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Web-Based Decision Support System for Budget Prediction Using the SAW Method for Tourism Recommendations

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ABSTRACT

Tourism plays a crucial role in regional and national economies, with local tourism in Indonesia, particularly in Jombang Regency, East Java, offering substantial development potential. However, tourists often face difficulties in planning trips that align with their budgets due to inadequate integration of information on costs, trip duration, and participant numbers. This study develops a web-based Decision Support System (DSS) utilizing the Simple Additive Weighting (SAW) method to enhance trip planning for tourism in Jombang. The DSS integrates data on budget, trip duration, and the number of participants to provide optimal recommendations based on user preferences and constraints. The SAW method facilitates a systematic and objective evaluation process for recommending tourist destinations. The research follows the ADDIE development model, encompassing Analysis, Design, Development, Implementation, and Evaluation stages. Key objectives include creating a system that consolidates cost, duration, and participant data, applying SAW for accurate recommendations, and ensuring an objective evaluation process. The system aims to improve trip planning efficiency, provide accurate recommendations, and enhance user satisfaction. The scope of this study is limited to applying the SAW method for budget prediction in tourism recommendations for Jombang. The developed system is a prototype that may require further refinement for comprehensive implementation.

Keywords: *Decision Support System, Simple Additive Weighting, Budget Prediction, Tourism.*

INTRODUCTION

In the current era of globalization, the tourism sector has become a vital part of regional and national economies. In Indonesia, local tourism, including in Jombang Regency, East Java, holds significant development potential. Despite Jombang's attractive tourist destinations, such as waterfalls, culinary spots, and natural areas, tourists often face difficulties in planning trips that fit their budgets (Singgalen, 2023). Tourists frequently encounter challenges due to a lack of integrated information on costs, trip duration, and the number of participants, leading to inefficient planning and potential budget overruns. This highlights the need for a decision support system (DSS) that can effectively manage information and provide tailored recommendations based on user preferences and budget constraints. The Simple Additive Weighting (SAW) method is a valuable technique within DSS for evaluating and recommending alternatives based on weighted criteria, such as total cost, trip duration, and the number of participants. By applying the SAW method, the evaluation process for tourist destinations becomes more systematic and objective.

This study aims to develop a DSS specifically designed to recommend tourist destinations in Jombang using the SAW method. The system will integrate data on budget, trip duration, and the number of participants to provide optimal recommendations according to user needs and preferences, thereby enhancing the efficiency and effectiveness of trip planning in Jombang. The research objectives include: developing a system that integrates information on costs, trip duration, and the number of participants; using the SAW method to provide accurate destination recommendations that match tourists' budgets and preferences; and implementing a systematic and objective evaluation process. The study is expected to offer several benefits, including integrated information, accurate recommendations, and enhanced user satisfaction through objective evaluations.

The research is limited in scope to the SAW method for budget prediction in tourism

recommendations for Jombang Regency. It targets tourists with specific budgets and preferences, and the developed system is a prototype that may require further development for full implementation.

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METHOD

The application development model used in this research is the ADDIE development model, which consists of five research stages as follows:

Figure 1. ADDIE Development Model

- **Analysis**
  This stage involves analyzing problems related to tourist attractions in Jombang, including the attractions themselves, management, and issues faced by both managers and visitors. The goal is to identify solutions to improve the services of tourist attraction managers and facilitate visitors. After identifying the urgent problem of determining the best tourist spots in Jombang Regency, a web-based application is developed to assist tourists in selecting the optimal tourist locations in Jombang Regency.
- **Design**
  After completing the analysis stage, the next stage is design. This involves creating a web-based application for identifying the best tourist locations, including designing the user interface, descriptions of tourist attractions, and other elements.
- **Development**
  The development stage involves building the web-based application according to the design specifications from the previous stage. Once the application is developed, functional testing is conducted to ensure its suitability and performance.
- **Implementation**
  In the implementation stage, the developed application is tested with users to identify any shortcomings from a user perspective. If problems are found, a system evaluation is carried out to address these issues.
- **Evaluation**
  The final stage involves evaluating user feedback to improve the application. The goal is to enhance user comfort and satisfaction by refining the application based on the collected input.

