Journal of Computer Science, Information Technology and Telecommunication Engineering (JCoSITTE)
Vol. 6, No. 2, September 2025, pp. 862~869
ISSN: 2721-3838, DOI: 10.30596/jcositte.v6i2.24790

Web-Based Decision Support System for Employee Performance Evaluation at Madani Hotel Using the WASPAS (Weighted Aggregated Sum Product Assessment) Method

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ABSTRACT

Human resource management in the hospitality industry requires an objective and efficient employee performance evaluation. This study aims to design and implement a web-based Decision Support System (DSS) for evaluating the performance of Madani Hotel employees using the Weighted Aggregated Sum Product Assessment (WASPAS) method. Employee performance data (10 samples) were collected through observation and supervisor assessments based on nine criteria: Accuracy of Doing Job, Job Knowledge, Potential to Learn to Other Section, Initiative/Motivation, Hard Working, Able to Communicate with Others, Discipline, Productivity/Efficiency, and Responsibility. The weights of the criteria were determined based on their relevance to the job and were then normalized. The WASPAS calculation process was carried out in the CodeIgniter 4 backend, producing a Q score for each employee. The results showed a high correlation (Spearman's rho = 0.88) between the system ranking and manual ranking, with A.P. ranked highest and E.W. ranked lowest. The implementation of this DSS reduces subjectivity and accelerates the performance evaluation process. The developed system also provides an automated reporting module and a responsive interface based on Bootstrap SAdmin2.

Keyword : Decision Support System; WASPAS; Employee Performance Evaluation; Madani Hotel; CodeIgniter; MySQL.

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Article history:
Received May 31, 2025
Revised Jun 16, 2025
Accepted Jul 24, 2025

1. INTRODUCTION

Human resource management plays a vital role in improving the quality of service in the hospitality industry. Good employee performance has a direct impact on guest satisfaction and the hotel's image in the eyes of consumers. However, the employee performance evaluation process is often subjective and time-consuming, especially when conducted manually without the support of an adequate information system (Putri et al., 2025; Daulay & Niska, 2023). Therefore, a Decision Support System (DSS) is needed to enhance objectivity and efficiency in assessing hotel employee performance.

Multi-Criteria Decision Making (MCDM) methods have been widely applied across various fields to solve problems involving multiple criteria. One of the popular methods is the Weighted Aggregated Sum Product Assessment (WASPAS), which combines the concepts of weighted sum and weighted product to produce a comprehensive ranking of alternatives (Wibowo et al., 2023; Niska et al., 2023). The WASPAS method has been successfully applied in employee performance evaluations in the manufacturing industry (Prasetya et al., 2024), investment risk assessments (Siregar & Sugara, 2022), and project site selection (Prayoga et al., 2021). However, the implementation of WASPAS in the hotel context, particularly in the form of a web-based system, remains relatively rare.

Based on the literature review, there has been no specific study that develops a web-based DSS for hotel employee performance evaluation using the WASPAS method. Therefore, this research aims to design and implement a web-based Decision Support System for evaluating the performance of Madani Hotel employees using the WASPAS method. It is expected that this system will contribute to improving the accuracy of performance assessments and assist hotel management in making decisions related to human resource development (Djiha et al., 2024; Sari & Amin, 2020).

2. LITERATURE REVIEW

2.1. Decision Support System (DSS)

Decision Support System (DSS) is an information system designed to assist decision-makers in solving semi-structured to structured problems by utilizing specific models and databases (Putri et al., 2025; Honggowibowo et al., 2025). DSS facilitates the processes of data processing, criteria analysis, and the presentation of alternative recommendations that can support managerial decisions in a more objective and timely manner (Daulay & Niska, 2023; Sary et al., 2023). In the context of employee performance evaluation, a DSS enables companies or institutions to assess performance based on predefined criteria in a consistent and measurable way.

