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Decision Support System Using The Ahp Method To Measure The Level Of Passenger Satisfaction At The International Terminal Of Tanjung Balai Asahan Port

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ABSTRACT

The Decision Support System (DSS) with the Analytical Hierarchy Process (AHP) method is an effective approach for measuring the level of passenger satisfaction at the Tanjung Balai Asahan Port International Terminal. The AHP method helps in identifying and evaluating various factors that influence passenger satisfaction, such as facilities, security, cleanliness, and service efficiency. By using AHP, the priority ranking of these criteria can be carried out based on opinions and assessments from passengers. It is hoped that the results of this SPK can provide valuable input for terminal managers to improve service quality, to create a more satisfying experience for passengers. This research discusses a decision support system that uses the Analytical Hierarchical Process (AHP) method to assess the level of passenger satisfaction at the Tanjung Balai Asahan Port International Terminal. Passenger satisfaction is a crucial factor in terminal operations, and measuring passenger satisfaction requires a systematic approach. This research conducted a direct survey of passengers with questions regarding their experiences while using transportation services. This survey can be carried out through interviews, and questionnaires. In this research, a scale or index is used to measure customer satisfaction. This index can combine various factors such as service, facilities, timeliness, and comfort. On operational data such as timeliness, number of complaints, level of delays, and incidents. This data can provide an indirect picture of passenger satisfaction.

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INTRODUCTION

Research related to the Decision Support System (DSS) using the Analytical Hierarchy Process (AHP) method to measure the level of passenger satisfaction at the Tanjung Balai Asahan Port

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International Passenger Terminal reflects a response to complex dynamics in the transportation and tourism industry. This terminal functions as the main gateway for the flow of international passenger arrivals and departures, so the quality of service therein has a direct impact on the destination image and passenger experience.

The background of this research can be traced to the need for a systematic and measurable approach to evaluating critical aspects that influence passenger satisfaction. In this context, the AHP method was chosen because of its ability to construct a hierarchical framework that maps relevant criteria and subcriteria. The selection of criteria, such as comfort, safety, information, and service efficiency, reflects the need to comprehensively describe the dimensions of passenger satisfaction.

By applying the AHP method, this research aims to provide a basis for an in-depth analysis of passenger preferences and priorities. AHP allows relative assessment of different criteria, generating weights that reflect the relative contribution of each element to the level of satisfaction. The decisions resulting from the SPK application are expected to help terminal management identify areas of needed improvement, optimize operational efficiency, and overall increase the level of passenger satisfaction.

More than just an evaluation tool, this research also examines the role of SPK with AHP in the context of data-based decision-making for terminal management. By involving various stakeholders, such as authorities, service providers, and passengers themselves, it is hoped that this SPK will produce policies and strategies that are more inclusive, transparent, and effective in improving service quality at the Tanjung Balai Asahan Port International Passenger Terminal. Thus, it is hoped that research will make a positive contribution to increasing the competitiveness and reputation of terminals at the global level.

METHODS

Analytic Hierarchy Process (AHP) can be used effectively to measure passenger satisfaction in the context of urban public transport:

1. Problem statement:
   The aim is to assess passenger satisfaction with the city's public transport system. So it measures passenger feelings objectively and identifies areas that need improvement.
2. Selection Criteria:
   Determine relevant criteria for passenger satisfaction. This can include:
   Punctuality: How well does the transportation system adhere to schedules?
   Comfort: Is the vehicle comfortable and clean?
   Safety: Is the transportation system safe for passengers?
   Information Availability: Is real-time information easily accessible?
   Accessibility: How easy is it for passengers to use the system?
3. Pairwise Comparison:
   Experts (such as passengers, transport operators, and managers) compare the importance of each criterion compared to other criteria.
   For example:
   Timeliness vs. Timeliness Convenience: Which is more important for overall satisfaction?
   Security vs. Security Information Availability: Which has a greater impact?
4. Weighted Score:
   Normalize the pairwise comparison matrix and calculate the weighted score for each criterion. Multiply the relative weight by the score for each criterion
5. Overall Satisfaction Score:
   Combine the weighted scores for all criteria to get an overall satisfaction score.
6. Improvement Recommendations:

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Identify areas with lower satisfaction scores (e.g. security or information availability).
Propose targeted improvements based on criteria that need improvement.
For example, investing in better safety measures or improving real-time information services.