RESULT AND DISCUSSION

ERD Design

The ERD diagram illustrates the structure of tables within the database and the relationships between these tables in the system. Each table stores specific data, and the relationships between tables show how data is interconnected. For example, users provide suggestions for destinations, destinations have alternatives, and the Decision Support System (DSS) method is used for calculations related to destinations. This diagram is also used to design your MySQL database structure, facilitating the implementation and management of data within the system.

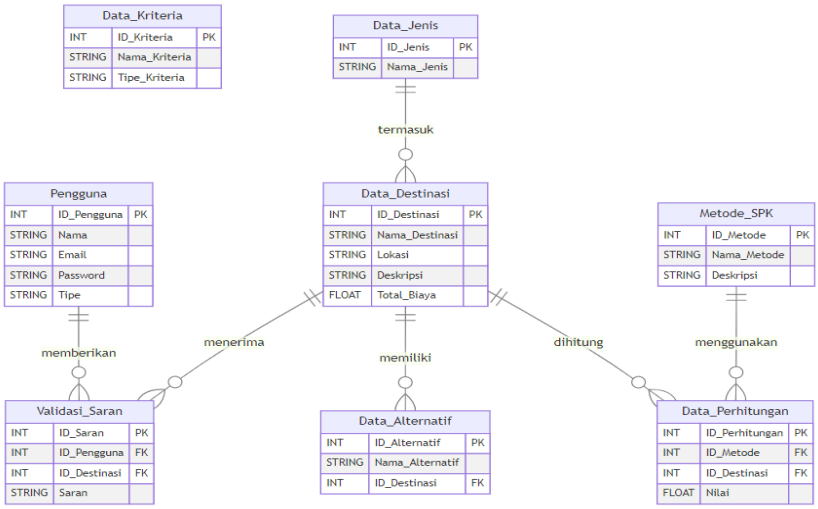


Figure 2 - Diagram ER (Entity-Relationship)

Diagram UML

This UML diagram illustrates the interaction between Users, the System, and Admins within the system. It shows how Users and Admins communicate with the System through various actions and processes.

- Users log in, access their dashboard, view recommendations, submit suggestions, and log out.
- Admins perform the same login process, manage data, validate user suggestions, carry out decision support calculations, and generate reports/statistics.

This diagram helps to understand the sequence of interactions and how different roles interact with the system at various stages.

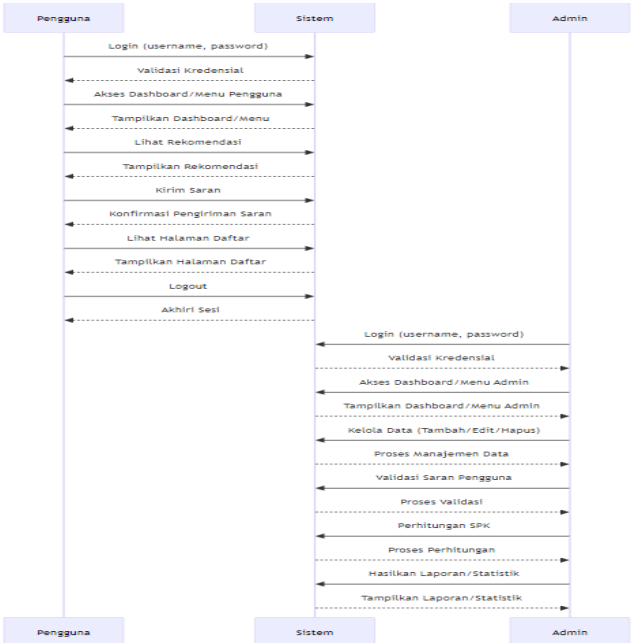


Figure 3. Diagram UML(Unified Modeling Language)

Web Project Model

The image below displays the model of your web project. This model provides a visual representation of the structure and interface of the developed web application, as well as how various components and features are implemented within the system.

