



# Application of the Analytical Hierarchy Process (AHP) Method in Determining the Best Employees

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### **Abstract:**

*Human resources are the most important part for the growth and development of a company. A company can develop well, of course, it is influenced by the quality of human resources, which in this case are employees who work in the company. Determination of the best employees is done not only by direct appointment by the leader or manager, but a company must conduct a performance assessment that has been carried out by its employees within a certain period of time, and of course there will be a reward for the success that has been achieved by its employees. The decision support system for determining the best employees is carried out using the Analytical Hierarchy Process (AHP) method to determine the weight of each criterion, to rank alternatives in the form of employee data. This research produces a decision support system that can recommend the best employees at PT. Medisafe Technologies based on the criteria that have been set by the AHP method.*

### **Keywords:**

*Analytical Hierarchy Process (AHP); best employee; PT. Medisafe Technologies*

## I. Introduction

Human resources are the most important part for the growth and development of a company. A company can develop well, of course, it is influenced by the quality of human resources, which in this case are employees who work in the company. Determination of the best employees is done not only by direct appointment by the leader or manager, but a company must conduct a performance assessment that has been carried out by its employees within a certain period of time, and of course there will be a reward for the success that has been achieved by its employees. This is intended to encourage every employee to always provide the best performance for the company in carrying out their duties and obligations in the company.

Employees are one of the most important assets owned by the company in its efforts to maintain survival, development, ability to compete and earn profits. Competition in the increasingly competitive business world has spurred companies to work harder in improving the quality of their companies. One of the efforts is to improve the quality of human resources because the quality of good human resources can increase the productivity and performance of a company. In order for the quality of the employees to be maintained and improved, the company needs to conduct an employee performance assessment in the form of determining the best employees. Determination of the best employees is an important aspect in performance management. Determination of the best employees will produce valid and useful information for employee administrative decisions such as promotions, training, transfers including the reward system and other decisions. The determination of the best employees currently running at the company under study is by way of representation due to limited time and the large number of employees, each department represents one employee to

participate in the determination of the best employees so that this method is not objective because it is not in accordance with employee data.

Human Resources (HR) is the most important component in a company or organization to run the business it does. Organization must have a goal to be achieved by the organizational members (Niati et al., 2021). Development is a change towards improvement. Changes towards improvement require the mobilization of all human resources and reason to realize what is aspired (Shah et al, 2020). The development of human resources is a process of changing the human resources who belong to an organization, from one situation to another, which is better to prepare a future responsibility in achieving organizational goals (Werdhiastutie et al, 2020).

Assessment of determining employee achievement in a company. So we need a decision support system using the AHP (Analytical Hierarchy process) method. AHP (Analytical Hierarchy Process) is a decision support system model developed by Thomas L. Saaty. The decision support system model will describe a complex multi-factor or multi-criteria problem into a hierarchy, the hierarchy is defined as a representation of a complex problem in a goal structure, which is followed by the level of factors, criteria, and so on down to the last level. Every employee wants to get the title as the best employee. Everyone wants the title. Especially if the company you work for is a national or even international company. Receiving awards for achievements for their hard work is a matter of pride. It is undeniable that many people work hard to pursue achievements. Because with the achievements will pave the way to develop his career.

## **II. Research Methods**

At this research stage, it will be explained one by one how the system of the whole research is made:

### **2.1 Analysis**

The analysis phase is carried out after collecting data obtained from literature studies and interviews regarding determining the best employees using the AHP method. The data obtained will be analyzed using the Analytical Hierarchy Process (AHP) method.

### **2.2 Design**

The design process is the system workflow process, the stages of working on the system and the stages of the system running well. At the design stage, the researcher describes the system's framework through a flowchart.

### **2.3 Testing**

The testing stage is needed to be a measure that the decision support system can be run according to the objectives, this test consists of black box testing and user acceptance test testing. This test is carried out in the following way:

#### **a. Black Box Test**

Black box testing is a test that aims to show software functions on how to operate, whether the data input (input) and data output (output) have been running as expected or not.

