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Journal of Logistics and Supply Chain

Journal homepage: https://ejournal.upi.edu/index.php/JLSC

Journal of Logistics and Supply Chain

Vendor Selection Analysis Based on AHP to Enhance Service Quality and Consumer Satisfaction at PT XYZ

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ABSTRACTS

In the midst of intense economic competition, all companies are required to improve their performance in order to maintain their existence in the business world. Not only must they be able to produce high-quality goods, but the company must also be able to provide extraordinary service to its consumers, especially companies engaged in logistics. One way to achieve the best service aspects is through selecting the right freight forwarding vendor. This study aims to determine the best vendor for PT. XYZ based on the most appropriate criteria using the Analytic Hierarchy Process (AHP) method. The qualitative method with a descriptive approach is the method used in writing this article with the results showing that the criteria that have the highest rating weights are the level of service criteria with 47%, the location criteria with 26%, the responsiveness criteria with 19% and the price criteria with 8%. After considering these four criteria, the sequence of vendors with the highest priority value is Vendor E with a total priority value of 0,59. Meanwhile, Vendor D and Vendor F occupy the second and third positions with a total priority score of 0,57 and 0,54.

ARTICLE INFO

Article History:
Submitted/Received 07 June 2022
First Revised 08 July 2022
Accepted 9 Sept 2022
Online Date 31 Sept 2022
Published Date 1 Oct 2022

Keyword:
AHP method,
Decision making
Vendor

1. INTRODUCTION

The competition of every company in the business world generally wants to be superior (Wulan & Hendrawan, 2018). In essence, every company has the same business orientation, namely to generate maximum profits by minimizing costs incurred (Nurjanah, 2020). Getting ahead in the market involves more than just providing high-quality products; outstanding customer service is also an important aspect. One important way to achieve better service is through choosing the right freight forwarding vendor. Speed and accuracy in the delivery of goods are key factors in meeting customer expectations.

As one of the state-owned enterprises (BUMN), PT XYZ is a business development that brings service users closer to Collection Points located in strategic locations and equipped with pick up and delivery services from first mile to last mile in one Express service that serves the B2B segment with a focus on package delivery with an integrated door-to-door approach. Behind the company's good reputation, it is not uncommon to find problems that can affect the level of customer satisfaction. One of the problems that occurred in the company after observations and interviews was related to the selection of vendors who were less careful. Where cooperation with other partners is established, but the expected quality standards are not met. This of course can cause problems in terms of untimely delivery of goods, damage or loss of goods, or even non-compliance with customer requests and specifications.

Vendors are suppliers of goods or services that have contractual cooperation ties to the company (Junaedi, 2020). The company must select vendors in accordance with the criteria required by the company (Oktavia et al, 2019). Vendor selection criteria will have an impact on the quality of goods to be supplied, thus ultimately affecting company productivity. The criteria in vendor selection must be known in advance to get a vendor that suits the needs of PT XYZ which will be used as a benchmark in vendor selection.

This research aims to determine the best vendor by selecting vendors based on appropriate criteria using the Analytic Hierarchy Process (AHP) method. This method is used to solve complex problems by structuring a hierarchy of criteria, interested parties, results by drawing various considerations as weights or priorities (Munthafa & Mubarok, 2017). The application of AHP in the selection of freight forwarding vendors allows companies to avoid delivery delays that can harm reputation and customer satisfaction.

The importance of selecting the right shipping vendor as an integral part of a superior customer service strategy, makes AHP a valuable tool in supporting better decision making. Therefore, with this research that applies the AHP method in the context of selecting a freight forwarding vendor to improve supply chain efficiency and effectiveness and ensure customers get optimal service can be a solution for the company, PT XYZ.

2. METHODS

The method used in this research is a qualitative method with a descriptive approach. Descriptive method is a method of processing data based on the supporting factors of the research object to then be researched and analyzed in more depth (Fattah *et al*, 2022). The problems raised in this method must be feasible and contain scientific value with a scope that is not too broad (Fatmawati, 2020). The stages carried out in this writing are summarized through the flowchart in **Figure 1.**

