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Selection of Primary Land Transportation Fleet Using Vehicle Operational Cost (VOC) Method in Logistics Companies

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Abstract

The selection of transportation fleets plays a crucial role in determining the cost efficiency of logistics operations. This study aims to evaluate the feasibility of investing in company-owned vehicles compared to using third-party rental services on the Bandung–KTSH route operated by PT X. Using a quantitative approach with a causal associative design, this research applies the Vehicle Operating Cost (VOC) method supported by investment feasibility analysis tools including Cash Flow, Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Period (PBP). The analysis shows that the average daily operational cost of company-owned vehicles reaches IDR 1.904.479, which is higher than the rental cost of IDR 1.865.385 per day. Additionally, the results show a negative NPV (-IDR 344.739.419), negative IRR (–11%), and an unattainable payback period within the 5-year investment horizon. Therefore, it is concluded that using leased vehicles is more cost-efficient than investing in company-owned trucks for this specific route.

1. INTRODUCTION

Transportation is an integral part of logistics, where transportation plays a role in transporting goods from one place to another (Qureshi & Abudllah, 2013). Logistics also plays an important role in the supply chain, especially in the distribution process of goods (Tare et al., 2024). In recent years, consumption patterns and logistics have changed along with economic development and a gradual increase in national income (Chen et al., 2016). This needs to be supported by the fleet used by the company to carry out these distribution activities. In using a delivery fleet, the company has two considerations, namely providing its own fleet or through a third party, in this case a truck vendor company (Kastella et al., 2024).

PT X is a subsidiary of PT Pos Indonesia, the business process of PT X, especially the Bandung Branch Office, is the delivery of primary goods (Bandung-KTSH) and secondary (Bandung-All PT X Hubs in Java) from PT Pos or postal goods. All postal goods deliveries are centered at the MPC (mail processing center) owned by PT Pos Indonesia in Bandung. Due to the routine delivery schedule every day, PT X uses several fleets available at the company. The fleet consists of 5 private fleets and 8 rental fleets. The goods delivery activity or shipments on the Bandung-KTSH route are transported using private fleets with an average tonnage or weight of of 4.2 to 6.7 tons per day with a FUSO fleet capacity of 8 to 12 tons. The data shows that the fleet's loading capacity is still not fully utilized.

When viewed from the cost and utility side of the vehicle, it is very ineffective. So, another alternative is to rent a CDD vehicle for the KTSH-Bandung route, and allocate Fuso on this route to be used for other operations. In line with this, research by Lindsey & Mahmassani (2017) considers the use of third party logistics (3PL) services in providing a delivery fleet, to increase vehicle utility at a more economical cost.

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From this background, this study aims to compare company-owned vehicles with rental vehicles, through the calculation of Vehicle Operating Costs (VOC) on company vehicles and the calculation of rental costs.

2. LITERATURE REVIEW

2.1 Transportation and Logistics

In the 1960s to 1970s, science related to transportation began to develop, transportation refers to public transportation and traffic, while logistics is considered a new field related to the physical delivery of goods and inventory management. In the 1980s there was the first research related to trucking, namely on the use of trains and ships for shipping goods. In the 1990s, transportation began to develop to include users (people) and goods, and in the 2000s, it began to develop along with the use of technology (Speranza, 2018). According to Jacobs (2018) transportation is the movement of people or goods from one place to another within a certain period of time using a tool driven by humans, animals, or machines. Broadly speaking, transportation is divided into three, namely land, water, and air transportation (Jacobs, 2018). Meanwhile, according to The Council of Logistics Management (CLM), Logistics is an element in supply chain management that focuses on planning, implementing, and controlling the flow and storage of goods, services, and related information efficiently and effectively, both in forward and reverse distribution flows, from the point of origin to the point of consumption, to ensure that customer needs are met (Neeraja et al., 2014).