- **Login Page**

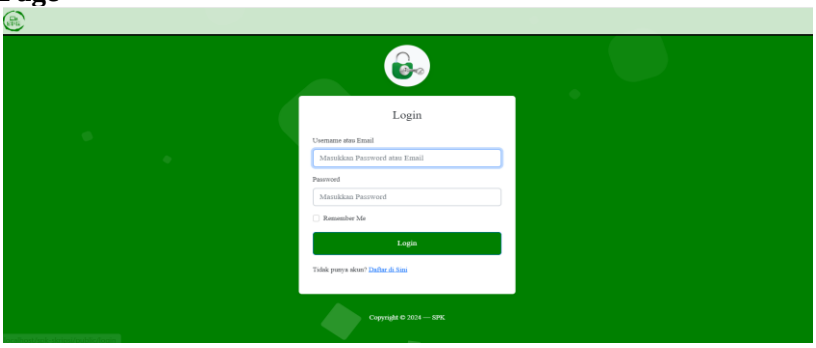


Figure 4. Login menu

Description: This page features a login interface where both Admin and Users enter their credentials. It is the initial access point for the system.

- **Admin Dashboard/Main Menu**

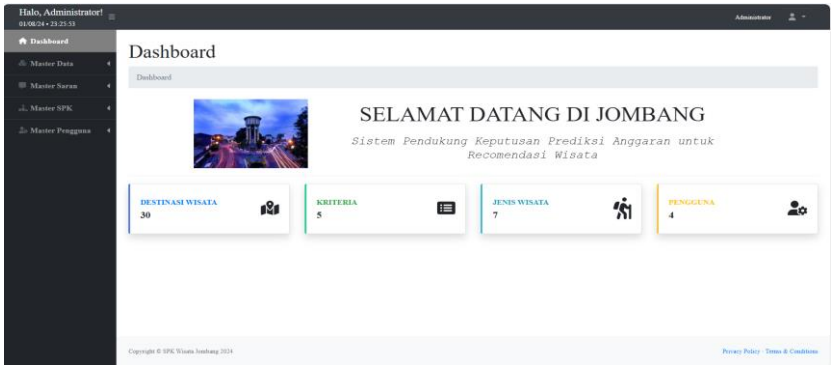


Figure 5. Admin Dasboard

Description: After logging in, Admins are presented with a dashboard that provides access to management features and system controls.

- **Data Management Page (Admin)**

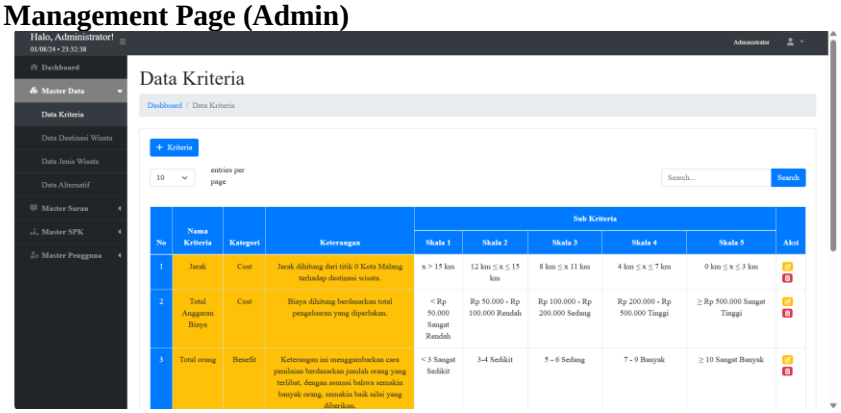


Figure 6. Data management Page

- **Description**: After logging in, Admins are presented with a dashboard that provides access to management features and system controls.
- **Suggestion Validation Page (Admin)**

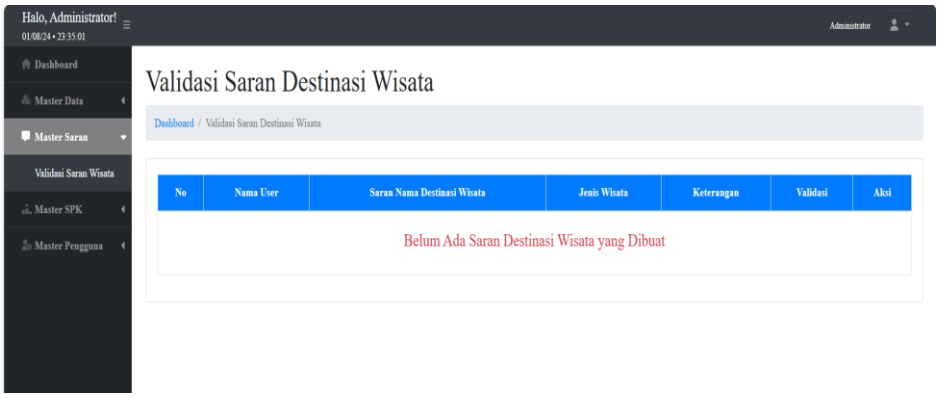


Figure 7. Sugguestion Validation Page

Description: This page allows Admins to review and validate user suggestions, ensuring the quality and relevance of feedback.