## **b. User Acceptance Test**

Test User acceptance test adalah pengujian akhir yang dilakukan oleh calon pengguna terhadap sistem yang akan diterapkan atau dipublikasikan nantinya. Pengujian ini diuji cobakan kepada pengguna. Apabila terjadi error atau tidak sesuai dengan tujuan yang akan dicapai maka dilakukan penganalisaan sistem kembali hingga tidak ditemukan adanya error, dan sesuai dengan tujuan yang akan dicapai.

## **2.4 Implementation**

The implementation phase is the implementation phase by using a program on a system. The system display or interface is made to make it easier for users to understand and operate the functions that exist in the system. This implementation stage is an amalgamation of each of the previous stages, so that the system built is ready for use, and has gone through the testing phase to avoid errors in the system. The testing process is carried out by conducting experiments and proving the features of the system that have been built whether they are in accordance with the needs or there are still shortcomings. So, this decision support system is ready to use.

# **III. Results and Discussion**

## **3.1 Analysis of the Analytical Hierarchy Process (AHP) method in determining the best employees**

The average value of the comparison was calculated using the Analytical Hierarchy Process (AHP) method to obtain the final weight of each criterion. In this case, the stages of performance appraisal using the AHP method can be shown. The steps taken are as follows :

### **1. Destination**

Determination of Prospective Employees for the best category is useful to help PT. Medisafe Technologies calculates the evaluation value of proposed Employees' portfolio files.

### **2. Criteria**

Criteria are attributes that support to decide on prospective employees according to the case being studied. The following are the criteria used in this study:

- a. QK = Work Quality
- b. KK = Working Quantity
- c. SK = Working Speed
- d. PB = Field Mastery
- e. DS = Discipline
- f. IS = Initiative
- g. LY = Loyalty

### **3. Alternative**

Alternative is the object of research that will be processed for the determination of a case. The alternatives used in this research are:

- a. Dedi = Employee 1
- b. Joshua = Employee 2
- c. Riki = Employee 3
- d. Eko = Employee 4

4. Determine the relative weight on each dimension

This stage is giving weight using the AHP (Analytic Hierarchy Process) model. According to Thomas L. Saaty, a quantitative scale of 1 to 9 to assess the comparative importance of an element with other elements can be seen in table 1 as follows :

**Table 1.** Table Penilaian Perbandingan Berpasangan

| Level of Interest | Definition  | Information   |
|-------------------|---|---|
| 1                 | Equally Important   | Both elements are equally important   |
| 3                 | A little more important   | One element is a little more important  |
| 5                 | More important  | One element is essential or very important (more important) than the other elements |
| 7                 | Very important  | One element is clearly more important than the other elements                       |
| 9                 | Absolute very important   | One element is absolutely more important than the other elements                    |
| 2, 4, 6, 8        | Middle value  | Values between two adjacent considerations  |
| opposite          | If activity i gets a number when compared to an activity j. Then j has the opposite value when compared to activity i |   |

### 3.2 Criteria Paired Comparison Matrix

AHP is done by using pairwise comparison. Decision making begins by loading a view of the entire decision network. For any pairwise comparison of matrices, the number 1 can be placed diagonally from the top left corner to the bottom right corner, because it means that the ratio of the same two things is 1.

**Table 2.** Paired Criteria Comparison Score

| Criteria | QK  | KK  | SK  | PB  | DS  | IS  | LY  |
|----------|-----|-----|-----|-----|-----|-----|-----|
| QK       | 1/1 | 3/1 | 5/1 | 7/1 | 3/1 | 7/1 | 7/1 |
| KK       | 1/3 | 1/1 | 3/1 | 5/1 | 1/1 | 5/1 | 5/1 |
| SK       | 1/5 | 1/3 | 1/1 | 3/1 | 1/3 | 3/1 | 3/1 |
| PB       | 1/7 | 1/5 | 1/3 | 1/1 | 1/5 | 1/1 | 1/1 |
| DS       | 1/3 | 1/1 | 3/1 | 5/1 | 1/1 | 5/1 | 5/1 |
| IS       | 1/7 | 1/5 | 1/3 | 1/1 | 1/5 | 1/1 | 1/1 |
| LY       | 1/7 | 1/5 | 1/3 | 1/1 | 1/5 | 1/1 | 1/1 |

