ANALYSIS OF PREFERRED FREIGHT FORWARDING SERVICE USING ANALYTICAL HIERARCHY PROCESS METHOD

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Abstrak

Pembeli dan penjual yang menggunakan transaksi online untuk pengiriman dapat menggunakan dua metode pengiriman tatap muka atau menggunakan layanan pengiriman. Setiap orang membutuhkan pengiriman yang cepat dan aman untuk memastikan barang diangkut pada waktu yang tepat dan ke tempat yang tepat. Permintaan akan jasa kurir semakin dibutuhkan. Keterbatasan mobilitas saat ini memaksa sebagian besar orang untuk membeli secara online daripada di pusat perbelanjaan. Metode Analytical Hierarchy Process dikembangkan awal tahun 1970-an oleh Dr. Thomas L. Saaty, seorang ahli matematika dari Universitas Pittsburg. Analytical Hierarchy Process pada dasarnya didesain untuk menangkap secara rasional persepsi orang yang berhubungan sangat erat dengan permasalahan tertentu melalui prosedur yang didesain untuk sampai pada suatu skala preferensi di antara berbagai set alternatif. Model keputusan ini menguraikan masalah multi kriteria yang kompleks menjadi satu struktur hirarki. Dari hasil penelitian dapat disimpulkan bahwa J&T mempunyai skor paling tinggi yaitu 0.345 atau 34,5%, kemudian JNE dengan skor 0.339 atau 33,9%, lalu SICEPAT dengan skor 0.316 atau 31,6% . Sehingga Jasa Ekspedisi yang paling diminati berdasarkan data yang diolah dari 103 responden adalah J&T.

Kata kunci: Jasa ekspedisi, transaksi online, analytical hierarchy process

Abstract

Buyers and sellers who use online transactions for shipping can use two face-to-face shipping methods or delivery services. Everyone needs fast and safe shipping to ensure goods are transported at the right time and place. The interest in dispatch administrations is progressively required. The ongoing portability constraints are compelling many people to purchase online instead of shopping centers. The Analytical Hierarchy Process technique was created in the mid-1970s by Dr. Thomas L. Saaty, a mathematician from the University of Pittsburgh. The Analytical Hierarchy Process is designed to rationally capture people's perceptions closely related to specific problems through procedures designed to arrive at a preference scale among various sets of alternatives. This choice model decays a complex multi-rules issue into a solitary various, leveled structure. From the study results, it can be concluded that J&T has the highest score of 0.345 (34.5%), then JNE with a score of 0.339 (33.9%), SICEPAT with a score of 0.316 (31.6%), so that the most desirable Expedition Service based on data processed from 103 respondents is J&T.

Keywords: expedition services, online transactions, analytical hierarchy process

INTRODUCTION

Delivery is the activity of delivering goods or services from producers to consumers. Every company certainly wants delivery activities that are on time, right in quantity, and on content. If this is fulfilled, then the quality of the company may increase (Kuning & Ananda, 2020). Therefore, the company consistently maintains its quality so that consumers always feel satisfied.

Several factors are involved in fulfilling consumer demand for quality products: suppliers of raw materials/materials, parties distributors, adequate resources, and a system that can control everything (Wulan & Hendrawan, 2018). If the

scattered factors run well, the company's quality will remain.

The company strives to deliver its products to consumers at the right time, in quality, and at the minimum possible price. One of the efforts is to choose the best expedition services from outside the company. The selection of expedition services is essential for companies to improve their logistics performance (Wulandari & Arvianto, 2016). Good cooperation between the company and the expedition must also be maintained to deliver to consumers as expected. Therefore, in choosing the trip, the right way is needed.

Decisions taken by someone in determining something in everyday life are sometimes based on experience or even on abilities that are not learned first. Decisions are made based on the choice of available information and priorities and using a preference process, which finally got the best decision (Rosiska & Harman, 2019). The dynamic business development aligns with the increasing public demand for products and services to meet all their needs. To maintain business continuity, a company must satisfy its customers (Aulawi et al., 2020).

