

## Improving Supply Chain Management Efficiency in Fashion: AHP-Based Vendor Selection

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### ABSTRACT

In an increasingly competitive industrial world, selecting the right vendor is crucial for maintaining the quality and continuity of a company's operations. This study was conducted at PT Bersama Zatta Jaya Tbk, a company engaged in the Muslim fashion industry, to evaluate and determine the best vendor for the "bergo" product category. The research employed mixed methods, combining both qualitative and quantitative approaches, with primary data obtained through interviews and questionnaires. The data analysis was performed using the AHP (Analytical Hierarchy Process) method. The results of the study indicate

Vendor Selection;  
Muslim Fashion Industry; Supply Chain Risk.

that quality is the priority criterion with a weight of 0.43681, making it the main factor in vendor selection. Vendor V1 was selected as the best with a weight of 0.30387, followed by V4, V2, and V3. This study emphasizes the importance of quality in vendor evaluation and provides recommendations for PT Bersama Zatta Jaya Tbk to focus on quality as the primary factor in the vendor selection process.



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## **1. Introduction**

The intense business competition today requires every company to revise their corporate strategies to improve daily operations and productivity (Armanegara et al., 2023). The highly competitive industrial world requires companies to recognize the importance of selecting vendors who can meet their needs with the right quality and timing. (Gao et al., 2020; Putri & Pulansari, 2022; Rivaldi et al., 2023). A mistake in selecting a vendor will have a direct impact on the company's productivity, such as delays or postponements in the delivery of goods due to choosing the wrong vendor. (Riadi et al., 2023). One critical part of the supply chain that plays a significant role and affects the continuity of a company's production process is the selection of the right and reliable vendor. (Saidatuningtyas, Ifa & Paradisya, 2019). A company's success heavily relies on the process of evaluating and selecting vendors, with researchers agreeing that suppliers and the provision of resources are crucial for business continuity (Asamoah et al., 2012; Muhammad et al., 2020).

PT Bersama Zatta Jaya Tbk is a company engaged in fashion, specifically in the production and distribution of Muslim clothing and accessories. The company is located in Cigondewah Kaler,

Bandung Kulon District, Bandung City, West Java Province. It is supported by the Elzatta and Dauky brand names. Currently, its stores are spread across 120 locations and are supported by 1,068 agents and 200,000 active members throughout Indonesia. The need for shipping goods to various islands, both within and outside Java, requires the company to have reliable vendors with good criteria to maintain product quality and customer service. Vendor selection criteria can assist the company in finding and evaluating vendors that can provide high-caliber products at competitive prices and are reliable in terms of availability. (Pratiwi et al., 2018; Riadi et al., 2023). This study will focus on selecting vendors for a single type of product that is routinely produced by the company, specifically the "bergo" product category. Currently, four vendors have been identified, and the best one will be selected. By choosing the optimal vendor, the company hopes to achieve both direct and indirect benefits.

The issue with vendor selection at PT Bersama Zatta Jaya Tbk is that there has not been a set standard criterion for making these selections. As a result, the company frequently encounters risks and undesirable issues, such as poor material quality due to defects, long lead times, inadequate service, and more. This research will address these issues by selecting vendors using appropriate methods to find the best vendor that meets the company's criteria. The aim is to reduce risks and maximize buyer value. Each business within a company has different procedures for evaluating and selecting suppliers. (Muhammad et al., 2020).

PT Bersama Zatta Jaya Tbk faces several challenges in its vendor selection process, which have significant impacts on its operational efficiency and supply chain management. One of the main issues is the lack of standardized vendor selection criteria, which has led to inconsistent decision-making processes. The absence of clear guidelines results in subjective judgments, increasing the risk of selecting underperforming vendors, leading to problems such as delivery delays and material defects (Gao et al., 2020; Riadi et al., 2023). Without formal standards, the company frequently experiences disruptions in its operations due to poor vendor performance (Asamoah et al., 2012). The research addresses this gap by applying the Analytical Hierarchy Process (AHP), a structured decision-making tool that helps the company set clear, hierarchical criteria for evaluating vendors based on quality, price, delivery time, and production capacity (Chen, 2020). This structured approach ensures consistent decision-making, reducing the risks of poor vendor selection (Ridwan & Azzat, 2024).