The next process is to add each column. Addition uses 3 (three) digits behind the comma, this is useful for rounding calculations. The results can be seen in table 3

**Table 3.** Results of the Number of Columns for Each Criterion

| Criteria | QK    | KK    | SK    | PB | DS    | IS | LY |
|----------|-------|-------|-------|----|-------|----|----|
| QK       | 1     | 3     | 5     | 7  | 3     | 7  | 7  |
| KK       | 0.333 | 1     | 3     | 5  | 1     | 5  | 5  |
| SK       | 0.2   | 0.333 | 1     | 3  | 0.333 | 3  | 3  |
| PB       | 0.143 | 0.2   | 0.333 | 1  | 0.2   | 1  | 1  |
| DS       | 0.333 | 1     | 3     | 5  | 1     | 5  | 5  |
| IS       | 0.143 | 0.2   | 0.333 | 1  | 0.2   | 1  | 1  |

|               |              |              |           |           |              |           |           |
|---------------|--------------|--------------|-----------|-----------|--------------|-----------|-----------|
| LY            | 0.143        | 0.2          | 0.333     | 1         | 0.2          | 1         | 1         |
| <b>Amount</b> | <b>2.392</b> | <b>5.785</b> | <b>13</b> | <b>23</b> | <b>5.785</b> | <b>23</b> | <b>23</b> |

Table 3 explains that there is a column sum for each criterion. For example, the criteria for Quality of Work (QK):  $1 + 0.333 + 0.2 + 0.143 + 0.333 + 0.143 + 0.143 = 2.392$ . The next process is to add each row. Addition uses 3 (three) digits behind the comma, this is useful for rounding calculations. The results can be seen in table 4

**Table 4.** Results of the Number of Rows for Each Criterion

| Criteria | QK    | KK    | SK    | PB    | DS    | IS    | LY    | Amount |
|----------|-------|-------|-------|-------|-------|-------|-------|--------|
| QK       | 0.436 | 0.506 | 0.385 | 0.304 | 0.506 | 0.304 | 0.304 | 2.746  |
| KK       | 0.145 | 0.169 | 0.231 | 0.217 | 0.169 | 0.217 | 0.217 | 1.365  |
| SK       | 0.088 | 0.056 | 0.077 | 0.130 | 0.056 | 0.130 | 0.130 | 0.667  |
| PB       | 0.062 | 0.057 | 0.026 | 0.044 | 0.057 | 0.044 | 0.044 | 0.288  |
| DS       | 0.145 | 0.169 | 0.231 | 0.217 | 0.169 | 0.217 | 0.217 | 1.365  |
| IS       | 0.062 | 0.057 | 0.026 | 0.044 | 0.057 | 0.044 | 0.044 | 0.288  |
| LY       | 0.062 | 0.057 | 0.026 | 0.044 | 0.057 | 0.044 | 0.044 | 0.288  |

In the addition of rows, the value is divided against the results of the summation of the columns of each criterion. For example, the value of 0.436 is obtained from  $1/2.392$ , and so on. Next is the sum of the rows for each criterion. For example, the criteria for Quality of Work (QK):  $0.436 + 0.506 + 0.385 + 0.304 + 0.506 + 0.304 + 0.304 = 2.746$ . After the addition of rows is obtained, then the next step is to look for the eigenvector values. The eigenvector value is obtained from the sum of the rows divided by the number of criteria.

