Multi Objective Optimization In The Basic Of Ratio (Moora) In Supporting Decision Making In Measuring Employee Performance Level Case Study PT.Padi Saga Utama

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Abstract.
Staff Employees are the most important assets or human resources owned by a company. in evaluating the work achievement of a staff, the company's management makes a ranking of work results for each work of its staff PT. Padi Saga Utama. The benefit of this research is to assist decision making to measure the level of staff performance who achieves the highest to lowest targets at PT. Padi Saga Utama. The sources used for this research are data taken from the company PT. Padi Saga Utama. The staff data processed were as many as 20 permanent staff who have been registered at PT Padi Saga Utama. data processing using the Multi Objective Optimization on The Basic of Ratio (Moora) method. The results of testing the Morra method obtained that the highest alternative calculation table score is R3 (0.2144), staff with good performance is R3. Based on the results of research conducted, the application of the Multi Objective Optimization method on the Basic of Ratio (Moora) is quite easy to use as the process of measuring the performance level of lecturers.

Keywords: Decision Support System, MOORA Method, Weighting Criteria, Staff and Good Performance.

I.   INTRODUCTION

PT. Padi Saga Utama, which is located on Jl. Gatot Subroto KM. 4.5, the city of Medan previously had an information system that was made by a vendor whose job was to help PT. Padi Saga Utama in information systems. One of the uses of the information system is in the form of SPK or decision making in evaluating the performance level of all staff within the PT. Padi Saga Utama.In evaluating the performance of the staff of PT. Padi Saga Utama has not fully utilized the information system, the improvement in staff performance results is related to the welfare of the staff themselves. There are several variables of staff performance appraisal of PT. Padi Saga Utama which is related to improving the performance of staff employees. The way to improve the work results or work achievements of the staff is to provide additional rewards or incentives per certain period. Incentives can be interpreted as a bonus for them. The MOORA method can be used to determine laboratory assistants [1]. MOORA implementation in determining the best mango quality. fruit, the MOORA method can choose alternatives and perform rankings to determine the best manga quality based on predetermined characters [2].The Moora Decision Support System method can be used for Recruitment of Journalists. The results of research calculations with the highest score are graduation as an employee of PT. Beware Medan [3]. Decision support system for selecting the best student using the MOORA method, the system can be used as a tool to determine the winner in the process of selecting students with more achievements quickly and accurately [4].

The application of the MOORA method can be used in selecting chili seeds, the results of applying the MOORA method in selecting chili seeds are chili types of Lado (N1) with a score of (Oi (max) = 0.2080) as an initial recommendation, BM (N4) with a value of (Oi (max) = 0.2071) is in second position and indrapura (N7) with a value (Oi (max) = 0.1974) is in third position [5].Used the MOORA method to decide whether to accept assistance for poor students. Thus, decision making can be compared between the workings of the old system and decision support in determining BSM funds using the MOORA method and there is no need to request data from students who receive assistance from poor students. [6]. By using the MOORAa level method precision of calculating the value of the range between group UKT better than using the method of calculating seb before (because the range of each UKT is the same) [7].The MOORA method can be used to determine who is entitled to be a Jamkesmas participant based on criteria by using a formula whose results are more accurate and on target [8].

The MOORA method can help and facilitate analysis and determine each work program from 22 sub-districts throughout Deli Serdang in terms of P2KB & P3A bodies in Deli Serdang Regency [9].Decision Support System that applies the MOORA (Multi-Objective Optimization based on Ratio Analysis) method of calculation. This is done to help with the possibility that the Bidikmisi scholarship can be awarded to the right person. A weight is assigned to each criterion by MOORA, which includes age, parental income, number of dependents, priority of home and average secondary/vocational school report cards [10]. The MOORA method is used in this system because to determine what fruit is suitable for sale so that the fruit can be of good quality, of course, it will be judged by its quality. So many criteria affect the quality of good fruit, this is a problem that needs to be resolved with a support system through the criteria and weights used, namely color (25%), fruit condition (20%), fruit texture (15%), level of maturity (20%), durability (20%) [11].By building an SPK, it can speed up determining the best tourist attractions with the MOORA method. If the application of the MOORA method has been made, the determination in ranking calculations in computerized form is complete, it will be easier to record and be able to find out the ups and downs of the development and progress of these tourist attractions whether they are still feasible or not [12].

