

Transportation Cost Analysis for Carton Box Shipments via On-Call Car Rental

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Abstract

Transportation costs present a significant challenge in managing company operations, particularly within the goods distribution sector. This study aims to analyze the efficiency of carton box shipping transportation costs during the period 2022 to 2024 by using on-call car rental services. The research method used is descriptive quantitative with the application of mathematical models to calculate the average monthly transportation costs. The data analyzed is secondary data from the company's financial statements that have been systematically processed. The results showed that there were significant fluctuations in transportation costs each year. The year 2023 was recorded as the most efficient period with an average cost of IDR 166,486,233 per month, compared to IDR 177,965,600 in 2022 and IDR 213,813,716 in 2024. The efficiency in 2023 shows the success of the transportation management strategy, while the increase in costs in 2024 is due to a surge in shipment volumes and rising fuel prices. This study concludes that the utilisation of on-call car rental services can serve as an efficient solution, provided it is backed by optimal logistics planning. The implications of these findings highlight the necessity for periodic evaluation of the transportation methods employed to sustain operational cost efficiency amidst fluctuating demand and pricing dynamics.

Keywords: Carton Box Shipping, Cost Efficiency, Logistics Management, On-Call Vehicle Rental, Transportation Cost Analysis.

1. Introduction

In the business world, the development of a service company depends on the profit the company achieves from its operational processes (Kans & Ingwald, 2016). In order for operations to run optimally, companies need cost planning and control (Putri & Surya, 2020). Transportation cost efficiency is an important aspect of company operations, especially in the logistics sector (Hasim & Holiawati, 2022). PT Pindo Deli Pulp and Paper Mills faces challenges in managing Carton Box delivery transportation, especially using on-call car rental services. Therefore, companies need to plan and control transportation costs effectively so that transportation expenses can be minimized without reducing the quality of delivery services (Gusty et al., 2023).



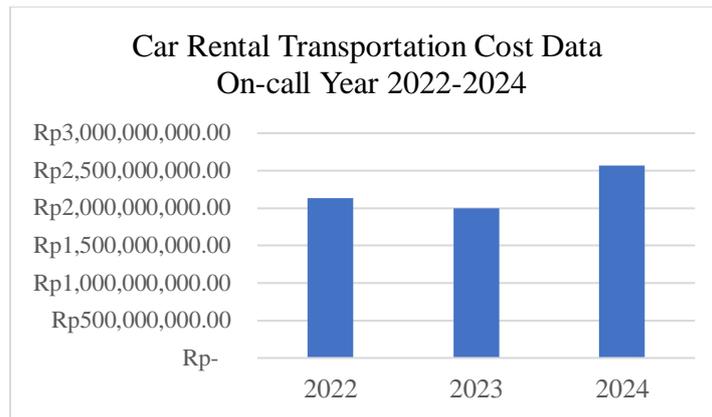


Figure 1. On-call car rental cost data for 2022-2024
 Source: PT Pindo Deli, Processed by the Author 2024

Figure 1 above shows data on On-call car rental costs from 2022 to 2024. It can be seen in the figure that in 2024, the rental cost reached the highest figure of almost IDR 2.5 billion, indicating a significant increase in demand for transportation services. In contrast, in 2023, the rental fee recorded the lowest figure of around IDR 2 billion, which could indicate a decrease in demand for transportation rental. The decrease in rental costs from 2022 to 2024 could be due to various factors, such as changes in operational needs, transportation usage optimization strategies, or fluctuations in the level of demand for rental services in each company.



Figure 2. Consumer Price Index for Freight Forwarding (Sep 2021 - Sep 2022)
 Source: Databoks, 2022

In Figure 2, the Badan Pusat Statistik (BPS) reported that the consumer price index (CPI) for goods delivery services reached 116.46 in September 2022, up 0.34% compared to the previous month. When compared to December 2021, the freight forwarding rate increased by 1.89%. Inflation in the transportation expenditure group was recorded at 8.8% in September 2022, with the increase in fuel prices as the main trigger. However, the impact of inflation on freight forwarding services is relatively small. Transportation cost efficiency is crucial in the current business environment, especially with rising fuel prices and inflation affecting logistics costs.

PT Pindo Deli Pulp and Paper Mills 2, located in Karawang, Indonesia, is one such company that faces ongoing challenges in balancing cost and efficiency in its shipping operations. The company utilizes two primary delivery methods—contract-based transportation and on-call vehicle rental. Unlike fixed contracts, on-call rental services charge

based on delivery distance and frequency, making cost efficiency more volatile and highly dependent on shipment volume and planning accuracy.