- **Decision Support Calculation Page (Admin)**

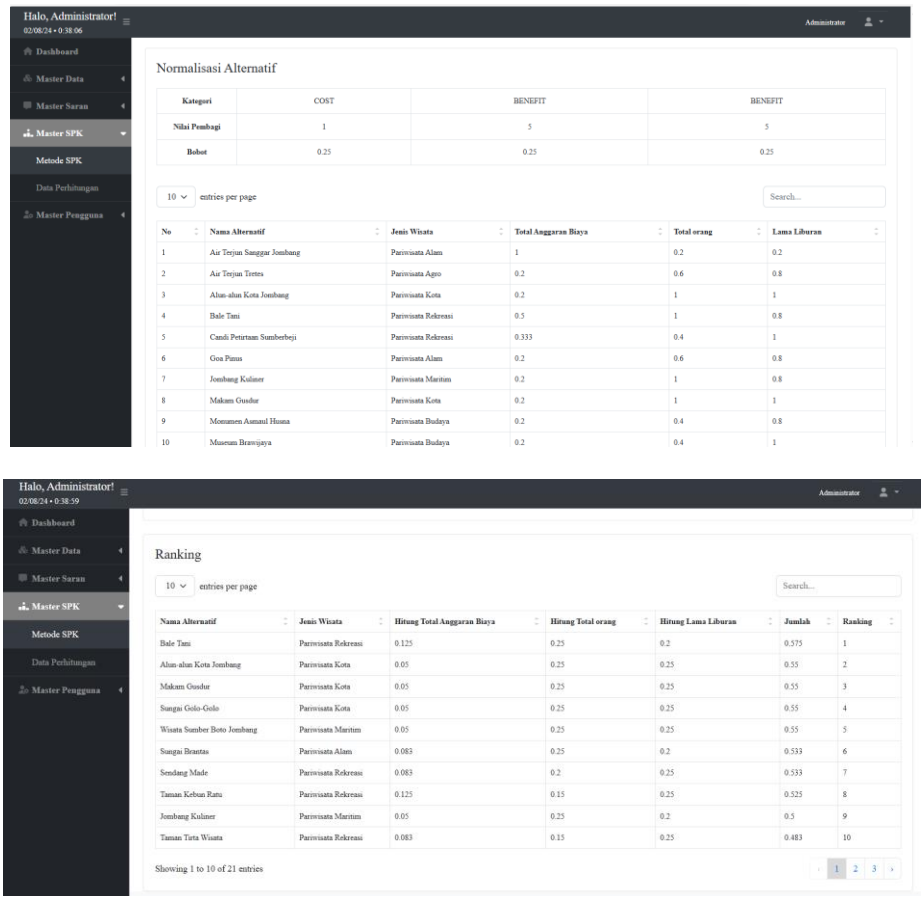


Figure 8. Decision Support Calculation Page

Description: This page allows the Admin to perform decision support calculations, essential for data analysis and system recommendations. The Admin can input data, apply the specified formulas, and obtain calculation results to support data-driven decisions.

