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## Measuring the Effectiveness of Furniture Sample Export via Air Cargo in the Furniture Industry Using Simple Weighting Method

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### ABSTRACT

This research aims to improve logistics in Indonesia's furniture export sector, focusing on companies that face challenges in choosing the best air cargo service for product samples. While air cargo is preferred for its speed and reliability, selecting the optimal provider remains complex due to various service factors. The study applies the Simple Additive Weighting (SAW) method to evaluate air cargo services based on six criteria: delivery speed, document preparation, problem handling, customer maintenance, promotional activities, and shipping cost. The results indicate DHL as the best provider with a score of 0.93913, followed by FedEx and TNT Express. DHL excels in delivery speed and document preparation, crucial for international trade. This study highlights the SAW method's effectiveness in offering a transparent, data-driven approach to logistics decision-making, potentially benefiting other companies facing similar logistics challenges, improving shipment efficiency, reducing costs, and enhancing global competitiveness.

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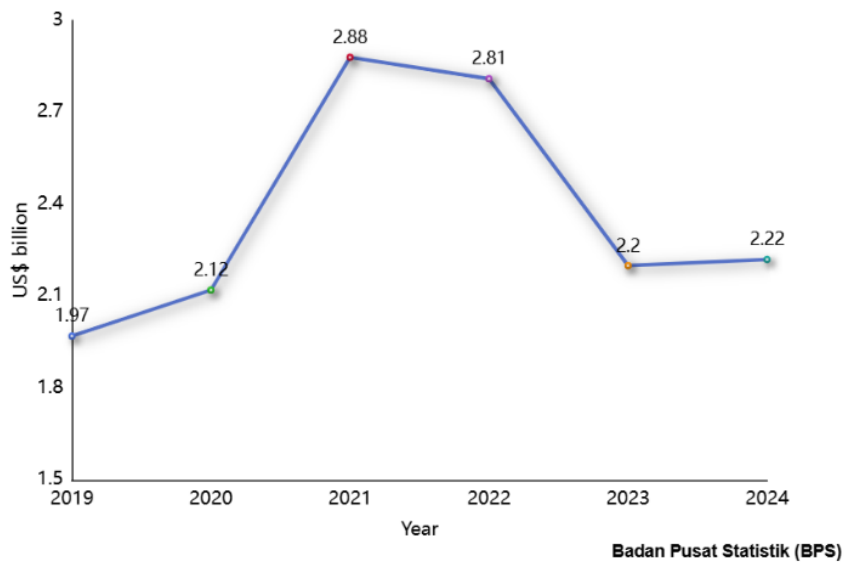
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**INTRODUCTION**

The manufacturing industry in Indonesia, particularly the furniture sector, continues to show steady growth and an increasing presence in international markets. According to data from [1], Indonesia’s furniture and craft product exports amounted to US\$1.97 billion in 2019, gradually increasing to US\$2.22 billion in 2024. However, the sector experienced a peak in 2021 at US\$2.88 billion, followed by a decline to US\$2.81 billion in 2022 and a further reduction to US\$2.20 billion in 2023. This decline in export values, especially post-2021, can be attributed to several factors, including disruptions in global supply chains, rising shipping costs, and delays in both air cargo and sea freight services. The COVID-19 pandemic, in particular, exacerbated these logistical challenges, significantly impacting delivery times and increasing operational costs,

thus affecting the overall export performance of Indonesian manufacturers. Moreover, global trends such as stricter sustainability regulations and the digital transformation of logistics are increasingly shaping how companies operate in international markets. These developments further complicate the logistics landscape for Indonesian exporters, particularly in sectors like furniture that rely heavily on global trade [2]. Despite these fluctuations, the long-term trend confirms the continued importance of the furniture sector in Indonesia’s export economy, especially to high-demand markets like Japan, the United States, and the European Union. This data is presented in Figure 1, showcasing the export values from 2019 to 2024, emphasizing the sector's resilience and ongoing growth despite logistical challenges.



