

## TRANSPORTATION METHODS TO OPTIMIZE SHIPPING COSTS FOR RESEARCH SOIL SAMPLES FOR STUDENTS OF THE FACULTY OF AGRICULTURE, INDONESIAN METHODIST UNIVERSITY

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### Abstract

Garuda express delivery is a services delivery air service done door to door collection service. Since the beginning of the establishment GED have has a great commitment to give the real who in accordance with international standards for a company courier and cargo. But, cost of unstable led defeat in compete. Besides the accuracy of delivery goods to the customer also very influenced the quality of service. For that required modeling right to issue delivery of goods on GED namely by transportation model and techniques transportation resolution, so that the cost of the deliver transportation merchandise can be optimal. A method of problem solving that used is the northwest corner-method, least cost-method and vogel aproximal-method, applied to in application pom-qm for windows 5. So the results that is the total cost of goods to some city destination optimal of Rp. 1.525.000, -

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### Keywords

Delivery Of Goods; Pom-QM for Windows 5; Transportation Mode

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### Introduction

The problem of distributing goods or transportation problems is a problem that arises when there is one commodity that is produced by several sources (origin) and must be distributed to several destinations (destination). To resolve or solve the problem of distributing goods, this can be done using a transportation model. Transportation can be a process of channeling or distributing goods to several or various regions. The high level of transportation

demand results in a lack of performance efficiency in serving the community or customers. So we need a transportation method that can complete and optimize transportation performance with the aim of saving costs and distance.

Management of scientific journals, which is often called journal management, has ten (10) roles/tasks that need to be provided. In this research, only seven (7) important roles will be discussed, including: researcher, layout editor, proofreader, journal manager, reviewer, editor and copyeditor. The research method used is the assignment method with the Hungarian algorithm. This research uses Excel QM V5.2 and QM for Windows V5 software and the results are two optimal solutions in the form of assignment formation with the same total processing time (24 hours). Even though the assignment formations obtained are different, there are several employees who have the same role in the two assignment formations produced [Herlawati, 2017].

A company wants minimum transportation costs when distributing goods from a source to a destination. This must also consider the capacity of goods from a company (source) and the demand for goods from the marketing location (destination). In this research, the initial solution method is used, namely the northwest corner method and the lowest cost method for calculations, while for the optimal solution the stepping stone method and modified distribution (MODI) method are used [Herlawati, 2016].

Delivery of goods at Garuda Express Delivery still often encounters problems, namely frequent delays in delivery to customers which can result in reduced service quality and other problems, namely unstable delivery costs resulting in losing in competition because they cannot offer the cheapest prices to customers and also have an impact on company income.

Therefore, researchers want to apply a transportation model to shipping goods with the solution methods used are the northwest method, the lowest cost method, and the Vogel method which aims to optimize the cost of shipping goods. The problem is What the transportation model wants to solve is determining the distribution of goods that will minimize total distribution costs.

## Methods

This research uses a quantitative approach, which involves collecting data through observation, interviews and literature study. Researchers describe relevant variables, such as means of transportation, destination route, and shipping weight. The collected data is then analyzed to determine the distribution of goods that minimizes total distribution costs.

Logical (real), data and systematic scientific methodology is commonly used by scientific actors in the field of research [Sujarweni, 2014]. Quantitative research is research that uses parameters with numbers that are added up so that the data and amounts will be analyzed [Suharsaputra, 2014]. Quantitative research methods are research methods that are intended to explain phenomena using numerical data, then analyzed, generally using statistics

Transportation is an activity for moving goods and people to a predetermined destination [Siregar, 2012]. Transportation produces products called transportation services. The need for transportation services follows the development of various activities that occur in all sectors of the economy and community life. This transportation model is able to solve various problems of distributing goods from source to destination with minimum total distribution costs [Siswanto, 2007].

## Discussion

In this research, analysis of freight transportation models was carried out using three main methods: the North West method, the Lowest Cost method, and the Vogel method. Each method is used to find solutions for shipping goods at optimal costs, taking into account shipping capacity and demand from several destination cities, namely Medan, Siantar, Kisaran and Tebing Tinggi. The delivery fee applied by the Garuda Express Delivery company is IDR 10,000 per kilogram of goods.

