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Decision support for trucking vendor selection at PT. Ricakusuma Lestari Abadi Based on the SAW method

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ABSTRACT

PT. Ricakusuma Lestari Abadi is a company engaged in freight forwarding services, distributing goods both domestically and internationally. In the shipping process, the company heavily relies on third-party trucking services. However, the selection process for trucking vendors has so far been conducted manually, without standardized evaluation criteria, which risks leading to subjective and inefficient decisions. Therefore, this study aims to develop a decision support system to select the best trucking vendor using the Simple Additive Weighting (SAW) method. The SAW method is used because it provides objective evaluation results based on the weighting of five main criteria: service quality (40%), cost (25%), vehicle condition (15%), vendor location (10%), and fleet availability (10%) (Alamsyah et al., 2021; Gunawan et al., 2023; Wibowo & Azizah, 2022). This research adopts a quantitative approach through observation, interviews, and literature study. The collected data were used to calculate the scores of seven trucking vendor alternatives. The results show that Johan Putra Perkasa scored the highest with a value of 0.80 and is recommended as the best vendor. Kumala ranked second with a score of 0.75, followed by Global Sukses Transportama with a score of 0.72. The developed system was implemented as a web-based application using PHP and MySQL to facilitate a more efficient, faster, and standardized vendor selection process (Lim & Silalahi, 2023).

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1. INTRODUCTION

In the era of globalization and open trade, the efficiency of logistics operations has become a decisive factor in maintaining competitive advantage (Paradise & Ginting, 2024; Vikaliana et al., 2024). Freight forwarding companies are at the heart of this ecosystem, ensuring the timely and secure delivery of goods. One such company, PT. Ricakusuma Lestari Abadi, provides freight services utilizing various transportation modes, with a particular emphasis on trucking from ports to warehouses and vice versa. However, the company currently faces challenges in the selection of trucking service providers. The process remains manual, lacks standardized procedures, and often relies on limited criteria such as cost or vendor proximity. Critical factors like service quality, vehicle condition, and fleet availability are frequently neglected, resulting in inefficiencies, delayed deliveries, and diminished customer satisfaction (Nurhayati & Rakhmawati, 2023).

To address these issues, the development of a Decision Support System (DSS) is proposed to enable a more objective and systematic vendor selection process (Andriani &

Darmawan, 2023). The Simple Additive Weighting (SAW) method has been chosen as the foundation for this system due to its effectiveness in solving multi-criteria decision-making problems (Paulina et al., 2024; Prasetiana et al., 2024). The SAW method operates by assigning weights to each evaluation criterion and normalizing the collected data to generate a quantitative ranking of available vendors. This enables decision-makers to comprehensively evaluate options and select the best trucking service provider based on multiple weighted considerations.

These criteria are validated by both management input and logistics literature as essential to addressing delivery delays, rising transportation costs, and vendor inconsistency (Nurhayati & Rakhmawati, 2023; Paradise & Ginting, 2024).

This research aims to design and implement a web-based decision support system that facilitates the selection of the most appropriate trucking vendor for PT. Ricakusuma Lestari Abadi. The system will be built on the SAW method and will incorporate five essential criteria: service quality, cost, vehicle condition, vendor location, and fleet availability. The benefits of this research are multifaceted. For the company, the system will streamline vendor selection with improved speed, accuracy, and fairness. For the author, it offers practical experience in developing a real-world application of the SAW method in an IT-based environment. Furthermore, the study provides a valuable reference point for future researchers interested in the application of decision support systems in logistics and vendor management (Saputri & others, 2021).

However, the scope of this study is limited. It focuses solely on the five aforementioned criteria and does not explore or compare alternative decision-making methods. Additionally, the research is restricted to a single case study involving PT. Ricakusuma Lestari Abadi, with data collection taking place between July and September 2024

2. RESEARCH METHOD

Research Approach

This study uses a quantitative approach with a case study method. The study was conducted at PT. Ricakusuma Lestari Abadi, focusing on the selection process of trucking vendors using the Simple Additive Weighting (SAW) method. This approach was chosen because it enables numerical data processing, allowing for objective analysis based on predefined criteria (Syahputra & Hasanah, 2023; Ulama et al., 2022).

Data Collection Techniques

To obtain accurate and relevant data, the researcher used three data collection techniques :By combining both methods, the study achieves a balance between subjective expert judgment and factual ground-level conditions, leading to more representative and actionable evaluations of vendor performance (Syahputra & Hasanah, 2023).

