

The Best Employee Decision Support System Using the Analytical Hierarchy Process Method at PT ASDP Indonesia Ferry (Persero)

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Abstract

Selecting the best employees aims to spur employee morale by improving performance and dedication. The selection of the best employees is selected based on company criteria. PT ASDP Indonesia Ferry (PERSERO) The best employee criteria applied by the company are Work Quantity, Work Quality, Attendance, Teamwork, and Initiative. Employee assessment is carried out every month by the assessment team (Vice President (VP) and Manager). The problem faced is determining the best employees with criteria and alternatives that are calculated manually. This system is a Decision Support System (DSS) built using the Analytical Hierarchy Process (AHP) method. Previously, the evaluation process for selecting the best employees had never been done. Some of the problems encountered were the absence of an employee performance appraisal process, there was no appropriate selection method, and a Decision Support System (DSS) was not available that could make it easier to assess the selection of the best employees.

Keywords: Best employees, Decision Support System, Analytical Hierarchy Process (AHP)

Abstrak

Pemilihan karyawan terbaik bertujuan untuk memacu semangat kerja karyawan dalam meningkatkan kinerja karyawan dan dedikasi di perusahaan tersebut. Pemilihan karyawan terbaik dipilih berdasarkan kriteria perusahaan adalah Kuantitas Kerja, Kualitas Kerja, Kehadiran, Kerjasama Tim, Inisiatif. Penilaian karyawan dilakukan pada setiap bulan oleh tim penilai yaitu Vice President (VP) dan Manager. Masalah yang dihadapi adalah bagaimana menentukan karyawan terbaik dengan kriteria dan alternatif yang dihitung secara manual. Sistem ini merupakan Sistem Pendukung Keputusan (SPK) yang dibangun dengan menggunakan metode Analitycal Hierarchi Process (AHP). Dimana sebelumnya proses evaluasi pemilihan karyawan terbaik belum pernah dilakukan. Beberapa permasalahan yang ditemui adalah tidak adanya proses penilaian kinerja karyawan, belum ada metode pemilihan yang tepat, dan belum tersedia Sistem Pendukung Keputusan (SPK) yang dapat mempermudah dalam menilai pemilihan karyawan terbaik.

Kata kunci: Karyawan Terbaik, Sistem Pendukung Keputusan (SPK), Analytical Hierarchi Process (AHP)

INTRODUCTION

The presence of valuable human resources will likely be a significant supporting component in an organization's progress. With quality human resources, a company can do its job, proliferate, and become famous. For this reason, it is essential to supervise human resources in a company by

determining the best employees to increase employee determination in further developing their implementation, commitments, and tasks so that they become better and develop.

To trigger employee performance, a company can choose the best workers every year by giving awards, prizes, and job promotions to selected workers. According to Mondy and Noe,

employee performance appraisal includes behavior or attitudes, skills, discipline, attendance, knowledge, and goal achievement. For this situation, the author provides a new normalization or criteria for selecting the best employees: quantity of work, quality of work, teamwork, attendance, and initiative. Inappropriate dynamics will cause the selected workers not to match the actual reality, while the better-weighted workers are sometimes not selected.

An agency needs to conduct an employee performance assessment to determine the success or non-success in carrying out its duties (Saefudin & Wahyuningsih, 2017). The determination of who becomes The Best Telesales has gone through various stages of the process from within the Telesales Team respectively and passed the assessment stage from the Management based on specific criteria set by (Septiani et al., 2019). The application created can be used by decision-makers while still based on a more effective decision support system in selecting the best customer (Taufik Kurnialensya & Rohmad Abidin, 2020).

Decision Support System using Analytical Hierarchy Process (AHP) is a decision-making method for prioritizing various alternatives (Nur Ajny, 2020). Based on the system, not based on someone's choice with the system, will help the company determine the best manager so that it does not take sides with one of the parties and make the wrong choice (Aisyah & Putra, 2022). To help related parties more effectively select the communities in need and those affected so that they are right on target as expected by all communities in Sundawenang Village by accurate and relevant data (Sembiring et al., 2020).