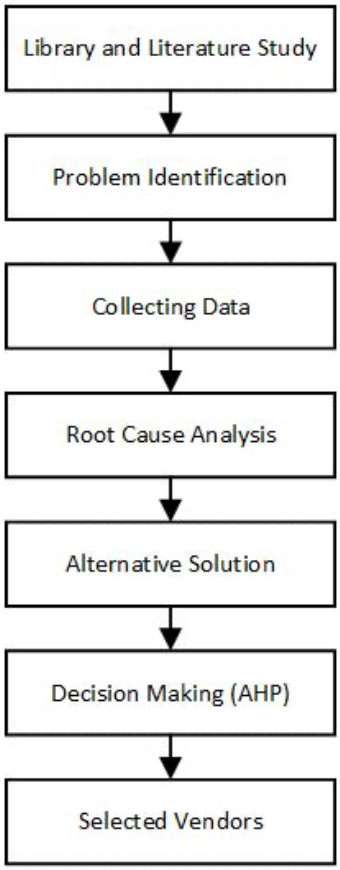

Figure 1. Stages of the research

(1) Library and Literature Study
Conducting field analysis and desk research was the approach adopted. The data required for this study was obtained through desk research, which involved collecting information and data from various sources such as books, notes, articles and other materials. Meanwhile, the field analysis method involves collecting data directly from the site, including observations and interviews. In the context of this research, the focus will be on PT XYZ, which is based in the city of Bandung.

(2) Problem Identification
This process involves an in-depth understanding of the background of the topic to be researched, identifying relevant knowledge gaps or problems, and formulating a clear and focused problem statement (Carcary, 2020). At this stage, researchers explore relevant literature and information, recognize current trends, and understand the potential impact of the problem. After identification, the problem is further refined and analyzed to determine its relevance, significance, and potential contribution to the broader field of knowledge. This stage provides the basis for formulating research questions that will guide the entire research process, ensure that the research has a fruitful direction, and provide a solid foundation for further investigation.

(3) Collecting Data
At this stage, the authors applies the planned approach to collect data relevant to the research objectives. During this process, the researcher ensures compliance with the research objectives, avoids bias, and maintains data quality.

Data collection may involve direct interaction with respondents or accessing secondary data sources such as archives, databases, or official documents (Mwita, 2022). The importance of consistency and rigor in data collection not only ensures the integrity of the research, but also contributes to the validity and reliability of the results to be obtained from data analysis.

(4) Root Cause Analysis
The analysis process is carried out using the qualitative Fault Tree Analysis (FTA) method. The FTA method is used to determine the basic event or combination of basic events of a problem (Duyo, 2020). Based on these objectives, researchers will use the Fault Tree Analysis (FTA) method to help identify existing problems at PT XYZ.

(5) Alternative Sollution
Several alternative solutions will be analyzed to get the best results for the company.

(6) Decision Making (AHP)
AHP method is a method used as a decision making tool to solve problems related to vendor selection that researchers raise. AHP is a method for ranking decision alternatives and choosing the best one with several criteria. AHP develops a numerical value to rank each decision alternative, based on the extent to which each alternative meets the decision maker's criteria (Permatasari, 2020).

(7) Selected Vendors
After all stages are carried out, the results will be obtained in the form of selected vendors and are worthy of being a partner of related companies.

In this study, the authors used two types of data, namely primary and secondary data. Primary data is data obtained by the author directly from the object of research (Yusdinata *et al*, 2019). Primary data in this study were obtained from interviews with the branch head of PT XYZ. Meanwhile, secondary data is data obtained indirectly from the object of research, usually in the form of company publications (Rusdi, 2019). This secondary data is obtained from the results of searching websites, journals or related scientific articles needed by the author.

3. RESULTS AND DISCUSSION

This chapter will explain related to company partner’s problem which is about dissatisfactory vendor selection. Author use the decision making method, namely the AHP (Analytical Hierarchy Process) method which is considered capable of solving problems faced by partners. The following is the procedure for implementing the AHP (Analytical Hierarchy Process) method:

3.1. Hierarchical Structure

(1) Identify the alternatives
The first stage of the AHP method is to identify the list of alternatives that the company has. Based on the results of interviews with PT. XYZ, there are several vendor options that can be an alternative for PT. XYZ, which is then sorted into Vendor A until Vendor H.

(2) Determine Vendor Selection Criteria
There are four vendor selection criteria, namely price, responsiveness, location and level of service.