This study aims to produce criteria for expedition services and order the best expedition services in product delivery. There are often problems with product delays sent via courier services or complaints from product consumers regarding defects (Aulawi et al., 2020). It is hoped that the results of this study can minimize the problems that often occur. In this digital era, online commerce is proliferating. Especially in big cities, some people prefer to shop online because the lifestyle of people who work requires a lot of time and effort. The main advantage of online shopping is that products tend to be cheaper, as merchants can lower operating costs and shoppers can quickly compare prices. In addition, distance is no longer an obstacle for shopping. Online business people enter the market soon, cheaply, and without geographical restrictions. Buyers can easily choose to do business with sellers in various locations worldwide. In addition, goods that have been processed will be sent via an expedition service (Olanta et al., 2019).

As the number of internet users increases, so make purchases of products online. In a procurement process, the main thing to consider is the distribution of the goods. Issuance will involve third parties as a bridge to fulfill a good supply chain process. Distributing goods is determined by the performance of each logistics vendor (Yonathan, 2020).

Buyers and sellers who use online transactions for shipping can use two delivery methods: face-to-face or delivery. Everyone needs fast and safe shipping to ensure goods are transported at the right time and place (Oktaviani et al., 2018). It is done to facilitate control or supervision of expedition services, facilitate the administrative process, and reduce the number of delays and claims for goods.

The interest in messenger administrations is progressively required. The ongoing portability constraints drive the vast majority to purchase online instead of in shopping centers (Kustian, 2016).

Due to many expedition services, this study took three samples of expedition services: JNE, J&T, and SICEPAT. Therefore, a test examined consumers' most in-demand shipping services.

One method that is often used in decision support is the AHP method. The AHP method breaks down a situation into its parts and organizes these parts or variables into a hierarchical arrangement. After the problem is defined, the next step is to compile a hierarchical model consisting of several levels of detail, namely the focus of the problem, criteria, and alternatives (Ramanda & Vikaliana, 2019). By using the AHP method, the issue of selecting spare parts suppliers will be constructive for companies in terms of choosing the best suppliers based on specific criteria (Pebakirang et al., 2017). The following is one of the uses of the AHP method in supporting decisions.

This method can provide results in the form of numbers resulting from the process selection. The results given later will also provide the results of the calculation of the criteria (Yanto, 2021). This figure will obtain the best results from several existing standards. The AHP method's stages begin with defining the problem, creating a hierarchical structure, starting with the general objectives, followed by bars and alternative options. Create a pairwise comparison matrix, Normalize data, Calculate the eigenvalues of a vector and test their consistency, Calculate the vector Eigen of each paired comparison matrix, and Test the surface of the hierarchy (Oktapiani et al., 2020).

Here is one of the definitions of AHP. AHP is a process of identifying, understanding, and providing an estimate of the system's interaction as a whole (Mutholib & Febrina, 2017). This method is suitable for assisting in the analysis and decision-making process by using defined criteria that are

easy to understand and use (Sitanggang et al., 2018). This research used the Analytical Hierarchy Process method, better known as AHP, to determine the best shipping service.

RESEARCH METHODS

In this study, three stages of research were carried out, namely:

1. Observation

Observation is one of the most effective data collection techniques for studying a system. When making observations, the authors carried out research methods and data collection by distributing questionnaires to the public using expedition services.

2. Interview

The author obtains data and examines the truth of the information and data by conducting direct questions and answers with expedition service users from the community with different professions and different age levels.

3. Literature review

We are conducting library research to collect data and information obtained from libraries, journals, articles, and the internet related to this research.

Types of research

The decision support system process can include quantitative and qualitative factors to find the best service provider. Many methods can be used to choose a courier service (Aulawi et al., 2020). The Analytical Hierarchy Process is a comprehensive decision-making model considering qualitative and quantitative matters.

Time and Place of Research

The data used in this study are data obtained from expedition service users through filling out questionnaires. The data collection technique in this study was carried out using the sampling method, where each population element had the same probability of being selected.

Research Target / Subject

This study aims to research which expedition services are most in-demand by consumers and make it easier for consumers to determine expedition services using the analytical hierarchy process method.

Procedure

This research consists of several stages: identifying existing problems, conducting a literature study related to these problems, collecting data in the form of the results of questionnaires that have been distributed, collecting data and processing and analyzing data, and finally drawing conclusions.