**Table 5.** EigenVector Values

| Criteria                | Number of Rows | Many Criteria | <i>Eigen Vector</i> |
|-------------------------|----------------|---------------|---------------------|
| <b>Work quality</b>     | 2.746          | 7             | 0.493               |
| <b>Working Quantity</b> | 1.365          | 7             | 0.193               |
| <b>Working Speed</b>    | 0.667          | 7             | 0.095               |
| <b>Field Mastery</b>    | 0.288          | 7             | 0.057               |
| <b>Discipline</b>       | 1.365          | 7             | 0.193               |
| <b>Initiative</b>       | 0.288          | 7             | 0.057               |
| <b>Loyalty</b>          | 0.288          | 7             | 0.057               |

Table 5 explains that the vector eigenvalues are obtained by the value of the number of rows divided by the number of criteria. For example on the criteria of Quality of Work (QK):  $2.746 / 7 = 0.493$ .

Comparison of criteria will be tested for absolute value by looking for the Consistency Ratio. If the Consistency Ratio value is less than 0.1, then the comparison criteria is correct and the eigenvector values can be used. If it is greater than 0.1 then a comparison of the criteria must be repeated.

Maximum eigenvalues:

$$\begin{aligned}
 &= (2.392 \cdot 0.493) + (5.785 \cdot 0.193) + (13 \cdot 0.095) + (23 \cdot 0.057) + (5.785 \cdot 0.193) \\
 &\quad (23 \cdot 0.057) + (23 \cdot 0.057) \\
 &= 0.8996 + 1.1569 + 1.2350 + 0.9430 + 1.1569 + 0.9430 + 0.9430 \\
 &= 7.2774
 \end{aligned}$$

Consistency Index Value :

$$CI = \frac{\lambda_{maks} - n}{n - 1}$$

$$= \frac{7.2774 - 7}{7 - 1} = \frac{0.2774}{6} = 0.0462$$

For n = 7, RI (random index) = 1,320 (saaty table), the consistency ratio (CR) value can be obtained as follows:

$$CR = \frac{CI}{RI} = \frac{0.0462}{1.320} = 0,035 < 0.100.$$

### 3.3 Alternative Comparison Matrix on Work Quality Criteria

**Table 6.** Comparison of Alternative Work Quality Criteria

| Work quality | Dedi | Joshua | Riki | Eko |
|--------------|------|--------|------|-----|
| Dedi         | 1/1  | 3/1    | 2/1  | 1/1 |
| Joshua       | 1/3  | 1/1    | 1/5  | 1/2 |
| Riki         | 1/2  | 5/1    | 1/1  | 3/1 |
| Eko          | 1/1  | 2/1    | 1/3  | 1/1 |

Table 6 shows the comparison between alternatives on the Quality of Work criteria. The determination of the value of the alternative comparison has been carried out, then the calculation of the number of columns and the number of rows is carried out. The method of calculation is as in the previous comparison of criteria. Then it will produce the eigenvector value:

**Table 7.** Eigen Vector Values

| Criteria   | Eigen Vector |
|------------|--------------|
| Dedi       | 0.355        |
| Joshua     | 0.078        |
| Riki       | 0.387        |
| Eko        | 0.243        |
| CR = 0.134 |              |

In table 7, the eigenvalues of the vectors are obtained from the number of rows divided by the number of alternatives. The number of alternatives n is 4. For example in Dedi: 1.374 / 4 = 0.355. CR value is obtained from Maximum eigenvalues:

$$= (2.833 \cdot 0.355) + (11 \cdot 0.078) + (3.533 \cdot 0.387) + (5.5 \cdot 0.243)$$

$$= 0.975 + 0.979 + 1.290 + 1.1165$$

$$= 4.3605$$

$$CI = \frac{\lambda_{maks} - n}{n - 1}$$

$$= \frac{4.3605 - 4}{4 - 1} = \frac{0.3605}{3} = 0.1202$$

For  $n = 4$ , RI (random index) = 0.9 (saaty table), the consistency ratio (CR) value can be obtained as follows:

$$CR = \frac{CI}{RI} = \frac{0.1202}{0.9} = 0,134$$

### 3.4 Alternative Comparison Matrix on Work Quantity Criteria

**Table 8.** Comparison of Alternative Work Quantity Criteria

| Working Quantity | Dedi | Joshua | Riki | Eko |
|------------------|------|--------|------|-----|
| Dedi             | 1/1  | 7/1    | 5/1  | 3/1 |
| Joshua           | 1/7  | 1/1    | 1/3  | 1/2 |
| Riki             | 1/5  | 3/1    | 1/1  | 5/1 |
| Eko              | 1/3  | 2/1    | 1/5  | 1/1 |