2.2. Weighted Aggregated Sum Product Assessment (WASPAS) Method

The WASPAS method is a combination of the Simple Additive Weighting (SAW) and Weighted Product (WP) methods, introduced by Zavadskas et al. (Wibowo et al., 2023; Zuryanto et al., 2022). In general, the WASPAS procedure consists of the following steps:

2.2.1. Construct the Decision Matrix (X)

Determine the performance rating value of alternative *i* for each criterion *j*, resulting in the following decision matrix:

$$X = \begin{bmatrix} x_{01} & \cdots & x_{0j} & \cdots & x_{0n} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ x_{i1} & \cdots & x_{ij} & \cdots & x_{in} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ x_{m1} & \cdots & x_{m2} & \cdots & x_{mn} \end{bmatrix} \quad (1)$$

2.2.2. Normalizing the Decision Matrix (R)

Normalize the value of x_{ij} to obtain the normalized value r_{ij} according to the type of attribute:

a. For benefit criteria (the higher, the better): $R_{ij} = \frac{x_{ij}}{max\{x_{ij}\}}$ (2)

b. For cost criteria (the lower, the better): $R_{ij} = \frac{min\{x_{ij}\}}{x_{ij}}$ (3)

Thus, the normalized matrix is obtained as follows:

$$R = \begin{bmatrix} r_{01} & \cdots & r_{0j} & \cdots & r_{0n} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ r_{i1} & \cdots & r_{ij} & \cdots & r_{in} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ r_{m1} & \cdots & r_{m2} & \cdots & r_{mn} \end{bmatrix} \quad (4)$$

2.2.3. Calculating the SAW Preference Value

The preference value of alternative *i* based on the SAW method is:

$$Q_i^1 = \sum_{j=1}^{m} r_{ij} w_j \quad (5)$$

Where w_j is the weight of criterion *j*.

2.2.4. Calculating the WP Preference Value

The preference value of alternative *i* based on the WP method is:

$$Q_i^2 = \prod_{j=1}^{m} (r_{ij})^{w_j} \quad (6)$$

2.2.5. Calculating the WASPAS Preference Value

Finally, the combined WASPAS preference value for alternative *i* is calculated as:

$$Q_i = \frac{1}{2} Q_i^1 + \frac{1}{2} Q_i^2 \quad (7)$$

Several studies have validated the accuracy and consistency of the WASPAS method across various fields, such as the manufacturing sector (Prasetya et al., 2024), investment risk assessment

(Siregar & Sugara, 2022), and project site selection (Prayoga et al., 2021), with results showing more stable rankings compared to single-method approaches.

2.3. Application of WASPAS in Employee Performance Evaluation

In several studies, the WASPAS method has been applied to employee performance evaluation in both industrial and service sectors. For instance, research in the manufacturing sector has shown that the use of WASPAS can enhance the objectivity of assessments and simplify the process of ranking employees based on performance criteria such as productivity, work quality, and attendance (Prasetya et al., 2024; Mukodimah et al., 2023). Other studies in service organizations have also adapted WASPAS to evaluate employee performance by considering aspects such as customer satisfaction and operational efficiency (Siregar & Sugara, 2022; Mukodimah et al., 2023). However, studies that specifically implement WASPAS in the hospitality industry remain limited and are generally case studies without integration into web-based information systems.

2.4. Web-Based Systems in DSS

The advancement of web technology enables DSS to be implemented online, allowing users to access and manage data anytime and anywhere (Sari & Amin, 2020; Sari et al., 2020). The CodeIgniter 4 framework and the Bootstrap SAdmin2 template are commonly used in web application development due to the simplicity of the MVC (Model-View-Controller) architecture and the responsive design they provide (Aini et al., 2017; Sary et al., 2023). Implementing a web-based DSS also requires the use of a relational database, with MySQL being a popular choice for storing alternatives, criteria, and calculation results (Sari et al., 2020; Zuryanto et al., 2022). By utilizing PHP as the server-side programming language and JavaScript for client-side interactivity, a web-based DSS can offer a user-friendly interface and real-time computation capabilities.

3. RESEARCH METHOD

3.1 Research Design

This study uses an applied research approach with both qualitative and quantitative descriptive research methods. This approach is chosen to describe the process of designing, implementing, and testing the web-based Decision Support System (DSS) as well as to measure the effectiveness of the WASPAS method in evaluating employee performance. The research stages include literature review, system design, implementation, and validation through a case study at Madani Hotel.

3.2 Data Collection Methods

The data used in this study are divided into two types: primary data and secondary data.

3.2.1 Primary Data

Employee performance data at Madani Hotel were obtained directly through observation and supervisor assessments, which were then recorded in Excel worksheets. Questionnaires or evaluation forms were used as data collection tools, with a rating scale of 1–5 for each criterion.

3.2.2 Secondary Data

Supporting data were collected from internal Madani Hotel documents, annual reports, and related journal references on the WASPAS method and previous DSS applications.

