The Effect of Loading and Unloading Delays and Truck Fleet Readiness on Operating Performance

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ABSTRACT

Operational performance is a critical factor in logistics management, directly affecting service quality, customer satisfaction, and overall company efficiency. Delays in unloading processes and the readiness of the truck fleet are common challenges that can hinder smooth operations. This study aims to examine how unloading delays and truck fleet readiness influence operational performance. A quantitative research method was employed, with data collected through questionnaires distributed to 30 operational staff members. Data were analyzed using SPSS version 26, including validity and reliability tests and multiple linear regression analysis. The results indicate that both unloading delays and truck fleet readiness have a significant impact on operational performance, both individually and collectively. The coefficient of determination shows that approximately 55.3% of operational performance variation is explained by these factors, while the remaining portion is influenced by other variables outside the scope of this study. These findings highlight the importance of optimizing unloading efficiency and ensuring fleet readiness to enhance overall operational performance.

Keywords*: Fleet Readiness, Logistics Management, Operational Performance, Truck Operations, Unloading Efficiency.*

INTRODUCTION

The freight forwarding industry in Indonesia is experiencing rapid growth, driven by the increasing demand for efficient and reliable logistics services. As a maritime nation with thousands of islands, Indonesia depends heavily on freight forwarding to connect its diverse regions and ensure the smooth distribution of goods (Pulungan, 2024; Fitri & Lubis, 2025). Effective and efficient distribution is a critical factor in expanding logistics flows and meeting community needs, directly impacting the overall performance of logistics companies. Freight forwarding, as a business entity, provides comprehensive services for managing the delivery, transportation, and receipt of goods via land, sea, and air transportation (Anna et al., 2021; Nurfitriana et al., 2021; Asmarajaya et al., 2021; Dinka et al., 2022). One such company, PT. Wahana Multi Logistik, established in 2001, offers a variety of shipping services, including handling hazardous materials through Wahana DGpack, adhering strictly to safety standards and applicable regulations. Despite its experience and service portfolio, the company faces operational challenges, particularly in maintaining timely deliveries. Delays in loading and unloading processes in warehouses often occur due to insufficient equipment, limited workforce, and complex

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shift arrangements. In addition, the truck fleet is not always optimal, given the limited number of vehicles and the lack of routine maintenance, which can further exacerbate distribution delays.

Data collected from October to December 2024 highlight these operational bottlenecks. For instance, out of 203 shipments in October, 37 experienced late arrivals, while in November, 17 out of 119 shipments were delayed. December presented the highest delay, with 93 out of 173 shipments arriving late. In terms of fleet readiness, the company operates a relatively small number of vehicles, including 2 pick-ups, 1 CDD BAK, 1 CDD BOX, 1 CDD BOX LONG, 1 CDE BAK, 1 CDE BOX, and 1 Blind Van (PT. Wahana Multi Logistik, 2025). These constraints directly affect operational performance, manifesting in increased labor costs due to overtime, inventory backlogs, and distribution delays that disrupt the fulfillment of Service Level Agreements (SLAs). Ensuring optimal operational performance is essential not only to increase productivity but also to maintain customer trust and loyalty, whereas operational bottlenecks can reduce efficiency and generate customer complaints (Singh et al., 2023; Syamil et al., 2025).

Previous research indicates that delays in loading and unloading significantly hinder operational efficiency and disrupt distribution schedules. Factors such as equipment failure, limited labor, and lack of coordination among involved parties have been identified as major obstacles (Widyawati & Hinriyani, 2020; Situngkir & Ginting, 2023; Asbullah et al., 2024; Paradise & Ginting, 2024). Similarly, truck fleet readiness, characterized by an adequate number of units, proper technical condition, and skilled drivers, plays a vital role in expediting deliveries and sustaining smooth distribution (Rahman et al., 2021). Research also suggests that effective management of loading and unloading operations, coupled with good fleet readiness, can maintain timely distribution and enhance company performance (Apriyani et al., 2020; Haslindah et al., 2022; Rikardo et al., 2023). Despite these findings, most studies have examined loading and unloading delays and fleet readiness independently, without exploring their combined influence on operational performance. This gap is particularly relevant in the context of integrated logistics operations, where multiple operational factors interact simultaneously to affect performance outcomes.

Therefore, this study seeks to address this research gap by investigating the simultaneous impact of loading and unloading delays and truck fleet readiness on operational performance. By analyzing both factors together, the research aims to provide a more comprehensive understanding of operational challenges in freight forwarding and offer insights into strategies for improving efficiency and service reliability. The main objective of this study is to determine how delays in loading and unloading, as well as the readiness of the truck fleet, collectively and individually influence operational performance in a logistics company.

