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Impacts Zero Over Dimension Over Loading Regulatory Compliance, Transportation Renewal Strategy, and Route Optimization On Operational Cost Efficiency

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Abstract: The effect of Zero Over Dimension Over Loading Regulatory Compliance, Transportation Renewal Strategy, and Route Optimization on Operational Cost Efficiency is a scientific article in the literature study within the scope of the field of science. The purpose of this article is to build a hypothesis of the influence of variables that will be used in further research. Research objects in online libraries, Google Scholar, Mendeley, and other academic online media. The research method employed in the research library utilizes e-books and open-access e-journals. The results of this article: 1) Zero Over Dimension Over Loading Regulatory Compliance has an effect on Operational Cost Efficiency; 2) Transportation Renewal Strategy has an effect on Operational Cost Efficiency; and 3) Route Optimization has an effect on Operational Cost Efficiency.

Keyword: Operational Cost Efficiency, Zero Over Dimension Over Loading Regulatory Compliance, Transportation Renewal Strategy, Route Optimization

INTRODUCTION

Based on empirical experience, many students and authors find it challenging to locate supporting articles for their scientific work, particularly as previous research or relevant studies. Relevant articles are needed to strengthen the theory under study, examine relationships or influences among variables, and develop hypotheses. This article discusses the Impacts of zero overdimension overloading, regulatory compliance, transportation renewal strategy, and Route Optimization on Operational Cost Efficiency, based on a literature review in the field of Logistics.

Based on the background, the purpose of this article is to develop hypotheses for further research, namely to formulate: 1) The effect of Regulatory Compliance in Loading (Zero Over Dimension Over Loading) on Operational Cost Efficiency; 2) The effect of Transport Equipment Renewal Strategy on Operational Cost Efficiency; and 3) The effect of Route Optimization on Operational Cost Efficiency.

METHOD

The method for writing a Literature Review article is through Library Research and Systematic Literature Review (SLR), analyzed qualitatively, sourced from online platforms such as Google Scholar, Mendeley, and other academic applications.

A Systematic Literature Review (SLR) is defined as the process of identifying, assessing, and interpreting all available research evidence to provide answers to specific research questions (Kitchenham et al., 2009).

In qualitative analysis, the literature review must be used in line with the methodological assumptions. One reason for conducting a qualitative analysis is that the research is exploratory (Ali, H., & Limakrisna, 2013).

RESULT AND DISCUSSION

RESULTS

Based on the background, objectives, and methods, the results of this article are as follows:

Operational Cost Efficiency

Operational Cost Efficiency is a company's managerial ability to optimize the allocation of expenses to maintain profitability without degrading service standards for consumers. As an instrument to support daily business activities, this cost coverage covers the organization's marketing, distribution, and overall administration. Theoretically, effective management of operating costs is expected to be able to stimulate the company's profit growth in a sustainable manner, which will ultimately increase the tax contribution in line with the strengthening of the entity's economy. (Dinda Aulia & Suparyati, 2023).

Operational Cost Efficiency in the logistics industry is currently undergoing a paradigm shift due to the implementation of the Zero ODOL (Over Dimension Over Loading) policy, which prohibits overloading as a cost-saving measure. This regulation forces business actors to transition from a cargo quantity strategy to a focus on operational resilience, including preventive fleet maintenance and shipping safety guarantees. Thus, Zero ODOL is not just an administrative limitation, but a strategic effort to minimize damage to road infrastructure and improve transportation safety standards. However, its success depends heavily on the consistency of integrated surveillance systems in the field (R. Harryawan Latullah et al., 2025).

The primary dimension of Operational Cost Efficiency focuses on optimizing resource utilization, as measured by strategic indicators such as fuel consumption efficiency, labor allocation productivity, and fleet maintenance cost rationalization. The synthesis of these factors shows that a company's operational effectiveness is highly dependent on comprehensive quality control. Failure to mitigate operational risks, such as delivery delays and damage to goods, will trigger an escalation of waste, resulting in significant operational cost overruns. (Rustandar et al., 2025).

