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Logistic Service Quality in Improving the Quality of Logistics Services for Companies Using the Analytical Hierarchy Process (AHP) Method

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ABSTRACT

The rapid development of organizations in the industrial sector is in line with today's technological advances. Logistics is an important process in companies that consider the quality of the delivery facilitator. The purpose of this study is to analyze how the effect of logistics service quality on improving the quality of goods delivery services using the LSQ dimensions of previous research. Then analyze the factors that make consumers dissatisfied with the quality of the services provided, then choose the criteria as an alternative weighting sample. The identification of criteria is adjusted to the Logistics Service Quality to review the main criteria to be taken. Then weighted on each alternative based on the main criteria that have been identified. This weighting is carried out by the AHP decision support method, where the alternatives and comparisons of each criterion are those that are inputted into the AHP and those that are considered unable to meet customer satisfaction are the output attributes of the LSQ. The results of this study indicate that there are main dimensions of logistics service quality in improving service quality, namely ordering condition, time, and information quality. Each comparison factor is tested for consistency using the Analytical Hierarchy Process (AHP), each main criterion has a consistency value of less than 0.1 so that the main criteria tested have a consistent comparison matrix and can be used as a basis for decision making for companies in choosing priority alternative criteria.

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1. INTRODUCTION

The development of industrial companies in Indonesia is now increasingly rapidly influenced by advances in information technology. Especially in the field of goods delivery services which is the process framework of a company that supplies raw materials to industrial companies [1]. Judging from the rapid development of the industry, it is one of the factors that the logistics industry will be on the verge of growth in the manufacturing, retail, and real estate sectors that are starting to surface [2].

Logistics plays a role in smooth transactions between companies because it is a facilitator of buying and selling goods and services to fulfill supply orders for consumer companies [3]. Consumer satisfaction is

judged by the quality of service, where a good delivery service is determined by the logistics concept that is owned [4]. So, in the logistics of delivering goods, time and place affect the satisfaction of consumers.

In this study, the author tries to apply the Analytical Hierarchy Process (AHP) method in the case of company problems, namely to determine the effect of Logistic Service Quality (LSQ) on freight forwarding companies. Previous research by Irene, et.al [5], on the relationship between the quality of logistics services with special emphasis on the determinants and customer satisfaction which also contains the expectations of customers to improve the quality of logistics services. By applying the AHP and LSQ methods, we will try to find out which sectors contribute dominantly to the company so that the strategy to determine service quality that is in accordance with the company's conditions and capabilities can be carried out using the decision support concept. Logistic Service Quality (LSQ) is an interrelated quality construction process, where the construction is reliable and valid across all customer segments. The emphasis is placed on each of the different constructions across several customer segments. With the LSQ scale, the supplier company can understand the desires and expectations of customers in improving service quality [6], [7].

In improving the quality of goods delivery services, there are several alternative criteria that focus on the condition of supply orders, the speed of delivery of supply goods, and the quality of information on delivery services when responding to consumer companies, so that good communication is established. From the criteria for improving the quality of services, a weighting will be carried out using an alternative company example [8], [9].

Measurement of service quality intends to evaluate the performance of supply goods delivery services with the dimensions of choice. Dimensions of measurement can be taken from how the level of customer satisfaction. Differences in previous research by Rosyada et al. (2020) on the object which only focuses on one object, namely JNE Express, but the research to be carried out is not specific, it can be from any freight forwarder [10]. Research by Hati & Juliati (2019) shows that there are differences in objects studied using JNE and the dependent variable, namely customer satisfaction and loyalty, while the research to be carried out has the dependent variable of logistics service quality [11]. Previous research by Halim et al (2019) had a different object which examined the Kentucky Fried Chicken restaurant in Surabaya, while the research that would be investigated was a freight forwarding service company [12]. Research by Imran & Ernawati (2020) describes differences in the company's regional coverage which is only in the city of Batam, while the research to be studied is not limited to one area but in all cities in Indonesia [13]. Research by Awasthi et al. (2018) uses the SERVQUAL and QFD-AHP methods while the research that will be carried out only uses AHP [14].