Another challenge the company faces is the variability in vendor performance, particularly regarding product quality and delivery timelines. Some vendors fail to meet the required quality standards, while others deliver late, resulting in production delays and customer dissatisfaction (Muhammad et al., 2020). This issue is particularly critical for a company with a large distribution network, supplying over 120 stores across various regions, where consistent vendor performance is essential for maintaining operational efficiency (Pratiwi et al., 2018). The AHP method used in the research identifies quality as the primary criterion for vendor selection, assigning it the highest weight (0.43681), thereby emphasizing the importance of selecting vendors that consistently meet the company's quality standards (Ridwan & Azzat, 2024). Additionally, by prioritizing delivery time as the second most important criterion, the research ensures that vendors are chosen based on their ability to fulfill orders within the required timelines, thus improving supply chain efficiency (Gao et al., 2020).

The risk of supply chain disruptions due to unreliable vendors is another significant issue faced by the company. In the fashion industry, timely product launches and inventory management are critical, and any disruption in the supply chain can have direct consequences on profitability and competitiveness (Putri & Pulansari, 2022). The company currently lacks a formal system to evaluate and mitigate vendor-related risks, leading to potential delays in product launches or insufficient stock levels (Armanegara et al., 2023). The study provides a solution by implementing a multi-criteria vendor selection model that balances quality, price, production capacity, and delivery time (Handayani

et al., 2023). This approach helps the company mitigate the risks associated with unreliable vendors by selecting those that offer a balanced performance, thereby minimizing the risk of supply chain disruptions (Wicaksana et al., 2020).

In addition, the company faces difficulties in evaluating the production capacity of its vendors, which often leads to supply bottlenecks when vendors are unable to meet the company's demand (Rivaldi et al., 2023). This mismatch between demand and vendor capacity results in stock shortages and affects the company's ability to meet customer expectations (Saidatuningtyas & Paradisya, 2019). The research addresses this issue by incorporating production capacity as one of the key criteria in the AHP model, allowing the company to assess each vendor's ability to meet its production needs (Hasiani et al., 2021). By evaluating vendor capacity systematically, the company can reduce the likelihood of supply shortages and ensure smoother production flows (Muhammad et al., 2020).

Lastly, the company's decision-making process for vendor selection has traditionally been subjective, lacking the analytical rigor necessary for making informed decisions (Rosmiati et al., 2023). This has often resulted in inconsistent vendor performance and misalignment between vendor capabilities and the company's operational needs (Ridwan & Azzat, 2024). By applying the AHP method, the research introduces a data-driven and objective framework for decision-making (Chen, 2020). The AHP method allows the company to evaluate and rank vendors systematically based on quantifiable criteria, ensuring that decisions are based on data rather than intuition or personal preferences (Wicaksana et al., 2020). This analytical approach enhances the company's ability to select vendors that align with its strategic goals, ultimately improving the overall efficiency and effectiveness of the vendor selection process (Cahya et al., 2022).

## 2. Methodology

The method used in this study is mixed methods, which is a research approach that combines two forms of research: qualitative and quantitative. This mixed method is used together in a research activity to obtain results that are more comprehensive, valid, reliable, and objective (Rosmiati et al., 2023). The data used in this study are primary data obtained from interviews and questionnaire responses to identify the best vendor criteria. The interview and questionnaire process in this study was conducted using purposive sampling with the following criteria:

- Possesses in-depth knowledge of the vendor selection and management process
- Experienced in interacting with vendors and understanding the impact of vendors on company operations
- Understands logistics and supply chain management aspects related to vendors

The assumption in this research is that the experts interviewed are familiar with the vendors partnering with PT Bersama Zatta Jaya Tbk and can provide weighted evaluations of each vendor. The benefit of this research is that the company can identify the best vendor using the AHP method and also understand the quality and performance of each vendor associated with PT Bersama Zatta Jaya Tbk. This research requires a structured and systematic process.

