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An AHP-Based Decision Support System for Selecting the Best Service Between GrabBike Hemat and GrabBike Standard

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ABSTRACT

The development of online ride-hailing transportation services in Indonesia has introduced various service options, such as GrabBike Economy and GrabBike Standard, each offering distinct advantages in terms of cost, travel time, comfort, and safety. This study aims to develop a Decision Support System (DSS) based on the Analytic Hierarchy Process (AHP) method to assist Grab users in selecting the service that best matches their preferences. A quantitative research approach was employed, with data collected through an AHP pairwise comparison questionnaire distributed to 31 Grab users in the Tangerang area. The analysis revealed that cost was the most influential criterion, with a weight of 60.0%, followed by travel time (24.9%), comfort (10.4%), and safety (4.6%). Overall, GrabBike Economy achieved a higher aggregate priority score of 52.6%, slightly outperforming GrabBike Standard at 47.4%. These findings indicate that users prioritize affordability over comfort and safety when choosing ride-hailing services. However, the Consistency Ratio (CR) of 27.5% suggests that respondents' judgments were not sufficiently consistent. This study concludes that the AHP method is effective in supporting multi-criteria decision-making within the context of online ride-hailing transportation and provides practical insights for service providers to develop strategies that better align with user preferences.

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1. Introduction

The rapid advancement of information technology has driven significant transformation across various sectors, including transportation. In Indonesia, ride-hailing services such as Grab have become one of the primary transportation solutions for urban communities due to their efficiency, accessibility, and convenience

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through digital applications. Grab offers several service options, including GrabBike Hemat and GrabBike Standard, each providing distinct advantages in terms of cost, travel time, comfort, and safety [1].

However, the diversity of these criteria often makes it difficult for users to determine the service that best suits their needs. A study by Saripudin [2] revealed that safety (36.02%) and service quality (23.73%) are the two most influential factors in selecting ride-hailing services, with GrabBike emerging as the preferred choice due to its affordability and strong brand recognition. In decision-making scenarios involving multiple subjective criteria, a Decision Support System (DSS) plays an important role by providing a data-driven approach to facilitate rational decision-making. One of the most widely adopted methods for developing a DSS is the Analytic Hierarchy Process (AHP), which enables decision-makers to decompose complex problems into a hierarchical structure and evaluate alternatives systematically through pairwise comparisons [3]. Previous studies have demonstrated the effectiveness of AHP in the transportation sector. For example, Salwa Salleh et al. [4] employed AHP to assess passengers' risk perceptions of e-hailing services, while Hadjoe [5] integrated AHP with Network Analysis to support the planning of Transit-Oriented Development (TOD)-based public transportation systems.

Based on this background, the present study addresses two primary research questions: (1) how the AHP method can be implemented within a Decision Support System to assist users in selecting between GrabBike Hemat and GrabBike Standard, and (2) which criteria have the greatest influence on users' decision-making process. Accordingly, this study aims to develop an AHP-based Decision Support System that assists users in identifying the most suitable GrabBike service according to their preferences while determining the relative weights of the decision criteria influencing service selection. This research contributes to the advancement of Decision Support Systems in the field of online ride-hailing transportation and offers practical implications for users by supporting more informed decision-making. Furthermore, the findings provide valuable insights for service providers such as Grab in designing customer-oriented strategies based on user preferences.

2. Methodology

2.1. Decision Support System (DSS)

A Decision Support System (DSS) is a computer-based system designed to assist decision-makers in solving semi-structured problems by providing information, analytical models, and decision-support tools for evaluating alternative solutions. Rather than replacing the role of decision-makers, a DSS enhances their analytical capabilities and facilitates the selection of the most appropriate alternative based on predefined criteria [6].

In the context of online ride-hailing transportation, a DSS can assist users in selecting the service that best matches their preferences, such as cost, travel time, comfort, and safety. By utilizing a DSS, users can make more informed and rational decisions when choosing between GrabBike Hemat and GrabBike Standard.

2.2. Analytic Hierarchy Process (AHP)

The Analytic Hierarchy Process (AHP) is a multi-criteria decision-making (MCDM) method developed by Thomas L. Saaty. AHP enables complex decision problems to be decomposed into a hierarchical structure, allowing both qualitative and quantitative assessments of multiple criteria through pairwise comparisons. This method has been widely applied in various fields, including transportation decision-making [7].

The AHP methodology consists of the following steps:

1. Defining the problem and establishing the decision objective.
2. Constructing a hierarchical structure representing the decision problem.
3. Performing pairwise comparisons among the elements at each level of the hierarchy.
4. Calculating the relative priority weights of each criterion and alternative.
5. Evaluating the consistency of the pairwise comparison matrix to ensure the validity and reliability of the judgments.

AHP is particularly effective in addressing both subjective and quantitative aspects of decision-making while incorporating user preferences into the evaluation of available alternatives.