Table 8 shows the comparison between alternatives on the Quantity of Work criteria. The determination of the value of the alternative comparison has been carried out, then the calculation of the number of columns and the number of rows is carried out. The method of calculation is as in the previous comparison of criteria. Then it will produce the eigenvector value.

**Table 9.** Eigen Vector Values

| Criteria      | <i>Eigen Vector</i> |
|---------------|---------------------|
| <b>Dedi</b>   | 0.545               |
| <b>Joshua</b> | 0.067               |
| <b>Riki</b>   | 0.365               |
| <b>Eko</b>    | 0.121               |
| CR = 0.236    |                     |

In table 9, the eigenvalues of the vectors are obtained from the number of rows divided by the number of alternatives. The number of alternatives  $n$  is 4. For example in Dedi:  $2.216 / 4 = 0.545$ . CR value is obtained from Maximum eigenvalues:

$$\begin{aligned} &= (1.676 \cdot 0.545) + (13 \cdot 0.067) + (6.533 \cdot 0.365) + (9.5 \cdot 0.121) \\ &= 0.929 + 0.871 + 1.679 + 1.159 \\ &= 4.638 \end{aligned}$$

Consistency Index Value:

$$\begin{aligned} CI &= \frac{\lambda \text{ maks} - n}{n - 1} \\ &= \frac{4.638 - 4}{4 - 1} = \frac{0.638}{3} = 0.213 \end{aligned}$$

For  $n = 4$ , RI (random index) = 0.9 (saaty table), the consistency ratio (CR) value can be obtained as follows:

$$CR = \frac{CI}{RI} = \frac{0.213}{0.9} = 0,236$$

### 3.5 Alternative Comparison Matrix on Working Speed Criteria

**Table 10.** Comparison of Alternative Work Speed Criteria

| <b>Working Speed</b> | Dedi | Joshua | Riki | Eko |
|----------------------|------|--------|------|-----|
| Dedi                 | 1/1  | 1/3    | 1/2  | 1/4 |
| Joshua               | 3/1  | 1/1    | 1/2  | 1/2 |
| Riki                 | 2/1  | 2/1    | 1/1  | 1/5 |
| Eko                  | 4/1  | 2/1    | 5/1  | 1/1 |

Table 10 shows the comparison between alternatives on the Speed of Work criteria. The determination of the value of the alternative comparison has been carried out, then the calculation of the number of columns and the number of rows is carried out. The method of calculation is as in the previous comparison of criteria. Then it will produce the eigenvector value.

**Table 11.** Eigen Vector Values

| <b>Criteria</b> | <i>Eigen Vector</i> |
|-----------------|---------------------|
| <b>Dedi</b>     | 0.092               |
| <b>Joshua</b>   | 0.234               |
| <b>Riki</b>     | 0.297               |
| <b>Eko</b>      | 0.521               |
| CR = 0.148      |                     |

In table 11 the eigenvector values obtained are obtained from the number of rows divided by the number of alternatives. The number of alternatives n is 4. For example in Dedi:  $0.36 / 4 = 0.09$ . CR value can be obtained from:

Maximum eigenvalues:

$$\begin{aligned}
 &= (10 \cdot 0.09) + (5.333 \cdot 0.234) + (7 \cdot 0.297) + (1.95 \cdot 0.5) \\
 &= 0.9 + 1.088 + 1.435 + 0.975 \\
 &= 4.398
 \end{aligned}$$

Consistency Index Value:

$$\begin{aligned}
 CI &= \frac{\lambda \text{ maks} - n}{n - 1} \\
 &= \frac{4.398 - 4}{4 - 1} = \frac{0.398}{3} = 0.133
 \end{aligned}$$