The concept of a decision support system can be applied as a tool to determine the ideal internet service provider as a wireless network in the home environment. One method that is relevant and has a calculation of consistency values in determining the priority level of criteria is the Analytical Hierarchy Process (AHP) method (M. I. H. Saputra & Nugraha, 2020). It is hoped that by using one of the methods in the decision support system, the calculation process by determining the predetermined criteria can provide output in the form of recommendations from the head of the PPA Kanit using the Sumarno1 Weight Product method (Sumarno & Harahap, 2020). Decision Support System (SPK) is a system aimed at supporting decision management and a computer-based system capable of solving unstructured problems. AHP is the most widely used method in solving multicriteria problems (R. H. Saputra et al., 2019). A decision support system (SPK) is an electoral

system commonly used to determine choices according to predetermined criteria and alternatives (Fatullah et al., 2022).

The decision-making of a problem, be it a simple or complex problem, requires thorough and accurate information, the ability to analyze and process information and the correct solution method (Djamain, 2015). The decision support system (SPK) is a system that can provide alternative solutions to these problems. The decision support system is currently developing with various methods, including the AHP (Analytical Hierarchy Process) method helping to make decisions (Hartanto & Prasetyowati, 2012). The AHP method is a method used to assess actions that are associated with a comparison of the weight of importance between factors as well as a comparison of several alternative options. This method will provide weighting results of each choice according to many established criteria, namely price, location, and type. The choice with the most significant weight is a choice that is a recommendation to be chosen by consumers (Ardiyanto et al., 2013).

Employee performance appraisals carried out by companies are generally only for assessing work performance, namely how work can be done well, achieve the targets set and achieve the desired end goal (hard skills). Assessments related to employees' soft skills have not been carried out much. Companies apply several criteria in conducting soft skill competency assessments, but the criteria still vary (Umar et al., 2018).

Employee performance appraisal is essential to support the smooth running of the business. Selection of the best employees will increase the motivation of employee performance. Decision Support System (SPK) can make assessing the selection of the best employees easier, so an SPK application is needed to assess the best employee selection. The methods that can be used are the AHP method, the AHP Method produces alternative priorities and the weight of criteria in determining the best employees objectively based on the criteria given by the store owner as a decision maker who will provide bonus rewards for the best employees, the goal is to motivate employees in improving their performance (Fu'adi & Diana, 2022).

PT ASDP Indonesia Ferry (Persero) It is one of the state-owned enterprises in Indonesia that participates in the operation of ferry transportation services and administration of the ferry port for passengers, vehicles, and merchandise. The primary capability of this company is to provide public transportation permits between adjoining regions and unite the

big islands while simultaneously providing public transportation access to areas that do not yet have crossings to accelerate development (pioneer crossings). To develop employee performance, you have to choose the best workers so that they can compete with each other to be on top.

Some companies give grants to the best workers with the best capacities among different workers. Therefore, the researcher wants to create a framework that recognizes the best PT ASDP Indonesia Ferry (PERSERO) workers who will be awarded later. This is expected to increase the spirit of representatives in their work, especially in providing the best assistance to consumers. The framework that will be built is a decision support network, or DSS, using the Analytical Hierarchy Process (AHP) method. One of the techniques in decision support is the Analytical Hierarchy Process (AHP) technique, which is a strategy to determine the demand for work needs.

Several studies on decision support systems (DSS) developed using the Analytical Hierarchy Process (AHP) method include applying the AHP and SAW methods for determining employee promotions. The criteria for selecting decision-making tools are skill, teamwork, discipline, and loyalty. Judging from each focus above, the importance of choosing a network that supports decisions in choosing the best talent for workers at PT. ASDP INDONESIA FERRY (PERSERO) and its impact can further develop employee performance and morale and influence organizations and associations. This affects the efficiency and improvement of workers.

However, it is difficult for the higher-ups to decide just like that. Several considerations need further consideration before selecting the best worker. Whether it's a non-complex problem or a complex problem, concluding a problem requires accurate and precise data so that it can have much insight that is suitable to be the primary concern. With the advancement of information technology innovation, including equipment and programming, different effects have been traced on various aspects of human life. One of them is the emergence of a dynamic model called decision-making. The Decision Support System (DSS) can dash effectively and successfully. The data that is monitored by the system must provide accurate, fast, coordinated and precise data through computerized data processing. On this basis, the researcher sets the title.

RESEARCH METHODS

This research will be implemented in the Analytical Hierarchy Process (AHP) method as the Best Employee Decision Support System at PT ASDP Indonesia Ferry (PERSERO).