Several previous studies have highlighted the importance of optimizing distribution routes and vehicle allocation in reducing transportation costs (Fadlisyah et al., 2020; Santoso et al., 2022). However, there are still limited studies that specifically examine the efficiency of using on-call vehicle rental in the context of manufacturing industry distribution. Therefore, this study focuses on analyzing the efficiency of transportation costs using the on-call car rental method in shipping carton boxes at PT Pindo Deli, and analyzing transportation costs for the period 2022 - 2024. The results of this study are expected to provide a basis for managerial considerations in managing effective and efficient shipping methods.

2. Literature Review

2.1. Financial Management

According to Handini (2020) financial management is an activity within the Company related to collecting funds, managing the use of funds, and managing assets in accordance with the company's general objectives. Meanwhile, Robert et al. (2023) mention that financial management is all activities related to managing the financial aspects of a business. The goal is to optimize expenditure by making effective use of available resources. Financial management focuses on the use and understanding of various analytical techniques as a basis for effective decision-making (Robert et al., 2023).

2.2. Cost Management

According to Hurriyaturrohman et al. (2022), cost management is a process that involves planning and implementing projects or work effectively and efficiently. This process includes various stages including planning, estimating, budget preparation, financing, funding, management, control, and evaluation of costs incurred compared to the designed budget. As noted by Ordynskaya et al. (2021) cost management is a process that aims to manage costs effectively. This process serves as a tool for planning, making decisions, and controlling expenditures, with the primary goal of ensuring organizational success (Septiawan & Panggiarti, 2022).

From the definition above, it can be concluded that cost management is a process that aims to manage expenses effectively and efficiently. This process not only includes technical aspects such as planning, estimating, budget preparation, financing, and evaluating costs against the budget, but also functions as a strategic tool in decision-making and controlling funds.

2.3. Transportation Cost

According to Ross and Ross (2015) transportation costs are costs incurred by companies to distribute goods. Transportation costs can be divided into two categories: fixed costs and variable costs. The ability to deliver goods to customers at the right time, in the right quantity, and in good condition greatly determines the product's competitiveness in the market.

Flexible logistics models such as on-demand vehicle rental have been shown to reduce idle capacity and improve delivery responsiveness (Lozzi et al., 2022). These costs usually depend on the conditions of the transportation network, such as location, distance, and number of transportation demand points. In addition, there are also variable operating costs. Variable costs are, in a sense, costs incurred over time due to changes in time and distance, for example, during the road transportation process, infrastructure or vehicles will undergo a

certain amount of wear and tear, and this part of the depreciation, repair, and maintenance costs can also be considered variable costs (Zhu & Li, 2024).

3. Methods

This research uses a quantitative descriptive method that aims to calculate and compare the average transportation costs for three years. Secondary data was obtained from PT Pindo Deli 2's transportation cost report for 2022-2024, which was accessed directly through the company's logistics department. To complement the data, semi-structured interviews were conducted with two logistics staff and one Carton Box section supervisor, to understand the cost fluctuations. The interviews were conducted directly at PT Pindo deli 2 Karawang carton box section in December 2024. Data validity was strengthened by comparing internal records with the company's monthly transportation costs. The analysis technique was carried out by calculating the total cost per year, then divided by the number of months (12 months) to obtain the average. Furthermore, the causes of cost changes were interpreted based on internal and external factors, such as shipment volume and fuel prices. According to Chakrabarty (2018), the formula for calculating the average is as follows:

$$\bar{x} = \frac{\sum X}{N}$$

Information:

$\sum X$: Total Transportation Cost

N : Number of Periods (Month)

4. Results and Discussion

Based on secondary data obtained from the PT Pindo Deli 2 transportation expenditure report, the following is a breakdown of on-call car rental transportation costs for the last three years, namely the period 2022 to 2024. This data is the basis for conducting analysis and efficiency of transportation costs in the company's goods delivery activities.

4.1. Research Results

Table 1 below shows data on on-call car rental costs per month for three consecutive years. The table shows significant fluctuations between months and years. The highest cost was recorded in 2024 in May and August, amounting to IDR 285,645,000 each, while the lowest cost was recorded in September 2022 at IDR 95,985,800. This fluctuation shows the dynamics of operational needs and the influence of macroeconomic conditions on the company's logistics costs.