2.2 Type of Transportation

Jacobs (2018) explains that there are six modes of transportation that are widely known by the public, namely: highway (truck), water (ship), air (plane), train (train), pipeline, and hand delivery. These types of transportation modes are suitable for handling certain types of commodities. The types of transportation modes according to Jacobs (2018) are as follows:

1. Road transport mode, some products move without some road transport. This type of mode offers great flexibility to move goods, almost any location that is not separated by water. Product size, maximum weight, and liquid or bulk can all be accommodated by this mode.
2. Water transport (ship) has a very high capacity and very low cost, but the transit time is slow, and because of the large area of shipping is not directly accessible for shipping using ship transport. This mode is very useful for most commodities such as oil, coal, and chemical products.
3. Air transport is fast but expensive. Small, light, expensive commodities are best suited for this mode of transport.
4. This mode of rail transport is a relatively cheap alternative, but each transit can take a long time. The suitability of the tracks can vary depending on the rail infrastructure.
5. Pipeline transportation, highly specialized and limited such as liquids, gases, and solids in slurry form. No packaging required and low cost per mile. Initial cost to build a pipeline is very high.

2.3 Vendor

According to Agriyantari (2014), vendors or suppliers are companies that provide services to companies, suppliers can function as distributors of goods. Choosing the wrong vendor can worsen the position of the entire supply chain process, finance and operations of the company. Customer complaints will increase and in some types of businesses, customers will give financial penalties. Vendor selection needs to be managed properly because it will determine competent vendors (Gaubert et al., 2024).

2.4 Vehicle Operating Costs (VOC)

Vehicle operating costs are important costs. Improvements or enhancements to the quality of transportation infrastructure and facilities are mostly aimed at reducing these costs. Vehicle operating costs include the use of fuel, lubricants, replacement costs (tires), vehicle maintenance costs, and driver wages or salaries (Ofyar in Yusi, 2014). Vehicle operating costs according to Lee et al. (2023) are all vehicle costs borne by the vehicle owner.

Insurance costs do not include vehicle operating costs because they are calculated as accident costs. The first four cost factors mentioned above are usually a function of speed. At low speeds, if the speed is increased, this cost will decrease until it reaches a minimum (at a relatively low speed) and then increase continuously after passing the relatively low speed limit. So, improving the transportation system by increasing the average speed can increase operating costs. The case of speed reduction caused by traffic congestion is an exception. The study of VOC calculation consists of the sum of fixed vehicle costs, variable costs and overhead costs. The equation is as follows

VOC = Fixed Cost + Variable Cost + Overhead Cost .....(1)

(1.) Fixed Costs

According to Rudianto (in Yusi, 2014) Fixed costs are costs that will relatively not change even if there is a change in the level of activity within certain limits. Fixed costs consist of vehicle depreciation costs, vehicle tax costs and vehicle crew salary costs.

(2.) Variable Costs

Variable costs are costs incurred when the vehicle is operating. Variable costs are often also referred to as variable costs, because these costs vary greatly depending on the results produced. Variable costs include fuel costs, service costs, spare part costs, other usage costs, etc.

(3.) Overhead Costs

According to Rudianto (2013) overhead costs are the costs of direct raw materials and direct labor but are still needed in the production process. Overhead costs are partly variable costs and partly fixed costs. Vehicle overhead costs are defined as indirect materials, Loading and Unloading Labor, and other costs that are not easily defined or charged directly to a job, production results, or the final destination of certain costs such as government contracts. Some researchers do it in 2 ways, namely:

a. Calculate 20-25% of the total fixed costs and variable costs
b. Calculating overhead costs in detail, namely calculating overhead costs that need to be monitored periodically by vehicle owners.

2.5 Cash Flow Projection

According to Miro (2008) Cash Flow provides an assessment of investment programs for the next few years. In this case, when compared to saving money in a bank, the value of investment money poured into a project in the next nth year, its value will be greater but in year 0, it is only a cost with a profit level of 0 (zero).

2.6 Net Present Value (NPV)

According to Bubeck et al. (2016), the Net Present Value (NPV) is calculated using the following formula:

$$NPV = \sum_{t=0}^{n} \frac{C_t}{(1+i)^t} - \sum_{t=0}^{n} \frac{Co_t}{(1+i)^t}$$

Keterangan:

(C)t	: Cash inflow in year t
(Co)t	: Cash outflow or payment in year t
n	: Lifespan of the unit/business
i	: Discount rate
t	: Year

2.7 Internal Rate of Return (IRR)

According to Baldric Siregar (2013), IRR is defined as the interest rate that determines the present value of the project's cash inflows equal to the present value of the project's costs. In other words, IRR is the interest rate that makes the project's NPV equal to zero. The formula used to calculate IRR is:

IRR = $i1$ – NPV1/(NPV1-NPV2) ($i2 - i1$) ..... (3)

Where :
$i1$ = most attractive interest rate
$i2$ = trial interest rate
NPV1 = initial NPV
NPV2 = NPV on $i2$

2.8 Pay Back Period (PBP)

According to Slamet (2009), PBP is the length of time used by a project to be able to recoup its initial investment. PBP can be said to be feasible by the company if the return period for the investment capital is returned quickly, while PBP can be said to be unfeasible by the company if the return period for the investment capital is not fast. PBP is used to find out how long the project can be formulated as follows

PBP = investment/(annual benefit) x time period .....(4)

Where :
• Faster payback period = worthy
• Longer payback period = not worthy

3. METHOD

This study uses a quantitative approach with a causal associative research type, which aims to analyze the cause-and-effect relationship between the variables studied. The data collection method is carried out through a survey, while the problem-solving approach used is the Vehicle Operational Cost (VOC) method, which is used to assess whether vehicle investment provides benefits or losses for the company. To support the analysis of investment feasibility, Cash Flow, Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Period (PBP) calculations are used to evaluate whether the company's vehicle fleet investment can be categorized as a financially feasible investment or not. All data used in this analysis were obtained through in-depth interviews with operational staff and drivers, as well as secondary data provided by PT X Branch Office Bandung. This combination of primary and internal company data ensures that the findings are grounded in actual field conditions and reflect the operational realities of the logistics process.

4. RESULT AND DISCUSSION

RESULT

4.1 Vehicle Operational Cost (VOC) Analysis

VOC calculations are divided into three parts, namely VOC based on fixed costs, non-fixed costs and others, in more detail as follows:

4.1.1 Fixed costs

- Vehicle Depreciation Costs
- New vehicle prices = IDR 621.000.000
- Residual value = 32,04 %
- Number of working days/year = 365 days
- Economic life of the vehicle (n) = 5 years

4.1.1.1 Vehicle depreciation cost/year

$$= \frac{Vehicle\ prices - (residual\ value\ x\ vehicle\ prices)}{Economic\ life\ of\ the\ vehicle}$$

$$= \frac{Rp\ 621.000.000 - (32{,}04\ x\ Rp\ 621.000.000)}{5}$$

= IDR 84.406.320 / year

4.1.1.2 Vehicle Installment Interest

- Loan (Vehicle price) = IDR 621.000.000
- Loan Term = 5 years
- Interest Rate = 31%

Capital Installment/year = Capital Interest + $\frac{principal\ debt}{loan\ term}$

- Principal debt

  = Vehicle price – Residual value

  = IDR 621.000.000 – IDR 84.406.320

  = IDR 536.593.680

- Capital installment/year

  = Capital interest + (principal debt)/(loan term)

  = 31% + (IDR 536,593,680)/5

  = IDR 33.268.808

4.1.1.3 Vehicle Crew Salaries

- Vehicle crew salary/month = IDR 3.339.580
- Number of vehicle crew = 2 drivers

Vehicle crew salary/year

= Salary/month x 13 (with THR)

= IDR 6.679.160 x 13

= IDR 86.829.080

4.1.1.4 Vehicle Crew Work Accident Insurance

Insurance Premium/Month : 1.27%

Insurance Fee/Month

= Vehicle crew salary (2 people) x 1.27%

= IDR 6,679,160 x 1.27%

= IDR 84.825

From the VOC calculations above, they are summarized in the following table 1:

Table 1. VOC Based on Fixed Costs

Type of Fee	Total Cost
Vehicle Depreciation Cost/Year	IDR 84.406.320
Capital Interest/Year	IDR 33.268.808
Vehicle Insurance	IDR 8.259.000
Vehicle Crew Salary (2 people)/Year	IDR 86.829.080
Work Accident Insurance/Year	IDR 1.017.900
Examination Test Fee/Year	IDR 910.000
Vehicle Tax Fee/Year	IDR 944.200
Total Fixed Costs/Year	**IDR 215.635.308**
Total Fixed Cost/Month	**IDR 17.969.609**
Fixed Cost Amount/Day	**IDR 691.138**

Source : Author Analysis, 2025.