1. Observation : Direct observation of operational activities in the import EMKL division of PT. Ricakusuma Lestari Abadi was conducted to understand the flow and challenges in vendor selection.
2. Interview: Interviews were conducted with the operations head, field staff, and delivery order administration personnel to gather insights on vendor assessment.
3. Literature Study: A review of scientific journals, articles, and books related to the SAW method and decision support systems in multi-criteria decision-making (Azhari, 2024; Nendya et al., 2023).

Criteria and Weight Determination

The selection of trucking vendors was based on five key criteria agreed upon by the company's management.

Table 1. Criteria and weight determination

No	Criteria	Type	Weight
1	Service Quality	Benefit	0.40
2	Cost	Cost	0.25
3	Vehicle Condition	Benefit	0.15
4	Vendor Location	Benefit	0.10
5	Fleet Availability	Benefit	0.10

Note: *Benefit* = The higher the value, the better.
Cost = The lower the value, the better.

Simple Additive Weighting (SAW) Method

The SAW method was chosen due to its systematic steps and ease of implementation (Dameria & Nursyanti, 2022; Wibowo & Azizah, 2022). The steps are as follows:

1. Forming the Decision Matrix (X): Each alternative (vendor) is evaluated based on predefined criteria.
2. Normalization of the Matrix: Conducted to ensure all values fall within the same scale (0–1), using different formulas for benefit and cost attributes.

   Benefit: $R_{ij} = \frac{X_{ij}}{X_{max}}$

   Cost: $R_{ij} = \frac{X_{min}}{X_{ij}}$
3. Final Score Calculation (V): Each normalized value is multiplied by the respective weight, and the scores are summed.

   $V_i = \sum(W_j \times R_{ij})$, di mana:

   - V_i adalah skor akhir alternatif ke-i
   - W_j adalah bobot kriteria ke-j
   - R_{ij} adalah nilai normalisasi dari alternatif i pada kriteria j
4. Ranking: The vendor with the highest final score is selected as the best vendor.

3. RESULTS AND DISCUSSIONS

Trucking Vendor Alternatives Data

Based on observations and interviews at PT. Ricakusuma Lestari Abadi, seven trucking vendor alternatives were identified for evaluation: a) Rumasondi Trans; b) Global Sukses; c) Transportama; d) Johan Putra Perkasa; e) Thirtawana Jaya; f) Rato Trans; g) MS Star; h) Kumala.

Each vendor was assessed based on five criteria : service quality, cost, vehicle condition, vendor location, and fleet availability.

Initial Evaluation Matrix

The values for each vendor across the five criteria are presented as follows.

Table 2. Initial evaluation matrix

Vendor	Service Quality	Cost (IDR)	Vehicle Condition	Location (km)	Fleet Availability
Rumasondi Trans	3	1,300,000	4	14	22
Global Sukses Trans	4	1,600,000	5	15	43
Johan Putra Perkasa	5	1,400,000	5	13	50
Thirtawana Jaya	3	2,200,000	3	21	25
Rato Trans	4	2,100,000	3	20	34
MS Star	4	1,700,000	4	19	42
Kumala	4	1,800,000	5	23	54

Normalization Matrix

Normalization was carried out to bring all values to a scale of 0 to 1. The normalized values for each criterion are as follows.

Table 3. Normalization matrix

Vendor	Service Quality	Cost	Vehicle Condition	Location	Fleet Availability
Rumasondi Trans	0.60	1.00	0.80	0.40	0.40
Global Sukses Trans	0.80	0.50	1.00	0.40	0.80
Johan Putra Perkasa	1.00	0.50	1.00	0.40	0.80
Thirtawana Jaya	0.60	0.25	0.60	0.80	0.40
Rato Trans	0.80	0.25	0.60	0.80	0.60
MS Star	0.80	0.33	0.80	0.80	0.80
Kumala	0.80	0.33	1.00	1.00	1.00

Final Score and Ranking

After multiplying the normalized values by their respective weights, the final scores are calculated as follows.

Table 4. Final score and ranking

Vendor	Final Score	Rank
Johan Putra Perkasa	0.80	1
Kumala	0.75	2
Global Sukses Trans	0.72	3
Rumasondi Trans	0.69	4
MS Star	0.68	5
Rato Trans	0.61	6
Thirtawana Jaya	0.51	7

