



Analysis Of Supplier Selection Prioritization Strategy Using The Analytical Hierarchy Process (AHP) Method (A Case Study PT. Dari Timur Indonesia)

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Abstract. This study evaluates the economic feasibility of applying the Analytical Hierarchy Process (AHP) for the supplier selection process at PT. Dari Timur Indonesia, a company engaged in the production of woven fabric products. The AHP method aids decision-makers in prioritizing suppliers by considering various key criteria such as price, product quality, customer service, order volume, and delivery timeliness. The process of supplier selection is crucial in ensuring operational efficiency, cost-effectiveness, and maintaining a competitive advantage within the industry. By using AHP, the ranking of suppliers is conducted systematically, allowing for a structured comparison of each criterion. This study also explores how supplier selection impacts the overall supply chain performance, including its ability to reduce operational costs and improve reliability. The research assesses the consistency and accuracy of the criteria used in AHP, validating its effectiveness as a decision-making framework. The findings show that integrating AHP into supplier selection significantly enhances supply chain management, leading to better operational outcomes, stronger supplier relationships, and improved resource allocation. This, in turn, contributes to greater organizational efficiency and long-term sustainability.

Keywords: AHP, Supplier Selection, Supply Chain, Economic Feasibility, PT. Dari Timur Indonesia

1 Introduction

Every organization encounters intricate decision-making processes, particularly within the domain of Supply Chain Management. This process involves the comprehensive management of various interconnected activities, ranging from the procurement of raw materials to ensuring customer satisfaction. It includes multiple stakeholders, such as suppliers, manufacturers, service providers, and distributors, including wholesalers and retailers, who are responsible for delivering products or services to the final consumers [1]. A critical component of Supply Chain Management is the selection of suppliers [2]. The choice of the right supplier has a profound impact on a company's success [3]. An optimal supplier not only enhances

profitability but also improves procurement performance, particularly in terms of quality, delivery, flexibility, and innovation [4].

Manufacturers generally dedicate over 60% of their total sales to procuring goods [5]. As a result, maintaining strong supplier relationships is essential for a company to ensure operational efficiency, effectiveness, and high product quality. Supplier selection typically presents two primary challenges. In single sourcing, one supplier is responsible for meeting all of the buyer's demands. On the other hand, in multiple sourcing, no single supplier is capable of fulfilling all requirements, leading management to distribute orders among several suppliers [7]. Thus, the supplier selection process must be approached systematically to reduce operational risks.

PT. Dari Timur Indonesia, a company focused on producing woven fabric products, depends significantly on its suppliers for raw materials. These fabrics are sourced from various regions across Indonesia, such as Toraja, Mamuju, Bima, Lombok, Rote, and Jepara. Each supplier comes with distinct characteristics and capabilities, making it crucial for PT. Dari Timur Indonesia to carefully assess and select its suppliers. To do this effectively, the company must consider several factors and make decisions at various stages, including determining supplier needs, Establishing procurement strategies, assessing prospective suppliers, determining evaluation techniques, and concluding contracts with the selected suppliers [8]. Typical criteria for selecting suppliers encompass aspects like cost, product quality, customer service, punctual delivery, and dependability [9].

One of the methodologies applicable for supplier selection is the Analytical Hierarchy Process (AHP), developed by Saaty [10]. AHP streamlines the decision-making process by deconstructing complex issues into a structured hierarchy of criteria and sub-criteria. This approach allows companies to prioritize suppliers by comparing relevant criteria in pairs and assigning weights or ranks based on their significance. It integrates both subjective judgments and objective analysis, synthesizing these into conclusions that align with intuitive estimates [11]. The AHP process typically involves four stages: identifying the key criteria and sub-criteria, structuring the problem into a hierarchy, and then analyzing and synthesizing the data [12]. One of the main benefits of AHP is its visual representation, making it easier for all stakeholders to grasp the decision-making process [13]. It is a suitable tool for companies aiming to identify top-quality suppliers [14].