Operational Cost Efficiency has been proven in previous research by (Abdul Jabbar Burhan & Nur Amalia, 2025), which shows that the use of optimization methods in transportation fleets can significantly reduce the average frequency of raw material deliveries. By implementing dump truck technology, the company has reduced trip frequency, thereby lowering total logistics costs. These findings confirm that selecting the appropriate mode of transport and optimizing scheduling are decisive factors in reducing operational costs and increasing distribution productivity.

Zero Over Dimension Over Loading Regulatory Compliance

Zero Over Dimension Overloading Regulatory Compliance is a national strategic initiative that aims to eliminate heavy and oversized cargo violations in road transportation to maintain infrastructure integrity. The government's concrete steps toward realizing this target include the issuance of the Minister of Transportation's Circular Letter No. 21 of 2019, which serves as a monitoring instrument for freight car operations. Although these regulations reflect the government's strong commitment, the literature shows that their enforcement effectiveness remains a subject of academic debate that warrants further review (Rishela Lukeny Armajaya, 2022).

Zero Over Dimension Overloading Regulatory Compliance is driven by the interaction of three fundamental factors: human, technical, and environmental. First, internal factors such as fatigue, aggressive driving behavior, and lack of experience significantly increase the risk of accidents. Second, there are mechanical and technical factors, where excess load adversely affects the roadworthiness of vehicles, shortens the economic life of the fleet, and triggers a surge in operational costs. Finally, external factors, such as damage to road infrastructure, are compounded by vehicle loads exceeding capacity, creating dangerous road conditions that are further exacerbated by erratic weather. These three elements are of paramount importance to the government, and it must enforce dimension and loading regulations to ensure transportation safety and the sustainability of public infrastructure (Sintia Putri Febriani & Mintarsih, 2023).

The Zero Over Dimension Over Loading Regulatory Compliance indicator comprises three main aspects: vehicle dimension adjustment in accordance with technical standards, strict operational supervision at distribution and crossing lines, and compliance with periodic motor vehicle testing in accordance with the Regulation of the Minister of Transportation No. 133 of 2015. These three indicators help ensure shipment safety, prevent infrastructure damage, and minimize repair costs from fleet mechanical problems. By meeting these regulatory standards, logistics companies can shift their focus from cargo volume to safer, more sustainable operational efficiency (Rishela Lukeny Armajaya, 2022).

Zero Over Dimension Overloading Regulatory Compliance relies heavily on the balance between the firmness of government regulations and the flexibility of business strategies to maintain logistics efficiency without sacrificing the resilience of road infrastructure. This is in line with research conducted by (Permana & Sayekti, 2024) which states comprehensively that strengthening freight transportation governance through Zero Over Dimension Overloading Regulatory Compliance requires a holistic approach that integrates various strategic pillars. These efforts go beyond sanctions enforcement and focus on building a safe, efficient, and sustainable foundation for cargo transportation.

Transportation Renewal Strategy

The Transportation Renewal Strategy, which updates and adjusts transportation equipment specifications, is a crucial tool for optimizing the smooth functioning of the supply chain, given its vital role in integrating all transportation functions. To avoid the burden of significant investments in procuring new truck units and managing operational personnel, many companies choose to outsource their distribution to third-party logistics providers (3PLs). However, partner selection must be selective; the inability to manage the conveyor's specifications and technical conditions not only increases the risk of operational failure but also has the potential to cripple the effectiveness of the entire supply chain (Giathi & Kabare Karanja, 2016).

The Transportation Renewal Strategy is a form of asset revitalization crucial for addressing productivity stagnation and deterioration in fleet performance driven by technical age. Through the process of rejuvenation, modernization, and systematic improvement, this strategy aims to revive the company's operational capabilities, so that the transportation infrastructure that previously experienced a decrease in efficiency can be transformed into a more reliable asset in supporting the acceleration of distribution (Lestari, S., Susanto, A., & Wahib, 2025).