Judging from the importance of improving the quality of freight forwarding services, because of this, we then conducted this research, with the aim of getting the weight of the main criteria based on the LSQ dimension in improving goods delivery logistics services.

2. METHODS

The quantitative approach used in this study, the quantitative method is the approach used to research a particular population or sample and is based on the philosophy of positivism [11], after the data is collected then the data is analyzed which is quantitative in nature used as an instrument in this study. This study uses data collection techniques through questionnaires and then will be tested quantitatively with convergent validity and reliability tests using the SPSS application [12]. The data collection process uses a questionnaire as an instrument that is distributed to companies that use logistics services. Questionnaire is a technique of collecting sample data from respondents through question instruments given by researchers.

To obtain information, there are steps in collecting data, namely by making a questionnaire consisting of question instruments that are in accordance with the research variables that have been determined, then determining the respondent to fill out the questionnaire in accordance with predetermined criteria, before filling out the questionnaire respondents are given procedures filling out the questionnaire and the purpose of this study, after filling out the questionnaire then selecting the completeness of the questionnaire data, if the data is incomplete then the data will not be used as research sample data.

The questionnaire data were adjusted to the LSQ dimensions from previous studies by Yu-Kai Huang, Yi-Wei Kuo, and Shi-Wei [8]. Weighting criteria using Multi Criteria Decision Making (MCDM), namely Analytical Hierarchy Process (AHP). The object of this research sample is the company that owns the goods and the users of goods delivery logistics services. The characteristics of the companies that we chose in this study include: a) companies that often use logistics services for at least one year b) there are goods delivery activities in a year that occur twice a year c) have received shipments of goods that are not appropriate d) through websites, companies use logistics services.

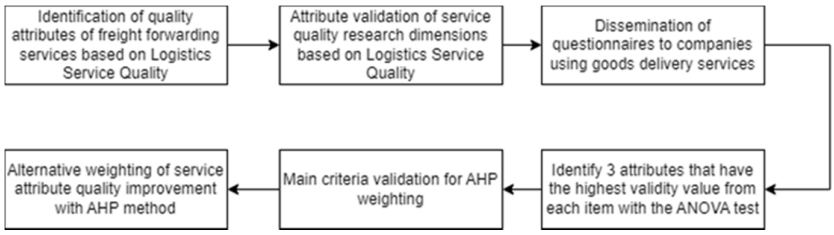

Fig. 1. Research Flow

The next step is to analyze the factors that make consumers dissatisfied with the quality of services provided, then choose the criteria as an alternative weighting sample. The identification of criteria is adjusted to the Logistics Service Quality to review the main criteria to be taken. Then weighted on each alternative based on the main criteria that have been identified. This weighting is carried out by the AHP decision support method, where the alternatives and comparisons of each criterion are those that are inputted into the AHP and those that are considered unable to meet customer satisfaction are the output attributes of the LSQ [4].

3. RESULTS AND DISCUSSION

The sample data was obtained through the distribution of questionnaires in a company that utilizes a logistics system to fulfill the supply of raw materials for production, where the sample data was obtained by 61 respondents which were then processed through validity and reliability tests to determine the average of each attribute of the questionnaire using the ANOVA statistical quantity analysis method.

Table 1. Convergent Validity Test

Construct	Item	Mean	Std. deviasi
Information Quality	Ease of accessing service information	3,97	0,73
	Accuracy of information from service providers	3,54	0,721
	freight forwarding (logistics)		
	Clarity of information from service providers	3,7	0,715
	freight forwarding (logistics)		
Order Procedure	Provided a website from a service provider	3,77	0,864
	delivery of goods (delivery of goods)		
	The delivery service provider does not	3,44	1,025
	limit volume		
	Procedure clarity	3,77	0,920
Time	Arrived fast	4,00	0,753
	The promised time is perfect	3,54	0,867
	Packing setup speed	3,56	0,786
Order Condition	Items arrived in good condition	4,13	0,806
	Item is not damaged	3,57	0,753
	Items are not lost	3,62	0,730
Order Discrepancies	Responsive in responding to problems	3,51	0,977

Handling	Quick in dealing with problems that appear	3,43	0,939
	Provide proper compensation	3,61	0,954

From the results of the convergent validity test, there is an average value of each criterion, the highest mean value is taken based on the results of them, order condition with a mean value of 4.13, then time with a mean value of 4.00, and information quality with a mean value of 3.78. Where the three levels of the mean value are used as the main criteria for calculating the weighting of the decision support method.