Not only, based on interview results, the four criteria were selected based on the results of author's observations regarding what aspects are the most needed by PT. XYZ to improve their performance.

a. Price
   Price is the total cost that must be incurred by the company to pay for trucking services to the alternative companies (William, 2017). There are three sub-criteria in the price criteria, including vendors whose prices are less than Rp. 15,000, between Rp. 15,000 to Rp. 20,000 and more than Rp. 22,500. If the price offered is low, the profit that can be obtained by the company will be higher. And vice versa, if the price offered by the vendor is high, the profit that can be obtained by the company will be lower.
b. Responsiveness
   Responsiveness is the ability of alternative companies to communicate well and provide quick replies or responses to both consumers and companies that invite them to work together (Kasinem, 2021). There are three sub-criteria in the responsive criteria. First, responsibility aspect which is assessed from the level of persistence of the vendor in completing the work that has been given. Second, good communication aspect which is assessed from the vendor's ability to understand the company's wishes and be able to minimize the occurrence of miscommunication. Third, fast response aspect which is assessed from the vendor's ability to respond as quickly as possible because basically time is the most important thing when dealing with shipping goods.
c. Location
   Location is the distance between the company and the alternative companies calculated by units (km) (Desparaja et al, 2020). There are three sub-criteria in the location criteria, including distances of less than 5km (<5km), distances of 5-10km, distances of more than 10km (>10km). If the distance between the vendor and the company is closer, it will be better it because it can minimize the distance and the travel time. Vice versa, if the distance between the vendor and the company is far, the travel time and the distance that must be taken will increase.
d. Level of service
   Facilities provided by the alternative companies in the process of cooperation between the two companies (Anindita et al, 2020). There are three sub-criteria in the level of service criteria. First, delivery’s punctuality aspect is assessed from the vendor's ability to arrange the delivery time of the goods so that the goods can arrive at the consumer according to the schedule. Second, fleet availability aspect which is assessed from the quality and the quantity of shipping fleets owned by vendors in order to meet the company's needs, whether on land, sea or air. Third, monitoring of shipments aspect which is assessed from the vendor's ability to monitor the goods being sent in real time in order to minimize the occurrence of errors.

3.2. Criteria Comparison Matrix

At this step, author will be comparing and determining the weight of each criteria based on the results of interviews with PT. XYZ. The comparison value between criteria is determined based on their classification from a scale of 1 to 9 by Saaty (Pamungkas *et al*, 2020) as listed in **Table 1** below:

Table 1. Interest Intensity Scale

Interest Intensity	Definition
1	Equally important as the others
3	Slightly more important than the others
5	Quite important than the others
7	More important than the others
9	Extreme importance than the others
2,4,6,8	Score between two adjacent ratings
Reciprocal	If element i has one of the above numbers compared to element j, then j has the opposite value when compared to i

Table 2. Pairwise Comparison Matrix between Criteria

	Price	Responsiveness	Location	Level of Service
Price	1	0.25	0.333333333	0.2
Responsiveness	4	1	0.5	0.333333333
Location	3	2	1	0.5
Level of Service	5	3	2	1
Total	13	6.25	3.833333333	2.033333333

3.3. Criteria Value Matrix

This matrix is obtained by dividing the results of the comparison matrix on each criteria with the total, then being added up and search for the priority values and the eigen values. The eigen value referred in here is the maximum point of eigen value. (Wicaksono et al, 2020). Priority values and eigen values can be calculated using the equation:

$$Priority = \frac{Sum}{n}$$

$$Eigen\ Value = \frac{Total\ of\ Comparison\ Matrix}{Priority}$$

The following example is the calculation of priority and eigen value for price criteria:

$$Priority = \frac{0{,}30224}{4} = 0{,}075560064$$

$$Eigen\ Value = \frac{13}{0{,}075560064} = 0.982280827$$

After all the criteria are calculated, the following of **Table 3** is an example of a matrix calculation table for the value of the criteria obtained:

Table 3. Criteria Value Matrix

	Price	Responsiveness	Location	Level of Service	Sum	Priority	Eigen Value
Price	0.076923077	0.04	0.086956522	0.098360656	0.30224	0.075560064	0.982280827
Responsiveness	0.307692308	0.16	0.130434783	0.163934426	0.76206	0.190515379	1.19072112
Location	0.230769231	0.32	0.260869565	0.245901639	1.05754	0.264385109	1.013476251
Level of Service	0.384615385	0.48	0.52173913	0.491803279	1.87816	0.469539448	0.954730212
Total	1	1	1	1	4	1	4.141208409

3.4. Consistency Index (CI) dan Consistency Ratio (CR)

This calculation is done to prove whether the respondent's preferences used are consistent or not. If the results of CR is <0.1 then the respondent's preferences are consistent and the calculation results can be declared correct (Olanta et al, 2019). Calculations are made based on the Random Consistency Index List (Syaifulloh & Kusrini, 2016) at **Table 4**.