For n = 4, RI (random index) = 0.9 (saaty table), the consistency ratio (CR) value can be obtained as follows :

$$CR = \frac{CI}{RI} = \frac{0.133}{0.9} = 0.148$$

### 3.6 Alternative Comparison Matrix of Field Mastery Criteria

**Table 12.** Comparison of Alternative Criteria for Field Mastery

| <b>Field Mastery</b> | Dedi | Joshua | Riki | Eko |
|----------------------|------|--------|------|-----|
| Dedi                 | 1/1  | 1/1    | 1/4  | 1/3 |

|        |     |     |     |     |
|--------|-----|-----|-----|-----|
| Joshua | 1/1 | 1/1 | 1/3 | 1/2 |
| Riki   | 4/1 | 3/1 | 1/1 | 2/1 |
| Eko    | 3/1 | 2/1 | 1/2 | 1/1 |

Table 12 shows the comparison between alternatives on the Field Mastery criteria. The determination of the value of the alternative comparison has been carried out, then the calculation of the number of columns and the number of rows is carried out. The method of calculation is as in the previous comparison of criteria. Then it will produce an eigenvector value.

**Table 13.** EigenVector Values

| Criteria      | <i>Eigen Vector</i> |
|---------------|---------------------|
| <b>Dedi</b>   | 0.135               |
| <b>Joshua</b> | 0.135               |
| <b>Riki</b>   | 0.474               |
| <b>Eko</b>    | 0.285               |
| CR = 0.017    |                     |

In table 13 the eigenvector values obtained are obtained from the number of rows divided by the number of alternatives. The number of alternatives n is 4. For example in Dedi:  $0.46 / 4 = 0.135$ . CR value can be obtained from:

Maximum eigenvalues:

$$\begin{aligned}
 &= (9 \cdot 0.135) + (7 \cdot 0.135) + (2.083 \cdot 0.474) + (3.833 \cdot 0.285) \\
 &= 1.035 + 0.952 + 0.977 + 1.073 \\
 &= 4.0373
 \end{aligned}$$

Consistency Index Value:

$$\begin{aligned}
 CI &= \frac{\lambda \text{ maks} - n}{n - 1} \\
 &= \frac{4.0373 - 4}{4 - 1} = \frac{0.0373}{3} = 0.0124
 \end{aligned}$$

For  $n = 4$ , RI (random index) = 0.9 (saaty table), the consistency ratio (CR) value can be obtained as follows:

$$CR = \frac{CI}{RI} = \frac{0.0124}{0.9} = 0,013$$

### 3.7 Discipline Criteria Alternative Comparison Matrix

**Table 14.** Comparison of Alternative Discipline Criteria

| Discipline | Dedi | Joshua | Riki | Eko |
|------------|------|--------|------|-----|
| Dedi       | 1/1  | 1/3    | 1/2  | 1/4 |
| Joshua     | 3/1  | 1/1    | 2/1  | 4/1 |
| Riki       | 2/1  | 1/2    | 1/1  | 1/5 |
| Eko        | 4/1  | 1/4    | 5/1  | 1/1 |

Table 14 shows the comparison between alternatives on the Discipline criteria. The determination of the value of the alternative comparison has been carried out, then the calculation of the number of columns and the number of rows is carried out. The method of calculation is as in the previous comparison of criteria. Then it will produce the eigenvector value.