The data to be used consists of results from questionnaires that are elaborated with interviews and reinforced using data source triangulation to enhance the validity and reliability of the research. The research instruments used have been validated by experts to ensure that the questions accurately measure the concepts or variables being studied (Atikah, 2024).

The AHP (Analytical Hierarchy Process) method was chosen in this study due to its ability to structure complex decision-making problems hierarchically, allowing decision-makers to consider both qualitative and quantitative factors (Saaty, 1980). Unlike TOPSIS, which focuses on ranking alternatives based on the relative closeness to an ideal solution, AHP provides a systematic approach to assign weights to multiple criteria and sub-criteria through pairwise comparisons, offering more transparency in the decision-making process (Chen, 2020). Additionally, AHP enables decision-

makers to quantify subjective judgments, making it particularly useful in contexts like vendor selection, where qualitative criteria such as quality and service reliability are essential (Hasiani et al., 2021). On the other hand, DEA (Data Envelopment Analysis) focuses on efficiency measurement, which may not fully capture the multi-criteria decision-making needs of this study, where trade-offs between criteria are important (Wicaksana et al., 2020). The ability of AHP to accommodate inconsistent judgments through its consistency ratio calculation further justifies its selection, ensuring that the decision-making process remains robust and reliable (Ardiansyah & Widiastutik, 2024). Therefore, AHP was deemed more suitable than TOPSIS or DEA for evaluating and selecting the best vendor based on multiple, hierarchical criteria in this context.

### 3. Results and Discussion

The results from the questionnaires obtained from the four company experts yield a pairwise matrix of criteria that will be used for weight calculation using the AHP method. In the AHP method, criteria are organized in a hierarchical structure. By arranging criteria in a hierarchy, AHP allows for a more systematic and structured evaluation, which aids in making more objective and data-driven decisions (Ardiansyah & Widiastutik, 2024). The criteria used in selecting the best vendor are based on previous literature. The hierarchical structure used is illustrated in Figure 2.

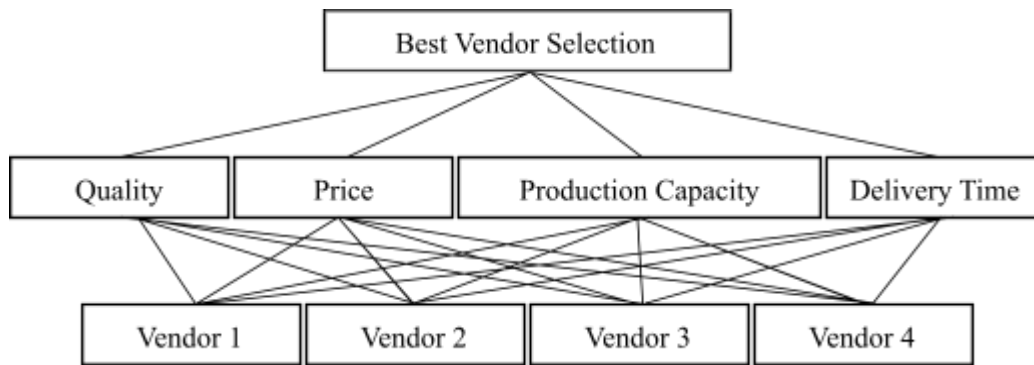


Figure 1. Hierarchical Structure of Best Vendor Selection  
Source: Data Processing Results

#### Weighting of Criteria

The pairwise comparison matrix is arranged to show the extent to which each element influences others in achieving the goals of the higher-level criteria (Nurjanah & Fatmawati, 2020). The pairwise comparison matrix of criteria is derived from the results of respondent evaluations. The initial step involves calculating the Geometric Mean to obtain the average value from all respondents. The values obtained from the Geometric Mean calculations are then entered into the pairwise comparison matrix, as shown in Table 2.

