Journal of Computing Innovations and Emerging Technology

Volume 1 | Issue 2 | December (2025)

Published by **Novamind Press**

JCIET

Journal of Computing Innovations and Emerging Technology

Analysis of A Decision Support System for the Selection of the Best Coffee Supplier at Arion Coffee Using AHP

Diva Anjeliansyah Putri [1*], Wahit Desta Prastowo [2]

[1,2] Bisnis Digital, Univeritas PGRI Yogyakarta, Yogyakarta, Indonesia

** Corresponding author: divap348@gmail.com*

Abstract* — This study aims to determine the best coffee supplier for Arion Coffee using the Analytical Hierarchy Process (AHP) as a structured multi-criteria decision-making approach. The evaluation involves four key criteria price, quality, delivery timeliness, and service with three supplier alternatives: Kopi Nusantara (SUP A), Java Beans Supply (SUP B), and Tropical Roast Indonesia (SUP C). Data were collected through interviews and expert evaluations from Arion Coffee's procurement team. The AHP method was used to assign weights to each criterion, conduct pairwise comparisons, and calculate consistency ratios. Results indicate that quality holds the highest importance (0.623), followed by price (0.216), delivery timeliness (0.106), and service (0.055). Based on the overall synthesis, Tropical Roast Indonesia (SUP C) achieved the highest score (0.441), followed by Java Beans Supply (0.337) and Kopi Nusantara (0.214). The findings highlight that coffee bean quality is the dominant factor influencing supplier selection, reflecting Arion Coffee's priority on maintaining product excellence over cost efficiency. The application of AHP provides a rational and objective framework for supplier evaluation, improving decision accuracy and reducing subjectivity.

***Keywords*—Coffee, Supplier, Decision Support System, Analytical Hierarchy Process (AHP)**

Manuscript received 13 Nov. 2025; revised 29 Nov. 2025; accepted 03 Dec. 2025. Date of publication 15 Dec. 2025.

I. Introduction

In the coffee industry, the quality of raw materials is a key element that determines the taste, aroma, and consistency of the final coffee products. Every stage of coffee processing depends on the quality of the beans used, making the selection of high-quality raw materials an aspect that cannot be overlooked. For Arion Coffee, a company focused on processing and selling coffee products, the availability of premium coffee beans from reliable suppliers is a fundamental requirement for maintaining product standards.

Decision-making related to supplier selection is not simple, as choosing the right supplier significantly affects various operational aspects of the company [1]. High-quality coffee beans not only ensure the taste and overall quality of the final product but also improve production flow, reduce the risk of losses due to substandard raw materials, and help keep production costs efficient. Additionally, selecting the right supplier contributes to increased customer satisfaction, as consumers experience consistent taste across the products they purchase [2]. Thus, supplier selection is a strategic activity with long-term implications for overall company performance.

Currently, supplier selection at Arion Coffee is still carried out manually by considering common aspects such as price, bean quality, delivery timeliness, and supplier reputation. However, decision-making based on subjective judgment often leads to inconsistencies and may hinder supply chain performance [3]. Arion Coffee also faces several challenges, such as variations in bean quality between batches that are difficult to evaluate objectively, differences in quality standards among suppliers, and delivery delays that disrupt production schedules. Moreover, increasing market demand requires suppliers capable of providing a stable supply over the long term. These conditions demand a more systematic and measurable approach to determining the best supplier [4]. In an increasingly competitive business environment, a structured system is needed to assist management in making optimal decisions based on predetermined criteria [5]. One effective method to address this issue is the Analytical Hierarchy Process (AHP).

In this situation, the Analytical Hierarchy Process (AHP) serves as an effective approach to support decision-makers. AHP enables the evaluation of multiple alternatives based on several criteria through pairwise comparison among elements [6]. This method has been widely used in supplier management, quality assessment, and logistics due to its ability to reduce subjectivity and generate more accurate priority weights [7]. AHP offers several strengths, including its capability to break down complex problems into a hierarchical structure, combine qualitative and quantitative assessments, and perform a Consistency Ratio test to ensure that judgments are consistent and reliable [8]. By applying AHP in selecting coffee suppliers, the company can determine the importance level of each criterion such as bean quality, price, delivery accuracy, supply availability, and supplier reputation [9].

