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# Implementation Of A Perfume Recommendation System Using Ahp And Topsis At Ivan Parfume

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**ABSTRACT**

The rapid growth of the refill perfume industry requires business owners to enhance service quality, particularly in assisting customers in selecting suitable fragrance products. At Ivan Parfume, the large variety of available scents often causes confusion among customers, while the current recommendation process remains manual and subjective. This study aims to develop a web-based Decision Support System (DSS) using a combination of the Analytical Hierarchy Process (AHP) and the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) methods to provide objective and accurate perfume recommendations The AHP method is employed to determine the priority weights of decision criteria, including price, longevity, packaging design, volume, and scent, while the TOPSIS method is used to rank perfume alternatives based on their closeness to the ideal solution. The system processes ten perfume alternatives and generates a ranked list of recommendations based on multi-criteria evaluation. The results indicate that the system is capable of producing structured and consistent recommendations aligned with user preferences. Furthermore, the system demonstrates good performance in handling multiple criteria simultaneously and provides transparent calculation results that can be easily interpreted by users. The implementation of the AHP-TOPSIS model improves decision-making efficiency by reducing subjectivity and processing time compared to conventional methods. This study demonstrates that the proposed system can effectively support retail businesses in delivering data-driven recommendations and enhancing customer satisfaction.

## INTRODUCTION

Currently, the perfume industry is experiencing rapid growth, driven by the public's high interest in fragrance products as lifestyle accessories (Pendidikan, 2024). This business is not only dominated by major brands but is also increasingly enlivened by the proliferation of perfume refill businesses offering a wide variety of scents (Siburian & Harahap, 2024). The intense competition in the perfume industry requires business operators to not only provide quality products but also deliver fast and targeted service to win over the market (Iqbal et al., 2022).

Perfume is composed of various blends of aromatic compounds, essential oils, fixatives, and solvents designed to create a fragrance. The use of perfume has now become an integral part of modern lifestyle, helping to boost self-confidence and enhance one's appearance (Setiawan & Nasution, 2022). The wide variety of scents and types of perfume available on the market often makes it difficult for consumers to choose the option that best suits their needs and budget (Syahputri et al., 2022).

This phenomenon is also evident at Ivan Parfume, a store specializing in the sale of all types and scents of refillable perfumes. The store was founded by Ivan Jhon Ferry Simbolon in 2017 and is located at Jln. Protokol Airjoman Pasar XII, Asahan Regency. Ivan Parfume offers a wide variety of scents. The sheer number of available scents often causes confusion for both new and regular customers who want to try new variants. Currently, the perfume recommendation process at Ivan Parfume is still done conventionally, namely through direct Q&A between the seller and the buyer. This method has a drawback: it takes a considerable amount of time, and the recommendations provided tend to be subjective, based solely on the salesperson's memory or personal taste, so they sometimes do not align with the customer's specific preferences (Supriyatna et al., 2024).

To address this issue, a computerized system is needed that can provide objective and rapid recommendations (Kaunan et al., 2023). The appropriate solution to this problem is the implementation of a Decision Support System (DSS) (Syahputra & Anwar, 2024). decision support system is a computer-based information system that generates various decision alternatives to assist management in addressing both structured and unstructured problems using data and models (Ginting & Puspasari, 2025).

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Therefore, the objective of this study is to apply the AHP and TOPSIS methods to determine the weightings of perfume evaluation criteria at Ivan Parfume and to develop a Decision Support System application that can assist Ivan Parfume in providing quick and objective perfume recommendations (Priyadi Priyadi et al., 2025).

## LITERATURE REVIEW

The development of Decision Support Systems (DSS) has been widely applied to assist decision-making processes in various domains, including product recommendation systems. DSS enables decision-makers to process complex data and generate objective alternatives based on multiple criteria (Barfar et al., 2021). In the context of recommendation systems, DSS plays an important role in reducing subjectivity and improving the accuracy of recommendations provided to users (Ginting & Puspasari, 2025).

Several studies have applied the Analytical Hierarchy Process (AHP) method to determine the priority weights of criteria in decision-making problems. AHP is known for its ability to structure complex problems into a hierarchical model and produce consistent weighting results (Putra & Prayitno, 2021). Previous research has shown that AHP is effective in evaluating criteria such as price, quality, and user preferences in product selection systems (Iqbal et al., 2022); (Kaunan et al., 2023). However, AHP alone is limited to determining criteria weights and does not provide a final ranking of alternatives.

