



Analysis and Design of a Decision Support System in Employee Selection using the AHP (Analytical Hierarchy Process) Method

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Abstract

Employee performance assessment is a crucial aspect in determining the quality of human resources that contribute to a company's success. However, the process of selecting the best employees at PT. Asia Carton Lestari has been carried out manually, resulting in problems such as assessment inaccuracy, the lack of clear criteria weighting, and a high potential for human error. This study aims to design and build a web-based Decision Support System (DSS) using the Analytical Hierarchy Process (AHP) method to improve the effectiveness and objectivity of employee assessments. The AHP method was chosen because of its ability to solve multi-criteria decision-making problems through pairwise comparisons and systematic calculation of priority weights. Four assessment criteria are used in this system: attendance, work quality, discipline, and responsibility. Implementation results indicate that the system is capable of generating recommendations for selecting the best employees more accurately and consistently, with the highest score of 0.229593 obtained by an employee named Adam as the best alternative. Furthermore, black box testing results indicate that all system functions are functioning as expected. Thus, this AHP-based DSS can be an effective solution for companies in improving the quality of employee performance assessments.

Keyword: Network Development Life Cycle, Large Language Models, Generative AI, SLR

1. Introduction

This is evident in the lack of clarity in the implementation of the best employee offering program. The cause of this problem is the lack of a system that can evaluate employees and provide recommendations for selecting the best candidates. This often presents challenges for managers, as manual assessments and human error in calculations can lead to errors in selecting the most suitable employees [1]. As a review, various elements such as skills, strengths, weaknesses, and potential ultimately play a role in setting goals, direction, strategy, and career development. However, in practice, companies have not fully maximized the results of the employee recruitment process. This is evident in the lack of clarity in the implementation of the best employee offering program. The cause of this problem is the lack of a system that can evaluate employees and provide recommendations for selecting the best candidates [2]. Therefore, it is crucial to have a system capable of supporting the selection process to ensure that recipients align with the desired targets. A Decision Support System (DSS) is a computer-based system that functions to solve various problems and acts as a decision-making tool [3]. Therefore, the Analytic Hierarchy Process (AHP) approach can be applied in this study to determine the best employees by considering the criteria established by PT. Asia Carton Lestari, located in Tangerang. This method was chosen because it can transform broad and complex problems into a more flexible and understandable model, provides a measurement scale and a method for setting priorities, considers logical consistency in the assessments used to determine priorities, and provides an overall picture of preferences for each available alternative [4]. The Analytic Hierarchy Process (AHP) is a method for handling and evaluating complex decisions using mathematical and psychological foundations. This technique was introduced by Thomas L. Saaty in the 1970s and has undergone various refinements over time. The AHP consists of three core elements: the primary goal or problem to be solved, a set of all known alternative solutions, and the criteria used to evaluate these alternatives. Using this method, a logical framework is created for decision-making by measuring criteria and alternative choices, and linking these elements to the primary goal.

2. Literature Review

This research is based on various references from previous studies related to the problem discussed. The review of these studies provides a theoretical foundation and important insights that support the process of writing this thesis. Therefore, several relevant literature studies served as the primary references in this research:

1. Research by Cholill and Prisiswo (Cholill & Prisiswo, 2020) explains that employees are a very important element for a company, because with employees who meet the required qualities and criteria, the company can experience growth and progress in the future. This also applies to PT. Dawam Prima Perkasa, which is looking for new employees who are suitable to contribute to the company. However, PT. Dawam Prima Perkasa faces challenges because the number of applicants taking the selection test causes an increase in documents that need to be adjusted to company criteria and requires a lot of time, thus increasing the risk of document errors. To reduce the possibility of errors and save time, a Decision Support System was designed to select the best candidates to work in the company. The method used in this Decision Support System is Additive Ratio Assessment (ARAS). This study has passed the validation process using Spearman rank correlation and obtained a value of 0.950. Based on these results, the ARAS method is very appropriate for screening new employee candidates at PT. Dawam Prima Perkasa. [5]
2. Hairani's research (Hairani, 2021) explains that PT Matahari Department Store Central Plaza Lampung as one of the companies that is classified as advanced and developing, this company really needs employees who have quality innovation and creativity, therefore the employee recruitment selection process is one of the important things in the continuity of the company's progress in terms of human resources as the company's process in entering the competitive world to achieve competitive advantage for the company. The application that was designed and will be implemented is supported by the TOPSIS method, using the waterfall development method and implemented so as to produce a Web-Based Decision Support System for Recommendations for the Appointment Status of Contract Employees to Permanent Using the TOPSIS Method (Case Study: Matahari Department Store Lampung) is an innovation using technology to help complete the work of humans, namely human resource managers, it is hoped that in the future this system will be developed following technological developments in the future. [6]
3. Sari's research (Sari, 2023) explains that PT. Charoen Pok phand Medan is a company engaged in the production and sale of animal feed. In selecting applicants, PT. Charoen Pok phand Medan usually provides several requirements or criteria to determine the abilities and personality of the applicant. The resulting data is usually stored in an applicant archive that must be compared one by one to obtain a decision. Of course, this is time-consuming and ineffective. We often find that new employees who enter a company only stay for a short period of time. The main reason is errors in recruitment/acceptance of new employees. After being recruited, it turns out that these employees do not have the skills or qualifications required for the job. The process of recruiting new employees is still not carried out professionally. This occurs because there is no systematic standard method for assessing the suitability of prospective employees. Seeing this phenomenon, the role of the Human Resources (HR) division in handling the problem of recruiting new employees is still considered less than optimal. The role of the Human Resources (HR) division, especially managers who conduct selection, is very necessary from the beginning of the new employee recruitment process. Because from the beginning of this process, prospective employees will be given provisions and preparation to work in a company. [7].
4. Research by M. Irsyad Fu'Adi and Anita Diana (Fu'Adi & Diana, 2021) explains that employee performance assessment is crucial for supporting business continuity. Selecting the best employees will increase employee motivation. This study uses the Analytical Hierarchy Process (AHP) method as a case study at the Saman Shoes Shoe Store, where the evaluation process for selecting the best employees had never been conducted before. Some of the problems encountered were the lack of an employee performance assessment process, the lack of an appropriate selection method, and the lack of a Decision Support System (DSS) that could facilitate the assessment of the selection of the best employees. Therefore, a DSS application is needed for the assessment of the selection of the best employees. The method that can be used is the AHP method. The AHP method produces alternative priorities and criteria weights in determining the best employees objectively based on criteria provided by the store owner as the decision maker who will provide bonus rewards for the best employees. The goal is to motivate employees to improve their performance. In this study, the AHP method was used to create a web-based DSS application, to provide more objective assessments every month, and to create several reports that convey effective issues, such as ranking reports, and employee performance assessment reports according to these criteria. [8].
5. Dona Kurnia's Research (Kurnia, 2020) Decision support systems are designed to assist decision-making in solving semi-structured or unstructured problems by adding human wisdom and computerized information, one of which is the recruitment of new employees. One method that can be used is the Analytical Hierarchy Process (AHP) method where the new employee recruitment process with the AHP method aims to assist managers in making decisions in the new employee selection process by presenting alternatives displayed in the form of an alternative ranking system. In this journal, a case study was conducted at PT. Mitra Bisnis Seluler Kota Bukittinggi which is currently conducting a new employee recruitment process. The analysis method used in this journal is the System Development Life Cycle (SDLC) because this SDLC method can facilitate the design of a decision support system starting from the registration process for new employee candidates to the selection process for new employee recruitment. To facilitate managers in making decisions about selecting new employee recruitment with the AHP method, it will be implemented into an application designed web-based so that the reach of employee recruitment screening is wider so that it will produce truly qualified employees. Recruitment of new employees uses 4 criteria, namely administration, knowledge, psychological tests and interviews with $CR = 0.01$ which indicates that the criteria are acceptable because the results shown $CR < 10\%$. Analysis was carried out on 5 samples of new employee candidates which resulted in a ranking where candidate 3 obtained the highest score of 0.28. After the testing process was carried out with the new employee recruitment application using the AHP method applied to 5 new employee candidates, it showed that the system can be categorized as being in good condition for use in decision making by managers in the new employee selection process. [9].

3. Reasearch Methods

To create a better decision-making process in selecting the best employees at PT. Asia Carton Lestari, several research approaches are required.

3.1 Rank Order Centroid Methodology

In the best employee selection system after the criteria and weights are determined. Furthermore, a manual calculation was carried out on the employee data sample as follows:

kriteria yang digunakan:

- a. C1 = Absence
- b. C2 = Quality of Work
- c. C3 = Work Discipline
- d. C4 = Responsibility
- e. C5 = Loyalty
- f. C6 = Communication

Perbandingan	Nilai
Attendance vs Quality of Work	5
Absenteeism vs Work Discipline	9
Absensi vs Tanggung Jawab	1
Attendance vs Responsibility	1
Attendance vs Communication	1
Quality of Work vs Work Discipline	1
Quality of Work vs Responsibility	3
Quality of Work vs Loyalty	7
Kualitas Kerja vs Komunikasi	2
Work Discipline vs Responsibility	1
Work Discipline vs. Loyalty	6
Work Discipline vs Communication	1
Responsibility vs Loyalty	3
Responsibility vs Communication	1
Loyalty vs Communication	2