Several previous studies have examined more objective decision-making methods for supplier selection or similar case studies in other industries. Prior research [10] demonstrated that AHP produces more accurate and consistent selection results compared to traditional subjective methods. In that study, criteria such as quality, price, and delivery timeliness were evaluated using pairwise comparisons, resulting in clear priority weights. The findings show that AHP reduces subjective bias and simplifies the selection of the best supplier. Another study [11] found that AHP is effective in the coffee industry because it can assess parameters such as flavor profile, supply consistency, and quality certification. This research shows that supplier decisions in the coffee industry rely on a combination of quantitative and qualitative criteria, making AHP an appropriate method for integrating both aspects.

A Decision Support System (DSS) is an interactive system designed to assist decision-making through the use of data, analytical models, and structured evaluation processes, particularly for semi-structured and unstructured problems [12]. AHP, as part of DSS methodologies, aims to break down complex problems into hierarchical structures, perform pairwise comparisons, and calculate priority weights for each criterion and alternative [13]. This approach enables decision-makers to evaluate various aspects holistically and identify the supplier that best meets the company's needs [14]. Numerous studies have shown that AHP enhances the effectiveness of supplier selection and reduces potential errors caused by subjective assessments [15]. Based on these findings, the application of AHP in supplier analysis, especially within the coffee processing industry such as Arion Coffee can provide a strong analytical foundation in determining the best supplier. This is essential for ensuring the availability of high-quality raw materials, maintaining product consistency, and supporting the company's operational sustainability in the long term.

This study has several significant differences compared to previous research. While earlier studies mainly focused on applying AHP in general industrial sectors such as manufacturing, food and beverage, or broader supply chain management, this research specifically analyzes the use of AHP in selecting coffee bean suppliers at Arion Coffee. This focus provides a unique contribution because the coffee processing industry has distinct characteristics, particularly regarding raw material quality, flavor consistency, and the long-term stability of supply. In addition, this study not only explores AHP from the technical perspective of weight calculation but also evaluates the suitability of this method in relation to Arion Coffee's operational needs. This approach provides a more comprehensive analysis by incorporating various criteria such as coffee bean quality, price, delivery timeliness, and the supplier's ability to meet production standards. This is a meaningful contribution because the coffee industry requires a precise and reliable supplier evaluation method. Moreover, the study assesses both the mathematical framework of AHP and its practical relevance to decision-making at Arion Coffee.

The Analytical Hierarchy Process (AHP) is used in this study because it offers several advantages over other multi-criteria decision-making methods such as TOPSIS, SAW, or MOORA. AHP can effectively accommodate subjective expert judgments through a structured pairwise comparison process, making it highly suitable for evaluating criteria that are qualitative in nature and difficult to measure directly, such as coffee bean quality, supplier service, and delivery reliability [16]. In addition, AHP provides a consistency validation mechanism through the Consistency Ratio (CR), allowing researchers to assess whether the evaluations given by respondents are logically consistent an important feature that is not available in methods such as SAW or TOPSIS. AHP also generates more precise priority weights by considering the relative importance of criteria in a hierarchical structure, resulting in decisions that are more objective, logical, and justifiable. With these advantages, AHP is an appropriate method for analyzing supplier selection problems that involve multidimensional factors.

The purpose of this study is to analyze the application of the Analytical Hierarchy Process (AHP) in the supplier selection process at Arion Coffee, identify the primary criteria prioritized by the company when choosing suppliers, evaluate the weight distribution based on the importance of each criterion, and assess the effectiveness of AHP in improving the objectivity and accuracy of supplier selection. Through this approach, the company is expected to obtain a more structured, transparent, and measurable foundation for determining the best supplier capable of supporting product consistency and the long-term operational sustainability of Arion Coffee.

II. METHODOLOGY

A. *Research Data Sources*

The data used in this study were obtained from both primary and secondary sources. Primary data were collected through interviews and expert judgment assessments involving Arion Coffee's procurement team to understand the challenges encountered in evaluating and selecting coffee bean suppliers. A total of three (3) expert respondents were involved, a number that is considered adequate for AHP-based expert judgment. Each respondent met the following criteria: (1) having a minimum of two years of experience in procurement or supplier evaluation; (2) being directly involved in purchasing or quality control activities; (3) possessing familiarity with supplier performance indicators such as cost, quality, delivery timeliness, and service.