LITERATURE REVIEW & HYPOTHESIS DEVELOPMENT

The Effect of Loading and Unloading Delays on Operational Performance

Delays in loading and unloading operations have a significant impact on operational performance within logistics and supply chain management (Jamari, 2023). Such delays disrupt material flow, increase operational costs, and reduce supply chain efficiency. Vieira and Fransoo (2015) found that loading and unloading delays directly contribute to lower distribution efficiency, especially in urban logistics. Similarly, Marzialia et al. (2022) emphasized that punctuality during loading dock operations is a critical indicator of overall operational performance.

According to Sanchez-Rodrigues and Potter (2010), logistics uncertainties such as loading and unloading delays negatively affect transport sustainability and fleet productivity. Friswell and Williamson (2019) also reported that long waiting times at transport depots reduce efficiency and increase driver safety risks. Furthermore, Ayutia et al. (2023) revealed a positive relationship between efficient handling of loading and unloading time and operational revenue improvement in maritime logistics. Sibarani et

al. (2024) supported this by highlighting that optimizing these processes enhances both operational sustainability and supply chain resilience. Wang (2018) demonstrated that delays within logistics operations increase lead time variability, which in turn decreases operational responsiveness. Ndubi et al. (2016) also found that managing time variability in logistics directly improves performance outcomes. Thus, loading and unloading operations play a critical role in determining the efficiency, sustainability, and resilience of logistics and supply chain management systems.

H1: Loading and unloading delays have a positive effect on operational performance.

The Effect of Truck Fleet Readiness on Operational Performance

Truck fleet readiness plays a vital role in determining operational performance in the logistics and transportation industry. A fleet that is properly maintained, technologically monitored, and consistently available for operations can improve efficiency, safety, and service reliability. Zakharov and Sapozhenkov (2025) explained that more frequent maintenance activities help extend engine life and strengthen fleet readiness, which supports better operational continuity. In line with this, Myrzabekov et al. (2025) found that effective maintenance planning significantly increases truck productivity and overall operational efficiency. Furthermore, Oszczypała et al. (2022) emphasized that high technical readiness, reflected by fewer repair and waiting periods, directly increases fleet availability and transport capacity, ultimately enhancing operational performance.

Barbashin et al. (2025) emphasized that predictive maintenance combined with network optimization enhances fleet readiness and stability of service levels in logistics networks. Samoylov and Simanenkov (2025) further discussed the integration of automation technologies for maintenance systems, improving transport equipment reliability and reducing operational delays. In a related study, Muzondo and Matowanyika (2025) highlighted that integrating IoT-based fleet management systems strengthens operational readiness by allowing real-time monitoring and predictive diagnostics, which minimizes breakdowns and downtime. Collectively, these studies confirm that truck fleet readiness positively affects operational performance by improving reliability, reducing maintenance-related delays, and ensuring consistent logistics delivery. The integration of predictive analytics, IoT, and maintenance automation represents the next frontier in optimizing transport fleet performance across industries.

H2: Truck fleet readiness has a positive effect on operational performance.

The Simultaneous Effect on Operational Performance

Efficient logistics performance depends heavily on both loading and unloading efficiency and truck fleet readiness, as these two variables jointly determine the smoothness of transportation flows and delivery reliability. Delays in loading or unloading can disrupt scheduling, reduce truck availability, and increase operational costs. Marzialia et al. (2022) emphasized that punctuality in loading-dock operations directly correlates with improved supply chain performance and customer satisfaction. Similarly, Friswell and Williamson (2019) highlighted that managing queuing and waiting times during loading and unloading reduces fatigue and idle time, enhancing overall operational productivity.

At the same time, truck fleet readiness ensures that transport capacity is maintained and downtime is minimized. Özcan et al. (2024) argued that maintaining fleet readiness and mitigating delays are critical for achieving timely delivery and sustaining operational excellence. Dmitriev (2025) also found that optimizing fleet utilization by monitoring load consolidation and unloading activities improves both efficiency and cost control. When these two factors are managed simultaneously, they create a synergistic impact, delays are minimized while fleet utilization is maximized, thereby strengthening operational performance and logistics reliability (Mukhtarov, 2023; Oteri et al., 2023).

Khomenko et al. (2025) further noted that delays at transit points, often caused by inefficient loading/unloading coordination, disrupt fleet scheduling and degrade supply chain performance. Thus, both loading-unloading efficiency and fleet readiness are interdependent drivers of operational success, and their combined optimization yields a simultaneous positive effect on operational performance.