In the Northwest method, replenishment starts from the northwest corner of the table by allocating the quantity of goods gradually until the resources at each point are exhausted. In the example case, the total amount of goods supplied is 145 kilograms, which is distributed in stages to each destination city. This process produces a basic feasible solution with a total shipping cost of IDR 1,655,000. This method emphasizes a systematic approach without considering minimum costs at the initial stage, so it does not always provide an optimal solution directly.

In contrast to the Northwest method, the Lowest Cost method starts by selecting the smallest cost in the transportation table. Distribution of goods is carried out as much as possible at the point with the lowest shipping costs until needs or capacity are met. In this case, shipping using the Lowest Cost method results in a lower total shipping cost, namely IDR 1,525,000. This method is effective in reducing costs, but requires more careful calculations to ensure each step remains within supply and demand limits.

Vogel's method offers another approach by considering the difference between the two smallest costs in each row and column of the transportation table. This approach gives priority to the row or column with the largest cost difference, so that distribution can be directed to a more efficient point in the long term. The results of the analysis using the Vogel method in this research also show a total shipping cost of IDR 1,525,000, equivalent to the results of the Lowest Cost method, but with a more systematic approach in choosing allocation priorities.

Overall, the results of this study show that choosing the right transportation method can significantly influence the cost efficiency of shipping goods. The Lowest Cost and Vogel methods provide more optimal solutions than the Northwestern method, especially in the context of cost minimization. However, each method has advantages and disadvantages that need to be considered based on the characteristics of the goods delivery and the company's logistics needs. This research provides important insights for logistics management to optimize

the goods distribution process by considering various variables that influence transportation costs.

This analysis also shows that although the Lowest Cost and Vogel methods provide more efficient solutions in terms of costs, both methods still require a deep understanding of resource allocation and capacity of each delivery point. In this case, it is important for companies to continue to monitor and evaluate delivery results periodically to ensure that the distribution of goods continues to run effectively, without any waste or mismatch in demand and supply of goods.

In addition, the results of this research show that although all three methods can provide feasible solutions in terms of shipping costs, each method has a different approach in dealing with the dynamics between supply and demand. The North West method, for example, is more procedural and is suitable when the need to make deliveries quickly and systematically takes precedence. On the other hand, the Lowest Cost and Vogel methods pay more attention to costs as the main factor in decision making, which can be more profitable for the company in the long run if the main focus is cost savings.

However, one of the challenges faced by companies is dependence on accurate and up-to-date data regarding shipping costs and capacity. Inaccuracies in data or sudden changes in demand can affect the calculation results and the effectiveness of the methods used. Therefore, companies need to ensure that the logistics information system used can update information in real-time and allows flexibility in planning the distribution of goods.

In this context, the use of sophisticated transportation management software (TMS) can be very helpful in optimizing shipping routes and costs automatically, according to dynamic market conditions. This technology can also support further analysis by integrating various external factors, such as weather, fuel rates, or vehicle availability, to produce more informed decisions.

This research also opens up opportunities for the development of new methods or adaptation of existing methods, especially in the context of low-cost inter-city goods delivery. This is very relevant for companies operating in the logistics and distribution sector, considering the intense competition in this industry, where efficient cost management is one of the main keys to maintaining competitiveness. Therefore, the use of more innovative and technology-integrated transportation methods can provide significant competitive advantages.

Overall, the results of these three methods provide a clear picture of how companies can select the most appropriate method based on their shipping needs and cost savings goals. By implementing the right methods, Garuda Express Delivery can optimize the delivery of goods to various destination cities, not only to reduce costs but also to increase efficiency and customer satisfaction.



## Conclusion

Based on research conducted by researchers by observing and analyzing transportation problems and applying transportation models and solution techniques related to the research, it can be concluded that: Garuda Express Delivery has its own method for the process of sending goods to several big cities in Indonesia. With this method, students incur transportation costs of IDR 1,655,000 per soil sample with a total of 140 kg of samples sent. After implementing the transportation model using the northwest method, lowest cost method, and the Vogel method, it is concluded that this method can save shipping transportation costs of IDR. 130,000,- per week or 8%. The POM-QM For Windows 5 application is a tool that can be used to find solutions to transportation problems. It is proven in this research that the results of the manual calculation technique using the northwest method, the lowest cost method, and the Vogel method produce the same optimal total transportation costs. Apart from that, this application is also very helpful in getting fast, precise and accurate information.

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