Table 1. Data on On-Call Rental Transportation Cost For 2022 - 2024

Number	Month	Transportation Cost		
		2022	2023	2024
1	January	196.992.900,00	164.790.200,00	235.645.000,00
2	February	193.804.300,00	102.127.000,00	193.995.000,00
3	March	230.622.200,00	184.675.400,00	221.685.000,00
4	April	227.850.800,00	133.473.200,00	151.365.000,00
5	May	172.467.500,00	166.367.000,00	285.645.000,00
6	June	228.178.600,00	105.835.400,00	221.685.000,00
7	July	171.588.400,00	184.325.000,00	230.730.000,00
8	August	172.810.200,00	215.291.600,00	285.645.000,00
9	September	95.985.800,00	196.078.000,00	193.995.000,00
10	October	157.254.600,00	205.670.200,00	209.550.000,00
11	November	145.647.500,00	169.097.200,00	180.720.000,00
12	December	142.384.400,00	170.104.600,00	155.104.600,00

Source: PT. Pindo Deli processed, 2024

Table 1 presents data on on-call car rental transportation costs for carton box shipments at PT Pindo Deli for the period 2022 to 2024. The data shows that there are fluctuations in costs each month, reflecting the dynamics of operational needs as well as other external factors such as shipment volume and transportation availability. The year 2024 shows a significant increase in some months compared to previous years, which may indicate an increase in distribution activity or an adjustment in vehicle rental rates.

Table 2. Data on On-Call Rental Transportation Cost For 2022 - 2024

Year	Total Transportation Cost	Monthly Average
2022	2.135.587.200	177.965.600
2023	1.997.834.800	166.486.233
2024	2.565.764.600	213.813.716

Source: PT. Pindo Deli processed, 2024

Based on the analysis of transportation cost data of PT Pindo Deli Pulp and Paper Mills 2 during the period 2022 to 2024, it is known that the use of on-call car rental on Carton Box shipments has a total cost for three years of IDR 6,699,186,600.

With details, in 2022 the transportation cost of on-call car rental was recorded at IDR 2,135,587,200.00 with a monthly average of IDR 177,965,600. In 2023, there was a decrease in costs to IDR 1,997,834,800. with a monthly average of IDR 166,486,233. However, in 2024, shipping costs increased significantly to IDR 2,565,764,600. with a monthly average of IDR 213,813,716.

Based on the results of the study, the average transportation costs during the period 2022 to 2024 are lower, namely in 2023. It can be interpreted that per year the more effective costs incurred.

4.2. Discussion

Based on the analysis of transportation data of PT Pindo Deli 2 Karawang during the period 2022-2024, significant fluctuations were found that reflect the effectiveness of the company's operational strategy. The decrease in costs in 2023, which is the most efficient year, is strongly suspected to be due to the implementation of efficiency strategies such as rearranging delivery routes and optimizing the use of transportation, as explained by Fadlisyah et al. (2020) that distribution efficiency is strongly influenced by the right delivery routes and schedules. In contrast, the increase in costs in 2024 can be attributed to the surge in shipping volumes as well as the increase in fuel prices that prompted the adjustment of rental rates. This suggests that transportation cost efficiency is not only determined by internal factors, but also influenced by external conditions that cannot always be controlled. This finding is reinforced by Santoso et al. (2022) who stated that the success of transportation efficiency depends on the integration of logistics planning and cost control in a sustainable manner. Therefore, the results of this study make a theoretical contribution to the study of cost management and logistics, and provide practical input for companies to conduct periodic evaluations and implement data-based cost monitoring systems in strategic decision making.

5. Conclusion

Based on the results of the analysis of transportation costs at PT Pindo Deli 2 during the period 2022 to 2024, there are significant fluctuations that reflect the dynamics in the company's operational strategy. Transportation costs in 2022 were recorded at IDR177,965,600, which reflects a stable condition. In 2023, transportation costs decreased to IDR166,486,233.33 which was the lowest value during the study period, indicating the company's success in implementing a more efficient operational strategy. However, in 2024, there was a significant increase in the average transportation cost to IDR 213,813,716.67, which was influenced by an increase in shipping volume and tariff adjustments due to a spike in fuel prices.

Future research should focus on comparing various transportation methods to identify the most cost-effective options across different operational settings. Involving multiple companies within the industry will facilitate benchmarking and the identification of best practices. Longer-term studies are necessary to capture cyclical trends in transportation costs, which are essential for sustainable management. The use of predictive analytics and cost-benefit evaluations of logistics technologies could assist companies in anticipating fluctuations and optimising their investments. Furthermore, investigating the relationship between transportation efficiency and overall profitability will clarify its financial implications. Incorporating environmental and resilience considerations will ensure that cost strategies align with sustainability and the robustness of the supply chain. Finally, the development of decision support systems that integrate real-time data will enable logistics managers to make more informed and dynamic decisions across various contexts.

This research contributes to the development of cost management and logistics literature, particularly regarding the application of flexible vehicle leasing methods in the context of manufacturing industry distribution. Practically, this research is an important reference for managerial decision-making based on historical transportation cost data. It is recommended that company management periodically evaluate the transportation methods used and integrate technology-based cost tracking and analysis systems. This research is limited to one company and one type of transportation method, and only covers a three-year period, so for future research it is recommended to compare various shipping methods,

involve more companies, and analyze the relationship between cost efficiency and profitability in more depth.

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