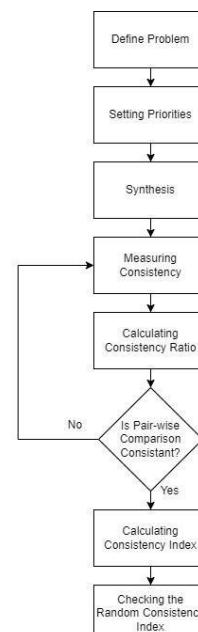


Figure 1. Flowchart AHP

Procedure or steps in the AHP method (Tonni et al., 2020):

1. Defining problems, determining solutions, and compiling a hierarchy of problems encountered.

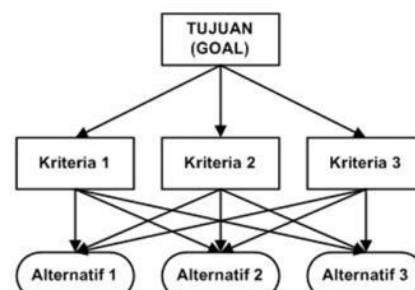


Figure 2 Problem Definition Example

2. Determine the priority by creating a pairwise comparison matrix and representing the relative importance of the elements.

Table 1 Criteria Comparison Format

	Kriteria 1	Kriteria 2	Kriteria 3	Kriteria 4
Kriteria 1	K11	K12	K13	K1n
Kriteria 2	K21	K22	K23	K2n
Kriteria 3	K31	K32	K33	K3n
Kriteria 4	Kn1	Kn2	Kn3	Knn

and tenure. After the user enters the weight value and presses the process button, the system will calculate it using the Analytical Hierarchy Process (AHP) method. The system will display the alternative with the highest value that dominates the other values.

Analytical Hierarchy Process (AHP)

I compared data between criteria and alternatives in a paired matrix using the AHP importance intensity scale. This process is carried out to determine the value of the consistency ratio comparison (also known as the consistency ratio or CR). The consistency requirement must be less than 10% or $CR < 0.1$.

Before comparing paired matrices between criteria and alternatives, determine the intensity of interest for each criterion and alternative. Determining the intensity of importance of each criterion and alternative is to avoid $CR > 0.1$ or inconsistency. The weakness of a manager when inputting comparison values between criteria into a paired matrix is that the input comparison values are often inconsistent.

Therefore, the intensity of the importance of each criterion and alternative is determined—the value of the intensity of interest given by the manager of PT. ASDP Indonesia Ferry (PERSERO) for each criterion and alternative is in the range of values from 1 to 9. The range of values from 1 to 9 is related to the comparison value developed by Saaty.

Hierarchical Structure Representation

After input (criteria data and alternatives), the representation is carried out in a hierarchical structure. The problems that must be formulated in building a hierarchical structure are identifying goals (goals), criteria, and alternatives (employees) that are assessed. The hierarchical structure of the best employee problem formulation can be seen in the image below.

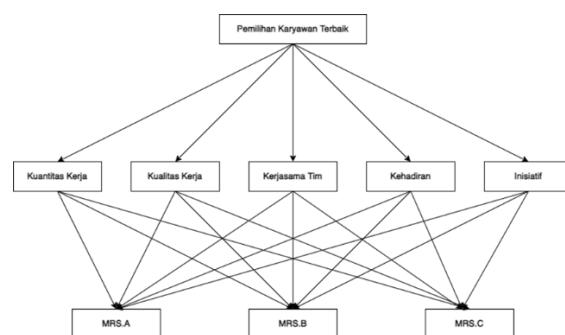


Figure 3 A Hierarchical Structure For Selecting The Best Employees

Identification of goals becomes the most critical decision in a case. The goal to be achieved in this thesis is the selection of the best employees. Identifying the best employee selection criteria can be initialized with the symbol K. The best employee criteria are summarized in Table 4 below.

Table 4 Criteria For Selecting The Best Employees

No.	Criteria Initials	Criteria Name
1	K1	Working Quantity
2	K2	Work Quality
3	K3	Teamwork
4	K4	Presence
5	K5	initiative

The alternative identification stage is to identify the employee as the object of assessment who is chosen to be the best employee. This thesis research takes an alternative sample of three employees, as shown in Table 5 below.

Table 5 Best Employee Candidate

No.	Alternative	Alternatif Name
1.	A1	Diah
2.	A2	Ayu
3.	A3	Viona

Comparison of Criteria in the Analytical Hierarchy Process (AHP) Method

This method has weights and several criteria needed to determine the best employees. The specified criteria are Working quantity, Quality of work, Teamwork, Presence, and Initiative. The above criteria are initialized with the symbol K, as seen in Table 4. From each of these criteria, the weight of each criterion will be determined to determine the intensity of interest in each criterion. The function of determining the intensity of importance of each criterion is to avoid $CR > 0.1$ or inconsistency.