II.   METHODS

The data used in this analysis is the performance appraisal data for PT. Padi Saga Utama. The data collected and used is data that was recapitulated for the period January 2019 - December 2021. A Decision Support System (DSS) is a system that can provide problem solving, solve a problem in a specific and structured or unstructured way. SPK is designed so that it can be used and utilized easily by people who only have basic skills in operating computers. SPK is designed by implementing high competency adaptation so that it can be used as an alternative in deciding [14].Multi Objective Optimization on The Basic of Ratio Analysis (MOORA) method introduced [16]. This relatively new method is used by Brauers in a decision with many criteria [17]. The virtue of the MOORA method is very simple, stable, and sturdy, this method tends not to require an expert in mathematics to use it also requires simple mathematical calculations. Furthermore, this method also has more suitable results to assist in making decisions, compared to other methods, the MOORA method is very simple and easy to apply [15]. The stages in solving various kinds of problems using the MOORA method are [15]:

1. Forming the Matrix

$$X = \begin{bmatrix} Z_{11} & Z_{12} & ... & Z_{1r} \\ Z_{21} & Z_{22} & ... & Z_{2r} \\ ... & ... & ... & ... \\ Z_{y1} & Z_{y2} & ... & Z_{y0} \end{bmatrix} \text{........................ (1)}$$

Information:

Xov = Response substitution J on criterion I

I   = 1, 2, 3... r is the order of the criteria

Z   = Decision matrix where x is the criterion representing the matrix

2. Determine the normalization matrix

$$Z*_{vp} = \frac{R_g}{\sqrt{\sum_{i=1}^{m} T_y^2}} \quad (i=1,2,…,u)………..… (2)$$

Information:

Ty   = matrix representing J on I

I   = 1, 2, 3, …u is the order of the criteria

Z*vp = Alternative normalization matrix J on criterion I

3. Determination of the weighting normalization matrix. Used to optimize many objects, then normalization is done with the maximum value minus the minimum value. then the optimization becomes as follows:

$$R * g_i = \sum_{j=1}^{u} x_{ij} - \sum_{e=k+1}^{m} P_{il} …………..(3)$$

Information:

j   = 1,2,3 …. g is the attribute with the highest status

e   = k+1, k+2, k+3…., n is the attribute with the highest status

R*g = Max-min normalized matrix for alternative J

If the attribute count is multiplied by the weight, the result is as follows

$$R * g = \sum_{j=1}^{g} w_j \, x_{ij} \; - \; \sum_{j=g+1}^{n} w_j \, x_{ij} \quad (4)$$

Information

I   = 1,2,3, …. g is an attribute with the highest character

Wj   = weight on alternative j

R*g = Normalized assessment result of j of all attributes.

Results can be plus or minus depending on the highest and lowest results in the decision matrix. The result is in the form of a ranking. That way, the best value has the highest Y_i score. The minimum alternative value has the lowest Y_i value.In the Multi-Objective Optimization of Ratio method, the result of normalization is in the form of an addition in terms of the highest and a reduction in terms of minimization. Where the value of h is the attribute that will be prioritized. Y_i is the I alternative normalization value for all criteria.

III.   RESULT AND DISCUSSION

The data used in this study is the data from the performance assessment of the staff of PT. Padi Saga Utama. In this case the data taken is data collected in the period January 2019 - December 2021, the data is taken from the Head of Human Resources affairs.

Table 1. Rating Intervals

Value	Weight
A	5
B	4
C	3
D	2
E	1

In table 1, it can be explained that the value of A is converted to 1, B (4), C (3), D (2), and E (1). Then each assessment section has an assessment score which can be seen in table 2.