**Figure 1.** Indonesia’s Furniture and Craft Product Exports

This robust growth has positioned Indonesian manufacturers as key players in the global market. However, the decline in export values raises concerns for companies in the

furniture sector, which regularly ship product samples to international buyers, especially in Japan [3]. The fluctuations in export figures underscore the growing need for Indonesian

manufacturers to ensure that their logistics processes are both efficient and resilient. The furniture sector, known for exporting bulky, quality-sensitive items, faces unique logistical challenges. Timely and reliable deliveries are crucial for maintaining strong business relationships with international buyers, who often use product samples to test quality, confirm specifications, or secure long-term contracts. The urgency of these shipments is particularly critical as delays can lead to lost business opportunities or damage to a company's reputation [4].

Air cargo has become the preferred choice for shipping these furniture product samples due to its speed, reliability, and ability to handle small-volume shipments with the required care. Despite the higher costs associated with air freight, the urgency of these sample shipments, combined with the risks of delays or miscommunications, makes air cargo a strategic solution for manufacturers in the furniture sector. However, these companies face a significant challenge in selecting the most effective air cargo service provider from a range of options [5]. The core issue lies in the difficulty of evaluating providers given high costs, potential delays, and a lack of a comprehensive evaluation framework that accounts for critical factors such as delivery speed, customer service, cost-effectiveness, and service reliability [6].

Previous research has emphasized service quality and brand image in sectors such as travel, retail, and e-commerce, but there is a notable gap in studies addressing the effectiveness of logistical services, particularly air cargo, in supporting export activities within the manufacturing sector. A review of recent literature reveals that most studies in logistics have focused on freight forwarding or supply chain management in

sectors like retail, where customer satisfaction and brand image are prioritized over logistical performance metrics [7]. Few studies have specifically examined air cargo services in the context of manufacturing exports, particularly in niche industries like furniture. This lack of detailed research in the context of furniture exports highlights the need for a comprehensive evaluation of air cargo services for product sample shipments [8].

This research specifically addresses the critical challenge faced by companies in the furniture sector in selecting the most effective air cargo service providers for exporting product samples. The study's innovation lies in applying the Simple Additive Weighting (SAW) method to logistics decision-making, a novel approach in the context of product sample shipments within the furniture export sector [9]. While there are numerous decision-making methods, SAW offers distinct advantages by providing a transparent, systematic approach that assigns weighted scores to each criterion, allowing companies in the furniture sector to make more objective and informed comparisons between different air cargo providers [10]. This approach not only allows for an efficient evaluation of air cargo services but also addresses the gap in the literature concerning the logistics challenges faced by manufacturing companies, particularly in the furniture export sector [11].

By applying the SAW method, this research provides a structured, data-driven approach to decision-making in export logistics. The novelty of this study lies not only in its focus on the furniture sector but also in its application of the SAW method, offering a unique perspective on optimizing logistics strategies in the context of international trade [12].

## RESEARCH METHOD

This study applied a quantitative research method to assess the effectiveness of exporting furniture product samples via air cargo in the furniture sector [13]. The evaluation utilized the Simple Additive Weighting (SAW) method to measure and rank different air cargo services based on several key criteria [14]. These criteria are:

1. Delivery speed measures how quickly a service provider can deliver shipments, which is crucial for international trade efficiency. In industries like furniture exports, faster delivery ensures timely distribution, meets customer expectations, and can significantly impact business success in a competitive market [15].
2. Document preparation service assesses the speed and accuracy of preparing shipment documents, crucial for customs clearance and overall efficiency. Timely and accurate documentation prevents delays and ensures smooth processing, especially in air cargo, where international shipping regulations demand precision [16].
3. Problem handling service evaluates how effectively a provider manages and resolves issues like delays, lost or damaged goods during shipment. Efficient problem resolution ensures smooth operations, reflecting the provider's reliability and commitment to customer satisfaction despite challenges [17].
4. Customer maintenance combines customer support and long-term relationship management, assessing responsiveness, communication effectiveness, and post-shipment assistance. This criterion is crucial for maintaining strong, repeat business

relationships and ensuring customer loyalty, a key performance indicator in the logistics industry [18].

