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Analysis of Selecting the Best Shipping Service Vendor Using the Analytical Hierarchy Process (AHP) Method at PT XYZ

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ABSTRACT

Choosing an expedition service is an important aspect for companies, especially companies operating in the trade sector. One method that can be used to select expedition services is the Analytical Hierarchy Process (AHP) method. This research aims to determine the order of criteria in selecting the expedition service to be selected and the expedition service to be selected. This research method uses a qualitative approach. This research uses the AHP method assisted by expert choice software.

From the results of the importance level assessment the most influential criteria in selecting expedition services at PT. Alternatives in selecting expedition services produce the following priority/weight scale: JNE is the first priority to be selected as the selected expedition service with a weight value of 501; Second is Pos Indonesia with a weight value of 322 and third is J&T with a weight value of 177.

INTRODUCTION

The dynamic business development is in line with the increasing consumer demand for products and services to meet all their needs. To maintain business continuity, companies need to focus on customer satisfaction. Companies must understand what things are considered important by consumers and strive to improve performance as best as possible in order to meet consumer needs effectively and efficiently.

Logistics activities play an important role in business and trade processes where there is a distribution process to deliver goods/products from producers/sellers to consumers. Distribution issues include the ease of obtaining products anytime and anywhere in a timely manner and at appropriate costs. In the implementation of logistics activities, the owners of goods tend to outsource to other parties that provide logistics services (logistics service providers) to handle the company's logistics affairs such as warehousing, delivery of raw materials/products, and packaging (Falsini et al., 2012).

The selection of expedition services is one of the important aspects for companies, especially those engaged in trade. This decision has a significant impact on consumer satisfaction and the company's image. Currently, there are many expedition services offering various choices of services and prices. This can make companies face various options that can be confusing. Therefore, an analytical method is needed to assist decision makers in choosing the right expedition service. This method must be able to solve complex problems and produce quality decisions. One method that can be used to solve complex problems in selecting expedition services is the Analytical Hierarchy Process (AHP) method. The Analytical Hierarchy Process is a decision-making method that can be used to address complex problems by simplifying the decision-making process and breaking down the problem into criteria and arranging these criteria in a hierarchy or a series of integrated levels.

PT XYZ is a print and online media company that must distribute its magazines to its customers every month. PT XYZ distributes the magazines to all elementary schools, junior high schools, senior high schools, and vocational schools, both private and public, in Bekasi City and Bekasi Regency. In carrying out the delivery of goods, PT XYZ does not yet have a fixed courier service, so there are often changes in the courier service every month. To improve customer satisfaction and the company's image, PT XYZ must be able to choose a courier service that can provide competitive prices, timely delivery, and responsiveness. Therefore, there needs to be definite criteria in determining the courier service so that PT XYZ can evaluate and select the right courier service.

METHOD

This research uses a qualitative method, with data collection techniques including observation, preliminary interviews, and questionnaires. Sample determination in this study was conducted using the Purposive Sampling technique, where selection is made deliberately based on criteria that have been determined and established according to the research objectives. This is because the AHP method requires dependence on a group of experts according to the type of specialists involved in decision-making. Therefore, the informants in this study are parties who have authority in decision-making. The decision-makers in choosing expedition services are the Chief Editor, Finance Department, and Manager. The data analysis technique used is the Analytical Hierarchy Process (AHP). Calculations were carried out with the assistance of Expert Choice software.

RESULT AND DISCUSSION

1. Building a Hierarchy

The criteria for the Analytical Hierarchy Process (AHP) method are usually arranged in a hierarchical form. The criteria and subcriteria in this study are the criteria and subcriteria used by the company in selecting expedition services, obtained from preliminary interviews. The problem of selecting expedition services for PT XYZ is structured into three levels. With level zero as the goal, the company must choose the best expedition service; the first level functions as the criteria for selecting expedition services; the second level consists of subcriteria that

explain the first-level criteria; and the third level is the alternatives, indicating which expedition service is most appropriate for the company to choose.

