KEY PERFORMANCE INDICATOR APPLICATION IN PERFORMANCE ASSESSMENT OF THE BEST EMPLOYEES WITH SIMPLE ADDITIVE WEIGHTING METHODS ON GENERAL AND HR DIVISION CASE STUDY: PERUM PERCETAKAN NEGARA RI

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Abstract

Management of human resources (HR) of a company greatly influences many aspects in determining the success of the company's work. One of the most important in the management of human resources (HR) in a company is the selection of the best employees periodically to encourage employee morale in increasing their dedication and performance. But in reality the PNRI Public Corporation is still not optimal in conducting the best employee selection, this is due to the unavailability of media that can process employee appraisals and provide recommendations in the selection of the best employees. This study aims to determine the best employee assessment and selection procedures at PNRI Public Corporation and to produce the best employee decision support system based on the needs of the PNRI Public Corporation. In determining the best employees in Perum PNRI, the system uses the Simple Additive Weighting (SAW) method. The criteria that have been used in the PNRI Public Office are attendance, work motivation, communication and collaboration, understanding and mastery of work, self-development, achievement of national work targets, rewards and sanctions. This system was developed with the PHP and MySQL programming languages. This information system can be used to process employee data from the incoming employee process, the employee appraisal process, the best employee selection process, to the process of creating employee value reports. The output in this system is the value of the best employee selection calculation with the SAW method and the best employee recommendations for PNRI Public Corporation and the assessment statistics display every quarter.

Keywords: *Decision Support System, Simple Additive Weighting (SAW), Best Employee Selection.*

Introduction

State Printing Company (Perum) of the Republic of Indonesia (PNRI) is one of the state-owned enterprises engaged in printing services. In an effort to realize a national standard company in the printing industry through the maximization of employee performance, for this reason the PNRI Public Corporation is trying to improve the overall aspects of the quality of human resources. One of the most important aspects in a company is in managing its human resources which greatly affects many determinants of work success. If Human Resources can be properly organized, it is hoped that the company can run all of its business processes properly.

Perum PNRI, especially in the division of Human Resources (HR) and General, conducts an employee performance appraisal system by setting employees who have the best performance at each end of the quarter as a form of appreciation for the employees. In assessing employee performance is still done manually, namely by filling out the assessment forms inputted by the administration of the HR and General Division. In the assessment manually, it certainly has a lot of shortcomings, especially in terms of subjectivity and the absence of performance measurement that has a very strong influence on the way of thinking, ways of thinking, behavior and work methods of employees within the company.

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In the performance appraisal system is a formal business carried out by the company to evaluate the results of activities that have been carried out by each division to be accountable by comparing actual results with the benchmarks set by the company.It is expected that by implementing this employee performance appraisal system, it is able to motivate all employees to be better and more passionate in achieving production targets and commitments in the company.

Literature Review

Simple Additive Weignting (SAW) method is often also known as the weighted addition method. The basic concept of this method is to find the weighted sum of performance ratings on each alternative on all attributes (Kusumadewi, 2006). This method requires the decision matrix normalization process (x) to a scale that can be compared with all available alternative ratings. In addition to the SAW method, several authors also used the Analytical Hierarchy Process method (Mujiastuti et al, 2017) and the fuzzy method (Meilina, 2015) to determine the KPI value. This method has several advantages including:

1. The assessment will be more appropriate based on the criteria and weight of the predetermined preferences.
2. Determine the criteria and weight values for each attribute, then proceed with the ranking process that will select the best employee performance alternatives from a number of alternative names of employees to be assessed.

The following are the steps for resolving decisions in calculations using the Simple Additive Weighting method:

1. Determine aspects of assessment that will be used as a reference in decision making, namely K_i: Assessment Aspects that will be used as a reference for assessment include:
   a) K1: Discipline
   b) K2: Work attitude
   c) K3: Potential and Capability
   d) K4: Work

2. Determine Value (X), alternative types (A_i) and value in the aspect of assessment (K_i), as an alternative example of the name of the employee to be assessed in decision making.