To address this limitation, the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method is often combined with AHP. TOPSIS is capable of ranking alternatives based on their distance from the ideal positive and negative solutions, making it suitable for selecting the best alternative from several options. Several studies have demonstrated that the integration of AHP and TOPSIS produces more accurate and reliable results compared to using a single method (Priyadi Priyadi et al., 2025).

Based on these studies, it can be identified that the combination of AHP and TOPSIS provides a comprehensive approach for decision-making by integrating criteria weighting and alternative ranking. However, the implementation of this method in perfume recommendation systems is still limited, particularly in small businesses. Therefore, this study aims to implement an AHP-TOPSIS-based DSS to provide objective, fast, and accurate perfume recommendations at Ivan Parfume.

## METHOD

This study employs a quantitative method with the following steps:

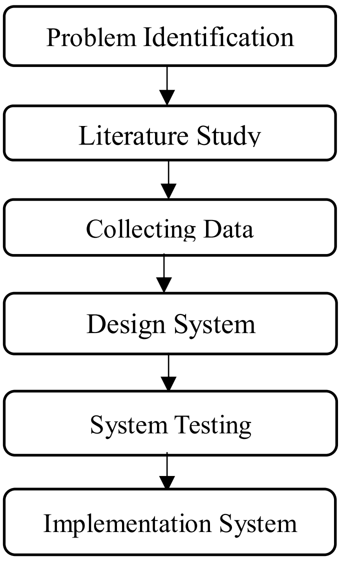


Figure 1. Research Stages

### Problem Identification

The author identifies the problems occurring at the research site. The problem identified in the background of this study is that the wide variety of scents at Ivan Parfume often confuses customers when making a choice, while the current recommendation system remains manual and subjective, relying solely on the salesperson's memory. This results in a slow and inaccurate service process, exacerbated by the lack of a computerized system capable of processing specific criteria such as price and longevity to generate objective recommendations.

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**Literature Study**

The literature review conducted by the author involved searching various written sources, including books, archives, magazines, articles, journals, and other documents relevant to the issue under study. The information obtained from this literature review was then used as a reference to support the arguments presented.

**Collecting Data**

At this stage, data collection was conducted through interviews with sources at Ivan Parfume and observations to obtain the necessary data.

**Design System**

In this phase, a system is designed using the design model (Erni Rouza et al., 2023). The model is a representation of the solution that illustrates the output of the processes within the developed system. The model was designed using UML (Unified Modeling Language), specifically by creating use case diagrams, class diagrams, activity diagrams, and sequence diagrams, as well as ERDs and flowcharts to illustrate the system's workflow and the design of the database and user interface (Syafina & Harahap, 2023).

**System Testing**

System testing is a process designed to evaluate whether the developed system meets expectations. This phase involves entering data into the application using black-box testing (Samiah et al., 2023).

**Implementation System**

System implementation is the process of putting a designed system into practice. At this stage, the system that has been developed will be implemented to help determine perfume recommendations at Ivan Parfume.

## RESULT

**Analysis Data**

In the design of a Decision Support System for perfume recommendations at Ivan Parfume using a combination of the AHP and TOPSIS methods, an analysis of the data flow being managed is required (Barfar et al., 2021). This analysis aims to identify the data components required by the system as input for processing, as well as the objective information that the system will generate as output to assist customers in making decisions (Putra & Prayitno, 2021). The processed data is presented in Table 1 below.

Table 1. Alternative Data

| Code | Product | Criteria | | | | |
|---|---|---|---|---|---|---|
| | | Price | Longevity | Design | Volume | Scent |
| A1 | Baccarat Rouge 540 | Rp85.000 | 12 hours | Luxury glass bottle (press) | 35 ml | Very Popular & Strong Brand Identity |
| A2 | Black Opium | Rp70.000 | 8 hours | Elegant glass | 50 ml | Loved by many consumers |
| A3 | Dior Sauvage | Rp90.000 | 8 hours | Elegant glass | 35 ml | Very Popular & Strong Brand Identity |
| A4 | Zwitsal Baby | Rp40.000 | 4 hours | Standard glass / plastic spray bottle | 85 ml | Fairly popular |
| A5 | Victoria Secret Bombshell | Rp65.000 | 7 hours | Kaca elegan | 35 ml | Loved by many consumers |
| A6 | Dunhill Blue | Rp60.000 | 9 hours | Standard glass / plastic spray bottle | 30 ml | Fairly popular |
| A7 | Garuda Indonesia | Rp50.000 | 7 hours | Standard glass / plastic spray bottle | 65 ml | Fairly popular |
| A8 | Chanel Coco | Rp110.000 | 10 hours | Luxury glass bottle (press) | 50 ml | Very Popular & Strong Brand Identity |
| A9 | Bulgari Aqua | Rp75.000 | 8 hours | Elegant glass | 50 ml | Loved by many consumers |
| A10 | Avril Forbidden Rose | Rp55.000 | 6 hours | Standard glass / plastic spray bottle | 30 ml | Fairly popular |