Research methodology

The stages in the preparation of this research began with identifying existing problems, analyzing data, and research results from this study which were the results of questionnaires from parties who were used as research samples (respondents), namely 103 people who used to use expedition services.

Then for data processing using the AHP method, the stages are as follows:

1. Arranging a Hierarchy of the Problems Faced
2. Creating Pairwise Comparison Matrices
3. Calculating Eigen Value and also Eigen Vector
4. Calculating the consistency index
5. Calculating consistency ratio

RESULTS AND DISCUSSION

1. Research Instrument Test
a. Validity Test For Instrument

It uses the product-moment correlation formula to test the instrument's validity. If the correlation coefficient has a significance of less than 0.05, it can be said that the item is valid. The calculation of the validity of the measuring instrument in this study was carried out using the SPSS 25.0 for Windows devices, which can be seen in Figure 2 below:

Figure 2. Validity Test Results

From Figure 2 above, it can be interpreted that the correlation of all questions gives significant results with a coefficient of less than 0.05, so it can be stated that all question items in the questionnaire are valid.

b. Reliability Test

This study uses the Alpha Cronbach formula. Cronbach's Alpha formula can be used for questionnaire instruments or question instruments in the form of descriptions.

The calculation of the reliability test of the questionnaire in this study used the help of the SPSS 25.0 for Windows program described in Figure 3.

Reliability Statistics

Figure 3. Reliable Test Results

In Figure 3, it is explained that from the reliable test results, the test results that are said to be trustworthy are if the Cronbach alpha value is 0.6 (critical importance).

2. Data analysis

In this study, the author uses the basic principles of the Analytical Hierarchy Process (AHP) method to determine the results of research and discussion. The criteria and alternatives used in this study are as follows:

a. Criteria:
1) Shipping Price

Price is an exchange rate equated with money or other goods for the benefits obtained from an item or service for a person or group at a particular time and place. The term price assigns a financial value to a product or service.

2) Service quality

Service quality is defined as the quality of the expedition, which includes many aspects such as the low frequency and cost of losses due to defective, late, exchanged, or lost goods.

3) Delivery Speed

Speed of delivery is distributing producer goods and services to consumers.

b. Alternative:

JNE, J&T, dan SICEPAT

The criteria and alternatives for job evaluation are described in Figure 4 in the following hierarchical structure:
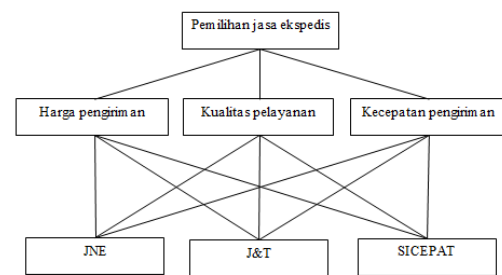

Figure 4. Hierarchical Structure of Expedition Service Selection

Figure 4 describes the hierarchical structure of this study. Then for the next stage, namely making a pairwise comparison matrix which will be shown in table 1 below:

Table 1. Average Comparison of Main Criteria

Main Criteria	Shipping Price	Service quality	Delivery Speed
Shipping Price	1,00	0,80	1,44
Service quality	1,25	1,00	0,91
Delivery Speed	0,69	1,09	1,00

The value in Table 1 is obtained from the results of filling out the respondent's questionnaire with a description of the paired comparison value scale as shown in the following table:

Table 2. Definition of comparison Scale

Intensity of Importance	Definition
1	Both elements are equally important
3	One element is slightly more important than the other
5	One element is more important than the other elements
7	One element is more important than the other elements
9	One element more essential than the other elements
2,4,6,8	The mean value between two adjacent criteria comparisons

In table 2, the description of the scale that the respondent has filled in is explained. Then normalize the pairwise comparison matrix by dividing the values of each cell by the total value in the column in question, described in table 3 below.:

Table 3. Normalization of Shipping Price Criteria

Criteria	JNE	J&T	SICEPAT
JNE	0,33	0,27	0,41
J&T	0,43	0,35	0,28
SICEPAT	0,24	0,38	0,30

Then add up the value of each row and divide by the number of elements to get the average value or eigenvector, which can be seen in Table 4 below:

Table 4. Eigenvector Main Criteria

Main criteria	Shipping price	Service quality	Delivery speed	AVG
Shipping price	0,34	0,28	0,43	0,349
Service quality	0,42	0,35	0,27	0,348
Delivery speed	0,24	0,38	0,30	0,304

The results of calculations in table 4 show that the shipping price criteria are very considered in the selection of shipping services with a weight of 0.349 or 34.9%, the next is the service quality criteria with a weight value of 0.348 or 34.8%, then the delivery speed criteria with a weight value of 0.304 or 30.41%.