Next, a correlation test is conducted to determine the strength and direction of the linear relationship of the correlation between variables by comparing the calculated R values and R table. The results are said to be valid if the Rcount> Rtable, and the significant value <0.05.

Table 2. Variable Correlations Test

Item	Pearson Correlation	Sig.	N
IQ1	1	0,00	61
IQ2	0,587	0,00	61
IQ3	0,482	0,00	61
OP1	0,469	0,00	61
OP2	0,407	0,01	61
OP3	0,599	0,00	61
T1	0,472	0,00	61
T2	0,460	0,00	61
T3	0,519	0,00	61
OC1	0,474	0,00	61
OC2	0,516	0,00	61
OC3	0,512	0,00	61
ODH1	0,539	0,00	61
ODH2	0,482	0,00	61
ODH3	0,671	0,00	61

From the reliability test, the results of the Cronbach's Alpha value for each criterion are greater than 0.6, so we can draw the conclusion that the level of stability of the measured data is high and reliable.

Table 3. Reliability Test

Item	Cronbach's Alpha	Description
IQ1	0,915	Reliabel
IQ2	0,915	Reliabel
IQ3	0,919	Reliabel
OP1	0,921	Reliabel
OP2	0,920	Reliabel
OP3	0,915	Reliabel

T1	0,917	Reliabel
T2	0,918	Reliabel
T3	0,917	Reliabel
OC1	0,917	Reliabel
OC2	0,918	Reliabel
OC3	0,917	Reliabel
ODH1	0,912	Reliabel
ODH2	0,912	Reliabel

From the results of the reliability test, getting Cronbach's Alpha value greater than 0.6, it can be concluded that the level of stability of the measured data is high and reliable. The next step is data processing to determine the priority weight of each attribute using the AHP (Analytical Hierarchy Process) method main. Consistency of assessment in the AHP method using Consistency Ratio (CR), which is formulated:

$$CR=\frac{CI}{RI} \quad (1)$$

$$\text{Where: } CI=\frac{(\lambda maks - n)}{n-1} \quad (2)$$

The following are the results of the calculation of the Consistency Ratio (CR) of each alternative,

Table 4. Eigenvector Normalization Of Order Condition Criteria

Criteria	C1	C2	C3	TOTAL	EVN
C1	2.99	7.65	19	29.64	0.6403262985
C2	1.26	2.98	7.65	11.89	0.2568650368
C3	0.5089	1.26	2.99	4.7589	0.1028086647
TOTAL				46.2889	

Table 5. Order Condition Criteria Consistency Ratio

E-maks	CI	CR
3.017202828	0.008601414162	0.01483002442

From the consistency ratio table for order conditions, the CR value <0.1. So it can be concluded that the comparison matrix is consistent.

Table 6. Eigenvector Normalization Of Delivery Speed Criteria

Criteria	C1	C2	C3	TOTAL	EVN
C1	2.99	0.5089	1.26	4.7589	0.1028086647
C2	19	2.99	7.65	29.64	0.6403262985
C3	7.65	1.26	2.98	11.89	0.2568650368
TOTAL				46.2889	

Table 7. Eigenvector

E-maks	CI	CR

3.017202828	0.008601414162	0.01483002442

From the table of consistency ratio criteria for the speed of delivery that the value of CR<0.1. So it can be concluded that the comparison matrix is consistent.

Table 8. Eigen Vector Normalization Of Information Quality

Criteria	C1	C2	C3	TOTAL	EVN
C1	3	11.4	1.1	15.5	0.2115174672
C2	1.1	2.98	0.32	4.4	0.06004366812
C3	11.4	39	2.98	53.38	0.7284388646
TOTAL				73.28	

Table 9. Information Quality Criteria Consistency Ratio

E-maks	CI	CR
3.068084061	0.03404203057	0.05869315615

From the consistency ratio table for the information quality criteria, the CR value <0.1. So it can be concluded that the comparison matrix is consistent.