1. Criteria Comparison Matrix (A)

	Absence	Work Quality	Discipline	Responsibility	Loyalty	Communication
A	1	5	9	1	1	1
K	1/5	1	1	3	7	2
D	1/9	1	1	1	6	1
T	1	1/3	1	1	3	1
L	1	1/7	1/6	1/3	1	2
C	1	1/2	1	1	1/2	1

2. Jumlah Kolom

Columns	Total
Attendance	4.311
Quality	7.976
Discipline	13.167
Responsibility	7.333
Loyalty	18.500
Communication	8.000

3. Matriks Normalisasi (Setiap elemen ÷ jumlah kolom)

Criteria	Weight
Attendance	0.283
Quality	0.248

Discipline	0.180
Responsibility	0.143
Loyalty	0.091
Communication	0.055

4.

4. Consistency Test

a. λ maks

$$\lambda_{maks} = 6.421$$

b. Consistency Index (CI)

$$CI = \frac{6.421 - 6}{5} = 0.084$$

c. Consistency Ratio (CR) Nilai RI (n=4) = 0.90

$$CR = \frac{0.084}{1.24} = 0.067$$

CR < 0.1 → Konsisten

3.2 Key Performance Indicator (KPI)

Final Score Results & Employee Ranking

Ranking	Alternatif	Nilai
1	Adam	0.0769
2	Dea	0.0758
3	Dela	0.0742
4	Doni	0.0735
5	Dika	0.0710
6	Okta	0.0690
7	Iqbal	0.0682
8	Hasan	0.0678
9	Tika	0.0641
10	Wahyu	0.0623
11	Joshua	0.0605
12	Joko	0.0584
13	Dimas	0.0569
14	Dadit	0.0542
15	Rudi	0.0513

Based on the results of calculations using the Analytical Hierarchy Process (AHP) method to determine the best employees using six criteria, namely Absenteeism, Work Quality, Work Discipline, Responsibility, Loyalty, and Communication, the priority weight of each criterion is obtained which shows the level of importance in the employee assessment process.

The pairwise comparison matrix was then normalized to obtain the priority weights for each criterion. Consistency testing was then performed by calculating the Consistency Index (CI) and Consistency Ratio (CR). The CR was 0.034, which is less than 0.1, indicating that the criteria comparison matrix is consistent and suitable for use in decision-making.

The next step is to calculate the alternative values for each criterion, then multiply these values by the criterion priority weights to obtain the final preference value. The calculation results show that Adam's alternative received the highest value of 0.0769, followed by Dea with a value of 0.0758, and Dela with a value of 0.0742.

Based on the ranking results, it can be concluded that Adam is the best alternative recommended as the best employee based on the criteria used in this study. Thus, the AHP method has been proven to assist the decision-making process in determining the best employee in a more systematic, objective, and structured manner.

5. Result and Discussion

This sales performance evaluation system was successfully implemented as a web-based application using the PHP programming language and a MySQL database.

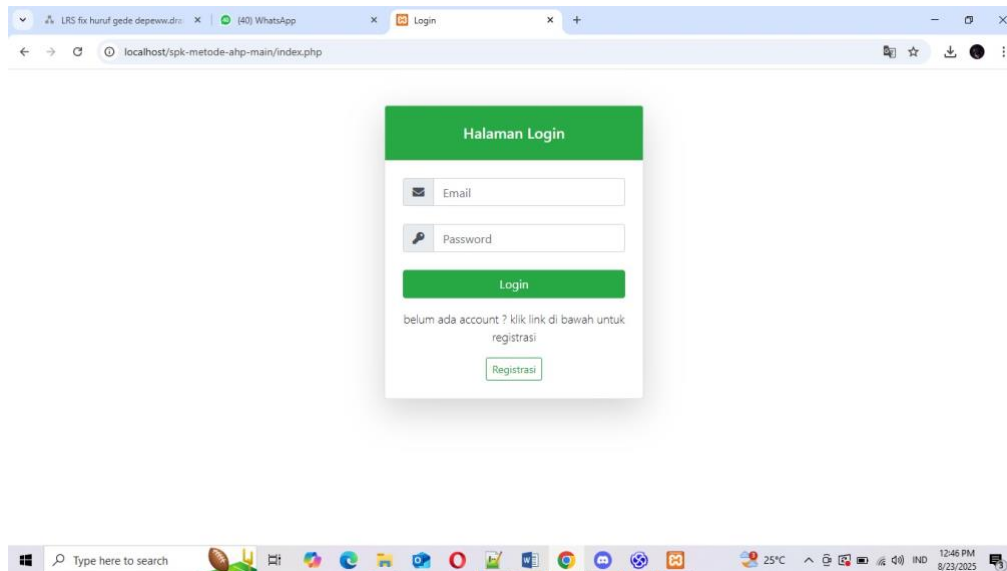


Fig.1: Login View

The login page is the first page that appears after the program is run by the user. To access the system, the user must first enter a username and password.