This study aims to analyze the supplier selection strategy at PT. Dari Timur Indonesia through the application of the AHP method. By using this approach, the company can determine the most effective priorities in its supplier choices, which is essential for ensuring operational continuity and gaining a competitive advantage. Proper prioritization helps prevent supply chain disruptions that could affect production. By selecting the right suppliers, PT. Dari Timur Indonesia can reduce purchasing costs, enhance competitiveness, and improve customer satisfaction. Additionally, this research will assess the key criteria and sub-criteria related to

supplier selection at PT. Dari Timur Indonesia, such as product quality, delivery timeliness, the supplier's ability to meet demands, and pricing. This analysis will enable the company to make more informed decisions in choosing suppliers that align with its operational goals and long-term strategy. Through the application of AHP, the study seeks to provide precise recommendations for which suppliers should be prioritized.

2 Literature Review

2.1 Supply Chain

The supply chain is directly related to the complete cycle of raw materials. It encompasses a series of management activities aimed at acquiring raw materials, transforming them into goods in progress or semi finished goods, and finally producing finished products that are distributed to consumers through the distribution channels [16]. The supply chain is not limited to suppliers but also includes broader aspects such as transportation, warehousing, retailers, and customers. In practice, the supply chain comprises several fundamental components: plan, source, make, deliver, and return [17].

The primary goal of the supply chain is to plan and coordinate all activities within the supply chain to provide optimal customer service while maintaining cost efficiency [18]. Therefore, to achieve this objective, the supply chain must operate efficiently, deliver high-quality products, and be fast, flexible, and innovative.

2.2 Supplier Selection

Supplier selection is a critical process due to its long-term impact. In today's highly competitive operational environment, it is nearly impossible to achieve successful production at low costs and deliver high-quality products without satisfactory suppliers.

2.3 Analytic Hierarchy Process (AHP)

The Analytic Hierarchy Process (AHP) is a method used to solve complex and unstructured problems by breaking them down into groups and arranging these groups into a hierarchy. Numerical values are then assigned to replace human perceptions in making relative comparisons. Through synthesis, it is possible to determine which element has the highest priority.

This study refers to the AHP analysis developed by Thomas L. Saaty in the 1970s. This model is employed for decision-making in addressing issues related to planning, alternative selection, priority setting, policy choice, and resource allocation.

3 Research Method

This research employs both qualitative and quantitative methods to gather data on supplier selection. Primary data is obtained through interviews, which provide in-depth insights into key supplier selection criteria from the viewpoints of stakeholders involved in the decision-making process. Additionally, questionnaires are distributed to respondents to perform pairwise comparisons between criteria and sub-criteria, following the AHP procedure. This study also utilizes secondary data derived from company documents related to supplier selection. The operational definition in this study refers to the operational definition of each criterion used in the research

Table 1. Table criteria and sub-criteria

No	Criteria	Sub Criteria
1	Price	a. Alignment of price with the quality of the produced goods (H1)
		b. The capacity to offer discounts for bulk purchases (H2)
2	Quality	a. Compliance of products with required specifications (Q1)
		b. Delivery of products without defects (Q2)
		c. Ensuring consistent quality control (Q3)
3	Service	a. Ease of communication (S1)
		b. Clarity and comprehensibility of information provided (S2)
		c. Responsiveness to customer inquiries (S3)
		d. Prompt resolution of customer issues (S4)
4	Delivery	a. Ability to meet the agreed delivery dates (D1)
		b. Efficiency in managing the transportation system (D2)
5	Quantity	Ability to meet the agreed delivery dates (D1)
		Efficiency in managing the transportation system (D2)

Source: Data Processed by research

This study employs the Analytical Hierarchy Process (AHP) to evaluate the significance assigned to each criterion and sub-criterion. The AHP procedure starts with constructing a hierarchy that represents the supplier selection problem across multiple levels, from the primary objective to the available alternatives. Once the hierarchy is defined, pairwise comparisons between criteria are carried out. Respondents are required to assess the relative importance of each criterion and sub-criterion. These assessments are analyzed to identify the relative weight of each criterion. The AHP method is applied to determine the weight of each criterion and sub-criterion. The process initiates with developing a hierarchical structure that breaks down the supplier selection problem into several layers, starting from the main goal down to the alternatives. After constructing the hierarchy, pairwise comparisons between criteria are conducted, allowing respondents to express the importance of each criterion and sub-criterion