Next, for the final results of the ranking of criteria by multiplying the results of the normalization eigenvectors from each of the tested criteria.

Table10. Main Criteria Ranking

C1	0.5008846749
C2	0.3261559147
C3	0.1729594104

In criterion 1, alternative 1 rank first, which means it is superior in maintaining the condition of supply orders. Then on criterion 2, alternative 2 is superior to other alternatives in terms of delivery time/speed. And alternative 3 becomes the first order in criterion 3 which is superior in responding to consumers from the company through good quality information.

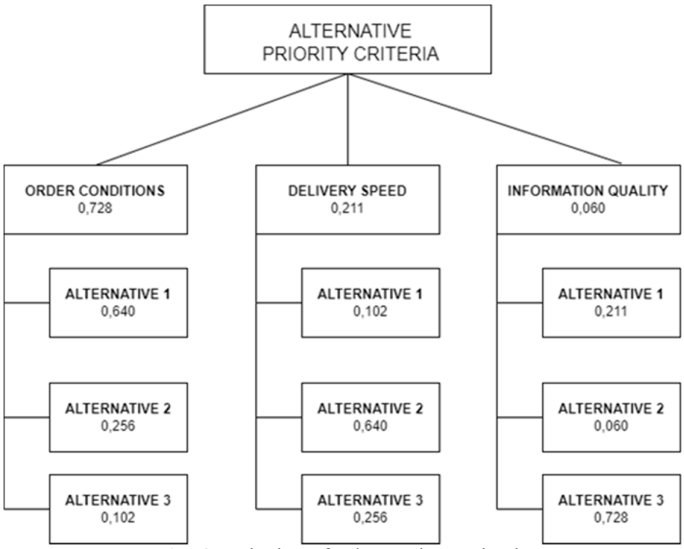

Fig. 2. Priority of Alternative Criteria

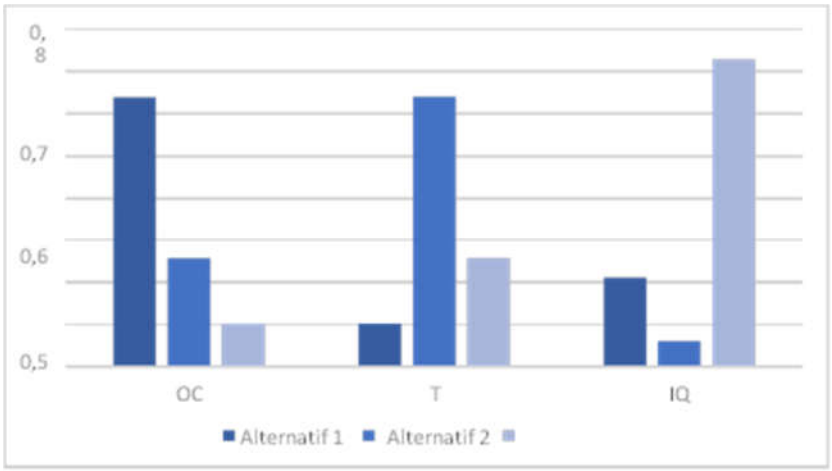

Fig. 3. Graph of Alternative Priority Criteria

In the alternative criteria priority chart, each dimension of the main criteria can be used as a construction decision support in choosing an alternative freight forwarder, where the construction decisions are weighted according to the needs of the consumer company.

4. CONCLUSION

Provide a statement that what is expected as stated in the "Introduction" chapter can ultimately result in the "Results and Discussion" chapter, so there is compatibility. Moreover, the authors can elaborate on the prospect of the development of research results and inspire further studies (based on results and discussion).

DECLARATION

Author Contribution

The quantitative approach used in this study, the quantitative method is the approach used to research a particular population or sample and is based on the philosophy of positivism.

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Conflict of Interest

Declare conflicts of interest or state “The authors declare no conflict of interest.”

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