**Table 15.** Eigen Vector Values

| Criteria      | <i>Eigen Vector</i> |
|---------------|---------------------|
| <b>Dedi</b>   | 0.094               |
| <b>Joshua</b> | 0.437               |
| <b>Riki</b>   | 0.149               |
| <b>Eko</b>    | 0.323               |
| CR = 0.313    |                     |

In table 15 the eigenvector values obtained are obtained from the number of rows divided by the number of alternatives. The number of alternatives n is 4. For example in Dedi:  $0.364 / 4 = 0.094$ . CR value can be obtained from:

Maximum eigenvalues:

$$\begin{aligned}
 &= (10 \cdot 0.094) + (2.083 \cdot 0.437) + (8.5 \cdot 0.149) + (5.45 \cdot 0.323) \\
 &= 0.91 + 0.9103 + 1.2665 + 1.7604 \\
 &= 4.8472
 \end{aligned}$$

Consistency Index Value:

$$\begin{aligned}
 CI &= \frac{\lambda_{\text{maks}} - n}{n - 1} \\
 &= \frac{4.8472 - 4}{4 - 1} = \frac{0.8472}{3} = 0.2824
 \end{aligned}$$

For  $n = 4$ , RI (random index) = 0.9 (saaty table), the consistency ratio (CR) value can be obtained as follows:

$$CR = \frac{CI}{RI} = \frac{0.2824}{0.9} = 0.313$$

### 3.8 Alternative Comparison Matrix of Initiative Criteria

**Table 16.** Comparison of Alternative Criteria Initiative

| Inisiatif | Dedi | Joshua | Riki | Eko |
|-----------|------|--------|------|-----|
| Dedi      | 1/1  | 1/1    | 1/1  | 1/1 |
| Joshua    | 1/1  | 1/1    | 1/3  | 1/1 |
| Riki      | 1/1  | 3/1    | 1/1  | 1/1 |
| Eko       | 1/1  | 1/1    | 1/1  | 1/1 |

Table 16 shows the comparison between alternatives on the Initiative criteria. The determination of the value of the alternative comparison has been carried out, then the calculation of the number of columns and the number of rows is carried out. The method of

calculation is as in the previous comparison of criteria. Then it will produce the eigenvector value

**Table 17.** EigenVector Values

| Criteria   | Eigen Vector |
|------------|--------------|
| Dedi       | 0.264        |
| Joshua     | 0.194        |
| Riki       | 0.253        |
| Eko        | 0.264        |
| CR = 0.063 |              |

In table 17 the eigenvector values obtained are obtained from the number of rows divided by the number of alternatives. The number of alternatives n is 4. For example in Dedi:  $0.968 / 4 = 0.264$ . CR value can be obtained from:

Maximum eigenvalues:

$$\begin{aligned}
 &= (4 \cdot 0.264) + (6 \cdot 0.194) + (3.333 \cdot 0.253) + (4 \cdot 0.264) \\
 &= 0.968 + 1.152 + 1.083 + 0.968 \\
 &= 4.171
 \end{aligned}$$

Consistency Index Value:

$$\begin{aligned}
 CI &= \frac{\lambda_{\text{maks}} - n}{n - 1} \\
 &= \frac{4.171 - 4}{4 - 1} = \frac{0.171}{3} = 0.057
 \end{aligned}$$

For n = 4, RI (random index) = 0.9 (saaty table), the consistency ratio (CR) value can be obtained as follows:

$$CR = \frac{CI}{RI} = \frac{0.057}{0.9} = 0,063$$

### 3.9 Loyalty Criteria Alternative Comparison Matrix

**Table 18.** Perbandingan Alternatif Kriteria Loyalitas

| Loyalty | Dedi | Joshua | Riki | Eko |
|---------|------|--------|------|-----|
| Dedi    | 1/1  | 1/5    | 1/1  | 1/7 |
| Joshua  | 5/1  | 1/1    | 1/2  | 1/5 |
| Riki    | 1/1  | 2/1    | 1/1  | 1/3 |
| Eko     | 7/1  | 5/1    | 3/1  | 1/1 |

Table 18 shows the comparison between alternatives on Loyalty criteria. The determination of the value of the alternative comparison has been carried out, then the calculation of the number of columns and the number of rows is carried out. The method of calculation is as in the previous comparison of criteria. Then it will produce the eigenvector value.

