



Design of DSS The Best Employee Performance Using Analytical Hierarchy Process UML Based

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Abstract– Employees are a highly needed human resource. In order to achieve the desired goals, the agency conducts the best performance appraisal of employees. The Analytical Hierarchy Process method is a method for determining criteria and choice alternatives, followed by calculating the eigenvector value and testing its consistency. The application of analytical hierarchical analysis of the best employee performance appraisal process, where the results of this assessment can encourage every employee to give the best performance to the agency. The best employee performance decisions are made at the ambalutu village hall office. There are several criteria for performance appraisal, namely communication skills, honesty, cooperation, and person. Analysis method analytical hierarchy process where each criterion will be assessed in pairs comparison with other criteria to get priority value. In this study the results of the ratio were 0.07, which means that the assessment was consistent because it was less than 0.1, so the percentage of communication values was 40%, honesty 34%, cooperation 17% and personal 10%.

Keywords: Performance Assessment; Process Analytical; Decision Support System

1. INTRODUCTION

Employee Performance Appraisal is a method used by an agency to reward performance in completing its duties and responsibilities [1]. Decision support systems aim to assist institutions in assessing the best employee performance [2] [3] [4] [5]. In the village hall office, employee assessment is still subjective and not yet relevant to the actual situation, resulting in unrealistic values [6]. Of course this causes the assessment process to be not optimal. For this reason, the researcher tries to find a solution to the problems that have occurred so far by designing a system for the best employee performance appraisal. There are 4 criteria for the best employee assessment, namely communication, honesty, cooperation, and interpersonal. The method applied that allows mathematical calculations with various criteria in this study is the Analytical Hierarchy Process (AHP). The result of this research is to design a decision support system application in making the best employee performance appraisal decision based on the web using the Analytical Hierarchy Process (AHP) method.

2. RESEARCH METHODOLOGY

2.1 Identification of problems

This stage defines the employee competency appraisal process, and formulates problems according to scope limits.

2.2 Research purposes

The purpose of this study is to manage employee performance appraisal data using the Analytical Hierarchy Process (AHP) method as a valid and efficient consideration in performance appraisal decisions at the village hall office in Ambalutu.

2.3 Study of literature

The literature used as a theoretical study in research that is in accordance with the problems related to employee performance appraisal, as well as determining the assessment criteria and weighting the per-criteria score.

2.4 Primary Data Collection

Suggest the criteria used as the assessment variable. Data collection is based on questionnaire data that has been filled in by respondents. Give weight to the value based on the respondent's data according to predetermined criteria.

3. RESULT AND DISCUSSION

Research data processing includes the per-criteria weighting and several alternatives using the Analytical Hierarchy Process (AHP) method [7] [8]. The best performance evaluation criteria have 4 criteria, namely communication, honesty, cooperation, personal. Each criterion is described in a hierarchy as follows:

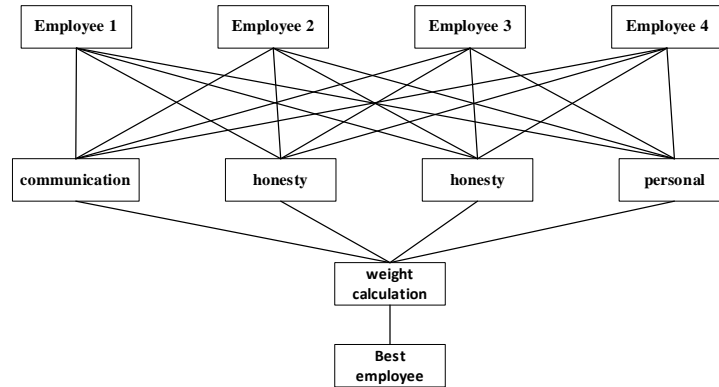


Figure 1. Analytical Hierarchy Proses (AHP) Method

Every employee has criteria, each criterion has a weighted value, so the best employee performance decisions can be made. Determining the weight of the criterion value, first the parameter of the weight of the value is determined. This parameter will be used as a reference for each weight value for each criterion [9] [10].