Table 1. Alternative Value Table

No	**Alternatif (A_i)**	**Kriteria(K_i)**			
		K1	**K2**	**K3**	**K4**
		30%	**40%**	**20%**	**10%**
1	Alternatif (A1)	X= A_1K_1	X= A_1K_2	X= A_1K_3	X=A_1K_4
2	Alternatif (A2)	X= A_2K_1	X= A_2K_2	X= A_2K_3	X=A_2K_4
3	Alternatif (A3)	X= A_3K_1	X= A_3K_2	X= A_3K_3	X=A_3K_4

3. Determine the weight of preferences or level of importance (W) of each criterion.

Tabel 2. Assessment Aspect Table

No	**Aspek Penilaian**	**Bobot %**
1	K1 = Disiplin	30%(W_1)

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2	K2 = Sikap Kerja	40%(W_2)
3	K3 = Potensi dan Kemampuan	20%(W_3)
4	K4 = Hasil Kerja	10%(W_4)
Total Skor Bobot		100%

4. The next stage of the alternative table above is obtained by the value of the decision matrix (X):

$$X = \begin{pmatrix} A1,K1 & A1,K2 & A1,K3 & A1,K4 \\ A2,K1 & A2,K2 & A2,K3 & A2,K4 \\ A3,K1 & A3,K2 & A3,K3 & A3,K4 \end{pmatrix}$$

5. Normalize the value of the X decision matrix by calculating the normalized performance rating (R_ij) value from the alternative (A_i), on the criterion (C_j), with the following formula for the 1st equation:

$$\mathbf{R_{ij}} = \frac{\mathbf{X_{ij}}}{\mathbf{Max(X_{ij})}}$$ Equation: 1

Information :

a) Rij is the result of the division value of each value in the criteria column with the highest value in each criterion column.

b) Xij is the value of each criterion column.

c) Max Xij is the highest value of each criterion column..

Alternative A1 :

$$R_{1,1}=\frac{X=A1,K1}{\text{Max } X(A1,K1;A2,K1;A3,K1)}$$

$$R_{1,2}=\frac{X=A1,K2}{\text{Max } X(A1,K2;A2,K2;A3,K2)}$$

$$R_{1,3}=\frac{X=A1,K3}{\text{Max } X(A1,K3;A2,K3;A3,K3)}$$

Alternative A2 :

$$R_{2,1}=\frac{X=A2,K1}{\text{Max } X(A1,K1;A2,K1;A3,K1)}$$

$$R_{2,2}=\frac{X=A2,K2}{\text{Max } X(A1,K2;A2,K2;A3,K2)}$$

$$R_{2,3}=\frac{X=A2,K3}{\text{Max } X(A1,K3;A2,K3;A3,K3)}$$

Alternative A3 :

$$R_{3,1}=\frac{X=A3,K1}{\text{Max } X(A1,K1;A2,K1;A3,K1)}$$

$$R_{3,2}=\frac{X=A3,K2}{\text{Max } X(A1,K2;A2,K2;A3,K2)}$$

$$R_{3,3}=\frac{X=A3,K3}{\text{Max } X(A1,K3;A2,K3;A3,K3)}$$

From the results of calculating the equation - 1 above, then obtained a normalized matrix value:

$$X = \begin{pmatrix} R_{1,1} & R_{1,2} & R_{1,3} & R_{1,4} \\ R_{2,1} & R_{2.2} & R_{2,3} & R_{2,4} \\ R_{3,1} & R_{3,2} & R_{3,3} & R_{3,4} \end{pmatrix}$$

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6. Preference (V_i) is obtained from the sum of the multiplication of the normalized matrix (R) row elements with the peeling weight (W) using the formula of the 2nd equation as follows:

$$\mathbf{V_i} = \sum_{\mathbf{j=1}}^{\mathbf{n}} \mathbf{W_j R_{ij}}$$ Equation 2

Information:
a) Vi is a ranking for every alternative employee name.
b) Wj is the weight value of each criteria.
c) Rij is the normalized performance rating value.