The next step is consistency. At this stage, it will determine whether the eigenvectors obtained from the synthesis of the priority process are valid or not based on the main criteria. Here are the steps to calculate the maximum principal eigenvalue (λmax).

a. I was multiplying unnormalized pairwise comparison matrices by eigenvectors.

$$\begin{pmatrix} 1,00 & 0,80 & 1,44 \\ 1,25 & 1,00 & 0,91 \\ 0,69 & 1,09 & 1,00 \end{pmatrix} x \begin{pmatrix} 0,349 \\ 0,348 \\ 0,304 \end{pmatrix} = \begin{pmatrix} 1,065 \\ 1,061 \\ 0,925 \end{pmatrix}$$

b. The result is divided by the eigenvector

$$\begin{pmatrix} 1,065 \\ 1,061 \\ 0,925 \end{pmatrix} : \begin{pmatrix} 0,349 \\ 0,348 \\ 0,304 \end{pmatrix} = \begin{pmatrix} 3,05 \\ 3,05 \\ 3,05 \end{pmatrix}$$

c. Divide the result of the addition operation by the number of rows or columns. The final result is used as the maximum.

$(3,05+3,05+3,05)/3=3,05$

The next step of consistency is to test the consistency of the hierarchy in the following way:

1. Calculating the consistency index (Consistency Index = CI)

Formula : CI = (λ maks – n)/ (n-1)

n is the number of rows or columns of a pairwise comparison matrix

$(3,05-3)/ (3-1) = 0,03$

2. Calculating consistency ratio (Consistency Ratio = CR)

Formula : CR = CI / RI

RI is a random value obtained from the Random Consistency Index table at a particular n.

For n = 3, RI = 0.58 Then CR = 0.03/0.58 = 0.04

Because the CR value <0.1 (10%), it is acceptable, meaning that the pairwise comparison matrix based on the main criteria has been filled with consistent considerations, and the resulting eigenvectors are reliable.

3. Research result

Multiplying the combined eigenvectors at the alternative level with the eigenvectors at the criterion level, which can be seen in Table 5 below:

Table 5. Decision results

	DELIVERY PRICE	SERVICE QUALITY	DELIVERY SPEED		EIGEN VECTOR CRITERIA		HASIL
JNE	0,336	0,349	0,331		0,349		0,339
J&T	0,357	0,342	0,334	x	0,348	=	0,345
SICEPAT	0,307	0,309	0,335		0,303		0,316

The result of the multiplication operation is from now on referred to as the decision eigenvector. From table 4 above, it can be concluded that J&T has the highest score of 0.345 or 34.5%, then JNE with a score of 0.339 or 33.9%, then SICEPAT with a score of 0.316 or 31.6% so that the most desirable EXPEDITION SERVICE based on data processed from 103 respondents is J&T.

CONCLUSIONS AND SUGGESTIONS

Conclusion

The process of making a selection analysis in determining expedition services can be done using the analytical hierarchy process method by determining criteria and determining weights to be calculated systematically. The analytical hierarchy process method, a decision support system method that usually solves various multi-criteria decision-making problems can also solve problems in determining expedition services. In selecting this expedition service, it can be concluded that the most desirable expedition service is J&T, with a value that has been obtained through calculations, namely 0.345 or 34.5%. The highest score of 0.345 or 34.5%, then JNE with a score of 0.339 or 33.9%, then SICEPAT with a score of 0.316 or 31.6%

Suggestion

In solving multi-criteria problems, the Analytical Hierarchy Process method is not the only decision-making method that can be used, and it would be better if you try it compared to other approaches to support more effective decision-making. If decision-makers want to make accurate decisions, they can use the Analytical Hierarchy Process method. This research can be used as a capital for similar research activities or other research as long as it is still implementing a decision support system using the Analytical Hierarchy Process method.

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