**Table 19.** EigenVector Values

| Criteria   | <i>Eigen Vector</i> |
|------------|---------------------|
| Dedi       | 0.094               |
| Joshua     | 0.178               |
| Riki       | 0.183               |
| Eko        | 0.587               |
| CR = 0.217 |                     |

In table 19 the eigenvector values obtained are obtained from the number of rows divided by the number of alternatives. The number of alternatives n is 4. For example in Dedi:  $0.364 / 4 = 0.094$ . CR value can be obtained from Maximum eigenvalues:

$$\begin{aligned}
 &= (14 \times 0.094) + (8.2 \times 0.178) + (5.5 \times 0.183) + (1.676 \times 0.587) \\
 &= 1.274 + 1.4104 + 0.957 + 0.944 \\
 &= 4.5854
 \end{aligned}$$

Consistency Index Value:

$$\begin{aligned}
 CI &= \frac{\lambda_{\text{maks}} - n}{n - 1} \\
 &= \frac{4.5854 - 4}{4 - 1} = \frac{0.5854}{3} = 0.1931
 \end{aligned}$$

For n = 4, RI (random index) = 0.9 (saaty table), the consistency ratio (CR) value can be obtained as follows:

$$CR = \frac{CI}{RI} = \frac{0.1931}{0.9} = 0,217$$

### 3.10 Results of the Analytical Hierarchy Process (AHP) Method

**Table 20.** Table of Values for Each Criterion

| Alternative | Criteria |       |       |       |       |       |       |
|-------------|----------|-------|-------|-------|-------|-------|-------|
|             | QK       | KK    | SK    | PB    | DS    | IS    | LY    |
| Dedi        | 0.355    | 0.545 | 0.09  | 0.135 | 0.094 | 0.264 | 0.094 |
| Joshua      | 0.078    | 0.067 | 0.234 | 0.135 | 0.437 | 0.194 | 0.178 |
| Riki        | 0.387    | 0.365 | 0.297 | 0.474 | 0.149 | 0.253 | 0.183 |
| Eko         | 0.243    | 0.121 | 0.521 | 0.285 | 0.323 | 0.264 | 0.587 |

With the eigenvalues of the criteria vector is

**Table 21.** Criteria Weight

| Criteria         | <i>Eigen Vector</i> |
|------------------|---------------------|
| Work quality     | 0.493               |
| Working Quantity | 0.193               |
| Speed            | 0.095               |
| Field Mastery    | 0.057               |
| Discipline       | 0.193               |

|           |       |
|-----------|-------|
| Inisiatif | 0.057 |
| Loyalty   | 0.057 |

Then the results of the ranking of the four alternatives are

**Table 22.** Ranking

| Alternative | Results | Ranking |
|-------------|---------|---------|
| Dedi        | 0.289   | 1       |
| Joshua      | 0.285   | 2       |
| Riki        | 0.259   | 3       |
| Eko         | 0.173   | 4       |

Table 22 shows the results of the matrix multiplication of the value against the weight of the criteria. For example in Dedi's alternative:  $(0.355 \times 0.493) + (0.545 \times 0.193) + (0.09 \times 0.095) + (0.135 \times 0.057) + (0.094 \times 0.193) + (0.264 \times 0.057) + (0.094 \times 0.057) = 0.289$ . so from the final result of the matrix multiplication, it can be seen the criteria for Dedi with a value of 0.289 or 29%, Joshua with a value of 0.28 or 28%, Eko with a value of 0.173 or 17%, and Riki with a value of 0.259 or 26%. The results of the analysis stated that the alternatives for employees in the best category were: Dedi (First Rank), Joshua (Second Rank), Riki (Third Rank) and Eko (Fourth Rank).

#### IV. Conclusion

After going through the testing stage on the Decision Support System (SPK) for selecting the best employees, it can be concluded that.

- 1) The SPK for selecting the best employees using the Analytical Hierarchy Process (AHP) method has been successfully built to produce a more objective decision in the form of a ranking list of the best employees
- 2) This SPK can handle if there are changes / additions to criteria and sub-criteria data because they are dynamic
- 3) The system provides the best Employee recommendation solution to the user according to the criteria and weights determined at the beginning before the calculation.

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