As seen below, results the normalized matrix value X in equation - 1 which is multiplied by the weight (W) in equation - 2, then obtained a formula as follows:

Alternative A1 : V= (($R_{1,1}W_1$)+ ($R_{1,2}W_2$)+ ($R_{1,3}W_3$)+ ($R_{1,4}W_4$))
Alternative A2 : V= (($R_{2,1}W_1$)+ ($R_{2,2}W_2$)+ ($R_{2,3}W_3$)+ ($R_{2,4}W_4$))
Alternative A3 : V= (($R_{3,1}W_1$)+ ($R_{3,2}W_2$)+ ($R_{3,3}W_3$)+ ($R_{3,4}W_4$))

The conclusion of the calculation results above will get the value of each alternative in the form of ranking with the highest value from other alternatives which will be arranged in the following table:

Table3. Normalization Table

No	**Alternatif(A_i)**	**Kriteria(K_i)**				**Total Nilai**
		K1	**K2**	**K3**	**K4**	
		30%	**40 %**	**20 %**	**10 %**	
1	Alternatif(A1)	$R_{1,1}$	$R_{1,2}$	$R_{1,3}$	$R_{1,4}$	V_1
2	Alternatif(A2)	$R_{2,1}$	$R_{2,2}$	$R_{2,3}$	$R_{2,4}$	V_2
3	Alternatif(A3)	$R_{3,1}$	$R_{3,2}$	$R_{3,3}$	$R_{3,4}$	V_3

System Design
Application of the Simple Addtive Weighting Method
The application of the Simple Additive Weighting method can be seen in the following calculation process:
1. Determine aspects of assessment that will be used as a reference in decision making.

Table 4. Assessment Aspect

No	**Aspek Penilaian**	**Kode Kriteria**
1	Disiplin	K1
2	Sikap Kerja	K2
3	Potensi dan Kemampuan	K3
4	Hasil Kerja	K4

1. 2. Determine alternative types, as an alternative example of the employee's name, who will be assessed in this decision making using 4 alternatives.

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Table 5. Employee's Alternative Values

No	Alternatif Karyawan	Kriteria			
		K1	K2	K3	K4
1	Arif	60	70	80	75
2	Eka	80	85	90	60
3	Hamid	75	65	75	70
4	Budi	65	75	65	80

2. Determine the weight of the assessment aspect or the level of importance (W) of each criterion is the company's right to determine the percentage of percent weight.

Table 6. Assesment Aspect Weighting

No	Kode Aspek Penilaian	Bobot (%)
1	K1	30% = 0,3
2	K2	40% = 0,4
3	K3	20% = 0,2
4	K4	10% = 0,1
Total Bobot		100% = 1

3. Next stage of the alternative data table is obtained by the decision matrix as follows:

$$\times = \begin{pmatrix} 60 & 70 & 80 & 75 \\ 80 & 85 & 90 & 60 \\ 75 & 65 & 75 & 70 \\ 65 & 75 & 65 & 80 \end{pmatrix}$$

4. Normalize the decision matrix X by calculating the normalized performance rating (R_ij) value of the alternative (A_i), on the criterion (C_j), with the following equation:

$$\mathbf{R_{ij}} = (\mathbf{X_{ij}} / \mathbf{Max}\,(\mathbf{X_{ij}})) \quad \text{Equation 3}$$

Information :

1) Rij is the result of the division value of each value in the row and column criteria with the highest value in each criterion column.
2) Xij is the value of each criterion column.
3) Max Xij is the highest value of each criterion column.How to find the value of the distribution of the highest value results for each alternative:

Arif : $r\,11 = \frac{60}{\text{Max}\,(60;80;75;65)} = 0.75$ $r\,12 = \frac{70}{\text{Max}(70;85;65;75)} = 0.82$ $r\,13 = \frac{80}{\text{Max}(80;90;75;65)} = 0.88$ $r\,14 = \frac{75}{\text{Max}(75;60;70;80)} = 0.93$	**Eka :** $r\,21 = \frac{80}{\text{Max}\,(60;80;75;65)} = 1$ $r\,21 = \frac{80}{\text{Max}\,(60;80;75;65)} = 1$ $r\,23 = \frac{90}{\text{Max}\,(80;90;75;65)} = 1$ $r\,24 = \frac{60}{\text{Max}(75;60;70;80)} = 0.75$
Hamid : $r\,31 = \frac{75}{\text{Max}\,(60;80;75;65)} = 0.93$	**Budi :** $r\,41 = \frac{65}{\text{Max}\,(60;80;75;65)} = 0.81$

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$r\,32 = \frac{65}{Max(70;85;65;75)} = 0.76$ $r\,33 = \frac{75}{Max(80;90;75;65)} = 0.83$ $r\,34 = \frac{70}{Max(75;60;70;80)} = 0.87$	$r\,42 = \frac{75}{Max(70;85;65;75)} = 0.88$ $r\,43 = \frac{65}{Max(80;90;75;65)} = 0.72$ $r\,44 = \frac{80}{Max(75;60;70;80)} = 1$

From the calculation of the equation above, a normalized matrix value is obtained:

$$\times = \begin{pmatrix} 0.75 & 0.82 & 0.88 & 0.93 \\ 1 & 1 & 1 & 0.75 \\ 0.93 & 0.76 & 0.83 & 0.87 \\ 0.81 & 0.88 & 0.72 & 1 \end{pmatrix}$$

5. The final result of the preference value (V_i) is obtained from the sum of the multiplication of the normalized matrix (R) row elements with the peeling weight (W) using the following formula:

$$\mathbf{V_i} = \sum_{\mathbf{j=1}}^{\mathbf{n}} \mathbf{W_j R_{ij}}$$ Equation 4

Information :

1) Vi is a ranking for each alternative employee name.
2) Wj is the weight value of each criterion.
3) 3) Rij is the normalized performance rating value.

Employee 1: (0.75 x 0.3) + (0.82 x 0.4) + (0.88 x 0.2) + (0.93 x 0.1) = 0.82

Employee 2: (1 x 0.3) + (1 x 0.4) + (1 x 0.2) + (0.75 x 0.1) = 0.97

Employee 3: (0.93 x 0.3) + (0.76 x 0.4) + (0.83 x 0.2) + (0.87 x 0.1) = 0.83

Employee 4: (0.81 x 0.3) + (0.88 x 0.4) + (0.72 x 0.2) + (1 x 0.1) = 0.83

From the final results obtained ranking process that is the sum of the normalized matrix multiplication results (R) with the weight so that the largest value selected as an alternative Employee Name 2 = 0.97 with the best performance value as the best solution from other alternatives.

Test Results

Here is an example of the calculation results by comparing the manual and computerized results. Below are the table results of manual calculations:

Table 7. Normalized Value Results

No	Nama	Nilai Ternormalisasi
1	Didik	3,30
2	Priagung	3,70
3	Dwi	3,30
4	Eka	3,30

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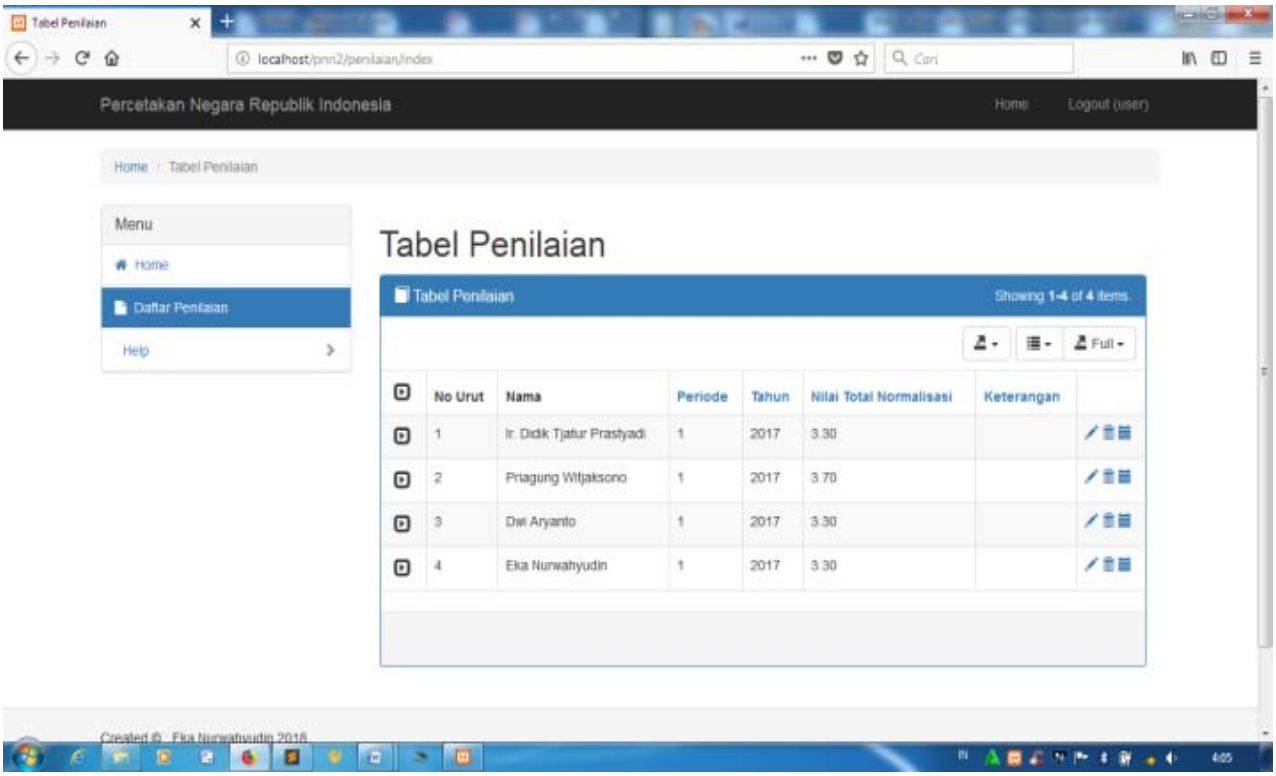
After an assessment with the KPI application, the following test is produced:



Picture. Display of Testing Results

Above is the result of testing from calculations using the KPI application. Below is a comparison table of the results of manual and system calculations.

Table 8. Comparison of Calculation Results

Rank	Nama Karyawan	Manual	Sistem
1	Didik	3,30	3,30
2	Priagung	3,70	3,70
3	Dwi	3,30	3,30
4	Eka	3,30	3,30

Conclusion

Service and presentation of information that is fast, precise and accurate is very important for the growth or development of an organization or agencies. In line with the development of science and technology that is the emergence of the application of the best employee performance appraisal using a computer is very helpful in getting information that is fast, precise and accurate.
Based on research, design and manufacture carried out by adhering to and analyzing employee performance appraisal systems can be summarized as follows:

1. Applications are made using simple additive weighting methods that have been computerized and no longer manually.

2. This application applies the simple additive weighting method as a support system in evaluating employee performance that makes it easier for companies to measure employee performance levels.
3. The ease of viewing the ranking results in this employee performance app can facilitate administrative staff in submitting the final report of assessment to company management.

References

Kusumadewi, S. et al. (2006). Fuzzy Multi-Attribute Decision Making (FUZZY MADM). Graha Ilmu. Yogyakarta

Mujiastuti, Rully; Meilina, Popy; Pramudiaji, Afridhhon Iwan. (2015). Penggunaan Metode AHP Dalam Menentukan Individual Development Plan Untuk Mengukur Kompetensi Teknis Kerja. Just IT Volume 7 no 2. Jakarta.

Meilina, Popy; Mujiastuti, Ruly; Setianingsih, Asih. (2015). Employee Adaptive Asessment Menggunakan Metode Fuzzy Sugeno Ordo Nol pada Penentuan Hasil Test Post. Prosiding Senatkom Vol 1 no 1. Padang.