5. Promotional form evaluates the air cargo company's promotional activities, such as discounts and loyalty programs, which can enhance customer satisfaction and retention. These efforts play a key role in building customer loyalty in competitive logistics services [19].
6. Shipping cost assesses the pricing competitiveness of a service provider. Lower costs are crucial for cost-sensitive businesses, as they directly impact the overall pricing strategy for exported furniture, making cost-effectiveness a key decision factor in the furniture sector [20].

The study aims to identify the most effective air cargo service for exporting furniture product samples by comparing criteria like delivery speed, reliability, customer maintenance, cost, and other factors across service providers.

### **Research Design**

This research follows a descriptive quantitative research design. The primary data are collected through structured questionnaires and semi-structured interviews with relevant stakeholders in the furniture sector [21]. These methods are employed to evaluate the effectiveness of air cargo services used by companies in the furniture sector. The research focuses on analyzing and comparing service providers based on the listed criteria, with rankings determined using the Simple Additive Weighting (SAW) method [22]. The alternatives for air cargo service providers considered in this study are shown in [Table 1](#).

**Table 1.** Alternative for Air Cargo Services

No	Alternative
1	DHL
2	FedEx
3	TNT Express

The decision-making process is organized in a hierarchical structure, as shown in [Figure 2](#). The main objective is to select the most suitable air cargo service for exporting furniture product samples for companies in the furniture sector. This figure represents the relationships between the criteria and alternatives, illustrating how the alternatives are compared based on the criteria. It forms the foundation for applying the Simple Additive Weighting (SAW) method to objectively assess and rank each air cargo provider [\[23\]](#).

**Time and Location**

The research was conducted from July 2024 to August 2024 in the furniture sector, focusing on companies located in Semarang, Central Java, Indonesia. The data collection activities took place at the company’s offices and through its export logistics division.

**Data Collection**

- Primary data was collected through questionnaires distributed to logistics managers, export staff, and decision-makers in the furniture sector. Semi-structured interviews were also conducted with key decision-makers to understand the criteria for selecting air cargo services and assess the importance of different service attributes, minimizing potential bias [\[24\]](#). External stakeholders, including logistics providers, customers, and industry experts, were consulted through questionnaires and interviews to provide a more comprehensive and balanced perspective. The sample included 50 staff members for the questionnaires

and 10 external stakeholders for interviews [\[25\]](#).

- Respondents from the furniture sector included logistics managers with 5 years of experience, export staff with up to 3 years of experience, and key decision-makers like the Head of Logistics with over 7 years in the sector. External stakeholders, such as logistics providers, customers, and industry experts, were selected based on their expertise in air cargo logistics for furniture exports.
- Secondary Data: Secondary data were gathered through a review of company records, including historical shipment data, previous evaluations of air cargo services, and industry reports related to air cargo in the furniture export sector [\[26\]](#). The secondary data complement the primary data by providing historical context and industry benchmarks.

**Data Analysis**

The data analysis used the Simple Additive Weighting (SAW) method, which involved six main steps. The steps of analysis include:

1. Normalization of Criteria: Data was normalized based on whether the criteria were "benefit" or "cost" attributes, using maximum values for benefit attributes and minimum values for cost attributes.
2. Weight Assignment: The importance of each criterion (e.g., delivery speed, customer maintenance) was determined through expert opinions from both internal and external stakeholders, using the Delphi method and pairwise comparison to ensure an objective and balanced weight assignment [\[27\]](#).

3. Rating Calculation: A rating matrix was created for each alternative (DHL, FedEx, TNT Express), scoring each air cargo service according to the criteria. The ratings were then normalized using the formula (1).

$$r_{ij} = \begin{cases} \frac{x_{ij}}{\text{Max}(X_{ij})} & \text{if } j \text{ is a benefit attribute} \\ \frac{x_{ij}}{\text{Min}(X_{ij})} & \text{if } j \text{ is a cost attribute} \end{cases} \quad (1)$$

Where  $r_{ij}$  represents the normalized rating for alternative  $A_i$  on criterion  $C_j$ .