3.1 Calculation of Weighted Value for Criteria

Based on the results of the weighted value of the questionnaire submitted to the two respondents, data is obtained and will be simplified or the average weight value of the two respondents is sought in the following way:

$$\frac{X_1 \times X_2}{n} \tag{1}$$

Information:

- X_1 = The value of the correspondent weight is one
- X_2 = The value of the correspondent weight is two
- n = Number of criteria

3.2 Pairwise Comparison Weighting Calculation Between Criteria

The pairwise comparison weighting process is carried out by comparing the data input between the criteria using the AHP interest intensity scale in order to find out the consistency value of the Comparison Ratio (CR) with the CR terms smaller or equal to 0.1. As stated by Saaty, if $CR < 0.1$, the assessment process can be said to be consistent.

$$\text{Criteria} = \frac{\text{criteria column value}}{\text{sum the value of the criteria column}} \tag{2}$$

After obtaining the results of the comparison value for each column, the priority value can be determined by adding the values of each row divided by the number of elements or criteria available to get the average value. In this study, the number of elements or criteria is 4 (four):

$$\text{Priority} = \frac{X_1 + X_2 + X_3 + \dots + X_n}{n} \tag{3}$$

Information:

- X_1 = The value on the first line
- X_2 = Value on the second line
- X_n = The value in the nth row
- N = Number of criteria

3.3 Consistency Ratio Calculation

After obtaining the priority value, the next step to take is to calculate the Consistency Ratio (CR). The calculation of the Consistency Ratio (CR) is useful to find out whether the weighting is consistent or not. Because if the value of $CR > 0.1$, the pairwise comparison matrix must be revised. In this case the first thing to do is to calculate the Pricipal Eigen Value (λ max) of the matrix. Look at the following table:

Table 1. Assessment Pairwise Comparison Matrix

Criteria	Communication	Honesty	Cooperation	Personal	Priority Vektor	Persentase (%)
Communication	2,00	1,00	3,00	2,00	0,40	40%
Honesty	4,00	3,00	1,00	0,50	0,34	34%
Cooperation	0,33	0,50	2,00	1,00	0,17	17%

Criteria	Communication	Honesty	Cooperation	Personal	Priority Vektor	Percentase (%)
personal amount	0,25	0,33	1,00	0,50	0,10	10%
	8,88	8.41	7,00	5,00	1,01	

So, from the above matrix, the equation above can be obtained, to find the value of λ max, which is adding up the multiplication results between cells in the number row with the priority vector column:

$$\lambda \text{ maks} = (X_1 \times A_1) + (X_2 \times A_2) + (X_3 \times A_3) + (X_4 \times A_4)$$

Information:

X_1 = The sum of the first criterion values

A_1 = First Priority Vector Value

$$\lambda \text{ maks} = (8,88 \times 0,40) + (8,41 \times 0,34) + (7,00 \times 0,17) + (5,00 \times 0,10) = 8,101$$

looking for value *Consistency Index* (CI) with the following formula:

$$CI = \frac{\text{lamda maks} - n}{n - 1} \tag{4}$$

Information: CI = *Consistency Index*
N = Number Criteria

For results *Consistency Index* (CI) in calculating these criteria are as follows:

$$CI = \frac{8,101 - 4}{4 - 1} = 1,367$$

Then after obtaining the CI value, the next step is to find the CR value with the formula:

$$CR = \frac{CI}{IR} \tag{5}$$

Information :

CR = Value Rasio *Consistency*

CI = *Consistency Index*

IR = Score Index Rasio

So in this study the IR value for n = 4 is 0.90, so that:

$$CR = \frac{1.367}{0,90} = 1,52$$

3.4 System Design

Broadly speaking, the system process to be designed is described by UseCase DiagramOperator [8]. System design at the ambalutu village hall office in the best employee performance appraisal can be described as follows:

a. Use Case Diagram

This use case diagram describes an interaction between one or more actors and a system to be created. The use case that will be proposed in Figure 2 below:

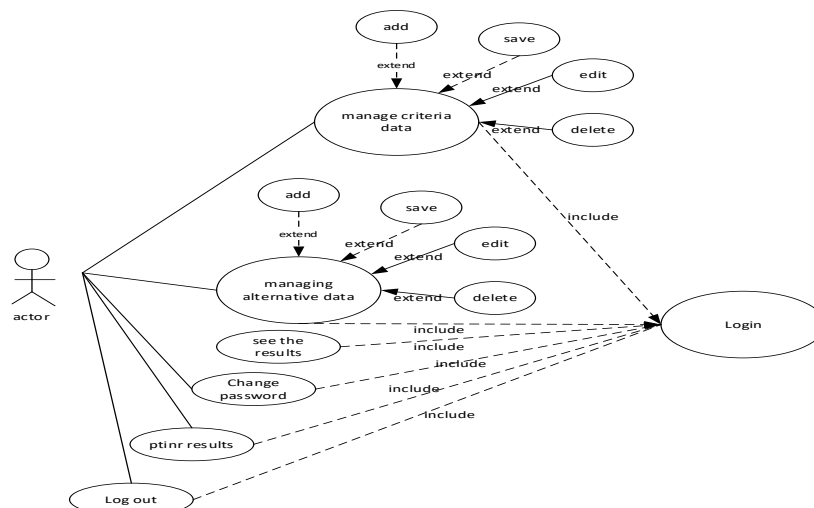


Figure 2. Use Case of Actor Operator

The following is a description of the use case diagram on the competency assessment system for employees of the Ambalutu Village Hall Office :

Table 2. Actor's Description

Actor	Description
Operator	The person in charge and has the right of access to input and data processing

Table 3. Use Case Description

Actor	Description
Login	Is a process for admin login in order to access or process data
Managing criteria data	It is a process of inputting or managing data criteria and alternatives that have been determined and includes 4 processes, namely, add, save, change, and delete.
Managing alternative data	It is a process of inputting values and calculations using the AHP method in assessing the soft skills of employees and includes 4 processes, namely, add, save, change, and delete.
See Results	Is a process to see the results of calculations that are already valid
Print Result	is the process of printing the actual results or reports from the calculations that have been inputted
Change Password	It is an operator process to change passwords to maintain system security
Logout	Is an action to make the process out of the system.

b. Class Diagram

Class diagrams are used to display classes in the system. The class diagram for the assessment of this employee is shown in Figure 3 below:

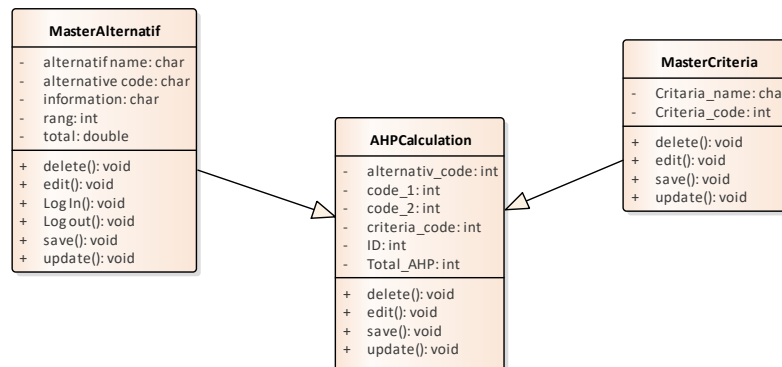


Figure 3. Class Diagram

c. Sequence Diagram

Sequence diagrams are used to sort the events or processes that occur in the performance appraisal system. Sequence diagrams processing the criteria values describe the system workflow when the user will input and process the criteria values. The following is a sequence diagram processing the proposed criteria values:

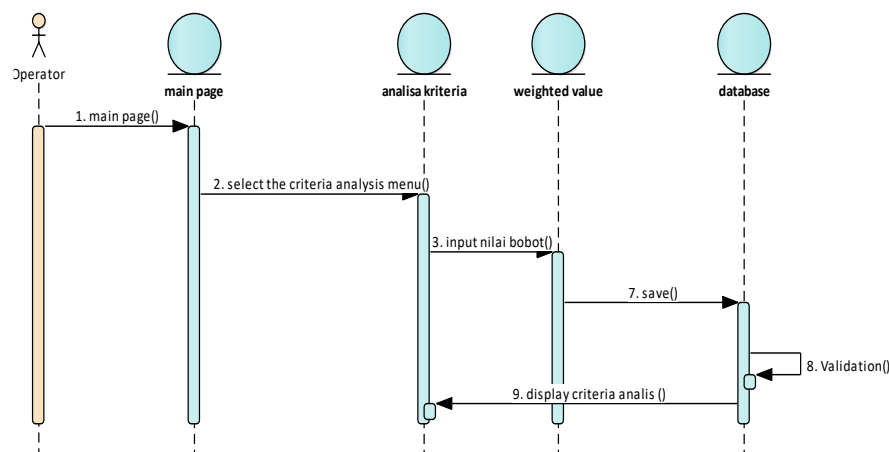


Figure 4. Processing the criteria value

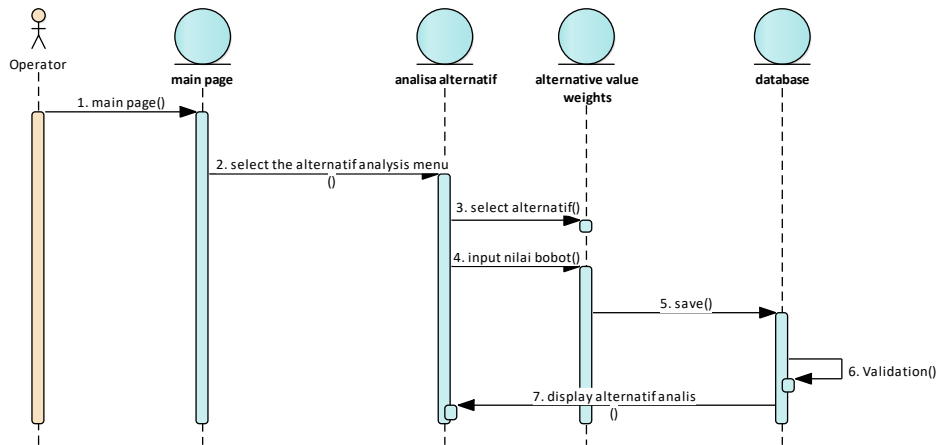


Figure 5. Sequence Diagram Processing Criteria Values

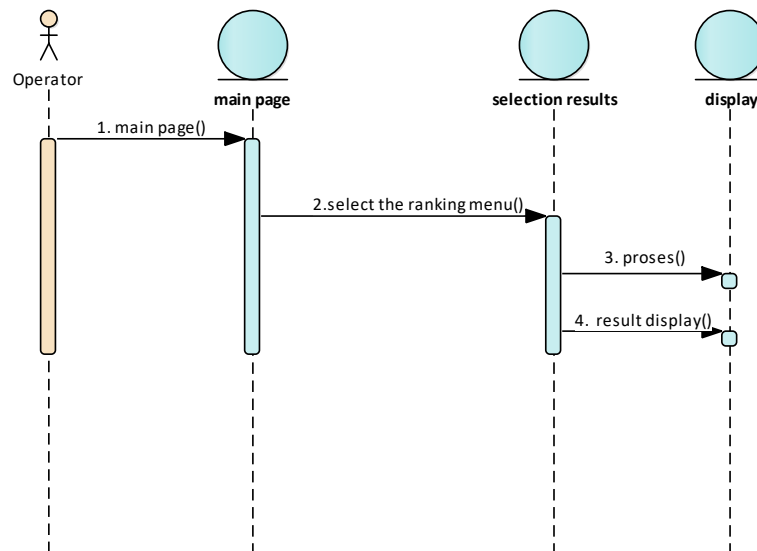


Figure 6. Sequence Diagram Result

d. Activity Diagram Operator

This operator activity diagram explains how the operator processes data and gives weight to the criteria and alternatives. In general, this activity diagram does not show details in each process, but only provides a global picture of how the process sequence is. The following is the Activity diagram of the operators shown in Figure 7 below:

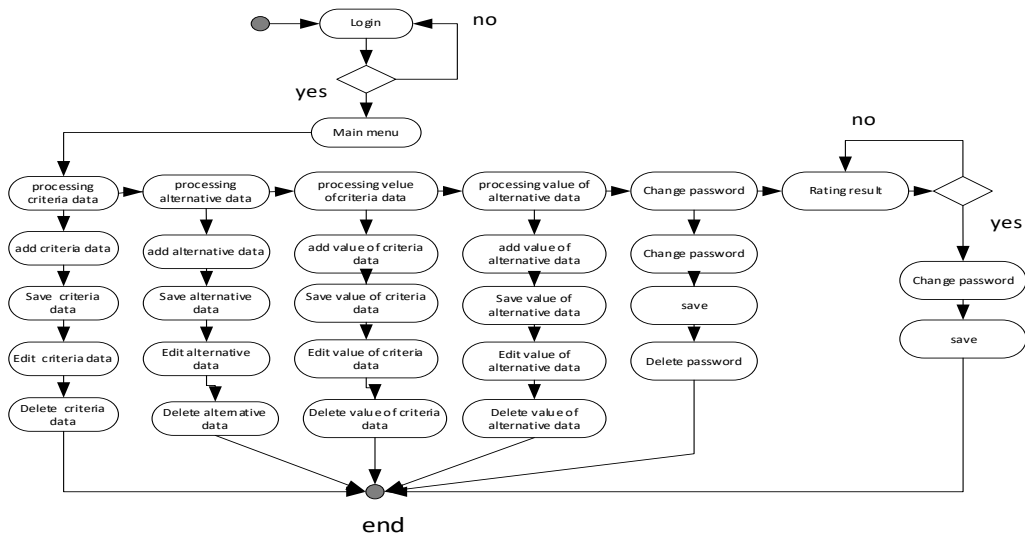


Figure 7. Activity Diagram Operator

The stages of data analysis that will be input and output in this study use primary data, so that the data that becomes input is the result and the weighted value of the questionnaire submitted to the respondent. Then the data is processed using the AHP method to get the highest value and alternatives. The data on employees who get the highest score compared to other employees are the best employees, because this alternative assessment has covered the entirety of several predetermined criteria as the basis for evaluating the best employees at the village hall office in Ambalutu.

3.5 Implementation Program

a. Employee alternative data form

In this form the operator can add new alternatives, modify, delete and print employee alternative data.

Kode	Nama Alternatif	Aksi
A01	Wwin Anggriani	[Yellow Bar] [Red Bar]
A02	Nopita Sari	[Yellow Bar] [Red Bar]
A03	Kiki Khodjiah	[Yellow Bar] [Red Bar]
A04	Andi Rahmansyah	[Yellow Bar] [Red Bar]
A05	Ade Irma	[Yellow Bar] [Red Bar]
A06	Zulkiswan	[Yellow Bar] [Red Bar]

Figure 8. Employee Alternative Data Menu Form

b. Calculation and Rank Result Form

The criteria priority weight matrix, after the comparison matrix is formed, the next step is to find the priority value. the results of priority values can be seen in Figure 9 :

	C01	C02	C03	C04	Bobot Prioritas
C01	0.4286	0.5581	0.3077	0.3	0.399
C02	0.2143	0.2791	0.4615	0.4	0.339
C03	0.2143	0.093	0.1538	0.2	0.165
C04	0.1429	0.0698	0.0769	0.1	0.097

Figure 9. Weighted Criteria Priority

Measuring the consistency of alternatives, assessments for alternatives based on existing criteria by making comparisons of alternatives as shown in Figure 10:

	A01	A02	A03	A04	A05	A06	A07	A08
A01	1	2	1	2	1	3	3	3
A02	0.5	1	1	3	2	3	3	3
A03	1	1	1	3	2	3	3	3
A04	0.5	0.333	0.333	1	1	3	2	2
A05	1	0.5	0.5	1	1	3	3	3
A06	0.333	0.333	0.333	0.333	0.333	1	2	3
A07	0.333	0.333	0.333	0.5	0.333	0.5	1	3
A08	0.333	0.333	0.333	0.5	0.333	0.333	0.333	1
Total kolom	5	5.833	4.833	11.333	8	16.833	17.333	21

Figure 10. Alternative Consistency Image

The final result calculation form for each employee is based on the criteria, after finding the weight of each criterion against the alternative, the next step is to find the eigenvalues of the criteria and alternatives. So that we get the total global priority as shown in Figure 11 :

Alternatif	C01	C02	C03	C04	Nilai	Rank
Vektor Eigen	0.399	0.339	0.165	0.097		
A01 - Wiwin Anggriani	0.193	0.195	0.218	0.196	0.198	
A02 - Nopita Sari	0.186	0.218	0.215	0.166	0.2	
A03 - Kiki Khodijah	0.198	0.159	0.163	0.206	0.18	
A04 - Andi Rahmansyah	0.104	0.132	0.114	0.103	0.115	
A05 - Ade Irma	0.137	0.108	0.102	0.118	0.12	
A06 - Zulkiswan	0.073	0.06	0.068	0.067	0.067	
A07 - Agus	0.064	0.06	0.057	0.065	0.062	
A08 - Dewi Safitri	0.046	0.067	0.063	0.078	0.059	

Figure 11. Eigenvalues of the Criteria and Alternatives

The results of this study can assist the Village Head in assessing the competence of employee performance quickly and efficiently with consistent assessment results. From several criteria selected as the basis for employee performance appraisal, the calculation results for 8 (eight) employees as an alternative are code A02 (Nopita Sari) with a value of 0.200, code A01 with a value of 0.198, code A03 with a value of 0.179, code A05 with a value 0.120, code A04 with a value of 0.115, code A06 with a value of 0.067, code A07 with a value of 0.062, and code A08 with a value of 0.059. The graph results can be seen in Figure 12:

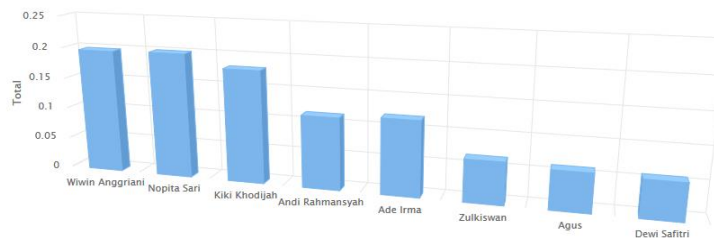


Figure 12. Image Ranking Graph

4. CONCLUSION

Based on the results of research and the assessment process carried out at the Office of the Village Hall of Ambalutu, Kec Buntu Pane regarding the performance appraisal of employees with 8 (eight) people as an alternative, several conclusions can be drawn, including: The criteria given by the researcher are very influential as the basis for evaluating the best performance of employees. This can be proven from the results of calculations carried out by researchers, namely communication criteria have a percentage of 40%, honesty criteria have a percentage of 34%, cooperation criteria have a percentage of 17%, and personal criteria have a percentage of 10%. The results of this study can assist the Village Head in assessing employee performance quickly and efficiently with consistent assessment results. From several criteria selected as the basis for the best employee performance appraisal, the calculation results for 8 (eight) employees as an alternative are code A02 (Nopita Sari) with a value of 0.200, code A01 with a value of 0.198, code A03 with a value of 0.179, code A05 with value 0.120, code A04 with a value of 0.115, code A06 with a value of 0.067, code A07 with a value of 0.062, and code A08 with a value of 0.059. The Analytical Hierarchy Process (AHP) method is a decision support system method that is suitable for the decision-making process in an assessment, either the best employee performance appraisal or other assessments. This method also makes it easy to assess with a lot of variables because the time spent in the assessment process is fast and efficient.

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