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Table 1 presents the alternative data used in this study, consisting of ten perfume products available at Ivan Parfume. Each alternative is evaluated based on five criteria, namely price, longevity, packaging design, volume, and scent. The price criterion represents the cost of each product, while longevity indicates how long the fragrance lasts when used. The design criterion reflects the attractiveness of the packaging, and volume indicates the quantity of perfume offered. The scent criterion describes the level of popularity and customer preference for each perfume variant. These criteria are used as the basis for evaluating and ranking the alternatives using the AHP and TOPSIS methods.

**Design System**

The design of the use case diagram in this system aims to model the functional interactions between the involved actors namely, the administrator and the customer and the perfume recommendation system at Ivan Parfume. This diagram illustrates the system's boundaries as well as the sequence of messages or activities that each actor can perform, such as the customer entering criteria and the administrator managing alternative data and weight values to generate accurate recommendation decisions (Siska Narulita et al., 2024). The use case diagram is shown in Figure 2.

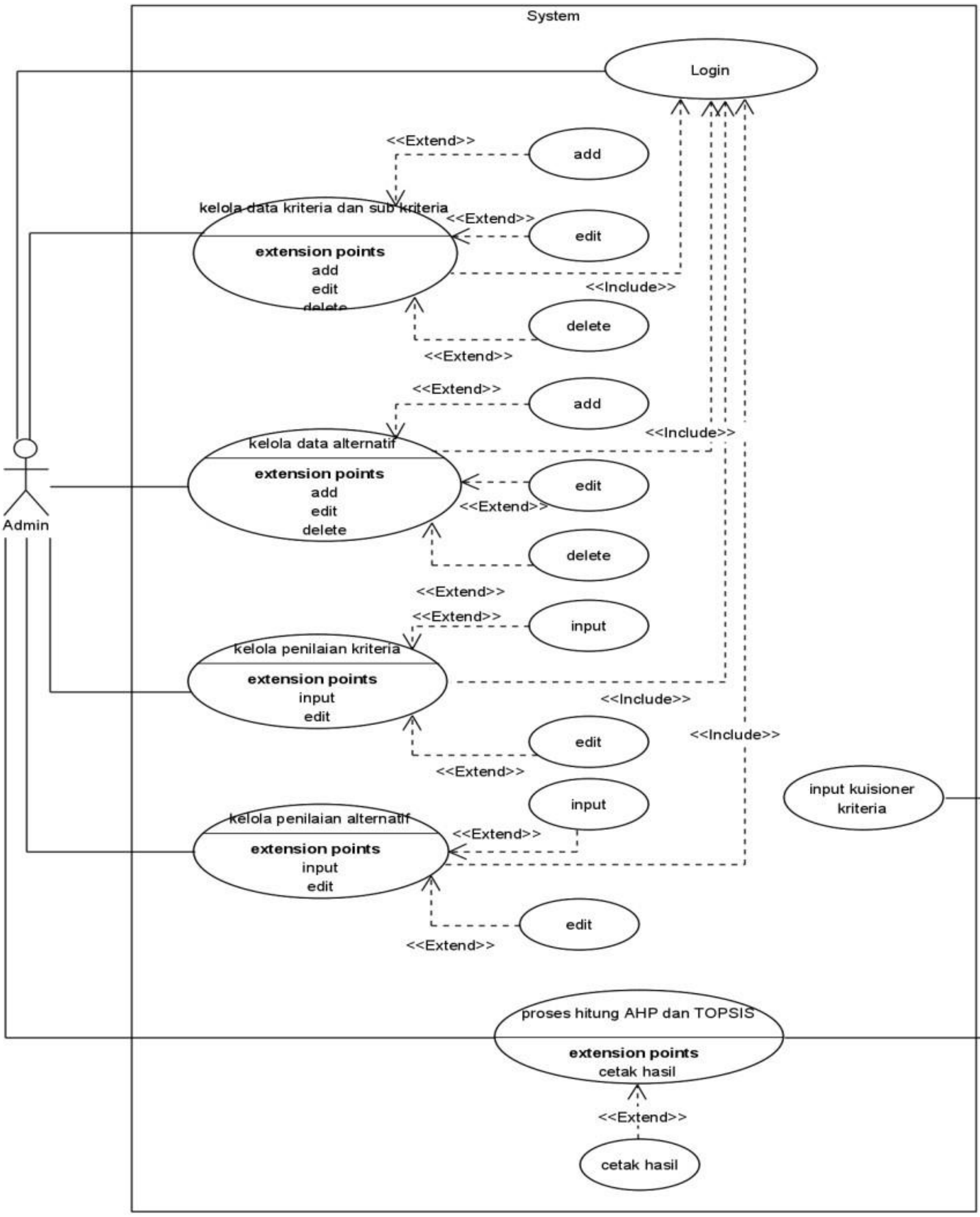


Figure 2. Design System

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Figure 2 illustrates the use case diagram of the proposed perfume recommendation system at Ivan Parfume. The system involves two main actors, namely the administrator and the customer. The administrator is responsible for managing system data, including inputting and updating criteria, alternatives, and weighting values used in the AHP method. In addition, the administrator can view and manage the results of the recommendation process.

