



# A Decision Support System for Selecting Employees Eligible for Bonuses at Uflo Technology Indonesia Using the Analytical Hierarchy Process (AHP) Method

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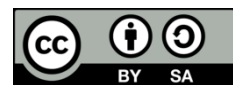
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## ABSTRACT

Decision Support Systems (DSS) play a crucial role in minimizing cognitive biases in human resource management processes, particularly in employee incentive or bonus schemes. This study aims to design, develop, and implement a web-based decision support system to determine which employees are most deserving of annual bonuses at Uflo Technology Indonesia by applying the Analytical Hierarchy Process (AHP) method. Conventional performance evaluations, which are often subjective, have the potential to reduce work motivation and lead to organizational injustice. To address these dynamics, this system objectively evaluates employee performance based on five main criteria: discipline, productivity, teamwork, work quality, and initiative and creativity. Empirical evaluation data is sourced directly from Uflo Technology's internal systems, including digital attendance records and daily job reports. Through the AHP algorithm, each criterion is analyzed using hierarchical decomposition and pairwise comparison to generate a consistent global priority weight, where the Consistency Ratio (CR) is rigorously tested to ensure it remains  $\leq 0.1$ . The final results of the study show that the system successfully performs automatic evaluation synthesis and alternative ranking. Computational validation using real-world data placed the Dodi alternative at the highest rank with a final score of 0.335. The implementation of this web-based system has proven capable of improving accuracy, transparency, and time efficiency in the managerial decision-making process within a corporate environment.

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## 1. INTRODUCTION

In the era of modern industry and exponential digital transformation, a technology company's competitive advantage depends heavily on the quality and productivity of its human resources. Uflo Technology Indonesia, as an entity operating in the field of technology solutions, is required to consistently maintain and improve the performance of its employees. One proven effective managerial tool for driving motivation, loyalty, and the retention of top talent is a performance-based bonus or incentive scheme (merit-based incentive). Targeted bonus awards serve not only as a form of financial appreciation but also as a catalyst

for creating a competitive and healthy work environment and strengthening alignment between individual goals and the organization's strategic vision [11], [13].

However, in practice, the process of determining bonus recipients often faces significant challenges regarding objectivity. Many organizations still rely on conventional evaluation methods that are intuitive, unstructured, and dominated by management's subjective judgments. This phenomenon is prone to various cognitive biases, such as the halo effect (judgment based on overall impressions), recency bias (focusing only on recent short-term performance), and personal proximity (personal liking). The impact of this subjectivity is highly detrimental to a company's internal stability, including the emergence of a sense of injustice, social jealousy among staff, a decline in work morale, and even an increase in employee turnover rates. Therefore, a scientific approach is needed that can convert qualitative parameters into measurable quantitative values through the application of a well-established decision support system theory [12].

Decision Support Systems (DSS) serve as information technology-based solutions designed to assist decision-makers (managers or executives) in resolving both semi-structured and unstructured problems [2], [3]. In the context of multi-criteria performance evaluation, one of the most robust and academically validated multi-criteria decision-making (MCDM) methods is the Analytical Hierarchy Process (AHP), developed by Thomas L. Saaty [10]. The primary advantage of AHP lies in its ability to break down complex problems involving numerous variables into a logical hierarchical structure, perform weighting through pairwise comparisons, and provide a rigorous mechanism for testing logical consistency via the Consistency Ratio (CR) calculation [4], [17].

Previous research conducted by Manurung (2017) demonstrated that the implementation of the AHP method in an employee bonus system significantly reduces subjectivity and yields accurate criteria weighting decisions [1]. Furthermore, integrating aspects of incentive fairness has been shown to enhance organizational operational efficiency and effectiveness at the macro level [12]. However, most systems developed in previous studies remain standalone and require manual data input from outside the system. This leaves room for inefficiency and the potential for human error during the performance data transfer process.

To address these limitations, this study focuses on the design of a web-based DSS that is contextually integrated with the internal application system of Uflo Technology Indonesia, located at Jalan Seser No. 46, Medan [14]. The novelty of this research lies in the utilization of real data from the company's internal systems, such as digital biometric attendance records and daily employee activity reports, which are directly transformed into an AHP comparison matrix model. The development of this system adopts a systematic software life cycle methodology to ensure the functionality and security of the built web interface [16], [19]. Through this research, it is hoped that the management of Uflo Technology Indonesia will have a strategic evaluation tool that is not only objective and transparent in determining bonuses but also capable of presenting real-time performance data visualizations to support sustainable talent management decisions [15], [18].