From table 1 above, the VOC results based on fixed costs per year are IDR 215.635.308 while per month it is IDR 17.969.609 and IDR 691.138/day.

4.1.2 Variable Costs

4.1.2.1 Fuel usage costs

- Fuel price/liter (diesel) : IDR 5.150
- Km-mileage/day : 420 km
- Fuel usage : 6 km/liter

- **Average fuel used/day**
  = Distance traveled/day : distance traveled per liter of fuel
  = 420 km : 6 km/liter
  = 70 liters/day

- **Fuel cost/day**
  = Fuel usage/day x Fuel price
  = 70 x IDR 6.500 (diesel)
  = IDR 455.000

4.1.2.2 Tire purchase costs

- Tire usage amount : 6 Fruits
- Tire Durability : 50.000 km
- Tire Price/Piece : IDR 2.100.000

- **Tire cost/km**

$$= \frac{\text{Tire price x Tire usage amount}}{Tire\ durability}$$

$$= \frac{\text{IDR 2.100.000 x 6}}{50.000\ km}$$

= IDR 252

- **Tire cost/day**

= Tire cost/km x Distance traveled/Day
= IDR 252 x 420 km
= IDR 105.840

4.1.2.3 Minor Service Fee

Minor service is carried out every: 5000 km

Cost per small service:

• Engine Oil	: 10 ltr x IDR 32.500/ltr = IDR 325.000
• Fat 0.50kg	= IDR 35.000
• Brake Fluid 0.3 ltr	= IDR 18.000
• Service Fee	= IDR 25.000
Amount	**= IDR 403,000**

- **Small service cost/km**

$$= \frac{Total\ cost\ per\ small\ service}{Km\ everytime\ service}$$

$$= \frac{\text{IDR 403.000}}{5000\ km}$$

= IDR 81

- **Small service fee/day**

= Minor Service Cost/km x Mileage/Day
= IDR 81 x 420 km
= IDR 34.020

4.1.2.4 High service costs

Major service is carried out every 50.000 km, the cost per major service is:

• Engine oil	: 10 ltr x IDR 32.500/ltr	= IDR 325.000
• Gear Oil	: 5 ltr x IDR 30.000/liter	= IDR 150.000
• Transmission Oil	: 5 ltr x IDR 33.000/ltr	= IDR 165.000
• Fat 0.50 kg		= IDR 35.000
• Brake Fluid 0.25 ltr		= IDR 18.000
• Oil Filter 1 piece		= IDR 136.000
• Service Fee		= IDR 100.000
Amount		**= IDR 929.000**

- **Major service cost/km**
  $= \frac{Total\ cost\ per\ small\ service}{Km\ everytime\ service}$
  $= \frac{\text{IDR } 929.000}{50.000\ km}$
  = IDR 19

- **Major service fee/day**
  = Major Service Cost/km x Distance Traveled/day
  = IDR 19 x 420 km
  = IDR 7.980

From the results of the VOC calculation based on variable costs, it is summarized in the following table 2:

Table 2. VOC Accumulation based on Variable Costs

Type of Fee	Total Cost
Fuel Cost/Year	IDR 141.960.000
Tire Cost/Year	IDR 33.022.080
Small Service Fee/Year	IDR 10.614.240
Major Service Fee/Year	IDR 2.489.760
Total Variable Costs/Year	**IDR 188.086.080**
Total Variable Costs/Month	**IDR 15.673.840**
Total Variable Costs/Day	**IDR 602.840**

Source : Author Analysis, 2025.

From table 2 above, it can be seen that the VOC every year is IDR 188.086.080, every month is IDR 15.673.840 and per day is IDR 602.840.