Rumasondi Trans = (0.60* 0.40)+ (1.00* 0.25)+ (0.80* 0.15)+ (0.40*0.10)+ (0.40*0.10)
= 0.24 + 0.25 +0.12+0.04+0.04
= 0.69
Global Sukses Transportama = (0.80* 0.40)+ (0.50* 0.25)+ (1.00* 0.15)+ (0.40*0.10)+ (0.80*0.10)
= 0.32 + 0.13 +0.15+0.04+0.08
= 0.72
Johan Putra Perkasa = (1.00* 0.40)+ (0.50* 0.25)+ (1.00* 0.15)+ (0.40*0.10)+ (0.80*0.10)
= 0.40 + 0.13 +0.15+0.04+0.08
= 0.80
Thirtawana Jaya = (0.60* 0.40)+ (0.25* 0.25)+ (0.60* 0.15)+ (0.80*0.10)+ (0.40*0.10)
= 0.24 + 0.06 +0.09+0.08+0.04
= 0.51
Rato Trans = (0.80* 0.40)+ (0.25* 0.25)+ (0.60* 0.15)+ (0.80*0.10)+ (0.60*0.10)
= 0.32 + 0.06 +0.09+0.08+0.06
= 0.61
MS Star = (0.80* 0.40)+ (0.33* 0.25)+ (0.80* 0.15)+ (0.80*0.10)+ (0.80*0.10)
= 0.32 + 0.08 +0.12+0.08+0.08
= 0.68
Kumala = (0.80* 0.40)+ (0.33* 0.25)+ (1.00* 0.15)+ (1.00*0.10)+ (1.00*0.10)
= 0.32 + 0.08 +0.15+0.10+0.10
= 0.75

System Implementation

This decision support system was developed as a web-based application using XAMPP, PHP, and MySQL. The system features include: a) User login; b) Input of criteria and alternative data; c) Automatic calculation using the SAW method; d) Display of normalized values and final rankings (Sitanggang et al., 2022).