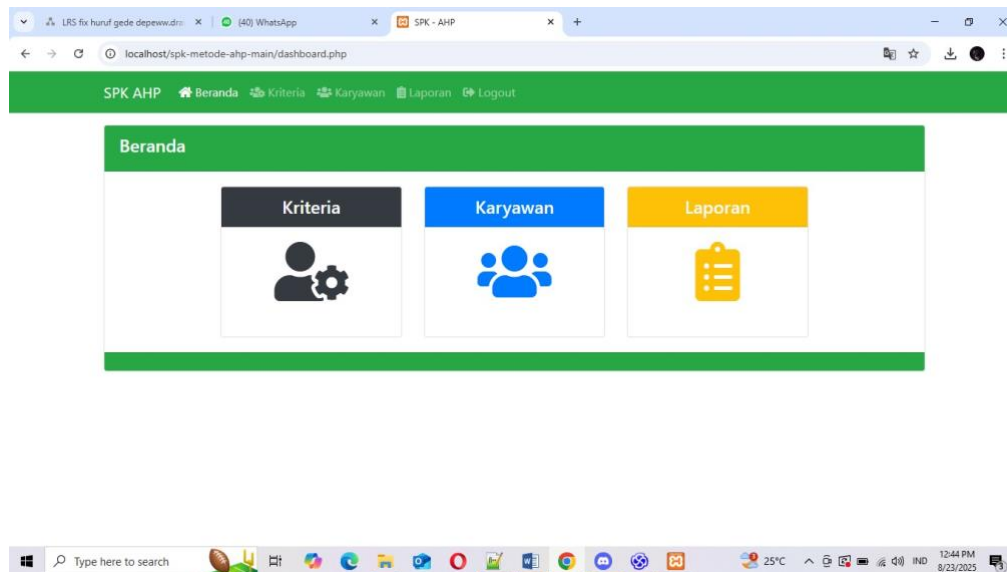


Fig.2: Main Menu Display

The main menu page displays all the menu options available in the decision support system for top employees. This form will appear when the user enters the correct username and password during the login process.

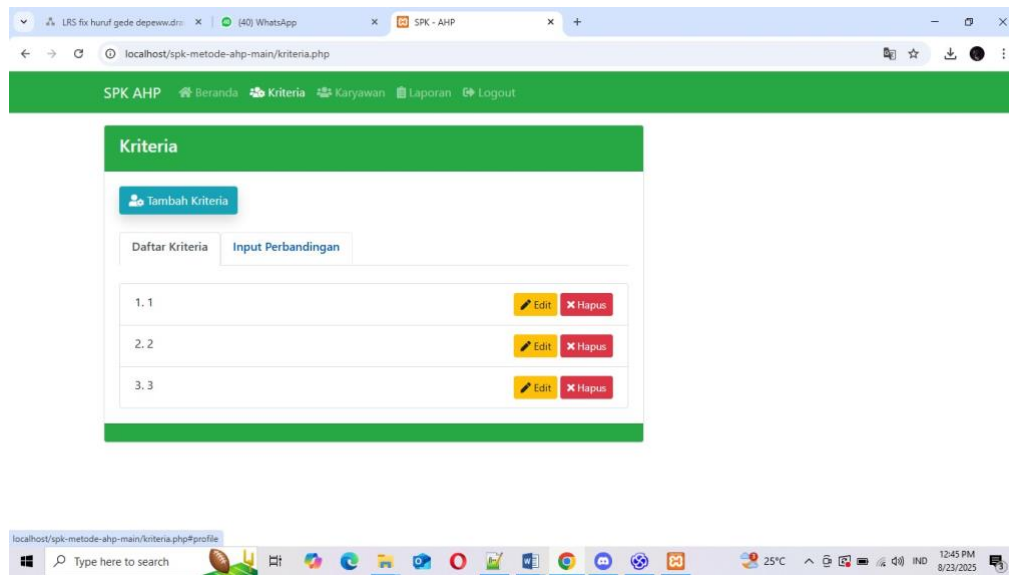


Fig.3: Criteria Data Display

This criteria data contains the criteria name along with the weight value with two options, namely benefit and cost.