4.1.3 Miscellaneous expense

- Meal/trip money = 2 (people) x IDR 45.000
- Parking/trip fee = IDR 30.000
- Toll/trip money = IDR 485.000
- Unforeseen expenses = IDR 100.000

Amount = IDR 705.000 (per day)

4.1.4 VOC/year

= Fixed costs + Variable costs + Other costs
= IDR 215.635.308 + IDR 188.086.080 + 219.960.000
= IDR 623.681.388

4.1.5 VOC/month

= IDR 623.681.388 : 12
= IDR 51.973.449

4.1.6 VOC/day

= IDR 51.973/449 : 26 working days
= IDR 1.998.978

4.1.7 VOC/km

= IDR 1.998.978 : 420 km (distance traveled per day)

From the calculation of all VOC above, it can be concluded in the following table 3:

Table 3. VOC accumulation

Total Fixed Cost/Year	IDR 215.635.308
Total Variable Cost/Year	IDR 188.086.080
Total Other Costs/Year	IDR 219.960.000
Vehicle Operating Cost/Year	IDR 623.681.388
Vehicle Operating Cost/Month	IDR 51.973.449
Vehicle Operating Cost/Day	IDR 1.998.978
Vehicle Operating Cost/Km	IDR 4.759

Source : Author Analysis, 2025.

4.2 Cash Flow Analysis

The cash flow analysis for fleet investment by the company is as follows:

Table 4. Cash Flow

Year	0	1	2	3	4	5
			a. Cash inflow			
Income	IDR 0	IDR 611.486.112	IDR 621.680.335	IDR 632.096.502	IDR 642.740.394	IDR 653.617.958
Sub-Total	IDR 0	IDR 611.486.112	IDR 621.680.335	IDR 632.096.502	IDR 642.740.394	IDR 653.617.958
			b. Cash out			
Initial investment	IDR 621.000.000					
Fixed costs		IDR 215.635.308	IDR 215.635.308	IDR 215.635.308	IDR 215.635.308	IDR 215.635.308
Variable costs		IDR 188.086.080	IDR 188.086.080	IDR 188.086.080	IDR 188.086.080	IDR 188.086.080
Miscellaneous expense		IDR 219.960.000	IDR 219.960.000	IDR 219.960.000	IDR 219.960.000	IDR 219.960.000
Sub-Total		IDR 623.681.388	IDR 623.681.388	IDR 623.681.388	IDR 623.681.388	IDR 623.681.388
Cash difference	IDR 621.000.000	-IDR 12.195.276	-IDR 2.001.053	IDR 8.415.114	IDR 19.059.006	IDR 29.936.570
Initial cash difference		-IDR 621.000.000	-IDR 633.195.276	-IDR 635.196.329	-IDR 626.781.215	-IDR 607.722.209
Balance	-IDR 621.000.000	-IDR 633.195.276	-IDR 635.196.329	-IDR 626.781.215	-IDR 607.722.209	-IDR 577.785.639

Source : Author Analysis, 2025.

Based on table 4 above. which is the result of cash flow analysis during the five-year period. it is obtained that the total income generated from operational activities has not been able to cover the initial investment costs and annual operational expenses. The annual cash difference shows a consistently negative value. indicating that the cash inflow is smaller than the cash outflow. This causes the cumulative cash balance to continue to decline. with the final balance in the fifth year recorded at -IDR 577.785.639. Thus. it can be concluded that the investment does not generate sufficient cash flow to return the initial capital within the planned period. and overall indicates an unhealthy cash flow condition from a financial feasibility perspective.

4.3 NPV Analysis

The following is a table of the processed NPV analysis:

Table 5. Net Present Value

Discount Rate = 5%	Year					
	0	1	2	3	4	5
Income						
Operational Income		IDR 611.486.112	IDR 621.680.335	IDR 632.096.502	IDR 642.740.394	IDR 653.617.958
Depreciation						IDR 310.500.000
Total Income		**IDR 611.486.112**	**IDR 621.680.335**	**IDR 632.096.502**	**IDR 642.740.394**	**IDR 964.117.958**
Outcome						
Investment cost	IDR 621.000.000					
Fixed cost		IDR 215.635.308	IDR 215.635.308	IDR 215.635.308	IDR 215.635.308	IDR 215.635.308
Variable cost		IDR 188.086.080	IDR 188.086.080	IDR 188.086.080	IDR 188.086.080	IDR 188.086.080
Other cost		IDR 219.960.000	IDR 219.960.000	IDR 219.960.000	IDR 219.960.000	IDR 219.960.000
Total Outcome		**IDR 623.681.388**	**IDR 623.681.388**	**IDR 623.681.388**	**IDR 623.681.388**	**IDR 623.681.388**
Profit/Loss	-IDR 621.000.000	-IDR 12.195.276	-IDR 2.001.053	IDR 8.415.114	IDR 19.059.006	IDR 340.436.570
NPV			**-IDR 344.739.419**			
IRR			**-11%**			
PBP			**276260581,3**			

Source : Author Analysis, 2025.