Table 1. Initial Pairwise Comparison Matrix

Criteria	C1	C2	C3	C4
C1	1	2,37841	3,86867	1,68179
C2	0,42045	1	2,21336	0,59460
C3	0,25849	0,45180	1	0,59460
C4	0,59460	1,68179	1,68179	1
<b>Total</b>	2,27354	5,51201	8,76383	3,87100

Next, normalization of the matrix is performed by dividing each column element by the total column value, as shown in Table 3.

Table 2. Criterion Matrix Normalization Results

Criteria	C1	C2	C3	C4
C1	0,43984	0,43150	0,44144	0,43446
C2	0,18493	0,18142	0,25256	0,15360
C3	0,11369	0,08197	0,11411	0,15360
C4	0,26153	0,30511	0,19190	0,25833
<b>Total</b>	1	1	1	1

Description:

C1 : Quality ; C2 : Price ; C3 : Production Capacity ; C4 : Delivery Time

The next step is to calculate the weights of each criterion by dividing the priority vector values by the number of established criteria. The priority vector values are obtained from the sum of each row in Table 3. Meanwhile, the Eigen Value is the result of multiplying the weights by the total column values of each criterion in Table 2, as shown in Table 4.

Table 3. Weight and Eigen Value Matrix

Criteria	Vector Priority	Weight	Eigen Value
C1	1,74724	0,43681	0,99310
C2	0,77251	0,19313	1,06453
C3	0,46337	0,11584	1,01522
C4	1,01688	0,25422	0,98408
<b>Total</b>	4	1	4,05694

Based on the Eigen Value calculations above, the next step is to calculate the Consistency Index (CI) by dividing the total Eigen Value difference by the number of criteria minus one, as follows:

$$I = \frac{(4,05694 - 4)}{(4 - 1)} = 0,01898$$

After obtaining the CI value of 0.01898, this value will be used to calculate the Consistency Ratio (CR). The CR is determined by dividing the CI by the Random Index (RI), where the RI is a constant in the AHP calculation. For four criteria, the RI value is 0.90. The calculation is as follows:

$$R = \frac{I}{RI} = \frac{0,01898}{0,9} = 0,02109$$

The obtained CR value is 0.02109, which is below the tolerance ( $CR < 0.1$ ), indicating that the pairwise comparison matrix of criteria is considered consistent. From the obtained weights, it can be determined that goods quality is the primary criterion required by the company with a value of 0.43681. The next criterion is delivery time with a value of 0.25422, followed by price with a value of 0.19313, and finally, production capacity with a value of 0.11584.

## Weighting of Alternatives Based on Criteria

Here is the pairwise comparison matrix of alternatives obtained from the questionnaire based on the first criterion, which is quality, as shown in Table 5.

Table 4. Initial Pairwise Comparison Matrix by Quality

Vendor	V1	V2	V3	V4
V1	1	2,73556	2,37841	2,37841
V2	0,36556	1	2,05977	0,36556
V3	0,42045	0,48549	1	0,50000
V4	0,42045	2,73556	2,00000	1
<b>Total</b>	<b>2,20645</b>	<b>6,95662</b>	<b>7,43818</b>	<b>4,24397</b>

Next is the pairwise comparison matrix of alternatives for the second criterion, which is price, as shown in Table 6.

Table 5. Initial Pairwise Comparison Matrix by Price

Vendor	V1	V2	V3	V4
V1	1	1,00000	1,00000	0,43472
V2	1,00000	1	1,62658	0,43472
V3	1,00000	0,61479	1	0,43472
V4	2,30033	2,30033	2,30033	1
<b>Total</b>	<b>5,30033</b>	<b>4,91511</b>	<b>5,92690</b>	<b>2,30416</b>

Next is the pairwise comparison matrix of alternatives for the third criterion, which is production capacity, as shown in Table 7.