H3: Loading and unloading delays and truck fleet readiness have a simultaneous positive effect on operational performance.

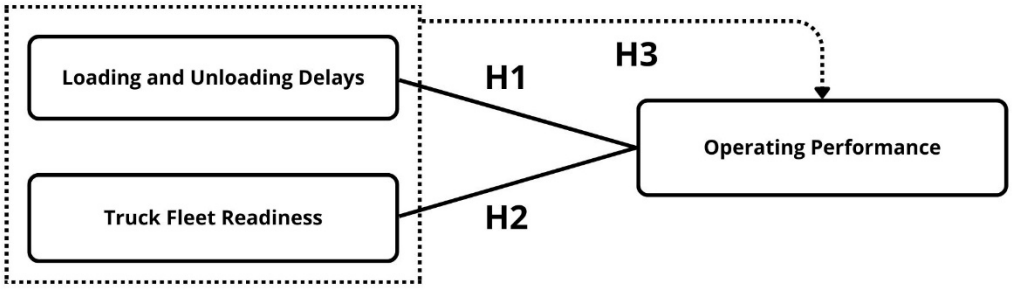


Figure 1. Research Model

Figure 1 illustrates the conceptual framework of this study, showing the hypothesized relationships between the variables. Loading and unloading delays and truck fleet readiness are proposed as independent variables influencing operational performance, represented by H1 and H2, respectively. Additionally, H3 indicates a potential combined effect of both operational factors on operational performance.

RESEARCH METHODS

This study used a quantitative research design, which tests hypotheses and examines the correlations between variables using numerical data and scientific principles (Waruwu, 2023; Ghanad, 2023; Fischer et al., 2023). Because it enables objective measurement, statistical testing, and generalizable results, this method is especially well-suited for investigating operational factors and their influence on operational performance, such as loading and unloading delays and truck fleet preparedness. A systematic questionnaire was utilized to gather primary data from all respondents, and secondary data, such as corporate records on shipments, delays, and fleet composition, were used to confirm findings and offer more context. In order to ensure thorough representation, saturated sampling was used, which included the entire population as the research sample (Amin et al., 2023; Suriani & Jailani, 2023). The population consisted of thirty employees from the operational division who are directly involved in daily operational activities. The study concentrated on one dependent variable, operational performance, and two independent variables, loading and unloading delays and truck fleet preparedness, each of which was operationalized into quantifiable indicators.

To assess respondents' opinions, the questionnaire used a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). The instrument underwent validity and reliability tests to guarantee measurement accuracy and consistency. Multiple linear regression analysis was used to evaluate the individual (partial) and combined (simultaneous) effects of independent variables on operational performance after descriptive statistics were used to summarize the characteristics of respondents and the distribution of research variables.

In addition, the analysis examined statistical significance, regression coefficients, and model fit indicators such as the coefficient of determination (R^2), which provides insight into the proportion of variance in operational performance explained by the studied factors. All data processing and analysis were conducted using SPSS version 26, a comprehensive statistical software that facilitates coding, computation, and interpretation

of quantitative data, ensuring rigorous and reliable results. This methodological framework enables a systematic evaluation of how operational delays and fleet readiness influence company performance, providing actionable insights for improving logistics efficiency and service reliability in freight forwarding operations.

RESULTS

In order to investigate how truck fleet preparedness and loading and unloading delays affect operational performance, the study gathered data from thirty respondents. The characteristics of the respondents should be described before the main analysis is presented. The demographic and professional profiles of the participants, including gender, age, educational attainment, and duration of employment, are compiled in Table 1. Comprehending these attributes offers a framework for analyzing the ensuing outcomes, since differences in background and education may impact opinions and reactions about operational procedures.