The value of the intensity of interest given by the manager or lead team project member for each criterion ranges from 1 to 9. The range of values from 1 to 9 relates to the comparison value developed by Saaty.

Based on the assessment obtained from the questionnaire that we submitted to the project manager or lead team member regarding the weighting of the intensity of interest of each criterion or comparison of criteria, it can be seen in Table 6 below.

Table 6 Assessment Obtained From The Questionnaire

No.	Comparison of Criteria	Value
1.	Working Quantity	Quality of work ✓ 5
2.	Working Quantity	Teamwork ✓ 9
3.	Work Quantity	Presence ✓ 3
4.	Work Quantity	Initiative ✓ 9
5.	Quality of work ✓	Teamwork 6
6.	Quality of work ✓	Presence 5
7.	Work Quality	Initiative ✓ 4
8.	Teamwork	Presence ✓ 3
9.	Teamwork ✓	initiative 5
10.	Presence	Initiative ✓ 3

The existence of the value of the intensity of the importance of the criteria (table 6) can be directly concluded from the AHP pairwise comparison matrix between each criterion. So, managers no longer need to compare one by one the value of the intensity of interest between criteria. The comparison of the paired matrix of the AHP criteria can be seen in Table 7 below.

Table 7 AHP Criteria Pairwise Comparison Matrix

Criteria	K1	K2	K3	K4	K5
K1	1	1/5	1/9	1/3	1/9
K2	5	1	6	5	1/4
K3	9	1/6	1	1/3	5
K4	3	1/5	3	1	1/3
K5	9	4	0,2	3	1

Information:

- : Lower triangular matrix comparison value
- : The comparison value of the upper triangular matrix (a mirror or reciprocal of the lower triangle value)

The results in Table 7 that the comparison value for himself (K1 to K1, K2 to K2, K3 to K3, and K4 to K4, K5 to K5) is 1, which means the intensity of interest is the same. The comparison of K1 with K2 is worth it. It can be explained that K2 is more important than K1. The comparison of K1 with K3 with a value of 9 can be explained by the fact that K3 is an absolute element rather than a K1 element. The comparison of K1 with K4 with a value of 3 can be explained by the fact that K4 is slightly more critical than K1. The comparison of K1 with K5 is worthwhile. It can be explained that K5 is an absolute element more than K1.

Comparison of Alternatives on Quantity of Work

The value of the intensity of interest given by the manager or lead team project member to each

alternative is in the range of values from 1 to 9 relates to the comparison value developed by Saaty. Based on the assessment obtained from the questionnaire that we submitted to the project manager or lead team member regarding the weighting of the intensity of interest of each alternative or the comparison of alternatives, it can be seen in Table 10.

Table 10 Alternative Comparison Value On Criteria

No.	Alternative comparison => Working Quantity	Value
1	Mrs. A ✓	Mrs.B 2
2	Mrs. A ✓	Mrs. C 3
3	Mrs. B ✓	Mrs. C 2

The existence of alternative interest intensity values (table 10) can be directly concluded with AHP pairwise comparison alternatives between each alternative so that managers no longer need to compare the interest intensity values between alternatives individually. In Table 11, the AHP alternative paired matrix comparison can be seen.

Table 11 Alternative Work Quantity Comparison Matrix

Working Quantity	A1	A2	A3
A1	1	2	3
A2	0,5	1	2
A3	0,3333333333	0,5	1

The results in Table 11 that the comparison value for itself (A1 to A1, A2 to A2, A3 to A3) is 1, which means the intensity of importance is the same. A1 is worth nearly the same as A2 but cannot be considered better than A2. The comparison of A1 with A3 with a value of 3 can be explained by A3 being better than A1. A comparison of A2 with A3 is worth 2 points, almost the same as A3, but cannot be considered better than A2.

Before calculating the priority weight value, the comparison value in each column cell is shown in Table 12 below.

Table 12 The Sum Of Each Column Of Comparison Values

Working Quantity	A1	A2	A3
A1	1	2	3
A2	0,5	1	2
A3	0,3333333333	0,5	1
Jumlah	1,833333333		6



Calculating the priority weight value is dividing each cell by the number in its column.