Table 6. Initial Pairwise Comparison Matrix by Production Capacity

Vendor	V1	V2	V3	V4
V1	1	0,36556	1,93434	0,73111
V2	2,73556	1	2,73556	2,73556
V3	0,51697	0,36556	1	0,51697
V4	1,36778	0,36556	1,93434	1
<b>Total</b>	<b>5,62032</b>	<b>2,09667</b>	<b>7,60424</b>	<b>4,98365</b>

The final pairwise comparison matrix of alternatives is for the fourth criterion, which is Delivery Time, as shown in Table 8.

Table 7. Initial Pairwise Comparison Matrix by Production Delivery Time

Vendor	V1	V2	V3	V4
V1	1	0,36556	2,73556	1,03395
V2	2,73556	1	1,93434	2,73556
V3	0,36556	0,51697	1	0,43472
V4	0,96717	0,36556	2,30033	1
<b>Total</b>	<b>5,06829</b>	<b>2,24808</b>	<b>7,97023</b>	<b>5,20423</b>

The calculation of the normalization matrix for the Eigen Value of alternatives is performed for each criterion, with the results for the price criterion shown in Table 9.

Table 8. Alternative Matrix Normalization Results by Quality

<b>Vendor</b>	<b>Vector Priority</b>	<b>Weight</b>	<b>Eigen Value</b>
<b>V1</b>	1,72663	0,43166	0,95243
<b>V2</b>	0,67248	0,16812	1,16954
<b>V3</b>	0,51260	0,12815	0,95320
<b>V4</b>	1,08830	0,27207	1,15468
<b>Total</b>	4	1	4,22985

Then, the normalization matrix for the Eigen Value of alternatives for the price criterion can be shown in Table 10.

Table 9. Alternative Matrix Normalization Results by Price

<b>Vendor</b>	<b>Vector Priority</b>	<b>Weight</b>	<b>Eigen Value</b>
<b>V1</b>	0,74951	0,18738	0,99316
<b>V2</b>	0,85523	0,21381	1,05089
<b>V3</b>	0,67114	0,16778	0,99444
<b>V4</b>	1,72412	0,43103	0,99316
<b>Total</b>	4	1	4,03166

Next, the normalization matrix for the Eigen Value of alternatives for the Production Capacity criterion can be shown in Table 11.

Table 10. Alternative Matrix Normalization Results by Production Capacity

<b>Vendor</b>	<b>Vector Priority</b>	<b>Weight</b>	<b>Eigen Value</b>
<b>V1</b>	0,75335	0,18834	1,05852
<b>V2</b>	1,87233	0,46808	0,98141
<b>V3</b>	0,50157	0,12539	0,95352
<b>V4</b>	0,87275	0,21819	1,08737
<b>Total</b>	4	1	4,08082

Finally, the normalization matrix for the Eigen Value of alternatives for the Delivery Time criterion can be shown in Table 12.

Table 11. Alternative Matrix Normalization Results by Delivery Time

<b>Vendor</b>	<b>Vector Priority</b>	<b>Weight</b>	<b>Eigen Value</b>
<b>V1</b>	0,90181	0,22545	1,14266
<b>V2</b>	1,75290	0,43823	0,98517
<b>V3</b>	0,51109	0,12777	1,01837
<b>V4</b>	0,83420	0,20855	1,08534
<b>Total</b>	4	1	4,23154

Based on the Eigenvalue values, the CR for each criterion will be obtained. The CR value must be no more than 0.1 for the assessment to be considered valid and consistent. The CR calculation for the quality criterion is 0.08513, which indicates consistency, as shown in Table 13.

Table 12. Alternative Consistency Ratio Value of Quality Criteria

CI	0,07662
RI	0,9
CR	0,08513

Next, the CR value for the second criterion, price, is 0.01173, which indicates that it is both valid and consistent, as shown in Table 14.

Table 13. Alternative Consistency Ratio Value of Price Criteria

CI	0,01055
RI	0,9
CR	0,01173

The CR value for the Production Capacity criterion is 0.02993, as shown in Table 15, indicating consistency since the CR value is less than 0.1.

Table 14. Alternative Consistency Ratio Value of Production Capacity Criteria

CI	0,02694
RI	0,9
CR	0,02993

The CR value for the final criterion, Delivery Time, is 0.08576, indicating consistency, as shown in Table 16.