Formulas Used:
Matrix Normalization:

Benefit Criteria: To calculate the normalized value for criteria where higher values are better, use the formula:

$$\text{Normalized Value}_{ij} = \frac{\text{Value}_{ij}}{\text{Max Value}_j}$$

This formula divides the alternative value by the maximum value of the criterion, resulting in a normalized value between 0 and 1, where a higher value indicates better performance on the criterion.
Cost Criteria: To calculate the normalized value for criteria where lower values are better, use the formula:

$$\text{Normalized Value}_{ij} = \frac{\text{Min Value}_j}{\text{Value}_{ij}}$$

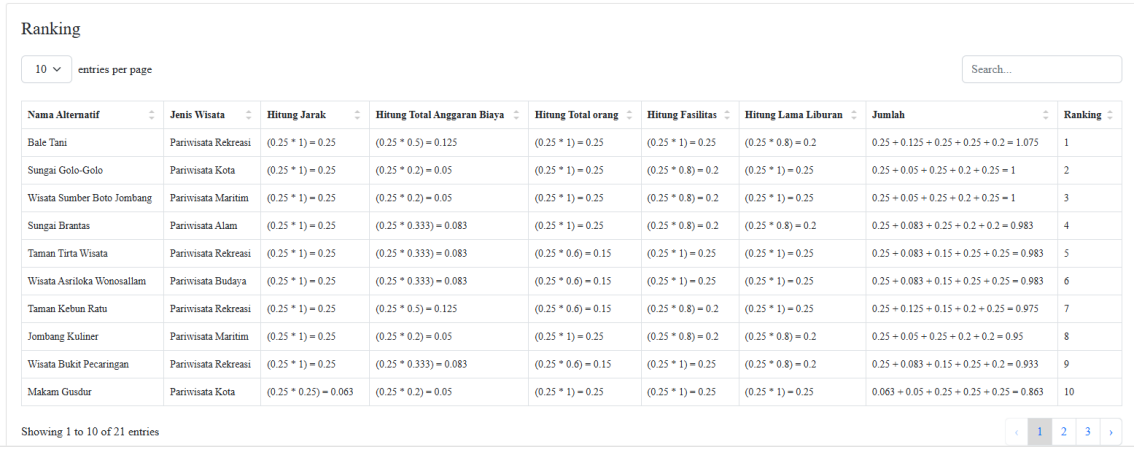
This formula divides the minimum value of the criterion by the alternative value, also resulting in a normalized value between 0 and 1, where a higher value indicates better performance on the criterion.

$$\text{Score}_i = \sum(\text{Normalized Value}_{ij} \times \text{Weight}_j)$$

Score Calculation: The final score for each alternative is calculated using:

This formula sums the product of each normalized value and its corresponding weight, producing a final score that reflects the overall performance of each alternative.

Report/Statistics **Page (Admin)**


Ranking

10 entries per page

Search...

Nama Alternatif	Jenis Wisata	Hitung Jarak	Hitung Total Anggaran Biaya	Hitung Total orang	Hitung Fasilitas	Hitung Lama Liburan	Jumlah	Ranking
Bale Tani	Pariwisata Rekreasi	(0.25 * 1) = 0.25	(0.25 * 0.5) = 0.125	(0.25 * 1) = 0.25	(0.25 * 1) = 0.25	(0.25 * 0.8) = 0.2	0.25 + 0.125 + 0.25 + 0.25 + 0.2 = 1.075	1
Sungai Golo-Golo	Pariwisata Kota	(0.25 * 1) = 0.25	(0.25 * 0.2) = 0.05	(0.25 * 1) = 0.25	(0.25 * 0.8) = 0.2	(0.25 * 1) = 0.25	0.25 + 0.05 + 0.25 + 0.2 + 0.25 = 1	2
Wisata Sumber Boto Jombang	Pariwisata Maritim	(0.25 * 1) = 0.25	(0.25 * 0.2) = 0.05	(0.25 * 1) = 0.25	(0.25 * 0.8) = 0.2	(0.25 * 1) = 0.25	0.25 + 0.05 + 0.25 + 0.2 + 0.25 = 1	3
Sungai Brantas	Pariwisata Alam	(0.25 * 1) = 0.25	(0.25 * 0.333) = 0.083	(0.25 * 1) = 0.25	(0.25 * 0.8) = 0.2	(0.25 * 0.8) = 0.2	0.25 + 0.083 + 0.25 + 0.2 + 0.2 = 0.983	4
Taman Tirta Wisata	Pariwisata Rekreasi	(0.25 * 1) = 0.25	(0.25 * 0.333) = 0.083	(0.25 * 0.6) = 0.15	(0.25 * 1) = 0.25	(0.25 * 1) = 0.25	0.25 + 0.083 + 0.15 + 0.25 + 0.25 = 0.983	5
Wisata Asriloka Wonosallam	Pariwisata Budaya	(0.25 * 1) = 0.25	(0.25 * 0.333) = 0.083	(0.25 * 0.6) = 0.15	(0.25 * 1) = 0.25	(0.25 * 1) = 0.25	0.25 + 0.083 + 0.15 + 0.25 + 0.25 = 0.983	6
Taman Kebun Ratu	Pariwisata Rekreasi	(0.25 * 1) = 0.25	(0.25 * 0.5) = 0.125	(0.25 * 0.6) = 0.15	(0.25 * 0.8) = 0.2	(0.25 * 1) = 0.25	0.25 + 0.125 + 0.15 + 0.2 + 0.25 = 0.975	7
Jombang Kuliner	Pariwisata Maritim	(0.25 * 1) = 0.25	(0.25 * 0.2) = 0.05	(0.25 * 1) = 0.25	(0.25 * 0.8) = 0.2	(0.25 * 0.8) = 0.2	0.25 + 0.05 + 0.25 + 0.2 + 0.2 = 0.95	8
Wisata Bukit Pecaringan	Pariwisata Rekreasi	(0.25 * 1) = 0.25	(0.25 * 0.333) = 0.083	(0.25 * 0.6) = 0.15	(0.25 * 1) = 0.25	(0.25 * 0.8) = 0.2	0.25 + 0.083 + 0.15 + 0.25 + 0.2 = 0.933	9
Makam Gusdur	Pariwisata Kota	(0.25 * 0.25) = 0.063	(0.25 * 0.2) = 0.05	(0.25 * 1) = 0.25	(0.25 * 1) = 0.25	(0.25 * 1) = 0.25	0.063 + 0.05 + 0.25 + 0.25 + 0.25 = 0.863	10