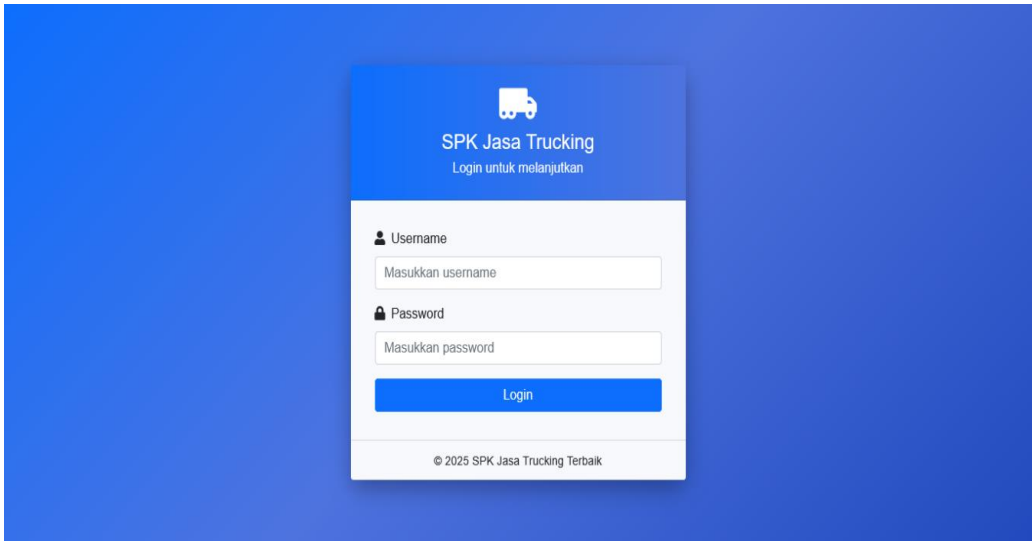

Figure 1. User login

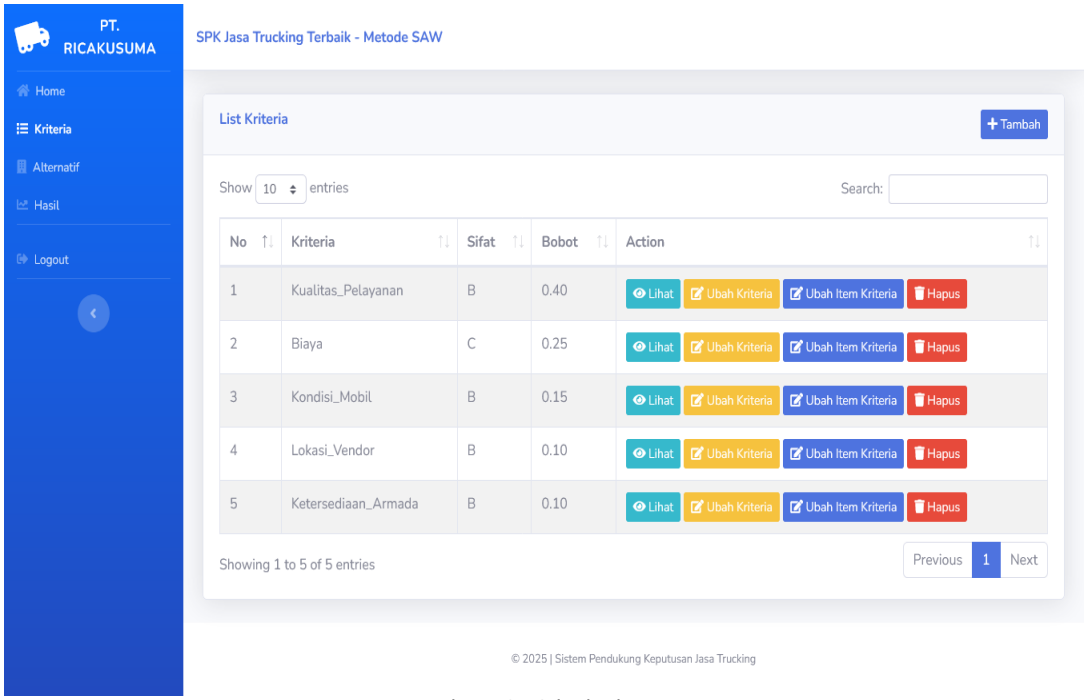

Figure 2. Criteria data

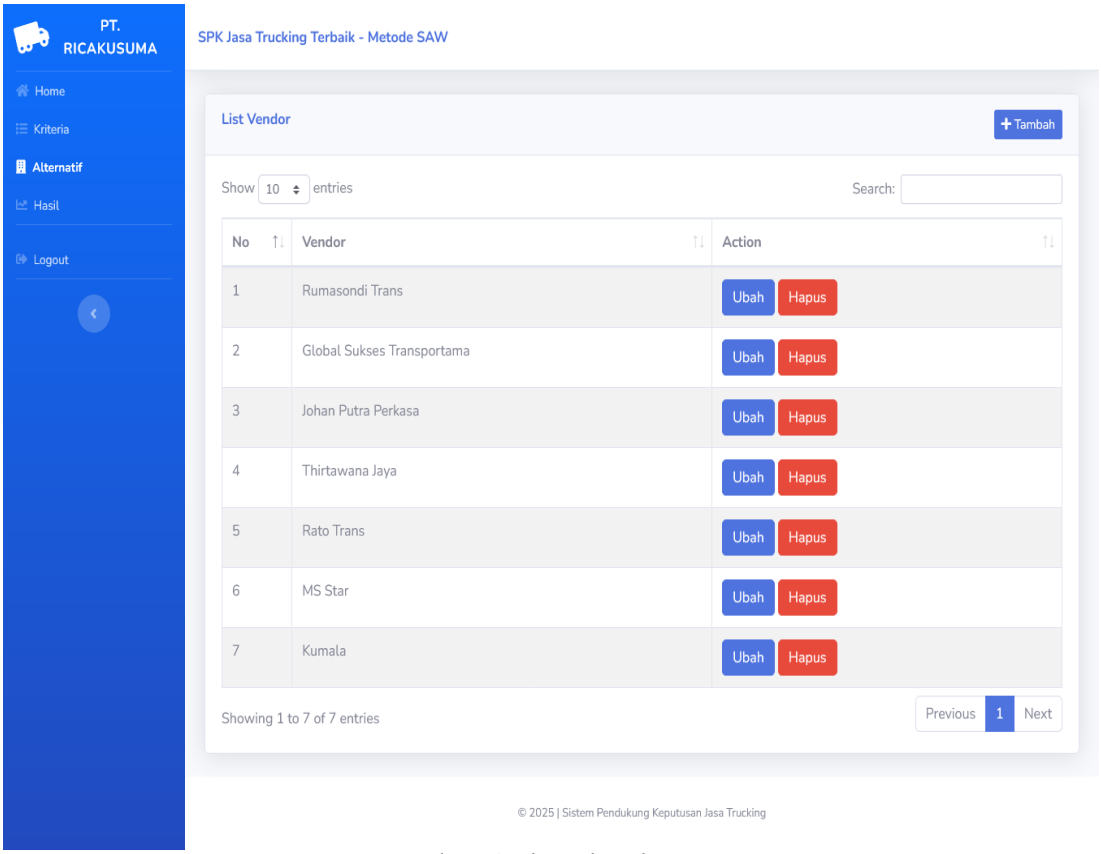

Figure 3. Alternatives data

Table 1 - Nilai Awal

Show 10 entries Search:

No	Alternatif	Kualitas_Pelayanan	Biaya	Kondisi_Mobil	Lokasi_Vendor	Ketersediaan_Armada
1	Rumasondi Trans	3.00	1.00	4.00	2.00	2.00
2	Global Sukses Transportama	4.00	2.00	5.00	2.00	4.00
3	Johan Putra Perkasa	5.00	2.00	5.00	2.00	4.00
4	Thirtawana Jaya	3.00	4.00	3.00	4.00	2.00
5	Rato Trans	4.00	4.00	3.00	4.00	3.00
6	MS Star	4.00	3.00	4.00	4.00	4.00
7	Kumala	4.00	3.00	5.00	5.00	5.00

Showing 1 to 7 of 7 entries Previous 1 Next

Figure 4. Initial input

Table 2 - Dihitung sesuai sifat cost atau benefit

Show 10 entries Search:

No	Alternatif	Kualitas_Pelayanan	Biaya	Kondisi_Mobil	Lokasi_Vendor	Ketersediaan_Armada
1	Rumasondi Trans	0.60	1.00	0.80	0.40	0.40
2	Global Sukses Transportama	0.80	0.50	1.00	0.40	0.80
3	Johan Putra Perkasa	1.00	0.50	1.00	0.40	0.80
4	Thirtawana Jaya	0.60	0.25	0.60	0.80	0.40
5	Rato Trans	0.80	0.25	0.60	0.80	0.60
6	MS Star	0.80	0.33	0.80	0.80	0.80
7	Kumala	0.80	0.33	1.00	1.00	1.00

Showing 1 to 7 of 7 entries Previous 1 Next

Figure 5. Attribute based calculation

Table 4 - Dijumlah sesuai dengan jasa trucking dan di dapat hasil rangking

Show 10 entries Search:

No	Alternatif	Kualitas_Pelayanan	Biaya	Kondisi_Mobil	Lokasi_Vendor	Ketersediaan_Armada	Total	Rangking
1	Rumasondi Trans	0.24	0.25	0.12	0.04	0.04	0.69	4
2	Global Sukses Transportama	0.32	0.13	0.15	0.04	0.08	0.72	3
3	Johan Putra Perkasa	0.40	0.13	0.15	0.04	0.08	0.80	1
4	Thirtawana Jaya	0.24	0.06	0.09	0.08	0.04	0.51	7
5	Rato Trans	0.32	0.06	0.09	0.08	0.06	0.61	6
6	MS Star	0.32	0.08	0.12	0.08	0.08	0.68	5
7	Kumala	0.32	0.08	0.15	0.10	0.10	0.75	2

Showing 1 to 7 of 7 entries Previous 1 Next

Kesimpulan : Dari hasil perhitungan yang dilakukan menggunakan metode Simple Additive Weighting (SAW), jasa trucking terbaik untuk di pilih adalah Johan Putra Perkasa dengan nilai 0.80

Figure 6. Final ranking

Discussion

The calculation results demonstrate that the SAW method is effective in ranking vendors based on objective evaluation scores. Johan Putra Perkasa was selected as the best vendor with a final score of 0.80, indicating strong performance across all criteria, particularly in service quality and fleet condition. Kumala and Global Sukses Transportama also emerged as viable alternatives based on their respective scores (Fayaqun et al., 2023; Mandias et al., 2021). The developed system adds transparency and efficiency to the decision-making process (Yuliana & Arifin, 2023).

4. CONCLUSION

Integration of these methods will also enable cross-method validation, support sensitivity analysis, and broaden the analytical capabilities of the decision support system (Febriyanti & Yusra, 2021).

Based on the research findings and the implementation of a decision support system for selecting the best trucking service at PT. Ricakusuma Lestari Abadi using the Simple Additive Weighting (SAW) method, it can be concluded that the previously manual and subjective vendor selection process has been effectively transformed into a structured, data-driven decision-making framework. By evaluating five key criteria service quality, cost, vehicle condition, vendor location, and fleet availability the SAW method enables a transparent and quantifiable assessment of available trucking service providers. The results of the calculation indicate that Johan Putra Perkasa is the most optimal vendor with a final score of 0.80, followed by Kumala with 0.75 and Global Sukses Transportama with 0.72. The developed web-based system further supports the process by enabling efficient data input, automatic score computation, and clear presentation of the ranking results, thereby improving both the accuracy and speed of managerial decision-making. To strengthen future implementations, the system could be enhanced by integrating other decision-making methods such as TOPSIS or AHP to validate results (Febriyanti & Yusra, 2021), incorporating additional evaluation criteria such as vendor responsiveness or delivery punctuality to enrich analysis (Mardiani & Hasan, 2024), ensuring regular updates to vendor data and criteria weights to maintain system relevance, and providing user training to guarantee consistent and effective utilization of the system across departments.

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