The Transportation Renewal Strategy, by adding the fleet at Rama Mulia Express Surabaya, systematically optimizes routes and redistributes asset workload, thereby reducing accumulated mileage per unit and accelerating delivery lead times. Factors such as increased carrying capacity and spatial efficiency not only reduce variable operational costs but also improve service responsiveness through an overall reduction in distribution cycle time (Daffa & Khoiroh, 2025).

The Transportation Renewal Strategy has been shown in previous studies to be a crucial tool for minimizing penalty costs and optimizing distribution allocation. In line with the findings (Hulu et al., 2025), Fleet modernization integrated with precision transportation methods can significantly reduce operational costs through greater distance and time efficiency. Implementing this strategy enables companies to maintain industry competitiveness while continuously increasing customer satisfaction.

Route Optimization

Route Optimization is defined as the strategic integration between efficient location sequencing and accurate synchronization of fleet operational schedules. The implementation of this concept aims to align the series of destinations with the estimated activity time at each point, thereby eliminating mileage inefficiencies while maximizing time utilization in the company's distribution cycle (Hariono & Palit, 2016).

Route Optimization is also a crucial tool in a distribution system, focusing on minimizing accumulated distance and travel time by determining the most effective route. By implementing precise schedule synchronization, this strategy can increase the utility of load capacity and rationalize the number of fleets operated to achieve superior distribution performance. (Yuniarti & Astuti, 2013).

Route Optimization has been a significant focus in previous studies aimed at improving logistics efficiency. As stated in the study (Trisna et al., 2019)The implementation of the Saving Matrix method has proven effective in significantly reducing total mileage and transportation costs. This efficiency is achieved by establishing sub-routes that prioritize incorporating consumer locations with the highest distance-savings value. By aligning routing towards means of capacity constraints, companies can eliminate unproductive routes, which ultimately have a direct impact on minimizing overall operational costs.

Relevant Research Results

Review relevant articles to establish research hypotheses by explaining the results of previous research and their similarities and differences with the research plan, using relevant prior research such as Table 1 below.

Table 1 Relevant Research Results

No	Author (Tahun)	Previous Research Results	Similarities With This Article	Differences With This Article
1	(Adawiyah et al., 2025)	Zero Overdimension Overloading, Regulatory Compliance, and employee performance significantly contribute to Operational Cost Efficiency.	Zero Over Dimension Over Loading Regulatory Compliance Impacts towards Operational Cost Efficiency	The main difference lies in the addition of the Transportation Renewal Strategy and Route Scheduling Optimization variables, and in the elimination of the employee performance variables. The research

No	Author (Tahun)	Previous Research Results	Similarities With This Article	Differences With This Article
				focuses on analyzing the implementation of the Zero Overdimension Overloading policy and its impact on operational cost efficiency.
2	(Saputra et al., 2025)	Zero Over Dimension Overloading, Regulatory Compliance, and Calculation of Heaviest Axis Load (MST) and vehicle stability analysis have a positive and significant impact on Operational Cost Efficiency.	Zero Overdimension Overloading Regulatory Compliance Impacts on Operational Cost Efficiency.	The difference lies in the research focus on how the level of compliance of industry players with the regulation empirically affects Operational Cost Efficiency.
3	(Fanani et al., 2014)	The Transportation Renewal Strategy, with its three aspects (environmental, economic, and social), has a positive and significant impact on Operational Cost Efficiency.	Transportation Renewal Strategy: Impacts towards Operational Cost Efficiency.	The difference lies in the Transportation Renewal Strategy in the land logistics sector. In contrast to previous research, this study explicitly analyzes the impact of transportation renewal on operational cost efficiency.
4	(Christiawan, 2019)	Transportation Renewal Strategy and the aspects of demand and supply: Positively Influencing and significant to Operational Cost Efficiency.	Transportation Renewal Strategy: Impacts towards Operational Cost Efficiency.	The difference lies in the Transportation Renewal Strategy within the context of logistics operations, with implications for Operational Cost Efficiency.
5	(Utami et al., 2024)	Route Optimization, penggunaan algoritma evolutionary, and metode nearest neighbor. Positive and significant impact on Operational Cost Efficiency	Route Optimization has an Impact on Operational Cost Efficiency.	The difference lies in the discussion's focus, which integrates route scheduling with its impacts on Operational Cost Efficiency.
6	(Fatma & Kartika, 2017)	Route Optimization, Ship Capacity, Port Window Time, and Loading and Unloading Rate have a	Route Optimization has an Impact on Operational Cost Efficiency.	It aims to empirically assess the extent to which route-scheduling optimization affects

No	Author (Tahun)	Previous Research Results	Similarities With This Article	Differences With This Article
		positive and significant impact on Operational Cost Efficiency.		Operational Cost Efficiency.

