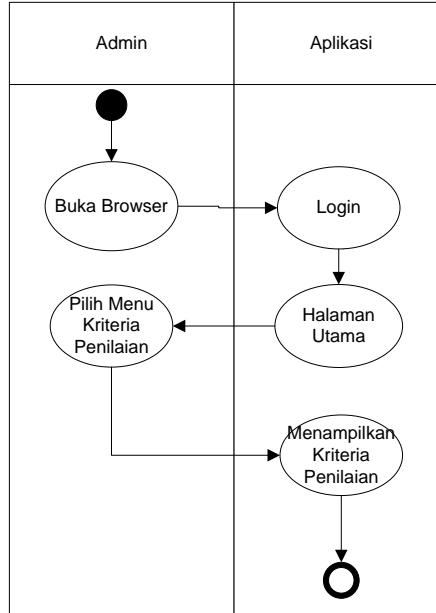


Fig 2. Activity Process Diagram Showing Assessment Criteria

From the activity diagram above, the admin selects the appraisal criteria menu and then employee inputs according to the criteria then the appraisal that appears is input.

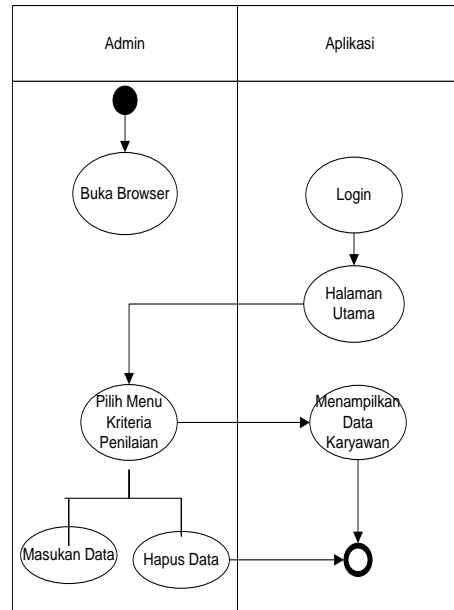


Fig 3. Activity Diagram Process Displays Employee Data

From the activity diagram above, the admin inputs employee data according to the appropriate criteria.

4.2 System Implementation

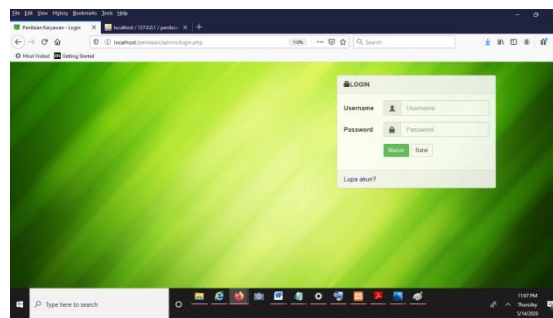


Fig 4. Login Menu

In the display above is the main menu display on the employee rating system

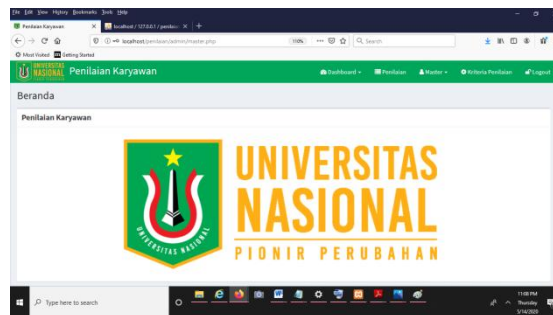


Fig 5. Admin page

Admin page is the page that appears after the admin enters the username and password.