The customer interacts with the system by selecting preference criteria, such as price, longevity, packaging design, volume, and scent, to obtain suitable perfume recommendations. The system then processes the input data using the AHP method to determine criteria weights and the TOPSIS method to rank the available alternatives.

The diagram also shows the interaction flow between actors and the system, where user input is processed into decision outputs in the form of ranked perfume recommendations. This model ensures that the recommendation process is structured, objective, and aligned with user preferences.

**Implementation System**

Interface implementation is the stage of translating the system's visual design into application pages that users can use to interact with the system. This stage presents the results of the implementation of each main page of the perfume recommendation decision support system. The purpose of interface implementation is to ensure that the system has a user-friendly, visually appealing interface that facilitates user interaction with the application.

- **Login Page**

This is the first step before users can access the system. On this page, users are prompted to enter their registered username and password. The system will perform a validation process to ensure that the entered data matches the information stored in the database. If authentication is successful, users will be redirected to the main page based on their access level.

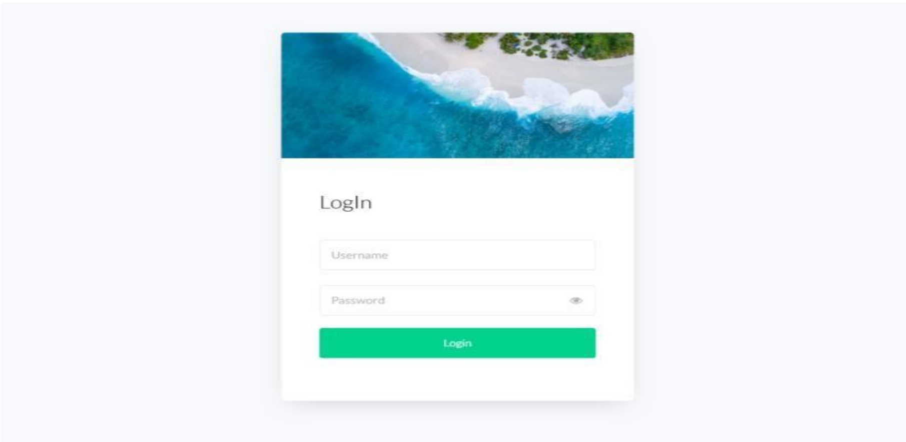


Figure 3. Login Page

- **Dashboard Admin**

The admin dashboard displays a summary of key system information and a navigation menu that makes it easy for admins to manage all application data.