DISCUSSION

Based on a theoretical study, the discussion of this literature review article is to review relevant articles, analyze the impacts between variables, and develop a conceptual framework for a research plan:

Impacts Zero Over-Dimensioning Overloading Regulatory Compliance Towards Operational Cost Efficiency.

Zero Over Dimension Overloading Regulatory Compliance is a government policy to eliminate fleets that exceed dimensional and operational load limits, ensuring standardized safety and maintenance of road infrastructure. The main objective of the loading regulation Zero ODOL is to reduce the rate of damage to national road infrastructure and improve traffic safety standards, thereby minimizing the number of accidents caused by mechanical failures of vehicles. In addition, this policy aims to create a healthy climate of competition in the logistics business and encourage long-term Operational Cost Efficiency through extending the economic life of the fleet. Strategically, this policy forces industry players to switch from overloading practices to optimizing more professional logistics and distribution management (Adawiyah et al., 2025).

Zero Over Dimension Overloading Regulatory Compliance can have a positive, significant impact on improving the company's Operational Cost Efficiency. If the Zero ODOL policy is well received by industry players, the perception of Operational Cost Efficiency will increase in harmony. To achieve these conditions, the company needs to strengthen three leading compliance indicators: adjusting vehicle dimensions to technical standards, tightening operational supervision at distribution and crossing lines, and ensuring compliance with periodic motor vehicle testing in accordance with Regulation No. 133 of 2015 of the Minister of Transportation. By complying with these regulatory standards, companies can minimize repair costs due to fleet mechanical problems and shift their focus from cargo quantity to safer, more sustainable operational efficiency (Adawiyah et al., 2025).

Zero Over Dimension Overloading Regulatory Compliance affects Operational Cost Efficiency through fleet mechanical load control, which directly reduces periodic maintenance costs, saves fuel, and extends the vehicle's economic life cycle. For companies, especially logistics managers, compliance with these regulations is crucial not only to avoid legal sanctions and administrative fines but also as a risk-mitigation strategy to prevent workplace accidents and unexpected costs arising from travel obstacles along the distribution line. By adhering to load standards, logistics managers can create a more predictable transportation system, ensure the safety of assets and personnel, and build a credible and professional company image in the eyes of stakeholders, which will ultimately improve the company's competitiveness in the long run and realize Operational Cost Efficiency (Saputra et al., 2025).

Impact of Transportation Renewal Strategy on Operational Cost Efficiency.

The Transportation Renewal Strategy is not just routine maintenance but a form of strategic asset revitalization designed to address productivity stagnation. When a transport fleet reaches a certain technical age point, there is often a significant drop in performance.

This strategy is here to break the chain of setbacks. Fundamentally, this strategy aims to transform inefficient infrastructure into a reliable asset. By reviving operational capabilities, the company can ensure smooth distribution without being hampered by unexpected fleet breakdowns. In the context of logistics management, this update is the key to accelerating the supply chain and maintaining the company's competitiveness amid rising distribution demand (Fanani et al., 2014).

The Transportation Renewal Strategy leverages the synergy between increased transportation capacity and spatial efficiency to systematically redefine the operational structure of logistics. Adding the fleet is the primary catalyst that allows companies to redistribute asset workloads more evenly, thereby reducing accumulated mileage per unit and extending the vehicle's technical life. Furthermore, integrating route optimization and unit count increases creates scalability that lowers the cost of operational variables while cutting the overall distribution cycle time. Thus, the factors in this strategy are not only focused on the vehicle's physical aspects but also on strengthening service responsiveness by reducing lead times, which is crucial to the company's competitive advantage.