Secondary data were obtained from relevant literature discussing the Analytical Hierarchy Process (AHP), decision support systems, and supplier management. The integration of both primary and secondary data ensures a comprehensive and structured analytical foundation for determining the best coffee supplier at Arion Coffee.

B. Data Processing Method

In this study, the data processing was conducted through the following stages:

1. Data Collection

   a) Data related to supplier selection criteria, such as price, quality, delivery timeliness, and service were collected through interviews and discussions with the procurement team at Arion Coffee.

   b) The primary data obtained consisted of expert judgment values for pairwise comparisons of both criteria and supplier alternatives currently considered by Arion Coffee.

2. Application of the Analytical Hierarchy Process (AHP)

   a) The collected data were processed using the AHP method through several steps, including constructing the decision hierarchy, developing pairwise comparison matrices, calculating priority weights, and performing consistency ratio assessment to ensure the reliability of expert judgments.

   b) The AHP procedure produced priority weights for each criterion as well as final priority scores for all supplier alternatives based on expert evaluations.

3. Result Analysis

   The results of the AHP process were analyzed to identify the supplier with the highest overall priority score as the most suitable recommendation for Arion Coffee. This analysis supports the company in making a structured and objective supplier selection decision, thereby enhancing supply chain effectiveness and ensuring the consistency of raw material quality.

C. Research Process Flow

The research process in this study can be described as follows:

1. Problem Identification
   The study begins by identifying the main issues faced by Arion Coffee related to inconsistencies in evaluating and selecting coffee supplier candidates. These issues arise because previous assessments were largely subjective and lacked a structured decision-making framework.
2. Data Collection on Criteria and Supplier Alternatives
   Data were collected to determine the primary criteria used in supplier selection, namely price, quality, delivery timeliness, and service. In addition, data on supplier alternatives currently under consideration by Arion Coffee were gathered. This information was obtained through interviews, discussions, and expert judgment from individuals involved in procurement and quality control.
3. Application of the Analytical Hierarchy Process (AHP)
   The AHP method was applied to assign weights to each criterion and evaluate supplier alternatives through pairwise comparison matrices. The AHP stages include developing the decision hierarchy, constructing pairwise comparison matrices, calculating priority weights, and synthesizing final scores to determine the ranking of each supplier.
4. Consistency Evaluation of Judgments
   Each pairwise comparison matrix was tested using the Consistency Ratio (CR) to ensure that expert judgments were logical and consistent. Only matrices with CR < 0.1 were considered valid for supporting the decision-making process.
   The formulas used are as follows:

   a. Consistency Index (CI):

$$CI = \frac{\lambda_{\max} - n}{n - 1}$$

   Where:
   $\lambda_{\max}$ = maximum eigenvalue of the comparison matrix
   n= number of criteria

   b. Consistency Ratio (CR):

$$CR = \frac{CI}{RI}$$

   Where:
   RI = Random Index, a standard value provided by Saaty depending on matrix size.
5. Hierarchy Structure of the AHP Model
   To systematically evaluate supplier performance, the AHP model in this study is structured into three hierarchical levels:

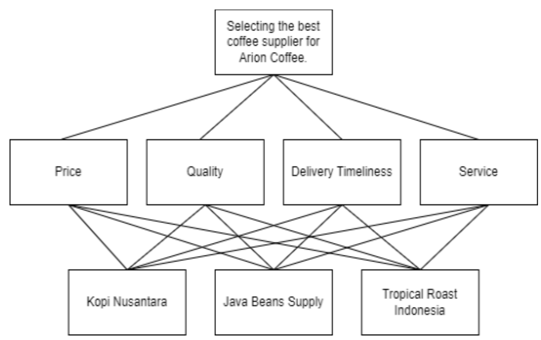

Fig 1. Process Hierarchy Structure

6. Formulation of the Final Supplier Recommendation
   Based on the global priority weights generated through AHP, the supplier with the highest overall score was identified as the best option for Arion Coffee. This step aims to provide an objective,

structured, and traceable recommendation for supplier selection.