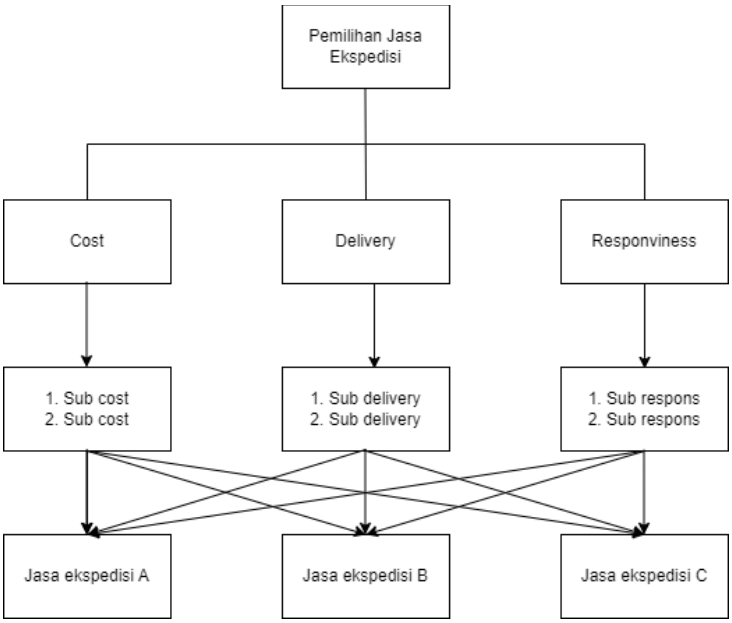


Figure 1. Hierarchical Structure of PT XYZ's Freight Forwarding Service Selection

Calculating the priority weight of each criterion

Calculate the priority weight of each level. Data for measuring the priority of criteria in selecting shipping services was obtained through questionnaires distributed to three informants.

Table 1. Prioritization of criteria in selecting shipping services

Criterion	Cost	Delivery	Responsiveness
Cost	1	1,442	2,268
Delivery	0,693	1	3,302
Responsiveness	0,441	0,303	1

Source: Results of AHP Processing

The combined results from the three informants assessing the criteria using the Expert Choice application. The results show that the cost criterion has a priority rating of 1.442 compared to the delivery criterion, and the cost criterion has a priority rating of 2.268 compared to the responsiveness criterion. The delivery criterion has a priority rating of 3.302 compared to the responsiveness criterion.

Table 2. Priority of Interest Weight Criteria in selecting shipping services

Criterion	Weight	Priority
Cost	0,448	I
Delivery	0,398	II
Responsiveness	0,154	III

Source: Results of AHP Processing

Table 2 above shows that in selecting expedition services, PT XYZ's first priority is the Cost criterion with a weight of 0.448, followed by the Delivery criterion with a weight of 0.398, and then Responsiveness with a weight of 0.154.

Calculating the priority weight of each level 2

a. Cost Criteria

Table 3. Priority assessment of subcriteria in the Cost criterion for selecting shipping services

COST COMPARISON MATRIX			**C1**	Shipping Costs
			C2	Payment Grace Period
COST	**C1**	**C2**		
C1	1	1/2		
C2	2	1		

Source: Results of AHP Processing

The result is that the payment grace period has a priority rating of 1.91293 compared to shipping costs.

Table 4. Priority of importance (Weight) of subcriteria in the Cost criterion in selecting shipping services

Subcriteria Cost	Weight	Priority
Shipping Costs	0,343	II
Payment Grace Period	0,657	I

Source: Results of AHP Processing

Based on the table above, it shows that the Payment Grace Period subcriterion is the first priority with a weight of 0.657, while the Shipping Cost subcriterion is the second priority with a weight of 0.343.

b. Delivery Criteria

Table 5. Priority assessment of subcriteria in the Delivery criterion in the selection of shipping services

DELIVERY COMPARISON MATRIX			**D1**	Punctuality of Pickup and Delivery
			D2	Accuracy of Arriving Goods
DELIVERY	**D1**	**D2**		
D1	1	3		
D2	0,333	1		

Source: Results of AHP Processing

The result is that the timeliness of goods pickup and delivery has a priority rating of 3.0 compared to the timeliness of goods arrival.