Column K1 = 0.545

Column K2 = 0.571, and so on

After the results of the division of each column are obtained, the eigenvector value or priority weight can be calculated (seen in Table 13). The priority weight value is the average value by adding up the values from each row and dividing them by the many criteria elements, and if they are added up, they will be worth one.

Table 13 Priority Weight Value Alternative

Eigen Value		Sum	Average
0,5454545	0,5714286	0,5	1,6168831
0,2727273	0,2857143	0,3333333	0,8917749
0,1818182	0,1428571	0,1666667	0,491342
Sum		1	0,1637807

After obtaining the alternative priority weights, the maximum land value (λ_{\max}), or eigenvalue, is calculated, the sum of multiplying the priority weights with the number of columns.

CR = $0.0015/0.58 = 0.0025$ (consistent because it meets the requirements of CR 0.1) And so on, until the initiative's alternatives are compared.

System Implementation

Based on the analysis and system design results, the best employee selection system is implemented by applying the Analytical Hierarchy Process method.

Results Analysis

This web-based system is designed specifically for users to provide recommendations for the best employment decisions based on the criteria applied at PT. ASDP Indonesia Ferry (PERSERO). The system has a main menu equipped with the AHP method to assist the calculation process and produce recommendations for the best employee decisions.

a. Attendance Pairwise Comparison Matrix

Matrix Perbandingan Serapanan			
Kriteria	Mrs. A	Mrs. B	Mrs. C
Mrs. A	1	0,333333	3
Mrs. B	3	1	3
Mrs. C	0,333333	0,333333	1
Jumlah	3,333333	3,333333	9

Matrix Perbandingan Kriteria					
	Mrs. A	Mrs. B	Mrs. C	Average	Priority Vector
Mrs. A	1,000000	0,333333	0,769231	0,333333	0,333333
Mrs. B	3,000000	1,000000	0,333333	0,666667	0,666667
Mrs. C	0,769231	0,333333	1,000000	0,333333	0,333333
Average Eigen Vector (Ave)				0,333333	
Consistency Index				0,02768	
Consistency Ratio				0,02768	

Figure 7 Attendance Pairwise Comparison Matrix

Figure 7 displays the pairwise comparison matrix: Mrs. A is 4.33333, Mrs. B is 1.53333, and Mrs. C is 9. Produces a Matrix Criteria value including 1) Principle Eigen Vector (max) of 3.05536, Consistency index of 0.02768, and Consistency Ratio of 4.77%

b. Calculation Results and Ranking

The system will display the best employee calculation menu, which displays calculations according to the desired month and year. If the month and year have been selected, the system will display the AHP ranking menu, as shown in Figure 10 below.

Hasil Perhitungan		Perhitungan		Perhitungan	
Overall Consistency		Priority Value (Pmax)		Normalized Strength	
Kriteria	0,333333	0,666667	0,333333	0,333333	0,333333
Mengajar	0,333333	0,666667	0,333333	0,333333	0,333333
Penelitian	0,333333	0,666667	0,333333	0,333333	0,333333
Keberlanjutan	0,333333	0,666667	0,333333	0,333333	0,333333
Total	0,333333	0,666667	0,333333	0,333333	0,333333

Peringkat	
1	Mengajar
2	Penelitian
3	Keberlanjutan
4	Peringkat

Figure 10 Menu Display Of AHP Calculation Results and Ranking

The AHP ranking menu display has several menu tabs that detail the AHP process on criteria, alternatives, and decision results in the form of a ranking. On the ranking menu tab, a list of the best employee recommendations is displayed that can be used as a consideration for managers in determining the best employee decisions.

CONCLUSIONS AND SUGGESTIONS

Conclusion

By making a decision support system for the best employees, it can assist leaders in making decisions to determine the best employees according to the existing criteria and using the Analytical Hierarchy Process (AHP) method, namely: The Management has determined the criteria used in the decision support system for selecting the best employees: work quantity, work quality, teamwork, attendance, and initiative. The decision weight of the best employee using the AHP method is close to the weight of the manual calculation decision used at PT. ASDP Indonesia Ferry (PERSERO). There is an intensity value for each criterion and alternative from the company. The manager does not have to input the value of the paired matrix comparison because the system will operate automatically so that the comparison value is consistent (CR 0.1).

Suggestion

From the research conducted, valuable suggestions can be generated for system development, such as adding other methods to complement the shortcomings of AHP.

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