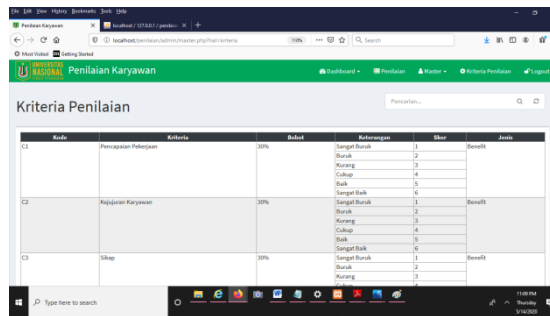


Fig 6. Criteria Menu

This criteria menu page contains information about the criteria and the number of 5 criteria and employees

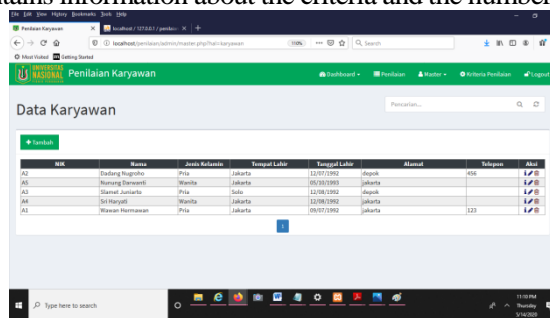


Fig 7. Employee Input Page

On the employee menu page is used to add or change employee data by clicking the add menu.

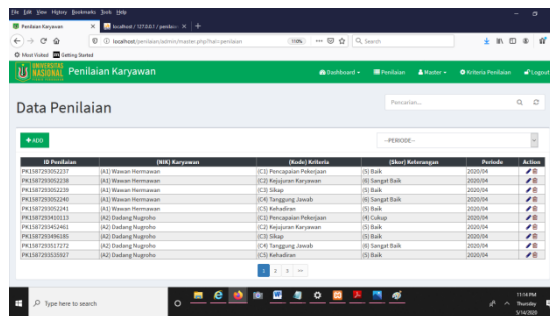


Fig 8. Page View Employee Data

The employee data view page is used to view employee data that has been inputted.

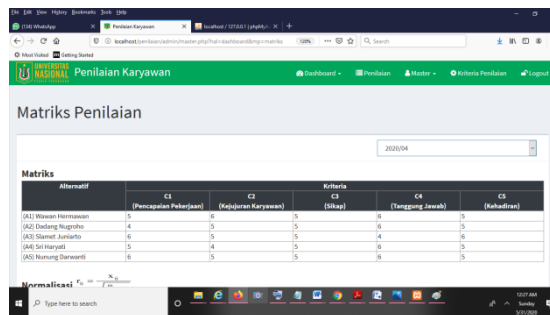


Fig 9. Monthly Assessment Page

The Ranking menu page is used to do monthly evaluations

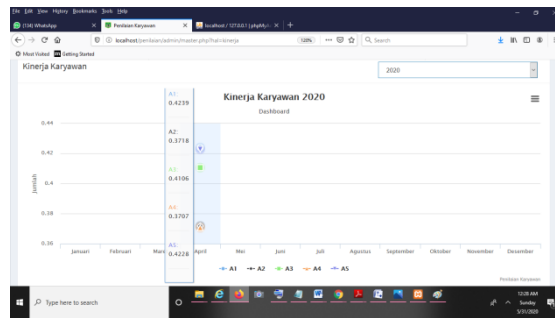


Fig 10. Yearly Assessment Page

The Ranking menu page is used to conduct annual assessments

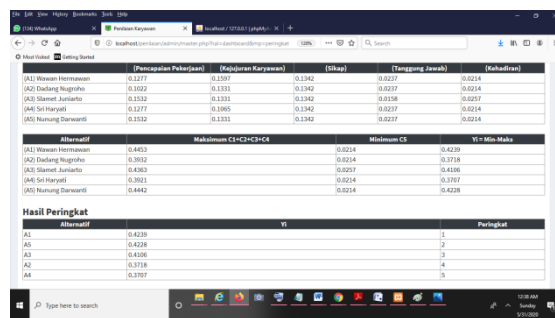


Fig 11. Ranking Menu Page

Peringkat menu page is used to view alternative results and calculation methods used.

5. Conclusion

Based on the results of research conducted, with the existence of a decision support system for employee appraisal at the National University, especially for Head of Study Program, it is easy to conduct employee assessments so that they are not manually. It can be seen that the Employee Assessment Decision Support System using the Multi Objective Optimization by Ratio Analysis (MOORA) method is quite easy to use as a way to determine employee assessments, because the settlement method is quite simple

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