Table 6. Priority of importance (Weight) of subcriteria in the Delivery criterion in the selection of shipping services

Delivery Subcriteria	Weight	Priority
Punctuality of Pickup and Delivery	0,750	I
Accuracy of Arriving Goods	0,250	II

Source: Results of AHP Processing

Based on the table above, it shows that the subcriteria of punctuality in picking up and delivering goods is the first priority with a weight of 0.750, while the subcriteria of accuracy of goods delivery is the second priority with a weight of 0.343.

c. Responsiveness Criteria

Table 7. Assessment of priority interests of subcriteria in the Responsiveness criterion in the selection of expedition services

DELIVERY COMPARISON MATRIX			**R1**	Quick Response to Undelivered Items
			R2	Ability to Provide Information
DELIVERY	**R1**	**R2**		
R1	1	1,710		
R2	0,585	1		

Source: Results of AHP Processing

The result is a quick response to goods that do not have a priority rating of 1.710 compared to the ability to provide information.

Table 8. Priority of importance (Weight) of subcriteria in the Responsiveness criterion in the selection of shipping services

Responsiveness Criteria	Weight	Priority
Quick Response to Undelivered Items	0,631	I
Ability to Provide Information	0,369	II

Source: Results of AHP Processing

Based on the table above, it shows that the subcriterion of quick response to undelivered goods is the first priority with a weight of 0.631, while the subcriterion of ability to provide information is the second priority with a weight of 0.369.

Calculating the priority weight of each level 3 Alternative selection of shipping services

a. Cost Criteria

1) Shipping Cost Criteria

Table 9. Priority assessment of subcriteria in the Cost criterion

for selecting shipping services

ALTERNATIVES	**POS INDONESIA**	**JNE**	**J&T**
POS INDONESIA	1	3,915	5
JNE	0,255	1	2,621

J&T	0,200	0,382	1

Source: Results of AHP Processing

The result is that Pos Indonesia has a priority rating of 3.915 compared to JNE, and Pos Indonesia has a priority rating of 5.0 compared to J&T. The JNE alternative has a priority rating of 2.621 compared to J&T.

Table 10. Priority of interest (Weight) Alternatives in the shipping cost subcriteria in selecting shipping services

Shipping Service Alternatives	Weight	Priority
Pos Indonesia	0,675	I
JNE	0,219	II
J&T	0,106	III

Source: Results of AHP Processing

Based on the table above, it shows that in the subcriteria of shipping costs, Pos Indonesia is the shipping service that meets this subcriterion with a weight of 0.675, followed by JNE with a weight of 0.219 and J&T with a weight of 0.106.

2) Payment Grace Period Subcriteria

Table 11. Assessment of priority interests of alternatives in the payment grace period subcriteria in the selection of expedition services

ALTERNATIVES	**POS INDONESIA**	**JNE**	**J&T**
POS INDONESIA	1	1/5	2,520
JNE	5	1	6,316
J&T	0,397	0,158	1

Source: Results of AHP Processing

The result is that JNE has a priority rating of 4.932 compared to Pos Indonesia, and Pos Indonesia has a priority rating of 2.520 compared to J&T. The alternative JNE has a priority rating of 6.316 compared to J&T.

Table 12. Priority of interest (Weight) Alternatives in the payment grace period subcriteria in the selection of expedition services

Shipping Service Alternatives	Bobot	Prioritas
Pos Indonesia	0,184	I
JNE	0,724	II
J&T	0,92	III

Source: Results of AHP Processing

Based on the table above, it shows that in the subcriteria of payment grace period, JNE is the shipping service that meets this subcriteria with a weight of 0.724, followed by Pos Indonesia with a weight of 0.184 and J&T with a weight of 0.092.

b. Delivery Criteria

1) Punctuality of Pickup and Delivery Sub Criteria

Table 13. Priority assessment of alternatives on the subcriteria of punctuality in picking up and delivering goods in selecting shipping services

ALTERNATIVES	POS INDONESIA	JNE	J&T
POS INDONESIA	1	0,620	2,520
JNE	1,613	1	3,302
J&T	0,397	0,303	1

Source: Results of AHP Processing

The result is that JNE has a priority rating of 1.613 compared to Pos Indonesia, and Pos Indonesia has a priority rating of 2.520 compared to J&T. The alternative JNE has a priority rating of 3.302 compared to J&T.