## **2. THEORETICAL FOUNDATION AND RESEARCH METHODS**

### **2.1 Decision Support System (DSS)**

The initial concept of a Decision Support System (DSS) first gained recognition in the 1970s when Michael S. Scott Morton introduced the term "Management Decision System" [2]. A decision support system is a computer-based application that serves as a tool to assist in formulating decisions, particularly for problems that are not fully structured [3]. Over time, various research organizations and educational institutions began to further develop these systems. Decision support systems aim to support the managerial decision-making process, not to replace it entirely, but rather to provide the information, alternative solutions, and analysis needed for decision-making [3].

### **2.2 The Analytical Hierarchy Process (AHP) Method**

The Analytical Hierarchy Process (AHP) is an approach developed by Thomas L. Saaty to assist in decision-making regarding complex problems by organizing them into a hierarchical structure. In this process, AHP compares each element in pairs based on relative importance, then converts these assessments into numerical values to calculate priority weights. By systematically integrating various considerations, this method facilitates decision-makers in determining the most logical, objective, and measurable choice [4].

### **2.3 Employee Bonuses and Performance Appraisals**

Human resources play a crucial role in an organization as they are the only element capable of thinking, feeling, taking initiative, and creating work through their knowledge and skills. To boost motivation and work enthusiasm, company leaders can provide incentives in the form of bonuses to employees [5]. Leaders award bonuses based on the performance and contributions employees have achieved. These bonuses not only serve as a form of appreciation for employee dedication but are also expected to foster harmonious working relationships between the company and its workforce [5]. Performance evaluation is a structured process

conducted to assess an employee's work outcomes based on specific indicators or benchmarks. This evaluation involves measuring how well and how much work an individual has completed within a specific timeframe [6].

#### 2.4 Data Collection Methods

Data collection methods were employed to obtain the information needed to develop an AHP-based decision support system, using the following techniques:

- a. Literature Review: Conducted by gathering references from books, journals, scientific articles, and other reliable sources related to DSS, the AHP method, and employee performance evaluation to establish a relevant theoretical foundation.
- b. Data from Uflo Technology Indonesia's Internal Application System: Primary data is extracted from the company's internal system, which records daily attendance and employee work activities. This information serves as the basis for performance evaluation in determining the weighting factors within the AHP model.

#### 2.5 Problem-Solving Method and Model Design

The stages of analysis and the problem-solving process using AHP include: (1) Determining the primary objective, (2) Assigning preference values using the AHP scale (1–9), (3) Identifying criteria and alternatives, (4) Creating a pairwise comparison matrix, (5) Calculating criterion priority weights through normalization, (6) Testing consistency by ensuring the Consistency Ratio (CR)  $\leq 0.1$ , (7) Calculating the final scores of the alternatives, and (8) Generating a feasibility ranking.

### 3. RESULTS AND DISCUSSION

#### 3.1 Validation of Calculations Using Microsoft Excel

Before implementation in a web-based system, manual calculations were tested using Microsoft Excel. This model uses five criteria (Discipline, Productivity, Teamwork, Work Quality, Initiative) and five employee alternatives (Ardan, Dodi, Ec Samuel, Iskandar, Rhapi).

Pairwise Comparison Matrix of Criteria: Comparisons were made based on the relative importance of the criteria on a scale of 1–9, as presented in the following table:

Table 1: Pairwise Comparison Matrix of Criteria

Kriteria	Disiplin	Produktivitas	Teamwork	Kualitas Kerja	Inisiatif
<b>Disiplin</b>	1.000	3.000	2.000	2.000	3.000
<b>Produktivitas</b>	0.333	1.000	2.000	2.000	2.000
<b>Teamwork</b>	0.500	0.500	1.000	2.000	3.000
<b>Kualitas Kerja</b>	0.500	0.500	0.500	1.000	2.000
<b>Inisiatif</b>	0.333	0.500	0.333	0.500	1.000
<b>Jumlah</b>	2.666	5.500	5.833	7.500	11.000

The matrix above was then normalized to obtain the priority weights for each criterion. The calculation results were then subjected to a logical consistency test to ensure that the Consistency Index (CI) and Consistency Ratio (CR) were below the tolerance limit ( $\leq 0.1$ ).

Comparison of Alternatives on the Discipline Criterion: Each employee alternative was compared in pairs specifically on the Discipline criterion to produce local weight values, as shown in the table below:

Table 2: Comparison of Alternatives Based on Discipline Criteria

Karyawan	Ardan	Dodi	Ec Samuel	Iskandar	Rhapi	Bobot Lokal
Ardan	1.000	0.200	2.000	2.000	2.000	0.169
Dodi	5.000	1.000	5.000	5.000	5.000	0.544
Ec Samuel	0.500	0.200	1.000	1.000	1.000	0.096
Iskandar	0.500	0.200	1.000	1.000	1.000	0.096
Rhapi	0.500	0.200	1.000	1.000	1.000	0.096
Jumlah	7.500	1.800	10.000	10.000	10.000	1.000