Table 4. Random Consistency Index List

Matrix Size	RI
1	0
2	0
3	0.58
4	0.9
5	1.12
6	1.24
7	1.32
8	1.41
9	1.45
10	1.49

Therefore because n = 4, the RI is worth 0.9.
CI = (4.141207409 – 4) / (4 – 1) = 0.04706947
CR = 0,04706947/0,9 = 0,052299411
So it can be concluded that the preferences of respondents are consistent.

3.5. Alternative Data and Final Result

The following **Table 5** is the condition data for each alternative obtained from the interview with PT. XYZ:

Table 5. Condition of Alternatives

	Price	Responsiveness	Location	Level of Service
Vendor A	<15000	Responsibility Good	<5km	Fleet Availability
Vendor B	>22500	Communication	>10km	Fleet Availability
Vendor C	<15000	Fast Response	5-10km	Fleet Availability
Vendor D	>22500	Responsibility	<5km	Delivery timeliness
Vendor E	>22500	Responsibility	5-10km	Delivery timeliness
Vendor F	>22500	Fast Response	>10km	Delivery timeliness
Vendor G	15000-20000	Fast Response	<5km	Delivery timeliness
Vendor H	<15000	Fast Response	>10km	Fleet Availability

The final step of the AHP method is to sort all alternatives based on the total value per alternative, which can be done using the equation:

$$Alternative\ (Criteria) = Priority\ Value\ of\ the\ Criteria\ x\ Priority\ Value\ of\ the\ Sub\ Criteria$$

As an example, the following is the calculation of the total value of alternative Vendor A for the price criteria:

$$Vendor\ A\ (Price) = 0{,}075560064\ x\ 0{,}197619048 = 0{,}014932108$$

Table 9. Vendor Ranking

	Price	Responsiveness	Location	Level of Service	Total	Ranking
Vendor A	0.014932108	0.122575474	0.065764968	0.039116337	0.242388887	5
Vendor B	0.037060412	0.014054721	0.112562457	0.039116337	0.202793927	7
Vendor C	0.014932108	0.053885184	0.086057684	0.039116337	0.193991313	8
Vendor D	0.037060412	0.122575474	0.065764968	0.339714635	0.565115489	2
Vendor E	0.037060412	0.122575474	0.086057684	0.339714635	0.585408206	1
Vendor F	0.037060412	0.053885184	0.112562457	0.339714635	0.543222688	3
Vendor G	0.023567544	0.053885184	0.065764968	0.339714635	0.48293233	4
Vendor H	0.014932108	0.053885184	0.112562457	0.039116337	0.220496086	6

Based on the table, it can be concluded that the best alternatives that partners can choose are Vendor E, Vendor D, Vendor F, Vendor G, Vendor A, Vendor H, Vendor B and Vendor C.

4. CONCLUSION

In the context of modern enterprises, maintaining an efficient and high-quality supply chain is a very important aspect in achieving competitive advantage. Therefore, selecting the right vendor plays a crucial role in ensuring the smooth flow of goods and services provided to customers. In an effort to overcome this challenge, this research addresses the problems faced by PT XYZ related to the sub-optimal vendor system. Through the Analytic Hierarchy Process (AHP) method approach, the author has explored a structured solution to deal with this problem more effectively. By breaking down the complexity of vendor selection into more specific criteria, the company can understand the important aspects that need to be considered in making better decisions. As a result of the evaluation using AHP, the four main criteria identified as key considerations in vendor selection are service level, location, responsiveness, and price.

The service level criterion is the most significant factor with the highest weight of 47%. This shows that the quality of service provided by vendors in terms of speed, accuracy, and handling of goods has a great impact on the final decision. Location and responsiveness criteria also receive significant attention in the vendor selection process. Strategic location has a weight of 26%, indicating that ease of access and efficient distribution are important factors in choosing a vendor. Meanwhile, responsiveness with a weight of 19% shows that the vendor's ability to respond quickly to requests and problems has a considerable influence in the selection decision. Although the price criterion has the lowest weight (8%) compared to the other criteria, it still has an impact on vendor selection. Although not the main factor, considering the cost aspect is an important part of maintaining a balance between service quality and company budget efficiency.

The ranking results generated by AHP provide clear guidance in selecting the vendor that best suits the company's needs. In this case, vendor E received the highest priority score (0.59), indicating that it is the most optimal choice based on the criteria. Vendors D and F were also well prioritized, ranking second (0.57) and third (0.54) respectively.

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