



## Logistics Selection Using AHP and Super Decisions Software

Akhmad Yasir Mubarak<sup>1</sup>, Ristiyaningsih Ristiyaningsih<sup>2</sup>, Pupung Purnamasari<sup>3</sup>

<sup>1,2,3</sup>Universitas Pelita Bangsa

Email: yasirmubarak42@gmail.com

### Abstract

The current trend of companies is to hand over their Logistics activities to third parties, so that they can focus more on their fields. The choice of Logistics services is also very crucial for the company, because it determines the reputation of a company in the eyes of customers. This study aims to evaluate the decision to choose the best logistics service that is used to meet customer needs, especially in terms of shipping goods. To do this, the AHP (Analytical Hierarchy Process) method is used to make decisions on the use of Logistics based on predetermined criteria, namely Cost, Services, and Reliability. There are five alternatives that are taken, namely using their own fleet, using instant delivery services such as Grab Express and GoBox or using third party Logistics services such as Trimulya Logistics and Herona Express. In this study, the calculation process uses the tools of the Super Decisions Software. The results of this study indicate that the criteria that have the highest weight are Services with a value of 0.50536 and the alternative that has the highest weight is Trimulya Logistics with a value of 0.363531.

**Keywords** Analytical Hierarchy Process, business decisions analysis, decisions support system, Super Decisions, third-party logistics.

### Introduction

Currently, the global economy triggers increasingly fierce business competition between industries, customers demand the best quality of service provided by the company. Competition in the business environment has finally triggered every company to rethink efforts that are felt to increase productivity, efficiency, quality, timeliness, and provide the best service that can increase the company's competitive advantage so that it can compete in the global market. Many companies now realize the need to focus and be consistent in their main field in order to compete and dominate the market, therefore some companies hand over activities that are not part of their field to third parties in order to focus more. Functions in logistics activities are often one of the processes whose implementation is often transferred to third parties.

**Figure 1. Chart of Logistics Sector Development**



Source: Badan Pusat Statistik (2021)



Based on the graph above, the growth of the third-party logistics business, especially in Indonesia, continues to grow from year to year. Based on data from the Supply Chain Indonesia page (2020), Indonesia's logistics sector in 2017 was valued at IDR 735.22 trillion, which means it experienced a growth of 13.99% from the previous year. In 2018, the growth of the logistics sector experienced a growth of 8.52%, which amounted to IDR 797.86 trillion. The following year, 2019, the growth of the logistics sector increased by 11.56% from the previous year, amounting to IDR 890.09 trillion and at the end of 2020, the logistics sector was recorded at IDR 971.80 trillion or a growth of 9.18% from the previous year. Third-party logistics providers usually specialize in warehousing activities and transport services that can be tailored to customer needs, to meet demand and delivery services for their products. (Villela, 2013)

PT JAM is a company engaged in packaging equipment that provides all types of duct tape, plastic, bubble wrap, foam sheet, stretch film, and various other products. In carrying out its operational activities, especially in the delivery of goods, the company often finds obstacles such as an inadequate fleet to transport goods in large capacities, or other obstacles, namely the distance to customers that are not possible to be reached using a private fleet. To overcome these problems, PT JAM made the decision to use third party logistics in order to help the company in terms of providing the best service to customers.

AHP has a wide application area in decision-making problems, which involve multiple criteria in systems of various levels or hierarchies. The strength of AHP lies in its ability to structure complex, multi-person and multi-attribute problems hierarchically and investigate each level of the hierarchy separately and then combine the results. The concept of the Analytical Hierarchy Process (AHP) method is actually to convert qualitative values into quantitative values. So that the decisions taken can be more objective. Analytical Hierarchy Process (AHP) is an analysis used in decision making with a systems approach, where decision makers try to understand a system condition and help make predictions in making decisions in solving problems with the Analytical Hierarchy Process (AHP). (Julius Olanta, 2019)

In this study, an evaluation will be carried out regarding the decision to select the best logistics service provider based on the AHP method. The criteria used are not much different from some previous studies, namely Reliability, Services and Cost. As for the alternatives chosen include 3PL companies that have collaborated with PT JAM, namely Trimulya Logistics and Herona Express, online freight transport service providers, namely Grab Express and GoBox, as well as alternatives using their own fleet. There are differences between this research and previous research, namely no longer using manual calculations with Microsoft Excel, but the calculation process will use tools from Super Decisions software.