Final Score Calculation and Ranking: The final score is calculated by multiplying the local weights of the alternatives by the global criteria weights. A summary of the integrated results for all criteria aspects is presented in the following table:

Table 3: Summary of Final Scores and Ranking

Nama Karyawan	Disiplin	Produktivitas	Teamwork	Kualitas Kerja	Inisiatif	Skor Akhir	Peringkat
Dodi	0.196	0.055	0.040	0.027	0.017	0.335	1
Ardan	0.061	0.055	0.040	0.027	0.017	0.200	2
Rhapi	0.034	0.055	0.040	0.027	0.017	0.173	3
Ec Samuel	0.034	0.027	0.040	0.027	0.017	0.146	4
Iskandar	0.034	0.027	0.040	0.027	0.017	0.146	4

### 3.2 Implementation of a Web-Based System

After the mathematical testing proved to be valid, the system was built as a web-based application using PHP architecture and a MySQL database. The tools used to develop this application are summarized in the following table:

Table 4: Application development tools

No	Bahan / Alat	Deskripsi Fungsi	Biaya
1	Komputer / Laptop	Digunakan untuk pengembangan lingkungan pengodean aplikasi	Sesuai harga pasar
2	Internet Access	To access library resources and online system testing	As per subscription
3	Microsoft Excel	Initial manual validation of matrix calculations and AHP formulas	In accordance with the license
4	XAMPP Software	A local web server to run Apache services and a MySQL database	Free (Open Source)
5	Visual Studio Code	A primary code editor for writing system program scripts	Free
6	Google Chrome	A web browser to test the system's interface and functionality	Free

The application interface provides a module for administrators to manage evaluation criteria and interactively enter pairwise comparison matrices. The system automatically performs normalization calculations, checks for consistency (CI and CR), generates alternative employee rankings, and displays a bar chart showing the distribution of scores to help managers make decisions regarding bonus awards.

#### 4. CONCLUSIONS AND RECOMMENDATIONS

##### 4.1 Conclusions

This study successfully designed and implemented a web-based decision support system using the Analytical Hierarchy Process (AHP) method to objectively determine employee bonus recipients at Uflo Technology Indonesia. Through the pairwise comparison method, the evaluation process can be conducted in a structured manner, minimizing management subjectivity. Testing with the company's real data confirmed the validity of the web system's computational results, which were consistent with the manual modeling results, placing Dodi in first place with a final score of 0.335.

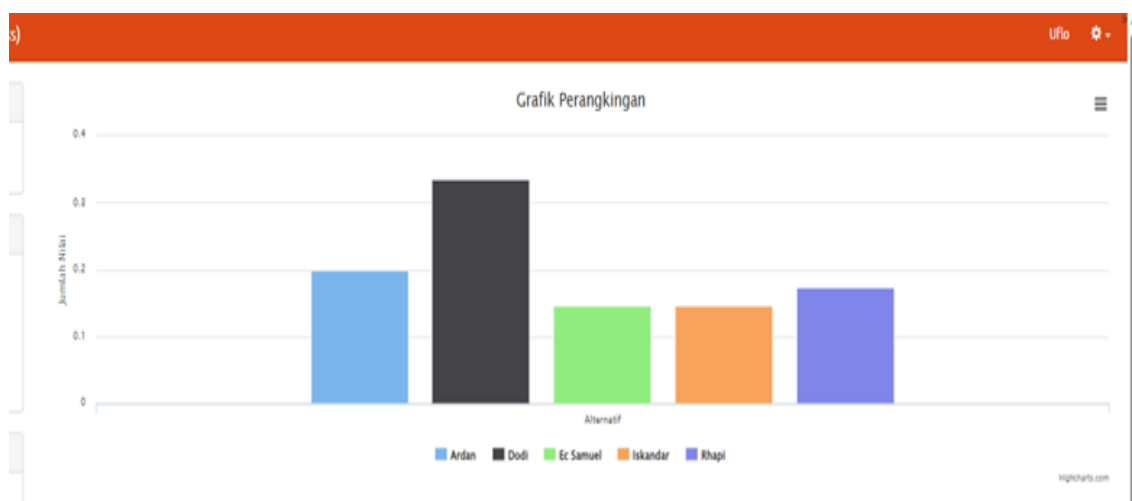


Figure 1. Illustration of Final Score

## 4.2 Recommendations

For future system development, it is recommended to add a user access rights management (RBAC) module to enhance data security. Additionally, the application can be directly integrated with HR databases (such as digital biometric attendance systems) to enable real-time retrieval of performance data. The inclusion of alternative comparative methods, such as TOPSIS or SAW, is also recommended to enrich the company's decision-making analysis capabilities.

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