These evaluations serve to calculate the relative weights of the criteria .

$$CI = (\lambda_{maks} - n) / (n - 1)$$

Next, AHP measures the overall consistency of the various judgments through a consistency ratio (CR), formulated as:

$$CR = CI / RI$$

If the CR value is below 0.1, the matrix is deemed consistent. However, if the CR exceeds 0.1, the comparisons need to be revised to enhance consistency. The final step in the AHP process is the synthesis of priorities, where the calculated weights are aggregated into a global priority score for ranking suppliers. The supplier with the highest priority score will be chosen as the most suitable option

4 Result and Discussion

Weighting Using the AHP Method

The AHP method used for supplier selection at Tenoon is divided into three hierarchical levels. At Level 0, the objective is defined, which is to identify the most suitable supplier. Level 1 includes the selection criteria, while Level 2 details the sub-criteria for each criterion. Finally, Level 3 presents the alternative suppliers for selection.

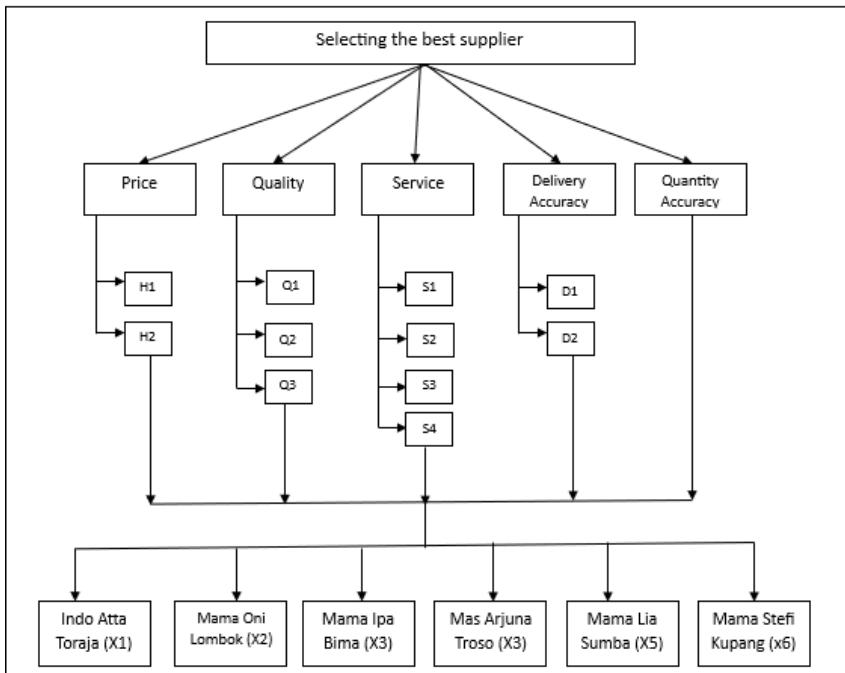


Fig. 1. AHP Hierarchy Structure for Supplier Selection

Source: Data Processed by research

The priority assessment data for supplier selection criteria were obtained from questionnaires completed by four respondents: the Founder & Managing Director, Director of Strategic Partnership, Community Engagement Manager, and Social Media Marketing Manager. The evaluations from the respondents were averaged using the geometric mean method.

Table 2. Table priority evaluation criteria for selecting suppliers

Criterion	Price	Product Quality	Service	Delivery Timelines	Quantity Accuracy
Price	1	0,33	1	0,50	1
Product Quality	3	1	3	1,50	3
Service	1	0,33	1	0,50	1
Delivery Timeliness	2	0,67	2	1	2
Quantity Accuracy	1	0,33	1	0,50	1
Total	8	2,67	8	4	8

Source: Data Processed by researche

The pairwise comparisons among the variables in the supplier selection process yielded the following weights

Table 3. Table priority weights for suppliers criteria

Criterion	Weight	Rank
Price	0,13	3
Product Quality	0,38	1
Service	0,13	3
Delivery Timeliness	0,25	2
Quantity Accuracy	0,13	3

Source: Data Processed by research

The analysis indicates that the quality criterion is given the highest importance, with a weight of 0.38. Following closely is delivery timeliness, which has a weight of 0.25. Meanwhile, price, service, and quantity accuracy are assigned equal weights of 0.13 each, reflecting their relatively lower priority. After determining the priority weights for the criteria and alternatives, a synthesis is conducted to compute the total weight for each supplier based on these criteria. A detailed table presents the global priority weights of the suppliers.