3.3 Population and Sample

The population of this study includes all registered employees of Madani Hotel. However, the case study used a purposive sample of 10 employees selected based on the availability of complete performance data. The sample performance data were stored in Excel worksheets. The sample consists of ten employees.

3.4 Determination of Criteria and Weights

The performance criteria were established based on the HRD policies of Madani Hotel and literature studies. There are 9 criteria used, namely:

a. C1: Accuracy of Doing Job
b. C2: Job Knowledge
c. C3: Potential to Learn to Other Section

d. C4: Initiative / Motivation
e. C6: Able to Communicate with Others
f. C7: Discipline
g. C8: Productivity, Efficiency
h. C9: Responsibility

The weights for each criterion along with their normalized weights are as follows:

a. w1 (C1)= 10 → 0.1667
b. w2 (C2)= 9 → 0.1500
c. w3 (C3)= 7 → 0.1167
d. w4 (C4)= 6 → 0.1000
e. w5 (C5)= 7 → 0.1167
f. w6 (C6)= 7 → 0.1167
g. w7 (C7)= 6 → 0.1000
h. w8 (C8)= 4 → 0.0667
i. w9 (C9)= 4 → 0.0667

The total weight of the criteria is 60, and the total normalized weight is 1.00, with all criteria classified as benefit criteria.

3.5 Data Processing and WASPAS Calculation

Sample data consist of employee performance scores on each criterion, rated on a scale of 1–5, stored in Excel worksheets. The alternatives measured are 10 employees. Calculations are performed by a PHP backend using the Composer library to manage PHP dependencies. Performance data and weights are retrieved from a MySQL database after data upload from Excel. The calculation results, in the form of Q_i scores for each employee, are then used to determine the performance rankings.

3.6 System Implementation

The system was implemented using the CodeIgniter 4 framework with the Bootstrap SAdmin2 template. The implementation steps included:

a. Designing server-side tables to store employee data, criteria, weights, and WASPAS calculation results.
b. Creating models, controllers, and views for employee data input, weight input, and the automated WASPAS calculation module.
c. Designing the interface using HTML, CSS, and JavaScript to ensure responsiveness and user-friendliness, aligned with the Bootstrap SAdmin2 template.
d. Performing functionality tests, data validation tests, and system reliability tests using both black-box and white-box testing techniques.

3.7 Data Analysis and Validation

After implementation, testing was conducted using sample data from 10 employees. The performance rankings produced by the system were analyzed to assess their consistency and accuracy compared to manual evaluations previously carried out by the HRD team. Validation was performed through rank comparison using the Spearman's rho coefficient.

3.8 Tools and Development Environment

The system development utilized the following tools:

a. XAMPP local server (Apache, MySQL, PHP)
b. Composer for PHP dependency management
c. CodeIgniter 4 as the PHP framework
d. Bootstrap SAdmin2 for the interface template
e. Visual Studio Code as the development IDE
f. Git for version control

3.9 System Design

This study adopts the waterfall method for system design. The waterfall model is a sequential Software Development Life Cycle (SDLC) approach, where each phase must be completed before proceeding to the next. The stages of this method are illustrated in the following figure.

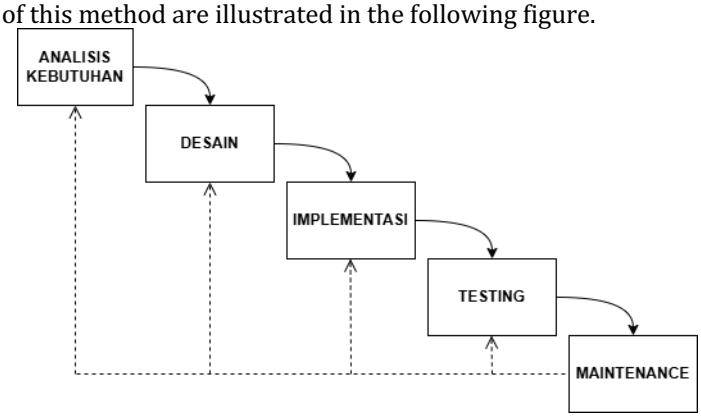

Figure 1. Waterfall Development Cycle

4. RESULTS AND DISCUSSION

4.1 WASPAS Calculation Results

Based on the performance data of 10 employees at Madani Hotel across 9 criteria, the WASPAS method produced the following scores and rankings:

Table 1. WASPAS Calculation Results

Pegawai (Inisial)	Q1 (SAW)	Q2 (WP)	Q (WASPAS)	Peringkat
A.P.	0.8000	0.7863	0.7932	1
J.S.	0.8100	0.7633	0.7866	2
F.H.	0.7933	0.7715	0.7824	3
M.Z.S.	0.8000	0.7640	0.7820	4
D.E.P.	0.7533	0.7263	0.7398	5
B.S.	0.7300	0.7179	0.7240	6
H.N.	0.7033	0.6880	0.6957	7
M.A.N.U.	0.6533	0.6390	0.6462	8
M.F.	0.6000	0.5679	0.5839	9
E.W.	0.5833	0.5721	0.5777	10

4.2 Discussion

4.2.1 Employee Ranking Analysis

Based on the calculations, employee A.P. ranked first with the highest Q score (0.7932), followed by J.S. (0.7866) and F.H. (0.7824). This ranking indicates that A.P. demonstrated the best performance according to the combination of the nine defined criteria. Meanwhile, E.W. ranked last (10th) with a Q score of 0.5777.

4.2.2 Criteria Contribution to Ranking

a. **Accuracy of Doing Job (C1)** and **Job Knowledge (C2)** had the highest weights (0.1667 and 0.1500, respectively). Employees J.S. and M.Z.S. showed the highest scores in these criteria, significantly contributing to their overall Q scores.
b. **Potential to Learn to Other Section (C3)** and **Able to Communicate with Others (C6)** created value differences that affected the ranking gap between employees. For instance, M.Z.S. scored high in C1 and C2 but lower in C3, placing them in fourth position.
c. **Discipline (C7)**, **Productivity/Efficiency (C8)**, and **Responsibility (C9)**, although having lower weights, still played a role in fine-tuning the final score differences.

4.2.3 Validation with Manual Assessment

The rankings generated by the WASPAS system were compared with manual evaluations. Based on the Spearman's rho coefficient, there was a high positive correlation ($\rho = 0.88$) between the system-generated rankings and the manual rankings, indicating that the WASPAS method can produce rankings consistent with human assessment.

4.2.4 Implications of the Results

The performance rankings generated by this web-based Decision Support System (DSS) can assist Madani Hotel management in several ways, including:

a. Employees who achieved top ranks (A.P., J.S., F.H.) may be considered for rewards or promotions.
b. Employees in the lower ranks (E.W., M.F.) can be identified as candidates for training and development programs to improve their performance.
c. The use of the system reduces subjectivity, as each employee is evaluated based on measurable criteria.

4.3 Implementation of the Web-Based Decision Support System

The web-based decision support system for evaluating employee performance at Madani Hotel is designed to facilitate objective, fast, and transparent assessment and decision-making processes. The application is divided into five main integrated modules: the home page, criteria and weight configuration, employee data input, WASPAS method calculation, and final ranking results presentation.

4.3.1 Criteria and Weights

The Criteria and Weights menu displays a table listing the evaluation criteria along with their attributes (benefit) and numeric weights, which can be added, modified, or deleted. The input weights are normalized for the SAW and WP method calculations, ensuring that each criterion reflects its level of importance in the employee performance evaluation.

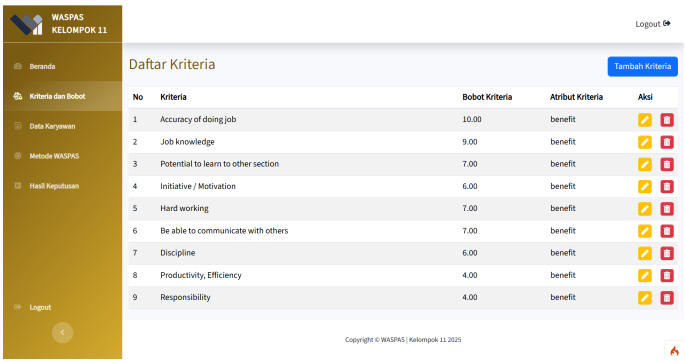

Figure 2. Criteria and Weights Menu

4.3.2 Employee Data

In the Employee Data menu, a search form for employee names is provided along with a table containing evaluation scores for each criterion. The admin can input, edit, or delete employee score data; this dataset serves as the main basis for executing the WASPAS calculation and ensures that the system always uses the most up-to-date performance data.