Table 14. Priority of interest (Weight) Alternatives in the subcriteria of punctuality in picking up and delivering goods in selecting shipping services

Shipping Service Alternatives	Bobot	Prioritas
Pos Indonesia	0,341	II
JNE	0,514	I
J&T	0,145	III

Source: Results of AHP Processing

Based on the table above, it shows that in the subcriteria of punctuality in picking up and delivering goods, JNE is the shipping service that meets this subcriteria with a weight of 0.514, followed by Pos Indonesia with a weight of 0.341 and J&T with a weight of 0.145.

2) Accuracy of Arriving Goods Sub Criteria

Table 15. Priority assessment of alternatives in the subcriteria of goods accuracy in the selection of expedition services

ALTERNATIVES	POS INDONESIA	JNE	J&T
POS INDONESIA	1	0,693	1,063
JNE	1,442	1	1,442
J&T	0,941	0,693	1

Source: Results of AHP Processing

The result is that JNE has a priority rating of 1.442 compared to Pos Indonesia, and Pos Indonesia has a priority rating of 1.063 compared to J&T. Alternatively, JNE has a priority rating of 1.442 compared to J&T.

Table 16. Priority of interest (Weight) Alternatives in the subcriteria of goods accuracy in the selection of expedition services

Shipping Service Alternatives	Bobot	Prioritas
Pos Indonesia	0,296	II
JNE	0,419	I
J&T	0,285	III

Source: Results of AHP Processing

Based on the table above, it shows that in the sub-criteria of accuracy of goods delivery, JNE is the shipping service that meets this sub-criteria with a weight of 0.419, followed by Pos Indonesia with a weight of 0.296 and J&T with a weight of 0.285.

c. Responsiveness Criteria

1) Subcriteria: Quick response to undelivered goods

Table 17. Priority assessment of alternatives on the subcriteria of rapid response to undelivered goods in the selection of shipping services

ALTERNATIVES	POS INDONESIA	JNE	J&T
POS INDONESIA	1	0,382	1
JNE	2,621	1	1,442
J&T	1	0,693	1

Source: Results of AHP Processing

The result is that JNE has a priority rating of 2.621 compared to Pos Indonesia, and Pos Indonesia has a priority rating of 1.0 compared to J&T. The alternative JNE has a priority rating of 1.442 compared to J&T.

Table 18. Priority of interest (Weight) Alternative in the subcriteria of rapid response to goods not arriving in the selection of shipping services

Shipping Service Alternatives	Weight	Priority
Pos Indonesia	0,229	III
JNE	0,492	I
J&T	0,279	II

Source: Results of AHP Processing

Based on the table above, it shows that in the subcriteria of quick response to goods not arriving, JNE is the shipping service that meets this subcriteria with a weight of 0.492, followed by J&T with a weight of 0.279 and JNE with a weight of 0.229.

2) Subcriteria: Ability to Provide Information

Table 19. Priority assessment of alternatives on the subcriteria of ability to provide information in the selection of expedition services

ALTERNATIVES	POS INDONESIA	JNE	J&T
POS INDONESIA	1	0,585	693

JNE	1,710	1	1,216
J&T	1,442	0,822	1

Source: Results of AHP Processing

The result is that JNE has a priority rating of 1.710 compared to Pos Indonesia, and J&T has a priority rating of 1.442 compared to Pos Indonesia. The alternative JNE has a priority rating of 1.216 compared to J&T.

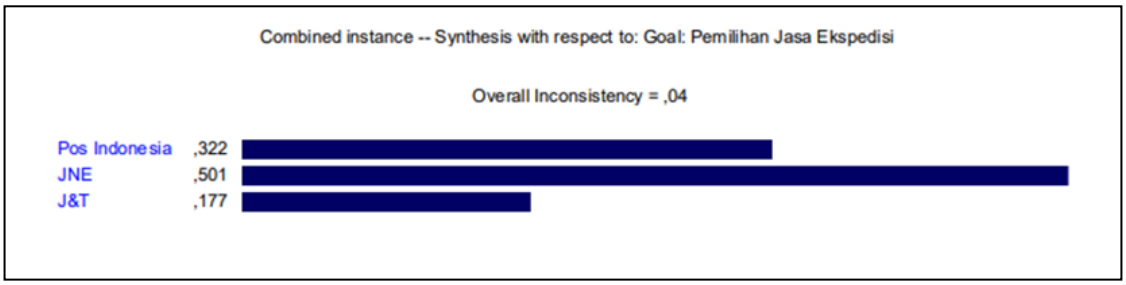
Table 20. Priority of interest (Weight) Alternatives in the subcriteria of the ability to provide information in the selection of expedition services