Table 2. Rating Weight

Criteria	Points
Work Target Assessment	10%
Work Quality	20%
Employee Performance	10%
Organizational Level	20%
Adaptability And Independence	10%
Communication Between Employees and Teamwork	10%
Knowledge About Work	10%
Ability To Organize Work and Self-Development	10%

In table number 2 it can be described about the assessment points which are an assessment of work targets by 10%, work quality by 20%, organizational level employee performance by 10%, adaptability and independence by 20%, communication between employees and teamwork by 10%, knowledge about work by 10%, ability to manage work and self-development by 10%, leadership and discipline by 10%. For the feasibility of the staff of PT. Padi Saga Utama receives a minimum bonus of 70% of the highest value in the final calculation.In this research the author uses the Multi Objective Optimization on The Basic of Ratio

System (MOORA) method. This method is used to obtain the performance appraisal results of staff who are entitled to a bonus.

The stages in MOORA can be seen in the following algorithm and followchart:
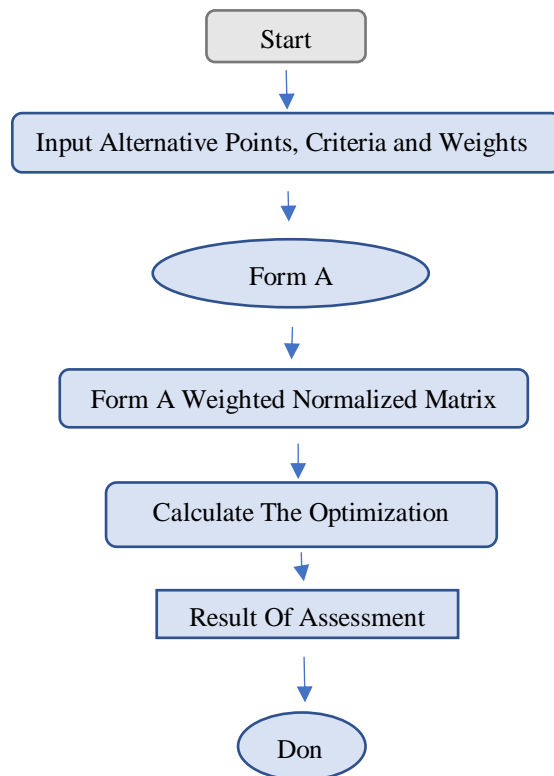
Start

Input Alternative Points, Criteria and Weights

Form A

Form A Weighted Normalized Matrix

Calculate The Optimization

Result Of Assessment

Don

Fig 1. MOORA Method Flowchart Process

3.1 Introducing Alternative Values, Criteria And Weights

At this stage of the process, what is done is to enter alternative values, criteria, and weights. To facilitate the calculation process, coding is carried out, which for each name of the criteria contained can be seen in Table 3 below

Table 3. Criteria Data

Criteria Code	Criteria name	Criteria type	Points
RG1	Work Target Assessment	+	10%
RG2	Work Quality	+	20%
RG3	Organizational Level Employee Performance	+	10%
RG4	Adaptability And Independence	+	15%
RG5	Communication Between Employees and Teamwork	+	10%
RG6	Knowledge About Work	+	15%
RG7	Ability To Organize Work and Self-Development	+	10%
RG8	Discipline Violations	-	10%

3.2 Creating The Matrix

At this stage all you must do is create a matrix. The matrix score used is based on the values that have been entered in the assessment data. Criteria values that use letters must be replaced with numeric values according to the data interval.