4. Final Ranking: After normalizing the ratings, the weighted sum for each alternative was calculated. The formula used to calculate the final preference score for each alternative in formula (2).

$$V_i = \sum_{j=1}^n w_j \cdot r_{ij} \quad (2)$$

Where:

- $V_i$  is the final score for alternative  $A_i$ ,
- $w_j$  is the weight of criterion  $C_j$ ,
- $r_{ij}$  is the normalized rating for alternative  $A_i$  on criterion  $C_j$ .

The alternatives were ranked based on their final scores to determine which air cargo service provider is most effective for companies in the furniture sector.

5. The evaluation was based on the following key criteria:
- Delivery Speed: The time taken for the shipment to reach the destination.
  - Document Preparation Time: The efficiency in handling export documentation.
  - Customer Maintenance: The responsiveness and support provided during the shipment process.
  - Problem Handling: The effectiveness in addressing issues

or delays during the shipping process.

- Customer Maintenance: The ongoing relationship and support after the shipment.
- Shipping Cost: The cost of using the air cargo service for product sample shipments [28].

To measure the performance of each air cargo service provider on the criteria listed above, a Likert scale was used in the questionnaires. Respondents rated each criterion on a scale of 1 to 5, where:

- 1 = Very Poor
- 2 = Poor
- 3 = Average
- 4 = Good
- 5 = Very Good

This scale allowed respondents to assess the services based on their experience and perspective, providing a quantifiable measure of each service's effectiveness. The scores were then used to calculate normalized ratings for each criterion [29].

The data was gathered based on the general perception of the respondents regarding the air cargo service providers, rather than per shipment or per provider. To mitigate potential bias in the respondents' perceptions, the following strategies were employed:

- Diverse Respondent Pool: The research involved a balanced mix of internal stakeholders (logistics managers, export staff, key decision makers) and external stakeholders (logistics providers, customers, industry experts). This approach ensures a broader, more representative view of the service providers' performance [30].

- Semi-Structured Interviews: Semi-structured interviews were conducted with key decision-makers to gather in-depth insights into the factors influencing service provider selection, reducing the potential for individual biases to dominate [31].
  - Data Triangulation: Both primary data (questionnaires and interviews) and secondary data (company records, industry reports) were used to cross-check and validate the findings, ensuring the robustness and reliability of the results [32].
6. To ensure reliability and validity, a pilot test was conducted with a sample group, and Cronbach's Alpha was used to assess consistency. The validity of the criteria weighting and scoring process was evaluated through expert reviews and comparisons with industry standards, ensuring the selected criteria and their weights accurately reflected key factors in air cargo service selection [33].

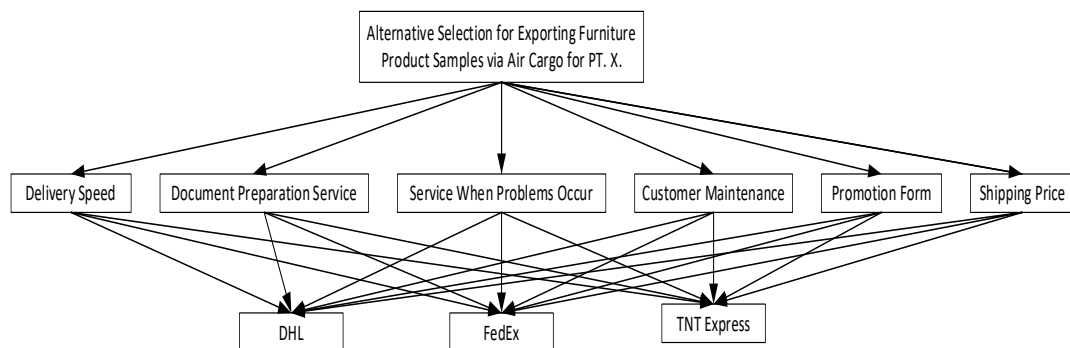


Figure 2. Hierarchical Structure of Alternative Selection.