7. Application:
   AHP-based models provide a scientific and objective approach to measuring passenger satisfaction. This helps decision-makers prioritize improvements and allocate resources effectively.

RESULTS AND DISCUSSION

Criterion Data

Criteria data is used as a reference/basis for assessment. In the criteria, we can add the criteria code and criteria name. In AHP, there is no need to give importance weights to the criteria as in the SAW method, because whether the criteria are important or not will be seen from the comparison between the criteria (explained in the next section). The following is an example of criteria data in the AHP method SPK calculation:

Table 1. Criteria Weights

Code	Name	Criteria Weight
C1	Reliability	0.51898
C2	Tangibles	0.24106
C3	Assurance	0.14062
C4	Empathy	0.07445
C5	Responsiveness	0.02489

Alternative Data

Alternative data is something/person that will be assessed. Alternatives usually contain alternative codes and alternative names. The following is an example of alternative data in the AHP method spk calculation:

Table 2. Alternative Data

Code	Name	Criteria Weight
A1	The port has adequate facilities	0.198992699
A2	Availability of baggage services for passengers	0.12710606
A3	Availability of safety equipment on board	0.122294531
A4	There are comfortable toilets and prayer rooms available	0.199913331
A5	Ticketing officer service is fast, precise	0.351693379

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Comparison Value

In AHP the comparison value is given between 1 and 9 by Saaty's theory. Following are the names of the Saaty values:

Table 3. Comparison Values

9	Absolutely very important of
8	Approaching the absolute of
7	Very important of
6	Approaching is very important from
5	More important than
4	Approaching is more important than
3	A little more important than
2	Approaching a little more important than
1	As important as
0.5	1 for approaching slightly more important than

Next, look for the CI (Consistency Index) which is obtained using the formula:

$$\frac{\lambda \max - n}{n - 1}$$

LambdaMax is the average of CM (Consistency Measure) = (5.365 + 5.278 + 5.299 + 5.275 + 5.198) / 5 = 5.2826 n is the number of criteria (matrix size) = 5, so: CI = (5.2826 – 5) / (5-1) = 0.071

Next, look for the RI (Ratio Index), based on theory. When the y ratio index has been determined, its value is based on the matrix order (number of criteria. The following is the table:

Table 4. Ratio Index

Matrix order	1	2	3	4	5	6	7	8	9	10
Ratio index	0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.46	1.49

Because the matrix consists of 5 criteria, automatically RI = 1.12.

From CI and RI, we can calculate the Consistency Ratio by finding CI / RI = 00.71 / 1.12 = 0.063.

CR values of 0 – 0.1 are considered consistent more than that it is inconsistent. So that the comparisons given for the criteria are consistent.

Calculation of Alternative Priority Weights

To find the priority weight of the criteria for an alternative, do as many criteria as possible. The steps are the same as finding the priority weight of the criteria. Following are the results of the calculation:

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#	A01	A02	A03	Bobot
A01	0.6	0.667	0.5	0.589
A02	0.2	0.222	0.333	0.252
A03	0.2	0.111	0.167	0.159

#	A01	A02	A03	Bobot
A01	0.571	0.6	0.5	0.557
A02	0.286	0.3	0.375	0.32
A03	0.143	0.1	0.125	0.123

#	A01	A02	A03	Bobot
A01	0.4	0.571	0.25	0.407
A02	0.2	0.286	0.5	0.329
A03	0.4	0.143	0.25	0.264

#	A01	A02	A03	Bobot
A01	0.545	0.632	0.3	0.492
A02	0.273	0.316	0.6	0.396
A03	0.182	0.053	0.1	0.111

#	A01	A02	A03	Bobot
A01	0.632	0.727	0.5	0.62
A02	0.158	0.182	0.333	0.224
A03	0.211	0.091	0.167	0.156

Figure 1. Alternative Priority Weights

Ranking

Based on previous calculations, the following are the results of ranking the level of passenger satisfaction at the Tanjung Balai Asahan Port International terminal