Table 15. Alternative Consistency Ratio Value of Delivery Time Criteria

CI	0,07718
RI	0,9
CR	0,08576

From the tables above, it can be seen that none of the CR values exceed 0.1, indicating that the process of determining the relative weights is within acceptable limits (consistent). These results can be considered valid and reliable to support the decisions made. A low CR value indicates that the comparisons are highly consistent, so the preferences expressed by the decision-makers are consistent with the method used. The ranking or order of the best vendors is presented in Table 17.

Table 16. Vendor Ranking Calculation Results

	C1	C2	C3	C4	SKOR	RANKING
<b>V1</b>	0,188552	0,036188	0,021818	0,057314	0,30387	1
<b>V2</b>	0,073436	0,041292	0,054224	0,111406	0,28036	3
<b>V3</b>	0,055977	0,032404	0,014526	0,032482	0,13539	4
<b>V4</b>	0,118844	0,083244	0,025275	0,053018	0,28038	2

Based on the table above, it can be concluded that the best vendor for the product is Vendor 1 with a value of 0.30387, followed by Vendor 4 with a value of 0.28038, then Vendor 2 with a value of 0.28036, and lastly Vendor 3 with a value of 0.13539.

From the data processing, it is evident that quality is the primary criterion for vendor selection at the company. This aligns with the statement made by the company's head of supply chain & data analyst when asked how the company measures the performance of selected vendors. The response was: "First, quality, consistency of quality, as well as delivery time, and price, that's it." This statement is also supported by research conducted by (Gao et al., 2020) which states that product quality is a key factor to consider in vendor selection because low-quality products can lead to significant losses, including product returns, loss of customer trust, and supply chain disruptions. Similarly, a study by (Putri & Pulansari, 2022) emphasizes that the quality of products from vendors plays a crucial role in maintaining the company's reputation and business sustainability, especially in highly competitive industries.

#### 4. Conclusion

Based on the research results and data processing using the AHP method, it can be concluded that the priority criterion in selecting vendors for the "bergo" product category at PT Bersama Zatta Jaya Tbk is quality, with a value of 0.43681. This indicates that quality is a crucial aspect of vendor selection and can serve as a basis for decision-making in establishing partnerships with vendors. The selected vendor using the AHP method is V1, with a weight of 0.30387, followed by V4, V2, and V3 with preference values of 0.28038, 0.28036, and 0.13539, respectively. The recommendation from this study is for PT Bersama Zatta Jaya Tbk to prioritize quality as the main factor in the vendor selection and evaluation process in the future. The choice of V1 as the primary vendor shows that the company should focus on partnerships that ensure high-quality standards for the "bergo" product category. Additionally, the AHP method used in this study has proven effective in identifying priority criteria and the most suitable vendors for the company's needs. Therefore, this method can be adopted for various other product categories to enhance overall vendor selection efficiency and effectiveness. The researcher also suggests that future researchers planning to explore AHP should consider identifying more criteria and sub-criteria for each vendor to make the vendor selection process more objective.

Based on the document, the main limitations of the research include the use of limited criteria and vendors in the decision-making process, which may not fully capture all factors influencing vendor selection at PT Bersama Zatta Jaya Tbk. The study focuses primarily on four main criteria—quality, price, production capacity, and delivery time—which, although significant, do not account for other potential factors like environmental sustainability, long-term vendor relationships, or risk management strategies. Furthermore, the number of vendors analyzed is small, limiting the generalizability of the results. In future research, it is recommended to expand the criteria to include additional factors such as financial stability, innovation capabilities, and alignment with corporate social responsibility. Additionally, increasing the sample size by evaluating a larger pool of vendors would provide a more comprehensive analysis and strengthen the objectivity of the selection process. Finally, integrating more sophisticated methods, such as multi-criteria decision-making tools (e.g., TOPSIS or DEA) alongside AHP, could improve the accuracy and robustness of the findings.

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