Showing 1 to 10 of 21 entries

‹ 1 2 3 ›

Figure 9. Report Page

Description: This page displays the detailed calculation results generated by the system, providing an in-depth view of the analyzed data in the form of tables. It supports data-driven decision-making by presenting detailed information and visualizations, enabling the Admin to perform further analysis and make well-informed decisions based on the displayed results.

- **User Dashboard/Main Menu**

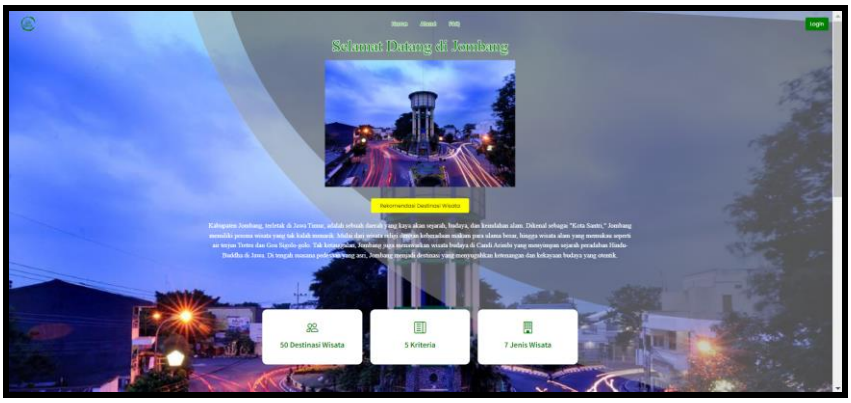


Figure 10. Dasboard Page

Description: After logging in, Users access a dashboard that offers navigation and displays key information relevant to their needs.

- **Recommendation Page**

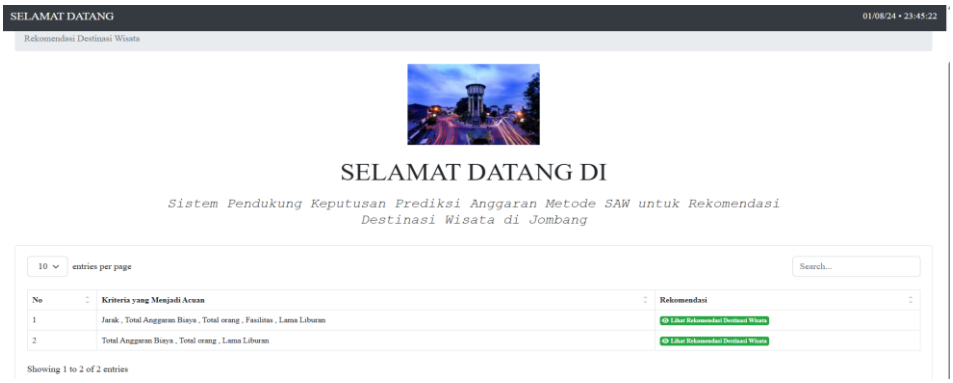


Figure 11. Recommendation Page

Description: Shows the application's recommendations to Users, based on their inputs and preferences.