TABLE I. THE FUNDAMENTAL SCALE OF SAATY

Intensity of importance on an absolute scale	Definition
1	Equal importance
3	Moderate importance of one the other
5	Essential or strong importance
7	Very strong importance
9	Extreme importance
2,4,6,8	Intermediate values between the two adjacent judgements

Source : Adapted from Saaty (1990)

III. RESULT AND DISCUSSION

This study uses the Analytical Hierarchy Process (AHP) framework to analyze the problem of selecting the best coffee supplier. Data were obtained through subjective assessments (expert judgments) from Arion Coffee's procurement team and then synthesized mathematically to determine the most suitable supplier based on multiple evaluation criteria.

A. Criteria and Alternatives

The study utilizes four main evaluation criteria:

1. Price (C1)
2. Quality (C2)
3. Delivery Timeliness (C3)
4. Service (C4)

The supplier alternatives considered are:

1. Kopi Nusantara (SUP A)
2. Java Beans Supply (SUP B)
3. Tropical Roast Indonesia (SUP C)

B. Hierarchial Decision Structure

The decision hierarchy consists of three levels:
Level 1 (Goal): Selecting the best coffee supplier for Arion Coffee.
Level 2 (Criteria): Price, Quality, Delivery Timeliness, and Service.
Level 3 (Alternatives): SUP A, SUP B, and SUP C.

C. Criteria Comparison Matrix

Pairwise comparisons were performed using the Saaty 1–9 scale, and the normalized matrix produced the following results:

TABLE II. PAIRWISE COMPARISON MATRIX

Criteria	Price (C1)	Quality (C2)	Delivery Timeliness (C3)	Service (C4)
Price (C1)	1	1/5	3	5
Quality (C2)	5	1	7	7
Delivery Timeliness (C3)	1/3	1/7	1	3
Service (C4)	1/5	1/7	1/3	1

TABLE III. PAIRWISE COMPARISON MATRIX

Criteria	Price (C1)	Quality (C2)	Delivery Timeliness (C3)	Service (C4)
Price (C1)	1	0,2	3	5
Quality (C2)	5	1	7	7
Delivery Timeliness (C3)	0,333	0,143	1	3
Service (C4)	0,2	0,143	0,333	1
Sum	6,533	1,486	11,333	16

D. Normalized Pairwise Comparison Matrix

$$\tilde{a}_{ij} = \frac{a_{ij}}{\sum_{k=1}^{n} a_{kj}}$$

TABLE IV. NORMALIZE

Criteria	Price (C1)	Quality (C2)	Delivery Timeliness (C3)	Service (C4)
Price (C1)	0,153	0,135	0,265	0,313
Quality (C2)	0,765	0,673	0,618	0,438
Delivery Timeliness (C3)	0,051	0,096	0,088	0,188
Service (C4)	0,031	0,096	0,029	0,063

E. Priority Vector (Criteria Weights)

Formula :
After the matrix is normalized, the weights of the criteria are obtained by:

$$w_i = \frac{\sum_{j=1}^{n} \tilde{a}_{ij}}{n}$$

TABLE V. CRITERIA EIGENVALUE MATRIX

Criteria	Price (C1)	Quality (C2)	Delivery Timeliness (C3)	Service (C4)	EVN
Price (C1)	0,153	0,135	0,265	0,313	0,216
Quality (C2)	0,765	0,673	0,618	0,438	0,623
Delivery Timeliness (C3)	0,051	0,096	0,088	0,188	0,106
Service (C4)	0,031	0,096	0,029	0,063	0,055

The Quality criterion has the highest priority weight of 0.623, showing that coffee bean quality is the most influential factor in supplier selection.

F. Consistency Matrix

Before proceeding with the calculations, it is necessary to evaluate the consistency of the pairwise comparison matrix used in the Analytical Hierarchy Process (AHP). onsistency assessment ensures that the judgments provided by decision-makers are logically coherent.

$$\frac{A \cdot w}{w} = [4{,}3078,\ 4{,}5354,\ 4{,}0752,\ 4{,}0646]$$

$$\lambda_{\max} = 4{,}2457$$

$$\text{CI} = \frac{\lambda_{\max} - n}{n-1} = 0{,}0819$$

RI (n=4) = 0,90

CR = CI / RI = **0,0910**

Interpretation: The Consistency Ratio (CR) is approximately 0.091, which is below the threshold value of 0.10. Therefore, the judgments are considered consistent and acceptable.