The Transportation Renewal Strategy significantly improves Operational Cost Efficiency by transforming the cost structure from a reactive to a proactive model. By systematically revitalizing assets, companies can reduce variable costs stemming from wasteful fuel consumption and high unplanned maintenance costs in fleets that have passed their technical age. This impact is further strengthened by the aim of route optimization and increased transportation capacity, which can reduce operational costs per distribution unit while minimizing financial losses due to vehicle downtime. Holistically, implementing this strategy balances infrastructure reliability and cost savings, ultimately accelerating delivery lead times and increasing long-term profitability (Fanani et al., 2014).

Factors that determine the synergy between Operational Cost Efficiency, asset depreciation rate, and technological modernization fundamentally shape the Impact Tool Renewal Strategy Logistics operational strategy. Economic factors, especially the accumulation of maintenance costs that are no longer proportional to productivity and fluctuations in the value of residual assets, are the leading indicators in determining the urgency of replacement. In addition, the reliability aspect, which minimizes downtime and ensures compliance with environmental regulations and occupational safety (K3) standards, also forces companies to update their fleets to ensure smooth workflows and comprehensive operational risk mitigation.

The Transportation Renewal Strategy plays a significant role in Operational Cost Efficiency, as this modernization step can create a holistic, sustainable, and positive impact. From an economic point of view, fleet renewal allows for savings in public transportation costs by shifting to more efficient modes and reducing the burden of government energy subsidy spending. This is in line with research conducted by (Fanani et al., 2014), which reveals that the revitalization of transportation facilities has made a real contribution to the three pillars of sustainability. From an environmental perspective, this renewal effectively reduces CO_2 emissions, while from a social perspective, the transition to a more modern fleet reduces traffic density, making mobility more efficient and productive. Overall, the renewal of means of transport is not just about physical maintenance but also a strategic instrument to achieve national cost efficiency and environmental sustainability.

Impacts Route Optimization towards Operational Cost Efficiency.

Route Optimization is a strategic process for determining the order of visit locations and the vehicle's operational schedule to achieve maximum efficiency. In practice, route optimization not only determines which lanes to take but also controls the timing of each vehicle's arrival at the location, ensuring they arrive at the planned time. Given the complexity of logistics distribution, route problems are classified based on their unique characteristics to facilitate the identification of the most effective solutions. One of the most commonly used algorithmic approaches in solving this challenge is the Vehicle Routing Problem (VRP). The use of this algorithm allows management to cut mileage and travel time, which ultimately has a direct impact on the Company's operational cost savings (Hariono & Palit, 2016).

Route Optimization Concept: Technically, each route is designed as a single trip that starts and ends at the depot, with each vehicle required to visit each customer exactly once. Given current resource limitations, this optimization concept also accounts for carrying capacity as a significant constraint, specifically the Capacitated Vehicle Routing Problem (CVRP). By applying the principles of vehicle routing, route setting, vehicle assignment, and scheduling transportation crews, logistics companies can ensure that each shipment is carried out using the shortest route and within legal load limits, resulting in maximum operational efficiency (Fatma & Kartika, 2017).

Route Optimization affects operational cost efficiency. If route optimization is well perceived, then Operational Cost Efficiency will be perceived well. The effectiveness of determining the distribution sequence depends on integrating various complex operational variables, ranging from the volume of demand at the destination location to the fleet's availability and carrying capacity, to service time limitations and loading and unloading durations. With the right optimization approach, management can formulate logistics solutions that minimize operational costs while still accurately meeting all customer demands. Achieving this optimal solution ensures that every fleet movement is carried out without violating capacity limits or operating-hour regulations, resulting in significant cost savings without sacrificing service quality (Fatma & Kartika, 2017).