## RESULT AND DISCUSSION

This section presents the evaluation results of air cargo services for furniture product sample exports, comparing DHL, FedEx, and TNT Express using the Simple Additive Weighting (SAW) method. The evaluation focused on criteria such as delivery speed, documentation services, problem handling, customer maintenance, promotional activities, and shipping costs [34].

1. Interview and Questionnaire Result  
Based on the interviews and questionnaires conducted, the evaluation of the air cargo service alternatives for furniture product exports shows the following rankings

in Table 3. DHL received the highest scores in Delivery Speed, Documentation Services, and Shipping Costs, contributing to its first-place ranking overall. FedEx excelled in Problem Handling Services, while TNT Express stood out in Customer Maintenance and Promotional Activities [35].

However, to strengthen the credibility of these rankings, we also incorporate objective data collected during the evaluation process. The following data was gathered from logistics records and air cargo service performance metrics in the furniture sector:

**Table 2.** Performance Metrics

No	Alternative	Average Transit Time (Hours)	On-time Delivery Percentage	Document Error Rate
1	DHL	48	95%	2%
2	FedEx	56	93%	4%
3	TNT Express	55	90%	3%

This objective data supports the subjective ratings obtained through interviews and questionnaires. For instance, DHL's top ranking in Delivery Speed aligns with its shortest average transit time and highest on-time delivery percentage. Furthermore, its

lower documentation error rate supports its top performance in Documentation Services [36]. Table 2 presents the Performance Metrics in more detail, showing the relationship between the objective data and the subjective ratings obtained.

**Table 3.** Summary of Evaluation Results Based on Interviews and Questionnaires

No	Alternative	Delivery Speed	Documentation Services	Problem Handling Service	Customer Maintenance	Promotional Activities	Shipping Cost
1	DHL	4	4	4	5	5	Rp. 306.000,-
2	FedEx	5	4	5	4	4	Rp. 345.000,-
3	TNT Express	5	4	4	5	4	Rp. 465.000,-

The above Table 3 summarizes the evaluation of each company in terms of the key criteria, with a rating scale from 1 to 5, where 5 is the best.

2. Normalization Weights

In the evaluation, Delivery Speed and Documentation Services were assigned the highest weights of 0.21739, reflecting their critical

importance. Problem Handling Services and Shipping Costs received moderate weights of 0.17391, while Customer Maintenance and Promotional Activities had the lowest weights of 0.13043 and 0.08696, respectively, indicating their lesser significance in the decision-making process [37].

**Table 4.** Weight Normalization of Criteria

No	Criteria Name	Code	Type of Criteria	Weight $W_i$
1	Delivery Speed	K1	Cost	5
2	Documentation Services	K2	Benefit	5
3	Problem Handling Service	K3	Benefit	4
4	Customer Maintenance	K4	Benefit	3
5	Promotional Activities	K5	Benefit	2
6	Shipping Costs	K6	Cost	4

This Table 4 illustrates the normalized weights of each criterion, reflecting their importance in the evaluation process. As shown, Delivery Speed and

Documentation Services are the highest-priority factors, followed by Problem Handling Services and Shipping Costs, with Customer

Maintenance and Promotional Activities being less critical in the final decision.

3. SAW Method Calculations

In this section, the calculations for the Simple Additive Weighting (SAW) method are performed. The first step involves normalizing the weights of each criterion to ensure they sum up to 1, followed by normalizing the performance ratings of each alternative. These normalized ratings are then multiplied by the respective weights to calculate the final preference scores for each alternative [38].