G. Pairwaise Comparison of Alternatives per Criterion

1. Price

TABLE VI. PRICE CRITERIA PAIRWISE COMPARISON MATRIX

Supplier	SUP A	SUP B	SUP C
SUP A	1	3	3
SUP B	1/3	1	5
SUP C	1/5	1/3	1
Sum	1,533	4,333	9

TABLE VII. DERIVING THE ALTERNATIVE WEIGHTS FOR THE PRICE CRITERION

Supplier	SUP A	SUP B	SUP C	Sum	EVN
SUP A	0,652	0,692	0,333	1,677	0,559
SUP B	0,217	0,231	0,555	1,003	0,334
SUP C	0,130	0,076	0,111	0,317	0,105

1.1 Consistency Ratio for Price

$$\lambda_{\max} = 3{,}0622$$

$$CI = \frac{\lambda_{max} - n}{n-1} = \frac{3{,}0622 - 3}{2} = 0{,}03111$$

$$RI = 0{,}58$$

$$CR = \frac{CI}{RI} = \frac{0{,}03111}{0{,}58} = 0{,}0536$$

$$CR = 0{,}0536 < 0.10$$

The consistency test for the Price criterion produces a Consistency Ratio (CR) of 0,0536, which is below the acceptable threshold of 0.10. This indicates that the pairwise comparison judgments made for evaluating supplier performance based on price are consistent and reliable.

2. Quality

TABLE VIII. QUALITY CRITERIA PAIRWISE COMPARISON MATRIX

Supplier	SUP A	SUP B	SUP C
SUP A	1	1/3	1/5
SUP B	3	1	1/3
SUP C	5	3	1
Sum	9	4,333	1,533

TABLE IX. DERIVING THE ALTERNATIVE WEIGHTS FOR THE QUALITY CRITERION

Supplier	SUP A	SUP B	SUP C	Sum	EVN
SUP A	0,111	0,077	0,130	0,319	0,106
SUP B	0,333	0,231	0,217	0,781	0,260
SUP C	0,556	0,692	0,652	1,900	0,633

2.1 Consistency Ratio for Quality

$$\lambda_{\max} = 3{,}001$$

$$CI = \frac{\lambda_{\max} - n}{n-1} = \frac{3{,}001 - 3}{2} = 0{,}0005$$

$$RI = 0{,}58$$

$$CR = \frac{CI}{RI} = \frac{0{,}0005}{0{,}58} = 0{,}00086$$

$$CR = 0{,}00086 < 0{,}10$$

The Consistency Ratio (CR) for the Quality criterion is 0.00086, which is far below the acceptable threshold of 0.10. This indicates that the pairwise comparison matrix for Quality is highly consistent, and the resulting weights are valid and reliable for use in the global evaluation process.

3. Delivery Timeliness

TABLE X. DELIVERY TIMELINESS CRITERIA PAIRWISE COMPARISON MATRIX

Supplier	SUP A	SUP B	SUP C
SUP A	1	1/5	3
SUP B	5	1	4
SUP C	1/3	1/5	1
Sum	6,333	1,400	8

TABLE XI. DERIVING THE ALTERNATIVE WEIGHTS FOR THE DELIVERY TIMELINESS CRITERION

Supplier	SUP A	SUP B	SUP C	Sum	EVN
SUP A	0,158	0,142	0,375	0,675	0,225
SUP B	0,789	0,714	0,500	2,003	0,667
SUP C	0,052	0,142	0,125	0,319	0,106

3.1 Consistency Ratio for Delivery Timeliness

$$\lambda_{max} = 3{,}0984$$

$$CI = \frac{\lambda_{max} - n}{n - 1} = \frac{3{,}0984 - 3}{2} = 0{,}04919$$

$$RI_{(n=3)} = 0{,}58$$

$$CR = \frac{CI}{RI} = \frac{0{,}04919}{0{,}58} = 0{,}0848$$

$$CR = 0.0848 < 0.10$$

The Consistency Ratio (CR) for the Quality criterion is 0,0848, which is significantly lower than the acceptable threshold of 0.10. This exceptionally low CR value indicates that the pairwise comparison matrix for the Delivery Timeliness criterion demonstrates a very high level of logical consistency in the judgments provided by the decision-makers.