Based on the results of the net present value (NPV) calculation in table 6 above, the results obtained were negative, namely - IDR 344.739.419 so it can be said that the investment used for an investment period of 5 years is **not feasible** to do.

4.4 Internal Rate of Return (IRR) Analysis

Based on the IRR calculation results in table 5 above. The calculated IRR value is -11%. which is significantly lower than the interest rate used. This indicates that the rate of return on the investment is below the cost of capital that must be borne. Thus, it can be concluded that this investment is not financially feasible.

4.5 Payback Period (PBP) Analysis

Based on the results of the Payback Period (PBP) analysis and the calculation of Vehicle Operating Costs (VOC) per year, it is known that the company has not been able to reach the break-even point within a period of five years. This indicates that the cash flow generated during the period is not sufficient to cover the initial investment.

4.6 Vehicle Rental Analysis

The following is the price for renting a vehicle to PT Dapensi Dwi Karya (DDK)

Table. 6 Vehicle Rental Prices

No.	Vehicle type	Capacity	Rental price / month	Rental price / day
1	Colt Diesel Engkel (CDE)	4-5 tons	IDR 28.300.000	IDR 1.088.462
2	Colt Diesel Double (CDD)	8 tons	IDR 38.700.000	IDR 1.488.462
3	Fuso	10-12 tons	IDR 48.500.000	IDR 1.865.385

Source : PT Dapensi Dwi Karya, 2024.

4.7 Sensitivity Analysis

Sensitivity analysis is essential, as it provides deeper insight into how fluctuations in key cost components affect the overall financial outcome. It enables the authors to identify which variables have the most significant impact (Jasmine et al., 2025), especially on the Net Present Value (NPV), thereby highlighting the cost factors that are most critical to the investment's financial feasibility. Table 7 presents the results of the sensitivity analysis, showing how variations in several cost components affect the calculation of NPV.

Table. 7 Sensitivity Analysis

Factors	-20%	-10%	0	10%	20%
Fuel cost	-IDR 221.816.917	-IDR 283.278.168	-IDR 344.739.419	-IDR 406.200.670	-IDR 467.661.920
Salary	-IDR 269.554.524	-IDR 307.146.971	-IDR 344.739.419	-IDR 382.331.866	-IDR 419.924.314
Rent cost (FUSO)	IDR 717.384.972	IDR 465.409.378	IDR 213.433.784	-IDR 38.541.810	-IDR 290.517.404
Rent cost (CDD)	IDR 1.124.702.054	IDR 923.641.095	IDR 722.580.137	IDR 521.519.178	IDR 320.458.219

Source : Author Analysis, 2025.

Table 7 demonstrates that price fluctuations significantly affect NPV outcomes. An increase in fuel costs by 10% and 20% leads to a lower NPV of –IDR 406,200,670 and –IDR 467,661,920, respectively. Similarly, an increase in driver salaries also causes the NPV to decline. The sensitivity analysis of FUSO rental costs shows that a 10% or 20% increase also results in negative NPV values. However, due to the actual volume of goods being consistently below the maximum vehicle capacity, the use of FUSO trucks, whether owned or leased, is considered inefficient. In contrast, leasing a CDD-type truck appears to be a more efficient and financially viable option. Even even in scenarios where the rental cost increases or decreases, CDD rental produce a positive NPV.

DISCUSSION

As shown in section 4.1.5 and Table 3, the owned FUSO vehicle has a daily VOC of IDR 1.998.978, slightly higher than the rental cost of IDR 1,865,385. Although the difference appears minor, financial feasibility analysis reveals that vehicle ownership requires an initial investment of IDR 621.000.000, with projected annual revenues ranging from IDR 611.486.112 to IDR IDR 653.617.958 over five years. A residual value of IDR 310.500.000, equivalent to approximately 50% of the vehicle's purchase price (based on used vehicle market estimates), is included in the final year. However, due to consistently high annual operating costs (around IDR 622.884.960), the resulting cash flows are insufficient to recover the investment. The calculated NPV is –IDR 344.739.419, indicating financial infeasibility. This is further supported by a negative IRR and a Payback Period that exceeds five years, confirming that the investment fails to reach break-even within the project timeframe.