The normalized weight for each criterion is calculated using the formula (3).

$$W_j = \frac{W_j}{\sum W_i} \quad (3)$$

Where:

- $W_j$  is the weight of each criterion
- $\sum W_i$  is the total sum of the weights

The calculations are as follows:

$$W_1 = \frac{5}{5 + 5 + 4 + 3 + 2 + 4} = 0,21739$$

$$W_2 = \frac{5}{5 + 5 + 4 + 3 + 2 + 4} = 0,21739$$

$$W_3 = \frac{4}{5 + 5 + 4 + 3 + 2 + 4} = 0,17391$$

$$W_4 = \frac{3}{5 + 5 + 4 + 3 + 2 + 4} = 0,13043$$

$$W_5 = \frac{2}{5 + 5 + 4 + 3 + 2 + 4} = 0,08696$$

$$W_6 = \frac{4}{5 + 5 + 4 + 3 + 2 + 4} = 0,17391$$

Thus, the normalized weights for each criterion are:

- Delivery Speed (K1): 0,21739
- Document Preparation Service (K2): 0,21739
- Service When Problems Arise (K3): 0,17391
- Customer Maintenance (K4): 0,13043
- Promotional Activities (K5): 0,08696

- Delivery Price (K6): 0,17391

The next step involves normalizing the performance ratings for each alternative. This is done by dividing each value by the maximum value for beneficial attributes (those where higher values are better) and by dividing by the minimum value for cost attributes (where lower values are better). The normalization process follows this formula (1). The performance ratings for each alternative (DHL, FedEx, and TNT Express) are normalized [39] as follows:

- Delivery Speed (K1)

$$DHL = \frac{MIN(4; 5; 5)}{4} = \frac{4}{4} = 1,0$$

$$FedEx = \frac{MIN(4; 5; 5)}{5} = \frac{4}{5} = 0,8$$

$$TNTExpress = \frac{MIN(4; 5; 5)}{5} = \frac{4}{5} = 0,8$$

- Document Preparation Service (K2)

$$DHL = \frac{4}{MAX(4; 4; 4)} = \frac{4}{4} = 1,0$$

$$FedEx = \frac{4}{MAX(4; 4; 4)} = \frac{4}{4} = 1,0$$

$$TNTExpress = \frac{4}{MAX(4; 4; 4)} = \frac{4}{4} = 1,0$$

- Service When Problems Arise (K3)

$$DHL = \frac{4}{MAX(4; 5; 4)} = \frac{4}{5} = 0,8$$

$$FedEx = \frac{5}{MAX(4; 5; 4)} = \frac{5}{5} = 1,0$$

$$TNTExpress = \frac{4}{MAX(4; 5; 4)} = \frac{4}{5} = 0,8$$

- Customer Maintenance (K4)

$$DHL = \frac{4}{MAX(4; 4; 5)} = \frac{4}{5} = 0,8$$

$$FedEx = \frac{5}{MAX(4; 4; 5)} = \frac{4}{5} = 0,8$$

$$TNTExpress = \frac{5}{MAX(4; 4; 5)} = \frac{4}{5} = 1,0$$

- Promotional Activities (K5)

$$DHL = \frac{5}{MAX(5; 4; 4)} = \frac{5}{5} = 1,0$$

$$FedEx = \frac{4}{MAX(5; 4; 4)} = \frac{4}{5} = 0,8$$

$$TNTExpress = \frac{4}{MAX(5; 4; 4)} = \frac{4}{5} = 0,8$$

• Delivery Price (K6)

$$DHL = \frac{MIN(306000; 345000; 465000)}{306000} = \frac{306000}{306000} = 1,0$$

$$FedEx = \frac{MIN(306000; 345000; 465000)}{306000} = \frac{345000}{306000} = 0,88696$$

$$TNTExpress = \frac{MIN(306000; 345000; 465000)}{306000} = \frac{465000}{306000} = 0,65806$$

After normalization, the ratings for each alternative on each criterion are summarized in the following decision matrix use formula (2). [Table 5](#) presents the ratings assigned to each alternative based on the respective evaluation criteria.