Table 4. Table overall weight of alternatives

Supplier	Total Weight	Rank
Indo Atta	1,38	5
Mama Oni	2,26	6

Mama Ipa	5,99	1
Mas Arjuna	2,86	2
Mama Lisa	2,52	4
Mama Stefi	2,85	3

Source: Data Processed by research

After completing the synthesis process, the priority weights assigned to each criterion are used to determine the weight for every supplier. The selection of suppliers according to specific criteria is outlined in the corresponding table.

Table 5. Table supplier weights according to criteria

Criterion	Indo Atta	Mama Oni	Mama Ipa	Mas Arjuna	Mama Lia	Mama Stefi
Price	0,25	0,37	1,26	0,51	0,48	0,25
Product Quality	0,35	0,64	1,81	0,68	0,58	0,69
Service	0,43	0,71	1,95	0,87	0,76	1,30
Delivery Timeliness	0,23	0,41	0,58	0,43	0,68	0,48
Quantity Accuracy	0,13	0,13	0,40	0,38	0,25	0,13
Total	1,38	2,26	5,99	2,86	2,74	2,85

Source: Data Processed by research

The table reveals that supplier Mama Ipa performs well in price (1.26), quality (1.81), service (1.95), and quantity accuracy (0.40), whereas Mama Lia distinguishes itself in delivery accuracy (0.68). To evaluate the consistency of the respondents' responses, a consistency test was carried out. A consistency ratio (CR) below 0.1 confirms that the pairwise comparison matrix is consistent, whereas a CR higher than 0.1 suggests inconsistencies in the comparisons. The subsequent table displays the consistency ratios (CR) obtained from the evaluations provided by the respondents.

Table 6. Table consistency ratios (CR) of respondents' evaluations

Pairwise Comparison	Consistency Rate	Description
Overall Criteria	0,00	Consistent
subcriteria for price	0,00	Consistent
subcriteria for quality	0,00	Consistent
subcriteria for service	0,00	Consistent
Accuracy in Delivery Subcriteria	0,00	Consistent
H1 Alternatives	0,04	Consistent
H2 Alternatives	0,04	Consistent
Q1 Alternatives	0,08	Consistent
Q2 Alternatives	0,05	Consistent

Q3 Alternatives	0,19	Consistent
S1 Alternatives	0,01	Consistent
S2 Alternatives	0,05	Consistent
S3 Alternatives	0,06	Consistent
S4 Alternatives	0,09	Consistent
D1 Alternatives	0,03	Consistent
D2 Alternatives	0,05	Consistent
Quantity Accuracy Alternatives	0,09	Consistent

Source: Data Processed by research

The table indicates that all evaluations provided by the respondents are consistent, so no additional adjustments are needed

5 Conclusion

The Analytical Hierarchy Process (AHP) method has demonstrated its effectiveness and value in helping PT. Dari Timur Indonesia chooses suppliers that align closely with the company's operational requirements. Through a systematic analysis process, AHP allows the company to objectively assess suppliers according to five primary criteria. The most critical criterion, with the highest weighting (0.38), is quality, followed by delivery accuracy (0.25). This indicates that the company places a high priority on the quality of raw materials and timely delivery to ensure smooth production operations. Furthermore, the criteria of price, service, and quantity accuracy were each given equal weights (0.13), implying that although these factors are important, they are considered secondary to quality and delivery accuracy.

In the supplier evaluation process, "Mama Ipa" emerged as the best supplier, scoring highest in various aspects, such as quality, price, and service. This supplier is able to provide goods that meet the desired specifications, offer competitive pricing, and deliver satisfactory service, making it the top choice for PT. Dari Timur Indonesia. With a consistency ratio (CR) falling below the 0.1 threshold, the results demonstrate that the AHP method provides valid and reliable outcomes in complex decision-making processes, such as supplier selection.

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