In addition to the financial analysis, field observations reveal that the current utilization of the FUSO truck is notably low, with a considerable portion of its cargo space left unused during daily operations. On average, the vehicle carries only around 4-6 tons of goods per day, despite having a capacity of 8 to 12 tons—resulting in a utilization rate of less than 50%. This inefficiency indicates a mismatch between vehicle capacity and actual distribution needs. In contrast, the CDD-type truck, with a maximum load capacity of 8 tons and a lower daily rental cost of IDR 1.488.462, offers a more practical and cost-efficient alternative. Its capacity is better aligned with the company’s typical shipment volume. Furthermore, sensitivity analysis confirms the robustness of this option. The CDD truck consistently produces positive NPV values, demonstrating strong financial feasibility across different cost conditions. Therefore, it is recommended that the company transition from FUSO trucks to leasing CDD units to enhance operational efficiency and optimize cost-effectiveness in fleet management.

The findings of this study indicate that vehicle leasing is a more feasible option compared to owning, particularly in distribution routes characterized by low cargo volume and suboptimal vehicle utilization. This contrasts with the study by Yanuar & Utama (2015), which concluded that for long-distance routes such as Bandung–Surabaya, investing in privately owned vehicles is more beneficial due to higher volume and usage intensity. On the other hand, the results of this research align with the study by de Sá (2022), which suggests that although vehicle ownership may offer lower operating costs, outsourcing or leasing provides advantages in service quality and operational flexibility—factors that are crucial for improving distribution efficiency. Furthermore, this study supports the findings of Dasgupta et al. (2007), who argue that leasing is more suitable in situations where vehicles incur high maintenance costs and have low utilization rates. In this study's context, this is evident in the underutilization of FUSO trucks. A more recent study by Tuomela (2024) also reinforces the argument that leasing enhances operational flexibility and is often considered strategically advantageous, particularly in dynamic market conditions. Therefore, the decision to lease or purchase logistics vehicles should not rely solely on financial aspects but must also consider strategic factors such as flexibility, fleet utilization efficiency, and operational resilience amid demand fluctuations.

The results of this study carry important practical and strategic implications for logistics companies in making fleet selection decisions. From a practical perspective, leasing vehicles offers better cost efficiency, especially in situations where cargo volumes do not fully utilize the capacity of owned vehicles—as observed in the use of FUSO trucks on the Bandung–KTSH route. Leasing also reduces the burden of upfront capital investment, maintenance costs, and the risk of asset depreciation. Strategically, outsourcing enhances operational flexibility, allowing companies to respond more quickly to demand fluctuations, route changes, or temporary service requirements.

Although this study includes sensitivity analysis of selected cost parameters, the analysis is limited to one variable from fixed costs (salaries) and one from variable costs (fuel). In addition, this study does not include an assessment of operational risk or other non-financial dimensions such as service quality and vendor reliability for vehicle rentals. These limitations suggest that future research should adopt a more holistic approach by incorporating multi-parameter sensitivity analysis, as well as risk evaluation, to provide a broader understanding of the financial and strategic implications of fleet selection and logistical decision-making.

5. CONCLUSION

Based on the financial analysis, field observations, and sensitivity testing, this study concludes that leasing CDD-type trucks is a more financially and operationally viable option compared to owning FUSO vehicles for the Bandung–KTSH distribution route. The consistently low utilization of FUSO trucks, combined with high operational costs and negative investment indicators such as NPV, IRR, and Payback Period, demonstrates that vehicle ownership is not feasible under current conditions. In contrast, CDD trucks offer better alignment with actual cargo volume, lower daily rental costs, and strong financial performance across various cost scenarios. These findings underscore the importance of matching vehicle capacity to operational needs and highlight the strategic advantages of outsourcing in enhancing flexibility and cost efficiency. Therefore, leasing appropriately sized vehicles, such as CDD units, is recommended as a more sustainable and adaptable solution for logistics operations with fluctuating or moderate demand.

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