Alternatif	C01	C02	C03	C04	C05	Nilai	Rank
Bobot prioritas	0.285	0.218	0.153	0.232	0.111		
A01 – Lokasi 1	0.589	0.557	0.407	0.492	0.62	0.535	1
A02 – Lokasi 2	0.252	0.32	0.329	0.396	0.224	0.309	2
A03 – Lokasi 3	0.159	0.123	0.264	0.111	0.156	0.156	3

Figure 2. Ranking of Satisfaction Levels

To find the total value by multiplying the criteria priority weights by each row of the alternative priority weight matrix. Example for row 1 = (0.285 * 0.589) + (0.218* 0.557) + (0.153* 0.407) + (0.232* 0.492) + (0.111* 0.62) = 0.535.
The ranking charts that have been tested using web-based applications are as follows:

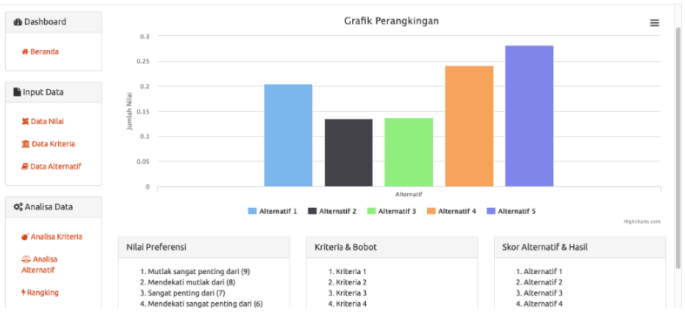

Figure 3. Ranking Graph

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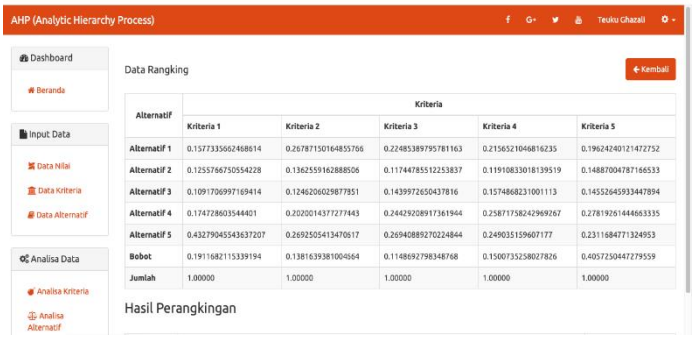

Alternatif	Kriteria				
	Kriteria 1	Kriteria 2	Kriteria 3	Kriteria 4	Kriteria 5
Alternatif 1	0.15773356624686614	0.26787150164855766	0.22485389795781163	0.21565210468162335	0.19624240121472752
Alternatif 2	0.12557667505542228	0.13625591628885506	0.11744785512253837	0.11910833018139519	0.14887004787166533
Alternatif 3	0.10917069971694140	0.12462060298777851	0.14399726504378160	0.15748682310011130	0.14552645933447894
Alternatif 4	0.17472860354440100	0.20200143772777443	0.24429208917361944	0.25871758242969267	0.27819261444663335
Alternatif 5	0.43279045543637207	0.26925054134706170	0.26940889270224844	0.24903519607177	0.23116847713249530
Bobot	0.19116821153391940	0.13816393810045640	0.11486927983487680	0.15007352580278260	0.40572504477795590
Jumlah	1.00000	1.00000	1.00000	1.00000	1.00000