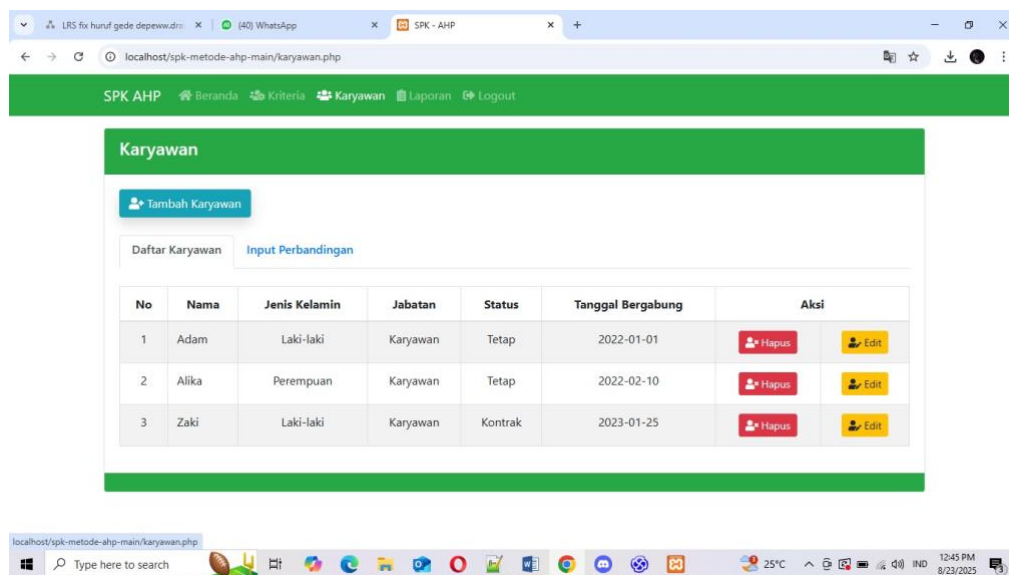


Fig.4: Alternative Data Views

This alternative data contains employee data that has been inputted according to the established criteria.

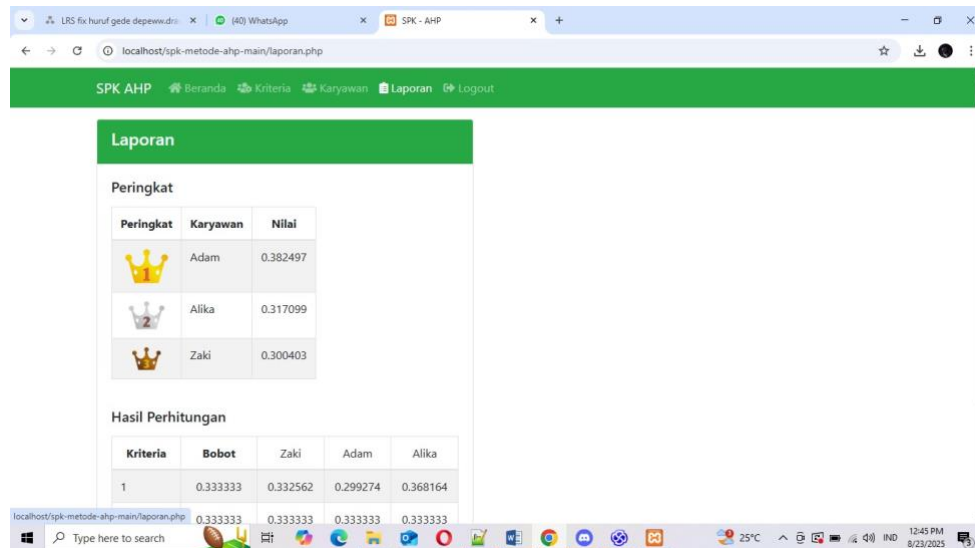


Fig.5: Report View

The report menu contains the final results, namely the data results are in accordance with the sequence of the AHP method calculation system.

5. Conclusion

The AHP method is an alternative for selecting the best employees because it is effective in handling complex, multi-objective, and multi-criteria decision-making problems. It also systematically integrates subjective and objective assessments through pairwise comparisons. This method can identify the most important factors, generate priorities, and rank alternatives hierarchically, which are then used as an objective and consistent decision-making tool. The final result of this study is an alternative with the highest ranking value. The implementation of this decision support system for awarding the best employees helps PT. Asia Carton Lestari make more precise and accurate decisions. The results of the system testing analysis indicate that the Analytical Hierarchy Process method, using PT. Asia Carton Lestari employee data, yielded the highest employee score of 0.19154 for Adam, a driver.

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