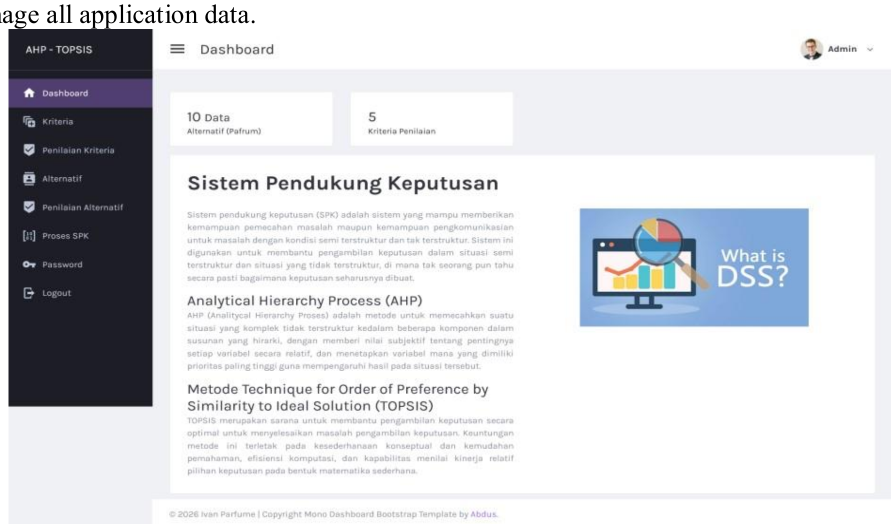


Figure 4. Dashboard Admin

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- **Criteria Page**

The criteria data page displays a list of all the evaluation criteria used in the system to calculate perfume recommendations.

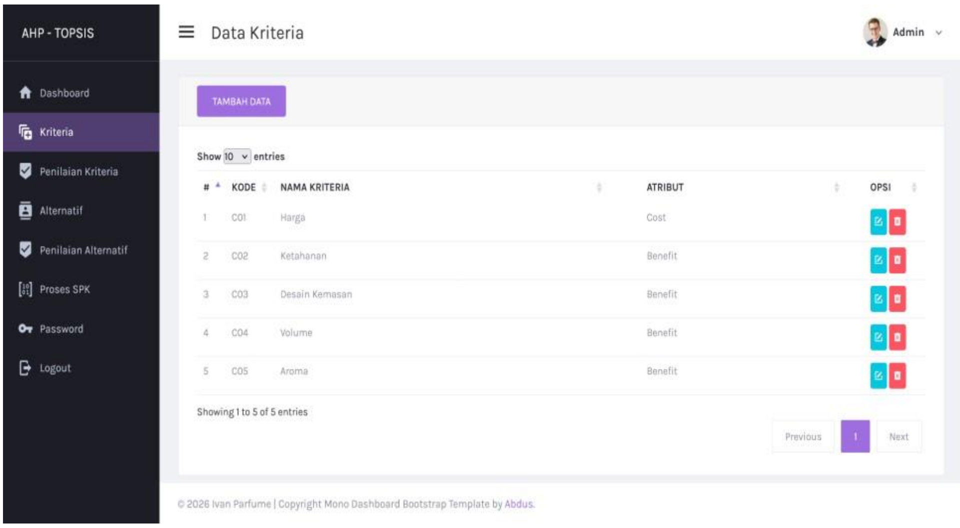


Figure 5. Criteria Page

- **Alternative Page**

The alternative data page displays all the alternative perfume data that will be processed and evaluated as recommended options within the system.

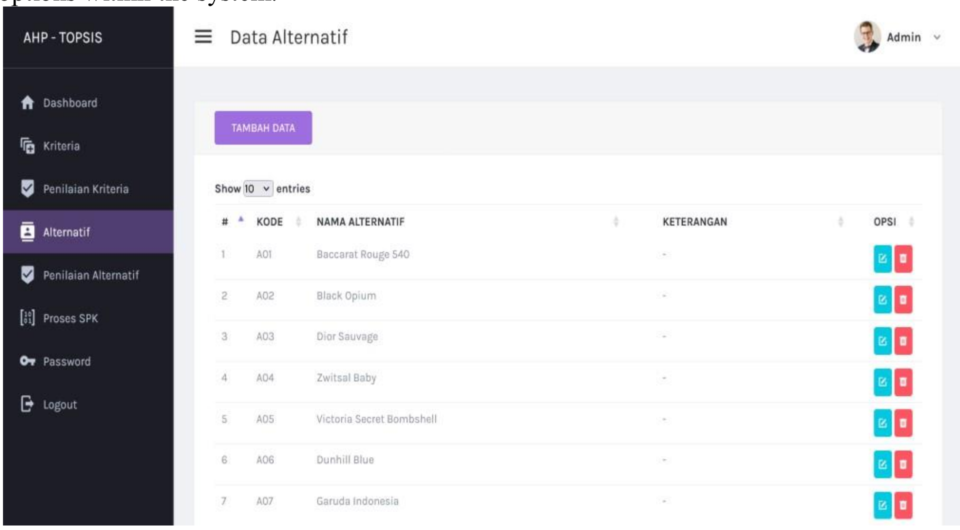


Figure 6. Alternative Page

- **Rating Page**

This page is used to enter comparison values between criteria as the basis for weighting using the AHP method in a decision support system.