2.3. Online Ride-Hailing Transportation and GrabBike Services

Online ride-hailing transportation is an innovation in the transportation service industry that enables users to book vehicles through internet-based mobile applications. Grab is one of the leading ride-hailing service providers in Southeast Asia, including Indonesia, offering various transportation services such as GrabBike Hemat and GrabBike Standard.

GrabBike Hemat is designed for users who prioritize affordability and cost efficiency, whereas GrabBike Standard emphasizes greater comfort and faster service. Users' preferences for these services are influenced by several factors, including safety, cost, waiting time, and service quality. In this context, implementing the AHP method within a Decision Support System enables users to evaluate and compare both services based on relevant decision criteria, thereby supporting more accurate and preference-based decision-making.

2.4. Related Studies

Several studies have investigated the application of the Analytic Hierarchy Process (AHP) in Decision Support Systems (DSS) across the transportation sector and other application domains.

- Rizky [7] conducted a systematic literature review on the application of the AHP method in Decision Support Systems and concluded that AHP is an effective approach for supporting multi-criteria decision-making across various fields, including transportation.
- Adzaki et al. [8] applied the AHP method to determine the most suitable villages for a community service program (*Kuliah Kerja Nyata* or KKN) by considering multiple decision criteria. Their findings demonstrate the flexibility of AHP in addressing diverse decision-making scenarios.
- Fatmawati et al. [9] implemented AHP to identify the best-performing employee at Dharmais Cancer Hospital. The study showed that AHP improves the objectivity of the selection process by evaluating candidates based on predefined criteria.

These studies provide a strong theoretical and methodological foundation for developing an AHP-based Decision Support System to support the selection of GrabBike services. However, unlike previous research, this study focuses specifically on assisting users in choosing between GrabBike Hemat and GrabBike Standard by considering user preferences related to cost, travel time, comfort, and safety.

2.5 Research Methodology

Research Design

This study is classified as applied research employing a quantitative approach. The primary objective is to develop a Decision Support System (DSS) based on the Analytic Hierarchy Process (AHP) to assist users in selecting the most suitable service between GrabBike Hemat and GrabBike Standard. A quantitative approach was adopted because it enables the objective measurement of criterion weights and user preferences through systematic numerical analysis [7].

Research Location and Period

The study was conducted in Tangerang, Indonesia, as the city is one of the regions with a high level of online ride-hailing service usage. Data collection was carried out in May 2025.

Population and Sample

The population of this study consisted of active Grab users in Tangerang who had experience using both GrabBike Hemat and GrabBike Standard services. A purposive sampling technique was employed based on the following criteria:

- Respondents had previously used either GrabBike Hemat or GrabBike Standard.
- Respondents were residents of Tangerang.

A total of 31 respondents participated in this study, meeting the minimum sample size generally recommended for AHP applications to produce valid and reliable results [10].

Data Collection Techniques

Data were collected using the following methods:

1. **Questionnaire**: A questionnaire was designed to collect users' preferences regarding the criteria for selecting GrabBike services. It was developed using the AHP pairwise comparison scale (1–9) to evaluate the relative importance of each criterion.
2. **Literature Review**: Previous studies were reviewed to identify relevant criteria for evaluating online ride-hailing services and to examine the application of AHP in Decision Support Systems [11], [12].

Data Analysis Techniques

The collected data were analyzed through the following stages:

1. **Hierarchy Construction**: Defining the decision goal (selection of the most suitable GrabBike service), the evaluation criteria (cost, travel time, comfort, and safety), and the alternatives (GrabBike Hemat and GrabBike Standard).
2. **Pairwise Comparison Matrix**: Constructing pairwise comparison matrices based on respondents' questionnaire data to compare the relative importance of the decision criteria.
3. **Priority Weight Calculation**: Calculating the relative weights of each criterion using the eigenvector method.
4. **Consistency Test**: Computing the Consistency Ratio (CR) to assess the consistency of respondents' judgments. A CR value of ≤ 0.10 indicates an acceptable level of consistency [3].
5. **Priority Synthesis**: Multiplying the criterion weights by the preference values of each alternative to obtain the final priority scores and identify the most suitable service.

The calculations were performed using Microsoft Excel and AHP software tools to ensure accuracy and efficiency in data processing.

Validity and Reliability

The validity of the questionnaire was evaluated through **content validity** by consulting experts in online ride-hailing transportation and the Analytic Hierarchy Process. The reliability of the collected data was assessed using the AHP consistency test by ensuring that the Consistency Ratio (CR) of each pairwise comparison matrix did not exceed 0.10 [7].

3. Results

3.1. AHP Analysis Results

In this study, the Analytic Hierarchy Process (AHP) was employed to evaluate users' priorities across four criteria for selecting GrabBike services: **cost, travel time, comfort, and safety**. Based on the aggregated pairwise comparison results obtained from 31 respondents, the global priority weights are presented in **Table 1**.