- **Suggestion Submission Page**

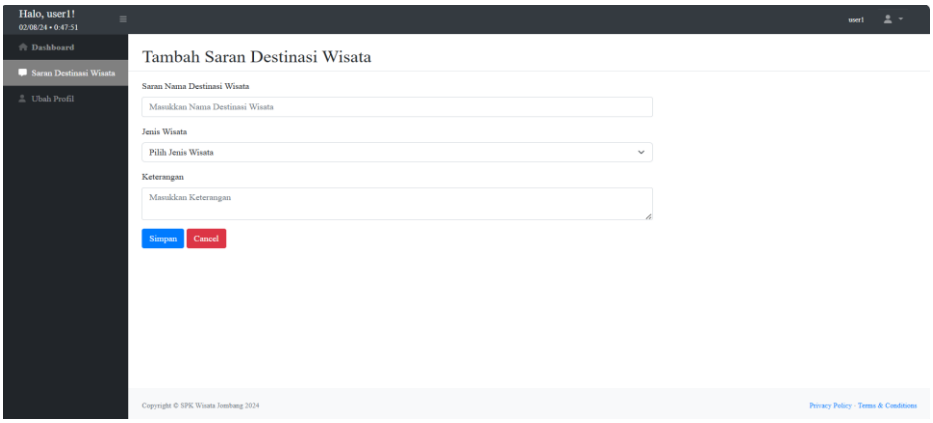


Figure 12. Suggestion Submid Page

Description: Users can submit their suggestions confirmation of their submission through this page.

- **Logout Page**

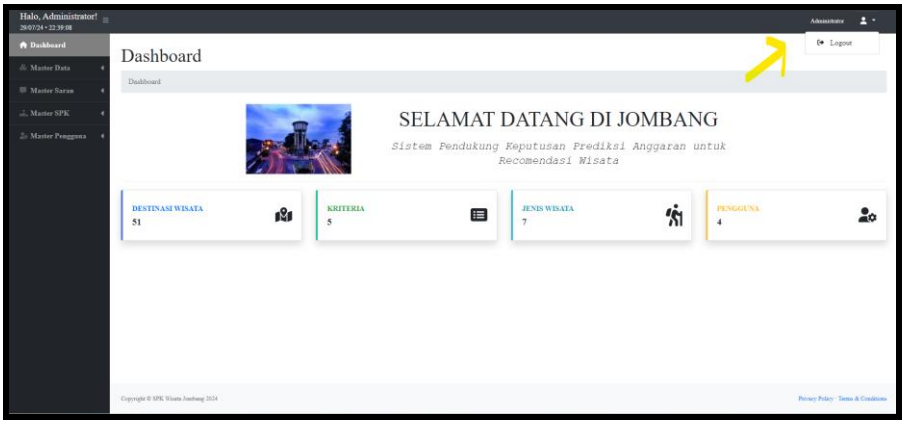


Figure 13. Logout Menu Button

Description: This page handles the logout process for both Admins and Users, ensuring a secure end to their session.

CONCLUSIONS

This study successfully developed a web-based Decision Support System (DSS) using the Simple Additive Weighting (SAW) method for recommending tourist destinations in Jombang Regency. The application of the SAW method within this system has proven effective in providing accurate and objective recommendations based on budget, trip duration, and number of participants. The findings indicate that this DSS enhances trip planning efficiency by integrating information and offering recommendations aligned with user preferences. The system features a user-friendly design and functionalities that facilitate interaction between users and admins.

However, the system is still a prototype and requires further development for full implementation. This research paves the way for more advanced system development and further adjustments to better meet future tourist needs.

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