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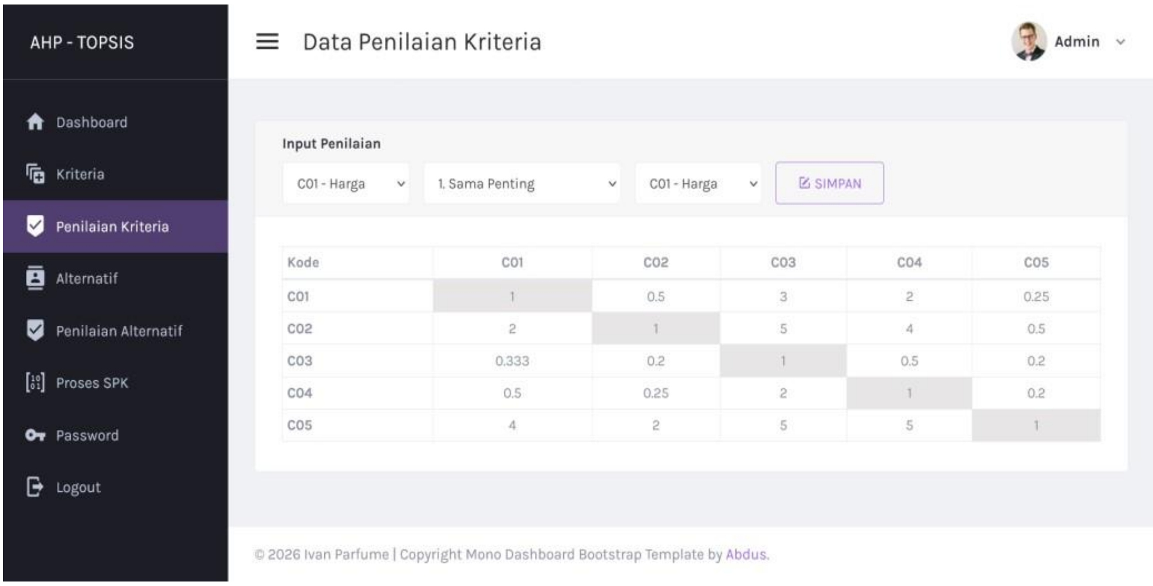


Figure 7. Rating Page

Figure 7 shows the rating page used to input pairwise comparison values between criteria in the AHP method. On this page, the administrator assigns relative importance values between each pair of criteria, such as price, longevity, packaging design, volume, and scent, using a predefined comparison scale.

These input values are then processed by the system to construct a pairwise comparison matrix, which is subsequently normalized to generate the priority weights of each criterion. In addition, the system automatically calculates the consistency ratio (CR) to ensure that the comparisons provided are logically consistent.

This page plays a crucial role in the decision-making process, as the resulting weights are used as input for the TOPSIS method in ranking perfume alternatives. Therefore, accurate input on this page directly affects the quality of the final recommendation results.

- **Calculation Result Page**

The SPK calculation results page displays the process and final results of the ranking of perfume alternatives based on the AHP and TOPSIS methods.