**Table 5.** Ratings for each Alternative on each Criterion

Alternative	K1	K2	K3	K4	K5	K6
DHL	1,00	1,00	0,80	0,80	1,00	1,00
FedEx	0,80	1,00	1,00	0,80	0,80	0,886
TNT Express	0,80	1,00	0,80	1,00	0,80	0,658

Next, multiply each normalized rating in [Table 6](#) by its respective weight:

**Table 6.** Calculation  $V_i$

Alternative	K1	K2	K3	K4	K5	K6	Total
DHL	1,00 x 0,21739 = 0,21739	0,21739	0,13913	0,10435	0,08696	0,17391	0,93913
FedEx	0,8 x 0,21739 = 1,7391	0,21739	0,17391	0,10435	0,06957	0,15425	0,89338
TNT Express	0,80 x 0,21739 = 0,17391	0,21739	0,13913	0,13043	0,06957	0,11445	0,8448

The final step is summing the weighted values for each alternative [40]. The total scores are:

- DHL= 0,93913
- FedEx = 0,89338
- TNT Express = 0,8448

DHL has the highest total preference score, indicating that it is the most suitable choice based on the criteria evaluated.

**Evaluation Results**

The analysis using the Simple Additive Weighting (SAW) method reveals that DHL is the most suitable air cargo service provider for furniture product sample exports, achieving the highest total score of 0.93913 (35.076%). DHL outperformed FedEx (0.89338, 33.368%) and TNT Express (0.84488, 31.556%), particularly in delivery

speed and document preparation services, which are critical for international trade efficiency. While FedEx ranked second, excelling in problem handling, its higher costs reduced its overall score. TNT Express, ranked third, showed strengths in customer maintenance but was hindered by poor cost efficiency and higher shipping prices. These findings highlight the importance of considering factors like cost efficiency and customer service in logistics decisions, not just delivery speed and document handling [41].

The normalized weighted decision matrix for the three alternatives is presented in [Table 6](#), where each criterion's weight and performance are assessed. The top-performing criteria—such as delivery speed (K1) and document preparation

(K2)—contributed the most to DHL's higher score. This aligns with previous studies emphasizing the importance of timely and efficient service in the logistics industry [42]. FedEx performed better in customer maintenance (K4), while TNT Express excelled in handling customer problems (K3), but both services were hindered by higher delivery costs, which affected their overall rankings.

The fluctuations in the export values for Indonesian furniture from 2021 onward can be attributed to several global trade patterns and policy changes, which are essential for understanding logistics decisions in the furniture sector. The COVID-19 pandemic significantly disrupted global supply chains, creating delays and uncertainties in shipping timelines and cost structures [43]. These challenges affected many Indonesian exporters, particularly those in industries requiring timely deliveries of quality-sensitive products, such as the furniture sector. The rising shipping costs and logistical disruptions also explain the post-2021 decline in export [Figures 1](#). In addition, the shift in demand in key markets like Japan, the US, and the EU further exacerbated these challenges, as buyers increasingly demanded faster delivery times, driving up costs and placing pressure on logistics providers [44].

The Simple Additive Weighting (SAW) method used in this study is grounded in established logistics theories, particularly Logistics Service Quality (LSQ) and Service-Dominant Logic (SDL). By focusing on criteria such as delivery speed, documentation services, and problem handling, this study ties into the LSQ framework, which emphasizes the importance of service reliability, responsiveness, and efficiency in logistics decisions [45]. The LSQ theory helps

highlight how timely and efficient services, such as those offered by DHL, align with the logistical needs of Indonesian furniture exporters who require quick, reliable delivery to maintain competitiveness in international markets [46].

The SDL framework highlights the value service providers create not only through the movement of goods but also through customer relationships and service quality. This is crucial for evaluating TNT Express and FedEx, which excel in customer support but lack cost efficiency. By linking the SAW method to these theories, the study justifies its approach and situates the research within logistics service optimization and supply chain resilience. It emphasizes the need for a holistic evaluation of air cargo services, considering both operational and service-related factors [47].

### ***Discussion of Findings***

The findings of this research align with existing logistics and decision-making theories, but they also provide a deeper, more specific insight into the application of the Simple Additive Weighting (SAW) method in logistics provider evaluation. Previous studies [48] underscore the importance of logistics service quality, focusing on reliability and speed as critical factors for operational efficiency. However, this research also extends the understanding of service selection by highlighting trade-offs not typically explored in more general logistics theory. For example, FedEx's superior performance in problem handling was overshadowed by its higher cost, which is in contrast with the general findings of cost-benefit evaluations in logistics selection by other scholars [49]. Furthermore, while the role of cost management and service reliability in choosing a logistics partner is well-

established in the literature [50], this study emphasizes that no single factor, such as cost or speed, can solely determine the best service provider.