## **Method**

The type of research used in this study is quantitative. Quantitative research is a type of research that produces findings that can be achieved (obtained) using statistical procedures or other means of quantification (measurement). Quantitative data can be defined as data in the form of numbers or quantified qualitative data (Sugiyono, 2015). This quantitative method is used when conducting research related to numerical data. This type of method requires a large amount of numerical data and can be calculated using statistical formulas. Researchers use quantitative methods because the data processed is numerical data, and is processed



mathematically with a software. Data is collected using instruments or measuring instruments, then analyzed with statistics or quantitatively.

The population used in this study are several stakeholders who are competent in their fields, especially in the fields of logistics and delivery. The sample used in this study is decision makers in several sections totaling 5 people including: Logistics section leader, Head of Warehouse, Driver Coordinator, Finance Manager, and Procurement Section.

In this study, researchers used Nonprobability Sampling techniques with the type of sampling, namely Judgement Sampling (on the basis of consideration), where the sample was taken based on certain objectives and understood well the problems to be revealed in the research. This is because the AHP method requires reliance on a group of experts according to the type of specification related to decision making. In addition, the respondents involved must have sufficient knowledge and experience about the problem.

In this study, decision making is carried out based on predetermined criteria and then the level of importance will be compared which is compiled in a questionnaire form and given a choice of weight importance values between these criteria and also compared to the selection of existing alternatives. Furthermore, the completed questionnaire is immediately distributed to decision makers, then the results of the questionnaire will be processed and calculated.

In order to achieve the desired objectives in this study, a data analysis method is used, namely the AHP method and the calculation uses tools from Super Decisions Software. This software can complete the AHP matrix computation process. The advantage of this software is its high level of accuracy compared to conventional programs such as Microsoft Excel.

## Results and Discussion

### Hierarchical Structure

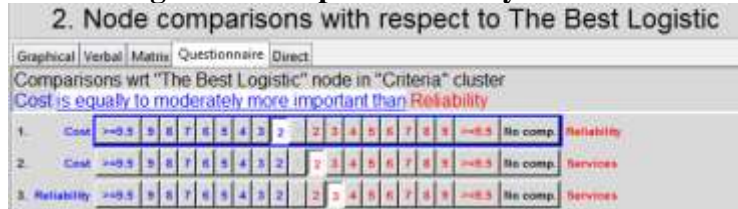
**Figure 2. Hierarchical structure of Super Decisions**



Source: Super Decisions Processing Version 2.0

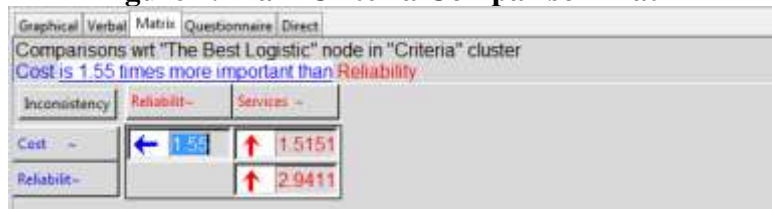
The function of the hierarchical structure is to divide the whole problem into several elements, where each element or element is interconnected so that it makes it easier for decision makers to make judgments by describing existing problems into a hierarchical structure, starting with goals, then criteria, sub-criteria and alternatives.

**Figure 3. Comparison of Key Criteria**



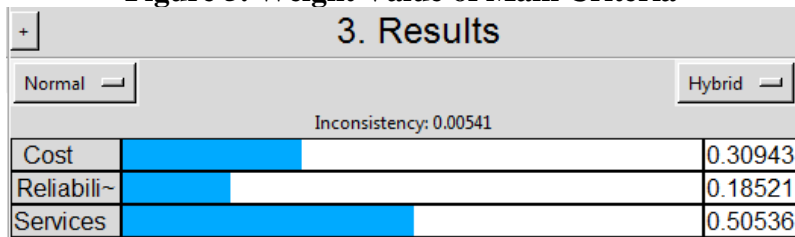
Source: Super Decisions Version 2.0 Processing