Shipping Service Alternatives	Weight	Priority
Pos Indonesia	0,241	III
JNE	0,415	I
J&T	0,344	II

Source: Results of AHP Processing

Based on the table above, it shows that in the subcriteria of Ability to provide information, JNE is the shipping service that meets this subcriteria with a weight of 0.415, followed by J&T with a weight of 0.344 and JNE with a weight of 0.241.

Figure 5. Overall final assessment weight of expedition services



Source: Results of AHP Processing

Based on the image above, it shows that overall, JNE is the first priority to be selected as a shipping service at PT XYZ with a weight value of 501. Then in second place is Pos Indonesia with a weight value of 322 and in third place is J&T with a weight value of 177.

Overall Consistency Rasio

Table 21. Consistency Rasio

Paired Comparison	CR	Explanation
Inter-criteria (level 1)	0,05	Consistent
Inter-subcriteria cost	0,00	Consistent
Inter-subcriteria delivery	0,00	Consistent
Inter-subcriteria responsiveness	0,00	Consistent
Between alternative subcriteria C1	0,05	Consistent
Between alternative subcriteria C2	0,04	Consistent
Between alternative subcriteria D1	0,00	Consistent
Between alternative subcriteria D2	0,00	Consistent
Between alternative subcriteria R1	0,03	Consistent
Between alternative subcriteria R2	0,00	Consistent

Source: data Processing Results

The result of the comparison between criteria and alternatives is that if the CR value is <0.1, then the paired comparison values in the matrix are considered consistent.

2. Discussion

From the AHP analysis above, the order of criteria in selecting expedition services at PT XYZ places the cost criterion first with a weight value of 448. The cost criterion used in this study includes two sub-criteria, namely shipping costs and payment grace period. Of these two sub-criteria, the payment grace period sub-criterion becomes the first priority with a weight value of 657 and the shipping cost sub-criterion is second with a weight value of 343.

The delivery criterion ranks second in selecting expedition services at PT XYZ with a weight value of 398. The delivery criterion used in this study includes two sub-criteria, namely timeliness of pickup and delivery and accuracy of items upon arrival. Of these two sub-criteria, timeliness of pickup and delivery becomes the first priority with a weight value of 750 and the accuracy of items upon arrival is second with a weight value of 250.

The responsiveness criterion ranks third in the selection of expedition services at PT XYZ with a weight value of 154. The responsiveness criterion used in this study includes two subcriteria, namely quick response to undelivered goods and the ability to provide information. Of these two subcriteria, quick response to undelivered goods is the first priority with a weight value of 631 and the ability to provide information is the second priority with a weight value of 369.

Overall, based on the criteria and subcriteria in the selection of expedition services, JNE occupies the first priority with a weight value of 501, Pos Indonesia the second priority with a weight value of 322, and J&T the third priority with a weight value of 177. This indicates that overall the expedition service chosen by the company is JNE because JNE has the highest weight value compared to the other two expedition services.

CONCLUSION

The order of the most influential criteria in choosing expedition services at PT XYZ is the Cost criterion with a weight value of 448. The second priority influencing the selection of expedition services is the Delivery criterion with a weight value of 396, while the third priority is the Responsiveness criterion with a weight value of 154.

Based on the criteria and sub-criteria in selecting expedition services at PT XYZ, overall JNE occupies the first priority with a weight value of 501. This indicates that JNE is the expedition service that will be chosen by PT XYZ because overall JNE has the highest weight value compared to Pos Indonesia, which has a weight value of 322, and J&T, which only has a weight value of 177.

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