Table 1. Global Priority Weights

Criterion	Priority Weight	Rank
Cost	60.0%	1
Travel Time	24.9%	2
Comfort	10.4%	3
Safety	4.6%	4

The overall **Consistency Ratio (CR)** was **27.5%**, which is considerably higher than the recommended threshold, indicating substantial variation in respondents' judgments. Nevertheless, the group consensus reached **98.7%**, suggesting a very high level of overall agreement among respondents.

The visualization of the AHP results for both the evaluation criteria and service alternatives is presented in **Figure 1** and **Figure 2**.

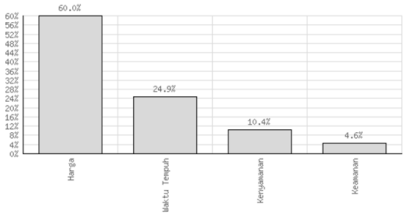

Figure 1. Global comparison of decision criteria using AHP

Decision Hierarchy

Level 0	Level 1	Glb Prio.	Bike Hemat	Bike Standard
Memilih Layanan Grab Bike	Harga 0.600	60.0%	0.658	0.342
	Waktu Tempuh 0.249	24.9%	0.311	0.689
	Kenyamanan 0.104	10.4%	0.306	0.694
	Keamanan 0.046	4.6%	0.472	0.528
		1.0	**52.6%**	**47.4%**

Figure 2. Priority weights of service alternatives (GrabBike Hemat vs. GrabBike Standard) based on each criterion

The two GrabBike service alternatives—GrabBike Hemat and GrabBike Standard—were subsequently evaluated based on the weighted decision criteria. GrabBike Hemat achieved an overall priority score of **52.6%**, while GrabBike Standard obtained **47.4%**. These results indicate that, overall, respondents showed a slight preference for GrabBike Hemat.

4. Discussion

The findings indicate that **cost** is the most influential factor in users' selection of GrabBike services, accounting for **60.0%** of the total priority weight. This result is consistent with the study by S. L. Handayani and Syarifudin [13], which reported that price significantly influences consumers' decisions when selecting online ride-hailing services. The finding is also supported by consumer behavior theory, which identifies price as one of the primary economic factors affecting purchasing decisions [14].

Travel time ranked second with a priority weight of **24.9%**, indicating that time efficiency remains an important consideration for users of online ride-hailing services. This finding is in line with the study conducted by Azlya et al. [15]. In contrast, **comfort** and **safety** received relatively lower weights, accounting for **10.4%** and **4.6%**, respectively. These results suggest that, in the context of GrabBike services, users tend to prioritize affordability and efficiency over higher levels of comfort and safety. This observation supports the findings of Nurlaela et al. [16], who reported that users of app-based transportation services tend to adopt a more pragmatic approach toward economy-class services than users of conventional transportation modes.

Regarding the service alternatives, GrabBike Hemat outperformed GrabBike Standard in terms of **cost** (65.8%), whereas GrabBike Standard achieved higher preference scores for **travel time** (68.9%), **comfort** (69.4%), and **safety** (52.8%). However, because cost received the highest overall priority weight, GrabBike Hemat emerged as the preferred alternative, reflecting respondents' strong preference for economical transportation options.

Despite these findings, the relatively high **Consistency Ratio (CR)** of **27.5%** indicates that respondents' pairwise comparisons were not sufficiently consistent. This inconsistency may have resulted from differences in respondents' perceptions or varying levels of understanding of the evaluation criteria. As noted by Kriswardhana et al. [17], although AHP is highly effective in accommodating subjective judgments, its reliability depends on respondents having a sufficient understanding of the comparison process to produce consistent evaluations.

5. Conclusions

This study successfully developed a Decision Support System (DSS) based on the Analytic Hierarchy Process (AHP) to assist Grab users in selecting between GrabBike Hemat and GrabBike Standard services. Among the four evaluation criteria—cost, travel time, comfort, and safety—**cost** emerged as the most influential factor, accounting for **60.0%** of the total priority weight, resulting in GrabBike Hemat being identified as the preferred alternative with an overall priority score of **52.6%**. Although GrabBike Standard performed better in terms of travel time, comfort, and safety, the findings confirm that cost is the primary determinant of consumers' decision-making, which is consistent with consumer behavior theory. However, the relatively high **Consistency Ratio (CR)** of **27.5%** indicates inconsistency in respondents' judgments, suggesting that further improvements are needed to enhance the consistency and reliability of the decision-making process.

For future research, the proposed Decision Support System should incorporate educational features that improve users' understanding of the evaluation criteria, thereby promoting more consistent judgments. The system interface should also be designed to be more intuitive by providing real-time visualizations that facilitate users' interpretation of evaluation results. Furthermore, integrating contextual information such as user location, traffic conditions, and weather data could improve the relevance and accuracy of the system's recommendations. Future studies are also encouraged to validate the proposed AHP model across different geographical regions and other online ride-hailing services to enhance its generalizability. Finally, the findings of this study may serve as valuable insights for service providers such as Grab in developing customer-oriented service strategies, particularly by emphasizing competitive pricing as a key factor in meeting user preferences.

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