4. Service

TABLE XII. SERVICE CRITERIA PAIRWISE COMPARISON MATRIX

Supplier	SUP A	SUP B	SUP C
SUP A	1	1/5	1/3
SUP B	5	1	3
SUP C	3	1/3	1
Sum	9	1,533	4,333

TABLE XIII. DERIVING THE ALTERNATIVE WEIGHTS FOR THE SERVICE CRITERION

Supplier	SUP A	SUP B	SUP C	Sum	EVN
SUP A	0,111	0,130	0,076	0,317	0,105
SUP B	0,555	0,652	0,692	1,899	0,633
SUP C	0,333	0,217	0,230	0,780	0,260

4.1 Consistency Ratio for Service

$$\lambda_{\max} = 3{,}038$$

$$CI = \frac{\lambda_{\max} - n}{n - 1} = \frac{3{,}038 - 3}{2} = 0{,}019$$

RI = 0,58

$$CR = \frac{CI}{RI} = \frac{0{,}019}{0{,}58} = 0{,}033$$

$$CR = 0{,}033 < 0.10$$

The Consistency Ratio (CR) = 0,033, which is far below the threshold of 0.10. This indicates that the judgments used in evaluating supplier service performance are consistent, logical, and acceptable.

H. Global Score and Final Ranking

$$\text{Global Score}_i = \sum_{j=1}^{n} (w_j \times a_{ij})$$

where:

w_j= weight of criterion j

a_{ij}= local priority of supplier $i$under criterion j

TABLE XIV. GLOBAL SCORE

Supplier	Price (0.216)	Quality (0.623)	Delivery (0.106)	Service (0.055)	Global Score
SUP A	0,120	0,066	0,023	0,005	0,214
SUP B	0,072	0,161	0,070	0,034	0,337
SUP C	0,022	0.394	0,011	0,014	0,441

TABLE XV. FINAL RANKING

Rank	Supplier	Total Score
1	Tropical Roast Indonesia (SUP C)	0,441
2	Java Beans Supply (SUP B)	0,337
3	Kopi Nusantara (SUP A)	0,214

The final synthesis shows that SUP C (Tropical Roast Indonesia) is the best-performing supplier with the highest global priority score. This indicates that SUP C offers the optimal balance of quality, delivery performance, service, and price relative to their importance in the overall evaluation. SUP C's exceptionally strong performance in the most critical criterion "Quality" significantly boosts its overall score, aligning well with Arion Coffee's focus on maintaining premium product standards.

The AHP based evaluation provides a transparent, quantitative, and methodologically rigorous framework for supplier selection. Based on the results, SUP C is recommended as the most suitable supplier for Arion Coffee, offering the strongest alignment with the company's operational priorities and quality standards. The use of AHP effectively reduces subjectivity, ensures consistency in judgment, and supports evidence-based decision-making in supplier management.

I. Discussion (Enhanced)

Based on the AHP results, the global priority ranking shows clear differences in the performance of the three coffee suppliers. These differences arise from the relative strengths and weaknesses of each supplier under the four evaluated criteria among them, Price, Quality, Delivery Timeliness, and Service.

1) Tropical Roast Indonesia (SUP C) – Highest Score (0.441)

   SUP C achieves the highest global score primarily due to its superior performance in the Quality criterion, which holds the largest importance weight (0.623). With a local priority value of 0.633, SUP C clearly outperforms the other suppliers in delivering high-quality coffee beans. This strong advantage significantly elevates its final score.

   Although SUP C does not dominate in Price or Delivery, its exceptional quality compensates for these shortcomings. The high-quality beans supplied by SUP C support Arion Coffee's strategic focus on consistency of taste and premium product positioning. This alignment explains why SUP C emerges as the optimal supplier despite moderate performance in other criteria.

   Managerial Implications:

   Arion Coffee should prioritize long-term contracts with SUP C to secure stable access to high-grade beans.

   Investment in deeper collaboration (e.g., farm audits, quality assurance programs) should be considered to maintain quality consistency.

   Pricing negotiations may be necessary to reduce cost without compromising bean quality.

2) Java Beans Supply (SUP B) – Second Rank (0.337)

   SUP B obtains the second-highest score due to excellent performance in Delivery Timeliness (0.667) and Service (0.633). These high local weights show that SUP B offers dependable logistics and strong communication, which are essential for maintaining uninterrupted production.