Table 4. Matrix Formation

Alternative	RG1 (+)	RG2 (+)	RG3 (+)	RG4 (+)	RG5 (+)	RG6 (+)	RG7 (+)	RG8 (-)
RR1	29	31	3	3	4	79	4	0
RR2	31	32	3	3	3	77	3	1
RR3	34	36	4	4	3	84	4	0
RR4	35	37	4	4	3	89	3	0
RR5	29	31	4	3	3	86	4	0
RR6	33	34	4	3	3	85	4	0
RR7	30	33	4	3	3	85	4	0

RR8	31	32	4	4	3	84	4	0
RR9	34	31	4	3	3	85	4	0
RR10	34	32	4	3	3	84	4	1
RR11	32	31	4	3	4	84	4	0
RR12	34	30	3	3	3	85	4	0
RR13	36	34	4	3	2	79	3	1
RR14	31	32	4	3	4	88	4	0
RR15	32	31	3	3	3	82	4	0
RR16	34	32	4	4	3	84	4	0
RR17	33	30	4	3	3	84	4	1
RR18	36	32	3	3	3	85	4	0
RR19	36	36	3	3	3	87	4	0
RR20	38	31	2	3	3	86	4	0

3.3 Create A Normalization Matrix

Based on the formula used, it can be explained that for the calculation of the RG1 criterion value in the first row of alternative RR1 which is worth "29", then it is calculated from the 29-value divided by all the RG1 values in the first row of the first column that have been squared. Then the value of RG1 29 is divided by the root of the total value of RG1, so that we get the first calculation result.

$$x_{RR1RG1} = \frac{29}{\sqrt{\begin{array}{c}[29^2 + 31^2 + 34^2 + 35^2 + 29^2 + 33^2 + 30^2 + 31^2 + 34^2 \\ + 34^2 + 32^2 + 34^2 + 36^2 + 31^2 + 32^2 + 34^2 + 33^2 \\ + 36^2 + 36^2 + 38^2]\end{array}}} \qquad x_{RR1RG1} = \frac{29}{\sqrt{[22.028]}} = 0,1953$$

then for the next row and column the same calculation is carried out

$$x_{RR2RG1} = \frac{31}{\sqrt{\begin{array}{c}[29^2 + 31^2 + 34^2 + 35^2 + 29^2 + 33^2 + 30^2 + 31^2 + 34^2 \\ + 34^2 + 32^2 + 34^2 + 36^2 + 31^2 + 32^2 + 34^2 + 33^2 \\ + 36^2 + 36^2 + 38^2]\end{array}}} \qquad x_{M2MT1} = \frac{32}{\sqrt{[22.028]}} = 0,2156$$

$$x_{RR3RG1} = \frac{34}{\sqrt{\begin{array}{c}[29^2 + 31^2 + 34^2 + 35^2 + 29^2 + 33^2 + 30^2 + 31^2 + 34^2 \\ + 34 + 32^2 + 34^2 + 36^2 + 31^2 + 32 + 34^2 + 33^2 \\ + 36 + 36^2 + 38^2]\end{array}}} \qquad x_{M2MT1} = \frac{34}{\sqrt{[22.028]}} = 0,2290$$

And so, on up to calculating the last row and column value RR20RG8.

3.4 Create A Weighted Normalization Matrix

After completing the calculation of all values in the normalization matrix, the next step is to multiply these values for each criterion by the percentage of each criterion. RG1 (Work Target Assessment) of 10%, RG2 (Quality of Work) of 20%, RG3 (Organizational level employee performance) of 10%, RG4 (Ability to adapt and independence) of 20%, RG5 (Communication between employees and teamwork) by 10%, RG6 (Knowledge about work) by 10%, RG7 (Ability to organize work and self-development) by 10%, and RG8 (Disciplinary Violations) by 10%. With the result like this:

RR1RG1 = 0,1953X0,10 = 0,0195
RR1RG2 = 0,2156X0,20 = 0,0431
RR1RG3 = 0,2290X0,10 = 0,0229
RR1RG4 = 0,2358X0,15 = 0,0353
RR1RG5 = 0,1953X0,10 = 0,0195
RR1RG6 = 0,2223X0,15 = 0,0333
RR1RG7 = 0,2021X0,10 = 0,0202

Arriving at the result, the weighted matrix values are:

RR20RG8 = 0.0000X0.10 = 0.0000

All weighted normalization matrix calculation values are entered and can be monitored in table 5.