The factors that impact Route Optimization are the method of determining a measurable distribution route, the availability of optimal solution search technology, and the elimination of subjective limitations in the delivery of goods. In practice, efficiency is often hampered by reliance on operator intuition or on shipping policies that trigger randomization based on the highest order volume. To overcome this complexity, a shift from conventional methods to scientific algorithms, such as evolutionary algorithms, is needed. As a population-based stochastic search method, this algorithm can solve the shortest route problem, or Traveling Salesman Problem (TSP), objectively without being constrained by load-priority constraints. This strategy can be implemented using tools familiar to practitioners, such as Microsoft Excel's Solver feature, to produce faster, more efficient logistics solutions. (Utami et al., 2024).

Route Optimization plays a significant role in Operational Cost Efficiency. This is evidenced by the application of the Saving Matrix method, which can restructure distribution patterns to be more systematic, for example, by dividing routes into several more measurable delivery stages. By producing 16 optimal distribution routes, the company can drastically minimize mileage, with a direct impact on budget savings. These findings show that transportation costs can be reduced to Rp1,506,500 per day. These results are in line with Pujawan's (2017) research, which states that data-driven route management and mathematical calculations are the primary keys to reducing logistics costs without compromising service performance (Yuniarti & Astuti, 2013).

Research Conceptual Framework

Based on the formulation of the problem, relevant research, and discussion, the conceptual framework of this article is shown in Figure 1.

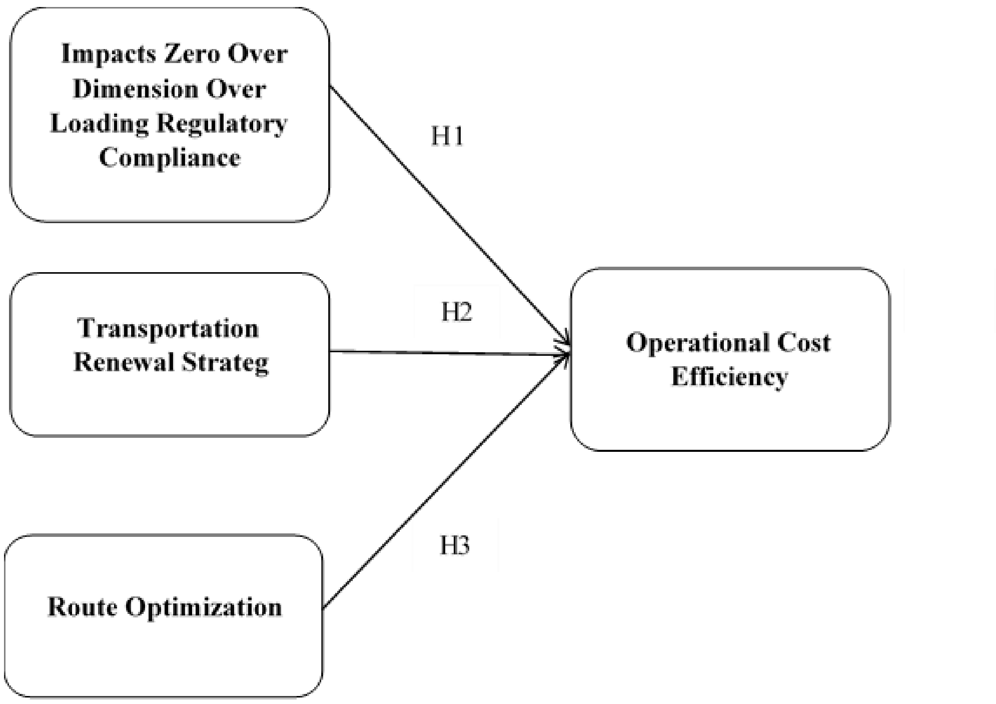

Figure 1: Conceptual Framework

Based on the conceptual framework image above, Zero Over Dimension Overloading, Regulatory Compliance, Transportation Renewal Strategy, and Route Optimization affect Operational Cost Efficiency

CONCLUSION

Based on the objectives, results, and discussion, the conclusion of this article is to formulate a hypothesis for further research, namely:

1) Zero Over Dimension Over Loading Regulatory Compliance Impacts towards Operational Cost Efficiency;
2) Transportation Renewal Strategy: Impacts towards Operational Cost Efficiency.
3) Route Optimization BerImpacts towards Operational Cost Efficiency.

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