   However, SUP B's performance on the Quality criterion (0.260), although acceptable, is significantly lower than SUP C. Since Quality is the most important criterion, this limits SUP B's overall ranking. Its Price score (0.334) is also moderate and does not provide a sufficiently strong advantage to surpass SUP C.

   Managerial Implications:

   SUP B can serve as a backup supplier during peak seasons or when SUP C faces capacity limitations.

   Arion Coffee should consider using SUP B for less premium product variants where logistics reliability is more important than bean quality.

   SUP B's strong service performance makes it a suitable partner for agile supply chain arrangements (e.g., rush orders, flexible delivery schedules).

3) Kopi Nusantara (SUP A) – Lowest Rank (0.214)

   SUP A receives the lowest global score due to weak performance in the Quality criterion (0.106), which severely reduces its overall ranking. Despite offering a competitive Price score (0.559), the low bean quality becomes a critical drawback given its high importance weight in the AHP model.
   SUP A demonstrates moderate performance in Delivery (0.225) and Service (0.105), but these strengths are insufficient to offset its quality deficiency. Since Arion Coffee's business model emphasizes specialty-grade coffee, SUP A's offering does not align well with the company's strategic requirements.
   Managerial Implications**:**
   SUP A may still be considered for lower-grade coffee or seasonal blends that do not require premium bean quality.
   Arion Coffee could explore potential quality improvement programs with SUP A if cost efficiency becomes a higher priority in the future.
   Currently, SUP A should not be the primary supplier for premium product lines.

IV. CONCLUSION

This study aims to identify the most suitable coffee bean supplier for Arion Coffee using the Analytical Hierarchy Process (AHP). Four main evaluation criteria were used: Price, Quality, Delivery Timeliness, and Service. The results show notable differences in supplier performance according to the relative weight of each criterion.

Based on the global priority scores, the final ranking of suppliers is as follows:

1. Tropical Roast Indonesia (SUP C) – *Global Score: 0.441*
   SUP C ranks as the best supplier due to its outstanding performance in the Quality criterion, which holds the highest importance weight. Its superior bean quality aligns strongly with Arion Coffee's emphasis on premium product consistency.

2. Java Beans Supply (SUP B) – *Global Score: 0.337*
   SUP B excels in Delivery Timeliness and Service, making it a reliable partner from a logistics and coordination perspective. However, its quality level, while acceptable, is not strong enough to surpass SUP C.

3. Kopi Nusantara (SUP A) – *Global Score: 0.214*
   Although SUP A offers competitive pricing, its low score in Quality significantly weakens its overall ranking, making it less suitable for Arion Coffee's premium product requirements.

A. *Research Limitations*

Despite providing useful insights, this study has several limitations:

1. Limited Criteria and Alternatives
   This study uses only four criteria and three suppliers. In real-world contexts, additional factors, such as sustainability, certification, supplier capacity, or long-term reliability, may also influence decision-making.
2. Subjectivity in Pairwise Judgments
   The AHP method relies heavily on human judgment in pairwise comparisons. Although consistency checks were performed, inherent subjective biases may still affect the results.
3. Lack of Quantitative Operational Data
   The evaluation was primarily qualitative. Integrating quantitative data such as defect rates, historical delivery times, and actual cost variations could produce a more robust analysis.
4. Static Evaluation
   Supplier performance can change over time due to market conditions, crop quality, or operational improvements. This study captures only a single-point assessment.

B. *Recommendations for Future Research*

Future studies may consider the following enhancements:

Expanding the number of criteria and supplier alternatives to increase analytical depth.

Applying hybrid decision-making methods, such as TOPSIS, VIKOR, Fuzzy AHP, or other MCDM techniques to reduce subjectivity.

Incorporating quantitative historical performance data to complement AHP results.

Conducting periodic evaluations to reflect dynamic changes in supplier performance and business needs.

Acknowledgment

The completion of this research would not have been possible without the support, guidance, and encouragement of many individuals and institutions. First and foremost, the researcher would like to express sincere gratitude to God Almighty, whose blessing and grace have enabled the successful completion of this work. The researcher extends heartfelt appreciation to Arion Coffee, especially the procurement team, for providing valuable insights and data essential to this study. Their cooperation and willingness to share information greatly contributed to the accuracy and relevance of the research findings.