This research also provides critical insights into the use of SAW and other Multi-Criteria Decision-Making (MCDM) methods in similar logistics contexts. Studies employing MCDM methods, such as those by [51], show consistent results regarding the effectiveness of these methods in evaluating service providers based on multiple criteria. However, unlike previous studies that predominantly focus on theoretical applications of MCDM, this research confirms the practical applicability of SAW by producing actionable results, validating its use in dynamic decision-making environments like air cargo services [52]. The conclusions drawn from this study reinforce the findings of earlier works and highlight the method's adaptability in various operational contexts.

### **Implications of Results**

The results have significant implications for businesses in the furniture sector engaged in international trade. Selecting the right air cargo service ensures faster delivery and efficient handling of product samples, which are vital for customer satisfaction and competitiveness. The findings suggest prioritizing DHL for its speed and reliability, considering FedEx as a backup for its strong problem handling, and evaluating TNT Express for customer maintenance despite its higher costs. Furniture companies should also annually reassess their logistics partners to align with evolving business priorities and market conditions [53].

For other furniture exporters, these insights provide a blueprint for navigating the complexities of logistics provider

selection. As the Indonesian furniture export industry seeks to maintain its global position, optimizing logistics strategies by re-evaluating service providers annually will help companies in the sector adapt to fluctuating market conditions and remain aligned with shifting business priorities [54].

Moreover, the use of the SAW method provides companies in the furniture sector with a clear and structured approach to selecting logistics partners based on data-driven insights. This method not only facilitates transparent comparisons of providers but also ensures that decisions are made on solid, empirical evidence. This approach can be extended beyond logistics to other areas within the company, such as vendor selection and supply chain optimization, enabling companies in the furniture sector to maintain a competitive edge in international markets [55].

### **Limitations and Future Research**

This study has limitations, including the narrow focus on only three air cargo providers, which limits the comprehensiveness of the findings. Future research should include more providers and explore other Multi-Criteria Decision-Making (MCDM) methods, such as TOPSIS, AHP, or ANP, for a more robust comparison of logistics services [56]. Another limitation is that this study was conducted within the context of the Indonesian furniture sector, which may limit the generalizability of the findings. Future research could include international logistics providers and explore the dynamics of different regions or industries to broaden the applicability of the results [57]. Third, the logistics industry is subject to dynamic market factors, including fluctuations in pricing, service offerings, and operational practices [58]. Future research should examine how

market changes impact the rankings and effectiveness of service providers. It could also incorporate more detailed data, such as actual delivery performance metrics, and involve external stakeholders to enhance the evaluation's realism and depth. Additionally, while the six criteria used in this study were important, further refinement is necessary [59]. Future studies could include customer feedback and account for changes in business priorities, enabling a more detailed evaluation. These limitations highlight areas for further research and offer opportunities to improve the decision-making process for logistics service providers, leading to a more adaptable evaluation model [60].

## CONCLUSION

This research evaluated the effectiveness of air cargo services for furniture sector companies exporting product samples, using the Simple Additive Weighting (SAW)

method. Key criteria assessed included delivery speed, document preparation, problem handling, customer maintenance, promotional activities, and shipping cost. The results showed DHL as the best provider (0.93913), followed by FedEx (0.89338) and TNT Express (0.84488). DHL excelled in delivery speed and document preparation, crucial for efficient international trade. The study recommends that furniture companies prioritize DHL for primary logistics, while considering FedEx for problem handling and TNT Express for customer maintenance. The findings provide valuable insights for the Indonesian furniture export sector, encouraging data-driven decisions and strategic logistics partnerships. Additionally, the study contributes to logistics literature, demonstrating how MCDM methods like SAW can optimize strategies in global markets. Regular logistics assessments are essential for maintaining a competitive edge.

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