Table 5. Normalization Matrix

Alternatif	RG1 (+)	RG2 (+)	RG3 (+)	RG4 (+)	RG5 (+)	RG6 (+)	RG7 (+)	RG8 (-)
RR1	0,0195	0.0427	0.0192	0.0317	0.0270	0.0314	0.0230	0.0000
RR2	0,0431	0.0440	0.0192	0.0317	0.0216	0.0306	0.0183	0.0400

RR3	0,0229	0.0494	0.0240	0.0396	0.0216	0.0334	0.0229	0.0000
RR4	0,0353	0.0507	0.0240	0.0396	0.0216	0.0334	0.0183	0.0000
RR5	0,0195	0.0427	0.0240	0.0317	0.0216	0.0354	0.0229	0.0000
RR6	0,0333	0.0467	0.0240	0.0317	0.0216	0.0342	0.0229	0.0000
RR7	0,0202	0.0453	0.0240	0.0317	0.0216	0.0338	0.0338	0.0000
RR8	0,0208	0.0440	0.0240	0.0396	0.0216	0.0338	0.0338	0.0000
RR9	0,0228	0.0427	0.0240	0.0317	0.0216	0.0338	0.0338	0.0000
RR10	0,0228	0.0440	0.0240	0.0317	0.0216	0.0334	0.0334	0.0400
RR11	0,0217	0.0427	0.0240	0.0317	0.0270	0.0034	0.0334	0.0000
RR12	0,0228	0.0413	0.0192	0.0317	0.0216	0.0338	0.0338	0.0000
RR13	0,0241	0.0467	0.0240	0.0317	0.0162	0.0314	0.0314	0.0400
RR14	0,0208	0.0440	0.0240	0.0317	0.0270	0.0350	0.0350	0.0000
RR15	0.0215	0.0427	0.0192	0.0317	0.0216	0.0326	0.0326	0.0000
RR16	0,0228	0.0440	0.0240	0.0396	0.0216	0.0334	0.0334	0.0000
RR17	0,0223	0.0413	0.0240	0.0317	0.0216	0.0334	0.0334	0.0400
RR18	0,0241	0.0440	0.0192	0.0317	0.0216	0.0338	0.0338	0.0000
RR19	0,0241	0.0494	0.0192	0.0317	0.0216	0.0346	0.0346	0.0000
RR20	0,0254	0.0427	0.0144	0.0317	0.0216	0.0342	0.0342	0.0000

3.5 Calculate Optimization Value

The optimization value is marked with the form yi. The yi score can be plus or minus based on the maximum (favorable) and minimum (unfavorable) numbers in the decision matrix. In this case, the decision on the eligibility of staff to receive incentives is determined from the result point yi. Where the yi point declared entitled to the incentive is the yi with a minimum of 70% of the highest yi value.

$yM1$ = (RG1+RG2+RG3+RG4+RG5+RG6+RG) - RG8

$\quad$ = (0.0195+0.0427+0.0192+0.0317+0.0270+0.0314+0.0230) - 0.0000

$yM2$ = (RG1+RG2+RG3+RG4+RG5+RG6+R7)-RG8

$\quad$ = (0.0431+0.0440+0.0192+0.0317+0.0216+0.0306+0.0183) – 0.04000

So, on up to

$yM20$ = ((RG1+RG2+RG3+RG4+RG5+RG6+G7) - RG8

$\quad$ = 0.0254+0.0427+0.0144+0.0317+0.0216+0.0342+0.0242) - 0.0000

The results of calculating the optimization value can be made a final table for the optimization value as follows.