Special thanks are also directed to the supervisors and lecturers of the Digital Business program at Universitas PGRI Yogyakarta, whose constructive feedback, academic guidance, and continuous support helped refine the structure and quality of this research. The researcher is also deeply grateful to family and friends for their constant motivation and understanding throughout the entire research process. Their encouragement has been a source of strength from beginning to end.

Lastly, the researcher acknowledges all individuals who have contributed directly or indirectly to the completion of this thesis. Every form of assistance, no matter how small, is deeply appreciated.

References

[1] C. S. Robiah, "Supplier Selection for Paper Procurement Using the Analytical Hierarchy Process (AHP) Method at CV. Mekar Mandiri Group" STIE Ekuitas, 2017.

[2] S. Sariatin and C. Ekawati, "Factors Influencing Customer Satisfaction," *J. Inform. Ekon. Bisnis*, pp. 1258–1261, 2023.

[3] R. A. Nainggolan, "Selection of Shrimp Crackers Raw Material Suppliers Using the MOORA and WASPAS Methods: A Case Study of UMKM Amplang Udang Mbah Isam," Universitas Islam Negeri Sultan Syarif Kasim Riau, 2025.

[4] Y. O. Djogo, S. Se, M. M. Resty Ismawanti, M. Ikom, and others, *Sustainability Supply Chain Management (Sscm): Manajemen Rantai Pasok Berkelanjutan*. Takaza Innovatix Labs, 2024.

[5] F. Sulianta, *Fundamentals and Concepts of Decision Support Systems*. Feri Sulianta, 2025.

[6] C. Rozali, A. Zein, and S. Farizy, "*Application of the Analytic Hierarchy Process (AHP) for New Employee Recruitment Selection*," *J. Inform. Utama*, vol. 1, no. 2, pp. 32–36, 2023.

[7] T. N. Mumtaz, "Analysis of Duck Egg Supplier Evaluation Using the Analytical Hierarchy Process (AHP) and Data Envelopment Analysis (DEA) (Case Study: Telur Asin Noerce)," Universitas Islam Sultan Agung, 2025.

[8] R. A. Hermawan, "A System for Determining Suitable Job Weighting for Employees Using the Analytical Hierarchy Process (AHP) Method and Fuzzy Technique For Order Preference By Similarity To Ideal Solution Method (Fuzzy Topsis)," Universitas Komputer Indonesia, 2021.

[9] S. Medina, P. D. Wike Agustin, S. T. P. Arif Hidayat, and P. D. M AIT, "Supplier Selection and Raw Green Coffee Bean Purchase Allocation Using the Fuzzy Analytic Hierarchy Process and Greedy Knapsack Algorithm at UKM Kopi Sido Luhur–Malang," Universitas Brawijaya, 2021.

[10] T. K. Saputra and others, "Determining Criteria for Selecting Fabric Material Suppliers in the Textile Industry Using the Analytical Hierarchy Process (AHP)," 2018.

[11] R. D. A. Bermano and D. Gustian, "Decision Support System for Supplier Selection at Tentera Coffee Corp Using the Analytical Hierarchy Process Method," *J. Rekayasa Teknol. Nusa Putra*, vol. 5, no. 1, pp. 13–21, 2018.

[12] M. S. Iswahyudi *et al.*, *Decision Support Systems.* Cendikia Mulia Mandiri, 2025.

[13] F. Ariani, "Decision Support System for Determining Priority in Selecting Promotional Media Printing Using the AHP Method," *J. Inform.*, vol. 4, no. 2, 2017.

[14] P. G. W. Keen, "Decision support systems: a research perspective," in *Decision support systems: Issues and challenges: Proceedings of an international task force meeting*, 1980, pp. 23–44.

[15] A. G. Saputro, "Application of the AHP (Analytical Hierarchy Process) Method in Selecting Suppliers for Convection Raw Material Procurement," *Musytari J. Manajemen, Akuntansi, Dan Ekon.*, vol. 23, no. 12, pp. 121–130, 2025.

[16] A. O. Ramadhan, R. A. Yudha, and others, "P Implementation of a Decision Support System in Determining Suppliers Using the Analytical Hierarchy Process," *J. Sains Masy.*, vol. 1, no. 1, pp. 1–10, 2024.