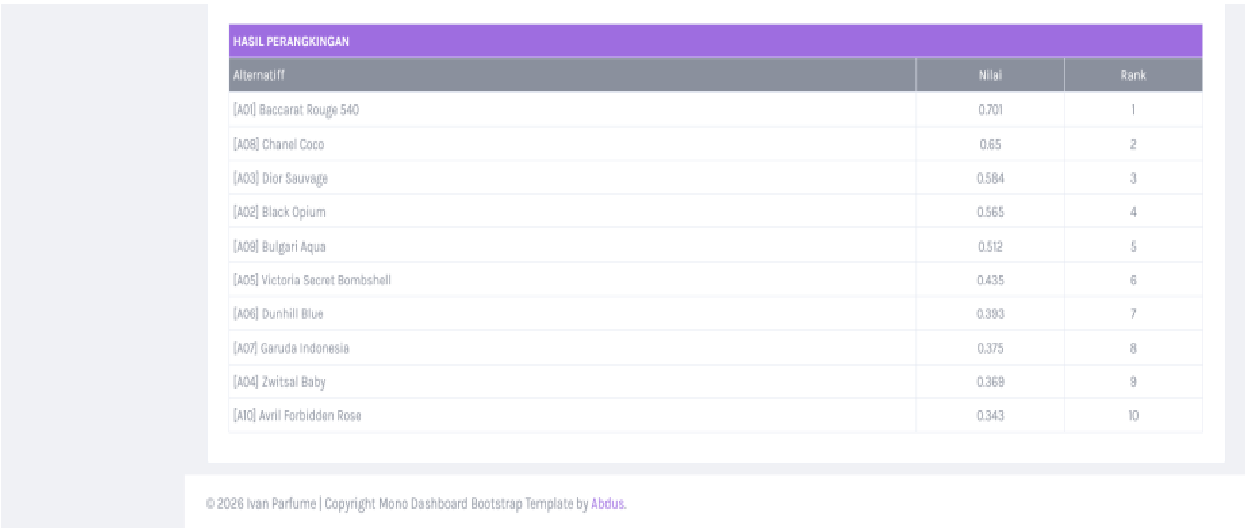


Figure 8. Calculation Result Page

Figure 8 illustrates the calculation result page, which displays the final ranking of perfume alternatives generated by the decision support system. This page presents the results of the integrated AHP and TOPSIS methods, where the criteria weights obtained from AHP are used as input for the TOPSIS calculation process.

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The system first normalizes the decision matrix and applies the weighted normalization based on AHP results. Then, the positive ideal solution and negative ideal solution are determined, followed by the calculation of the distance of each alternative to these ideal solutions. Based on these calculations, a preference value is generated for each alternative, which determines its ranking.

The final output shown on this page is a sorted list of perfume alternatives from the highest to the lowest preference value, where the top-ranked alternative represents the most recommended product. This page enables users to easily interpret the results and supports objective decision-making based on quantitative analysis.

## DISCUSSION

The implementation of the AHP and TOPSIS methods in this study provides complementary roles in the perfume recommendation process. The Analytical Hierarchy Process (AHP) is primarily used to determine the priority weights of each criterion, such as price, longevity, packaging design, volume, and scent. AHP is effective in structuring complex decision problems into a hierarchical model and ensuring consistency in pairwise comparisons. The consistency test results indicate that the weighting process is reliable and can be used as a valid basis for decision-making. However, AHP has limitations in that it does not directly produce a final ranking of alternatives, making it insufficient when used as a standalone method.

On the other hand, the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) is highly effective in ranking alternatives based on their distance from the ideal positive and negative solutions. TOPSIS is capable of providing clear and measurable results in determining the best alternative, making it suitable for final decision-making. Nevertheless, TOPSIS relies heavily on the accuracy of the input weights, and without proper weighting, the ranking results may not reflect actual preferences.

Based on the results of this study, the combination of AHP and TOPSIS proves to be more effective than using either method individually. AHP ensures accurate and consistent weighting of criteria, while TOPSIS provides an objective ranking of perfume alternatives. This integration minimizes subjectivity, improves decision accuracy, and produces recommendations that align with customer preferences. Therefore, the combined AHP-TOPSIS approach is considered an effective solution for supporting perfume selection decisions at Ivan Parfume.

## CONCLUSION

Based on the results of implementing a Decision Support System for perfume recommendations using the AHP and TOPSIS methods at Ivan Parfume, several conclusions can be drawn: The Analytical Hierarchy Process (AHP) method was successfully applied to determine the priority weights of criteria (price, durability, packaging design, volume, and scent) in an objective and measurable manner, and produced consistency values that met the requirements, making it suitable for use in decision-making. The Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method was capable of ranking perfume alternatives based on their proximity to the ideal solution, thereby generating a sequence of the best perfume recommendations according to customer preferences. The Decision Support System (DSS) designed and developed is capable of making the perfume selection process at Ivan Parfume faster, more accurate, and more objective compared to manual systems, thereby addressing issues of subjectivity and improving the quality of service provided to customers.

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