Table 6. Optimization Results

Alternative	Prepentive Value	%	Recommendation
RR1	0.1945	97.05	Worthy
RR2	0.1685	84.08	Not feasible
RR3	0.2138	100.00	Worthy
RR4	0.2229	100.00	Worthy
RR5	0.1978	98.70	Worthy
RR6	0.2144	100.00	Worthy
RR7	0.2104	100.00	Worthy
RR8	0.2176	100.00	Worthy
RR9	0.2104	100.00	Worthy
RR10	0.1709	85.27	Worthy
RR11	0.1839	91.76	Worthy
RR12	0.2042	100.00	Worthy
RR13	0.1655	82.15	Not feasible
RR14	0.2175	100.00	Worthy
RR15	0.2019	100.00	Worthy
RR16	0.2188	100.00	Worthy
RR17	0.1677	83.68	Not feasible
RR18	0.2082	100.00	Worthy
RR19	0.2152	100.00	Worthy
RR20	0.2042	100.00	Worthy

The accuracy of the presentation of each sample is calculated by the following formula:

$$\text{Level of accuracy} = \frac{\text{Level of Accuracy}}{\text{Prepentive Average}} * 100 \qquad (1)$$

The next process of finding the pre-emptive average points is the result with the following formula:

$$Average\ percent = \frac{\text{Total Overall Preventive value}}{\text{Sample}} * 100 \qquad (2)$$

Based on the calculation results using the MOORA method, it produces the lowest yi point with a value of 0.1655 and the highest yi value with a value of 0.2229. Based on the lowest limit point, it is determined whether PT Padi Saga Utama staff are entitled to a bonus, which is at least 85% of the highest score, so 85% of 0.2229 is 0.1694. So, there are 3 (three) alternatives that get a score below 0.1694 and 17 (seventeen) alternatives that get a score above equal to 0.1685.

3.6 Staff Assessment Decision Results

After getting the results of the optimization points, the calculation of the optimization value is archived into the database so that it can be a reference value for staff recommendations who are judged to be entitled or not to get a bonus. Therefore, from the results of the optimization value obtained data on staff who are recommended to deserve a bonus and who are not entitled to a bonus.

Table 7. Recommendation Results

No	Alternative	Code	Final score	Recommendation
1	Alfina Adewati	RR1	97.05	Worthy
2	Ariyandi	RR2	84.08	Not feasible
3	Aulia Putera	RR3	100.00	Worthy
4	Cindy Chintya Aulia T	RR4	100.00	Worthy
5	Dedy Chandra Wardani	RR5	98.70	Worthy
6	Dian Citra Pratiwi	RR6	100.00	Worthy
7	Eldo Pradana Caniago	RR7	100.00	Worthy
8	Ellen Esteria Imansari B	RR8	100.00	Worthy
9	Elliana Angelina Sipayung	RR9	100.00	Worthy
10	Fariz Muhammad R	RR10	85.27	Worthy
11	Fatimah Khoirunnisa Nasution	RR11	91.76	Worthy
12	Ika Puspita	RR12	100.00	Worthy
13	M. Aqil Ramadhi Nasution	RR13	82.15	Not feasible
14	Nopita Purnamasari Turnip	RR14	100.00	Worthy
15	Patrick Putra Lumban Tobing	RR15	100.00	Worthy
16	Rahmat Wibowo	RR16	100.00	Worthy
17	Rizki Fauzan Sugiono	RR17	83.68	Not feasible
18	Sahrial	RR18	100.00	Worthy
19	Siska Mayasari	RR19	100.00	Worthy
20	Syafrizal Amanda Tambunan	RR20	100.00	Worthy

IV.   CONCLUSION

The MOORA method can be used in a decision support system to evaluate the performance of bonus recipient employees. From 20 employee staff data of PT. Padi Saga Utama resulted in 17 outstanding staff who were entitled to bonuses, and 3 staff with poor performance who were not entitled to incentives with codes (RR2), (RR13), and (RR17). the author also suggests that a decision support system using the MOORA method can also be used in determining the selection of prospective leaders in companies and in determining promotion.

V.   ACKNOWLEDGMENTS

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