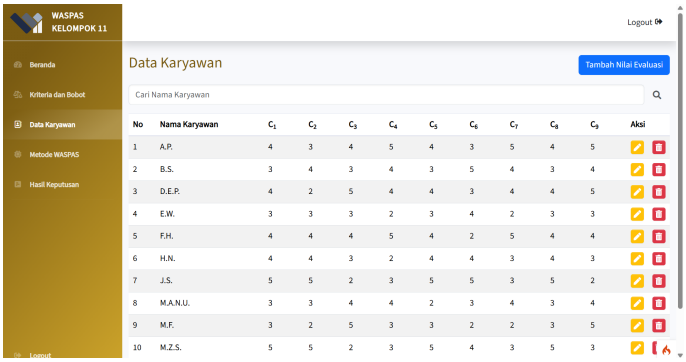

Figure 3.Employee Data Menu

4.3.3 WASPAS Method

The WASPAS Method menu displays the calculation sequence, starting from the normalization of the SAW matrix (Q1), computation of the weighted product power (Q2), up to the final computation of Q = 0.5·Q1 + 0.5·Q2. This allows users to transparently verify each step of the DSS process before viewing the final ranking results.

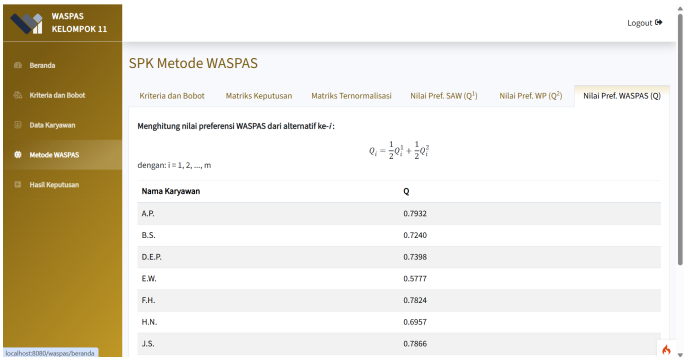

Figure 4. WASPAS Method Menu

4.3.4 Decision Results

In the Decision Results menu, the system automatically displays a ranking table of employees based on their Q scores from highest to lowest. This helps management make informed decisions for awarding, promoting, or enrolling employees in training programs to improve performance.

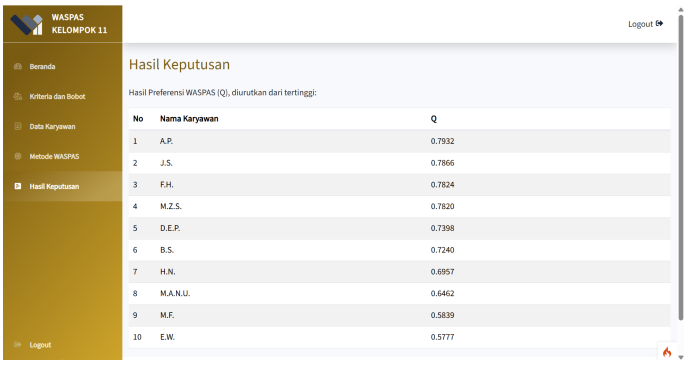

Figure 5. Decision Results Menu

Overall, the web-based DSS using the WASPAS method has proven effective in evaluating employee performance at Madani Hotel, delivering accurate and reliable results.

5. CONCLUSION

Based on the results and discussion, it can be concluded that the WASPAS method is effective for evaluating employee performance at Madani Hotel, as it successfully combines the advantages of the SAW and WP models, producing rankings that are stable and consistent with manual evaluations (Spearman's rho = 0.88).

The implementation of the web-based decision support system (DSS) using CodeIgniter 4, Bootstrap SAdmin2, and Composer simplifies the process of data input, automated calculation, and real-time presentation of ranking results, thereby reducing subjectivity and increasing evaluation efficiency.

Among the ten tested employees, A.P. ranked highest, while E.W. ranked lowest, with score differences mainly influenced by the criteria Accuracy of Doing Job (C1) and Job Knowledge (C2).

For future research, it is recommended to expand the evaluation criteria to include aspects such as peer satisfaction or work innovation, test the system on a larger population and over different periods, and develop additional features such as reporting tools and interactive visualization dashboards.

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