Figure 4. Ranking Data

CONCLUSION

The results of the Decision Support System (SPK) research using the Analytical Hierarchy Process (AHP) method to measure the level of passenger satisfaction at the Tanjung Balai Asahan Port International Terminal showed that the level of passenger satisfaction was 0.535 or 53.5%. The AHP method allows pairwise comparisons between relevant criteria, thus providing a more comprehensive view of assessing passenger satisfaction. Measuring customer satisfaction is essential to understanding how satisfied customers are with a product or service by helping identify areas that need improvement. By gathering feedback, businesses can make informed decisions to improve their offerings, resulting in a better customer experience. Satisfied customers are more likely to remain loyal. Assessing satisfaction levels regularly allows businesses to address issues quickly and retain their customer base. High satisfaction contributes to repeat business and reduces customer churn. Happy customers become brand advocates. When customers are satisfied, they are more likely to recommend the business to others. Positive word-of-mouth marketing can have a significant impact on reputation and attract new customers. Customer satisfaction differentiates a business from competitors. Businesses that consistently meet or exceed customer expectations will gain a competitive advantage. Satisfied customers are less likely to switch to competing brands. Satisfied customers tend to spend more and are less sensitive to price. Their lifetime value contributes significantly to a company's earnings. On the other hand, dissatisfied customers can result in lost revenue and increased costs due to complaints and returns.

REFERENCES

[1] AH Hasugian and H. Cipta, "Understanding Decision Support Systems," J. Computer Science. and Inform., vol. 02, no. April, pp. 14–30, 2018. [6] SC Astuti and A. Pamungkas, "Determining the Location of Minimarkets in Pakal District," J. Tek. ITS, vol. 8, no. 2, 2020, doi: 10.12962/j23373539.v8i2.47156.

[2] Cheun Lee (2005). Evaluation index from information accuracy, content relatedness, integrity, variety in displaying, information timely updating, convenient navigation, easy application, system rapidity, safety and privacy, service response in time, guaranteed service, individualization service, etc.

[3] Diana, A., And Fu'adi, M. I, "Decision Support System Using the Analytical Hierarchy Process (AHP) Method for Selection of the Best Employees at the Saman Shoes Shoe Store," Civilization of Science, Engineering and Technology., Vol. 9, no. 02, PP 265-280, 2021.

[4] I.Mahendra and PK Putri, "Implementation of the Analytical Hierarchy Process (AHP) Method in the Home Purchase Decision Support System in Tangerang City," J. Teknoinfo, vol. 13, no. 1, p. 36, 2019, doi: 10.33365/jti.v13i1.238.

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Doi. 10.54209/jurnalkomputer.v16i01.190