**Figure 4. Main Criteria Comparison Matrix**



Source: Super Decisions Version 2.0 Processing

**Figure 5. Weight Value of Main Criteria**

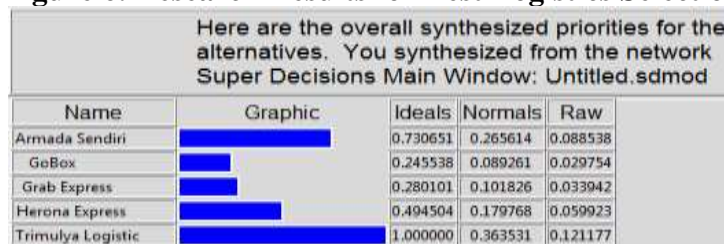


Source: Super Decisions Version 2.0 Processing

From the calculation results in the figure above, it is obtained that the priority order is Services Criteria to be the highest priority with a weight value of 0.50536. Cost criteria are the 2nd priority with a weight value of 0.30943. Reliability criteria are the 3rd priority with a weight value of 0.18521.

**Determination of the Best Alternative**





**Figure 6. Research Results for Best Logistics Selection**



Source: Super Decisions Version 2.0 Processing



**Figure 7. Ranking of Best Logistics Selection**

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	Armada Sendiri	0.0885	0.2656	0.7307	2
	GoBox	0.0298	0.0893	0.2455	5
	Grab Express	0.0339	0.1018	0.2801	4
	Herona Express	0.0599	0.1798	0.4945	3
	Trimulya Logistic	0.1212	0.3635	1.0000	1

Source: Super Decisions Version 2.0 Processing

Based on the picture above, showing the results of research with the AHP (Analytical Hierarchy Process) method using Super Decisions software, so it can be concluded, the best 3PL order is Trimulya Logistics has the highest weight with a value of 0.363531. Armada Sendiri has the second highest weight with a value of 0.265614. Herona Express has the third highest weight with a value of 0.179768. Grab Express has the fourth highest weight with a value of 0.101826. GoBox has the fifth highest weight with a value of 0.089261.

### **Results and Discussion**

The results of this study indicate that the criteria that are the top priority in determining the best logistics for shipping goods at PT JAM are the Services criteria with a weight value of 0.50536, then the Cost criteria are the 2nd priority with a weight value of 0.30943 and the Reliability criteria are the 3rd priority with a weight value of 0.18521. The results of this study differ from research conducted by Astuti and Fatma (2017), which evaluated the selection of courier service providers based on the AHP method with the highest criterion being Reliability with a weight of 0.4018, followed by Cost, Convenience, and Services criteria. The results of this study are also different from research conducted by Julius Olanta and Edy Sianto (2019), in the results of their research it can be seen that the best courier service for sending gadgets in the city of Surabaya is the JNE expedition with the most influential factors sorted from the most important is Reliability with a weight of 0.4178 followed by Service Features, and Company Image. This difference is caused by the subjectivity of the research object on the criteria and sub-criteria set based on actual conditions in the field.

Based on the results obtained from the calculation with Super Decisions, it shows that the logistics fleet which is the main choice of PT JAM based on the decision making method using AHP is Trimulya Logistics with a weight value of 0.363531. Trimulya Logistics excels in the assessment based on all sub-criteria of the Reliability criteria, namely On-time, Accuracy and Integrity. As well as superior to the Services Criteria with the Mileage and Load Capacity sub-criteria, but weak in the Communication sub-criteria. In addition, Trimulya is also weak on the sub-criteria of the Cost Criteria, namely Affordable Prices and Cost Details.



## Conclusion

Based on the research objectives, data processing and discussion in this study, it can be concluded that the order of priority of the criteria obtained from the calculation of the AHP method is Services Criteria being the highest priority with details of the order of sub-criteria as follows: Mileage, Capacity, Communication. Cost criteria are the second priority with details of the order of the sub-criteria as follows: Affordable Price, Cost Breakdown. Reliability criteria are the third priority with details of the order of the sub-criteria as follows: Integrity, Accuracy, On-time. The order of alternatives or logistics fleets obtained from the calculation of the AHP method is: Trimulya Logistics, Armada Sendiri, Herona Express, Grab Express, GoBox.

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