[5] Ilham, IG Suwijana, and Nurdin, "Decision Support System for Scholarship Acceptance at Sojol 2 Vocational School Using the Ahp Method," J. Elektron. Info System. And Comput., vol. 4, no. 2, pp. 48–58, 2018.
[6] Irawan, Y, "Decision Support System for Determining Web-Based Scholarship Acceptance at Darul Huda Islamic High School Using the Analytical Hierarchy Process (AHP) Method," JIK, Vol. 7, no. 01, Pp 1-6, 2018, Doi: 10.33060/jik/2018/vol7.iss1.74
[7] Jadiaman Parhusip, "Application of the Analytical Hierarchy Process (AHP) Method in the Design of a Decision Support System for Selection of Non-Cash Food Assistance (BPNT) Recipient Candidates in Palangka Raya City," J. Teknol. Inf. J. Science and Applications. Bid. Tech. Inform., vol. 13, no. 2, pp. 18–29, 2019, doi: 10.47111/jti.v13i2.251.
[8] Lan Lee (1999). Evaluation index from commercial content, customer's concern, effective navigation, website design, safety, etc.
[9] Mahendra, GS, And Ernanda, AK Y, "SPK Determining ATM Locations Using AHP and SAW Methods," Teknosi, Vol. 5, No, 01, Pp 49-56, 2019, Doi: 10.25077/teknosi.v5il.2019.49-56
[10] Mawar, R., And Parida, M, "Decision Support System for Determining Web-Based Scholarship Acceptance at SMK Negeri 1 Talangpadang Using the Analytical Hierarchy Process (AHP) Method," JIK, Vol. 7, no. 02, Pp 149-156, 2019, Doi: 10.35959/jik.v7i2.164
[11] N. Andriyani and A. Hafiz, "Comparison of AHP and Topsis Methods in Determining Outstanding Students," Semin. Nas. Technol. And Business 2018, pp. 362–371, 2018.
[12] Nilasari, E., & Istiatin. (2015). The Influence of Service Quality on Consumer Satisfaction at PT Dealers. Ramayana Motor Sukoharjo. Paradigm Journal of the Batik Islamic University of Surakarta, 13(1).
[13] Putri, E., Harianto, W., And Azis, A, "Assessment of Customer Satisfaction with Service Quality X Using the Servqual and Analytical Hierarchy Process (AHP) Method," JTST, Vol. 2, no. 03, 2020, Doi: 10.21067/jtst.v2i3.4762
[14] R. Rachman, "Application of the AHP Method to Determine the Quality of Apparel in the Garment Industry," J. Inform., vol. 6, no. 1, pp. 1–8, 2019, doi: 10.31311/ji.v6i1.4389.
[15] R. Rahardian, N. Hidayat, and RK Dewi, "Decision Support System for Determining Poor Family Assistance Recipients Using the Analytical Hierarchy Process Method - Preference Ranking Organization for Enrichment Evaluation II (AHP-PROMETHEE II)," J. Pememb. Technol. Inf. and Computer Science., vol. 2, no. 5, pp. 1980–1985, 2018.
[16] Raišienė, A.G., & Raišys, S.J. (2022). Business Customer Satisfaction with B2B Consulting Services: AHP Based Criteria for a New Perspective. Sustainability, 14(12), 7437. https://doi.org/10.3390/su1412743
[17] SR Sinaga, "Determining Employee Overtime Using the Analytical Hierarchy Process (AHP) Method," J. Inkofar, vol. 1, no. 2, pp. 40–50, 2019, doi: 10.46846/jurnalinkofar.v1i2.67.
[18] Saputra, M., And Nugraha, N, "Decision Support System Using the Analytical Hierarchy Process (AHP) Case Study Method: Determining Internet Service Providers in the Home Network Environment," JITR, Vol. 25, no. 03, PP 199-212, 2020.
[19] Schaupp, Bélanger (2005). Evaluation index from safety, performance of system use, website design, privacy, convenience of purchasing, reliability, distribution, product strategy, product value, customization, etc.
[20] Septilia, HA, And Styawati, "Decision Support System for Providing Aid Using the AHP Method," JSTI, Vol. 1, No. 02, PP 34-41, 2020.
[21] Shim, Shin (2002). Evaluation index from contact convenience, customer service information, convenience of getting product information, etc.

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Doi. 10.54209/jurnalkomputer.v16i01.190

[22] Simanjuntak, LS, Sagala, JR, And Gea, A, "Implementation of a Decision Support System using the AHP Method in Determining the Level of Customer Satisfaction," Armada Informatika Journal, Vol. 2, no. 01, Pp. 2598-0416, 2018.
[23] Szymanski Hise (2000). Evaluation index from convenience, merchandise planning, website design, financial safety, etc.
[24] Tokoro, Y, "Application of the Analytical Hierarchy Process (AHP) Method in Determining the Level of Malnutrition Vulnerability of Toddlers in Sentani District, Jayapura Regency," SAINS, Vol. 16, no. 01, Pp. 21-28, 2016.
[25] Utha, R., Salianto., And Manan, LO A, "Marketing Strategy to Increase Sales at Waroeng X-Bro in Kendari City," SJEB, Vol. 01, No. 03, Pp. 31-41, 2021
[26] Yu Hongyan, Gao Dan (Year not stated). Customer satisfaction evaluation system based on AHP and fuzzy method.