Table 1. Respondent Profile

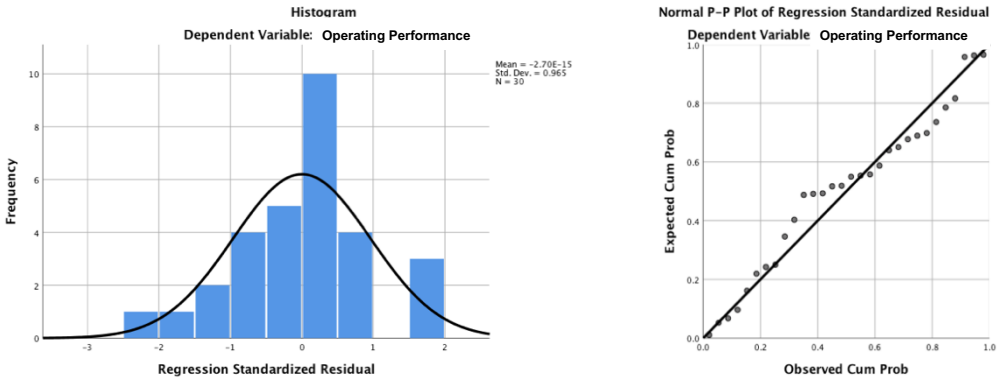
Characteristic	Items	Amount	Percentage
Gender	Male	19	60%
	Female	11	40%
Age	20-29 Years	8	27%
	30-39 Years	16	53%
	40-49 Years	5	17%
	>50%	1	3%
Education	Senior High School	11	37%
	D3	8	27%
	S1	10	33%
	S2	1	3%
	S3	0	0%
Length of Working Time	1-3 Years	9	30%
	3-5 Years	11	37%
	>5 Years	10	33%

The profile of the respondents is shown in Table 1. Compared to females (40%), males made up the majority of responders (60%). The majority were between the ages of 30 and 39 (53%), followed by those between the ages of 20 and 29 (27%), 40 and 49 (17%), and over 50 (3%). In terms of education, the majority of respondents (37%) had completed their senior year of high school, followed by S1 graduates (33%), D3 graduates (27%), one S2 degree (3%), and no S3 degree. In terms of duration of employment, 30% had one to three years of experience, 33% had three to five years, and 37% had more than five years.

Table 2. Reliability Test

Variable	Cronbach Alpha
Loading/Unloading Delay (X1)	0.752
Truck Fleet Readiness (X2)	0.719
Operational Performance (Y)	0.716

The reliability analysis of the research variables is shown in Table 2. Cronbach's Alpha ratings for each variable range from 0.716 to 0.752, indicating adequate reliability. These results indicate that the measurement items for loading/unloading delay, truck fleet readiness, and operational performance are consistent and reliable for capturing the intended constructs in this study.



(a) (b)

Figure 2. (a) Normal Distribution Graph (b) Normal P-Plot Regression

Considering Figure 2, one feature of a normal distribution is that the residual values are dispersed near zero, as shown by the residual distribution's bell-like structure in the histogram graph. The majority of the residual points on the P-P Plot graph follow the diagonal line, suggesting that the data is regularly distributed. The histogram findings show that the normalcy assumption has been satisfied because there are no notable variances.

Table 3. Kolmogorov-Smirnov Test

Test	Item	Value
N		30
Normal Parametersa,b	Mean	0.0000000
	Std. Deviatipn	1.90923298
Most Extreme Differences	Absolute	0.108
	Positive	0.108
	Negative	-0.076
Test Statistic		0.108
Asymp. Sig. (2-tailed)		0.200[c,d]

The study model has satisfied the normality assumption since Table 3's Kolmogorov-Smirnov results have a significance value of 0.200, which is greater than 0.05 and indicates that the residual data investigated has a normal distribution.

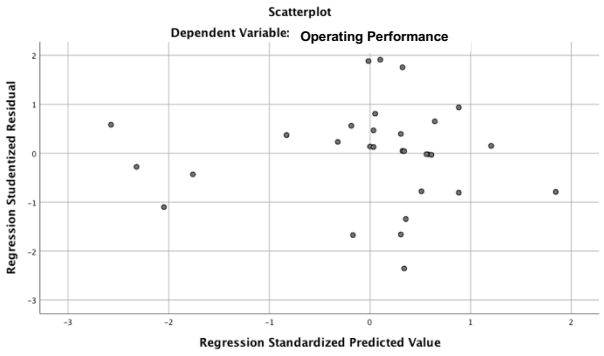


Figure 3. Scatterplot Result

According to Figure 3, the scatterplot-based heteroscedasticity test, the data points seem to be dispersed randomly and lack any discernible pattern. This shows that the regression model has a constant residual variance or satisfies the homoscedasticity assumption.

Table 4. Heteroscedasticity Test & Multicollinearity Test

Variable	Heteroscedasticity		Multicollinearity	
	t-statistics	**Sig.**	**Tolerance**	**VIF**
Constant	-0.840	0.408	–	–
Delay Loading and Unloading	-0.225	0.824	0.886	1.129
Truck Fleet Readiness	1.388	0.176	0.886	1.129

The heteroscedasticity test results are shown in Table 4. The coefficients for both delay in loading and unloading (p = 0.824) and truck fleet readiness (p = 0.176) are above 0.05, indicating no evidence of heteroscedasticity in the regression model. According to the table, the truck fleet readiness variable likewise has a tolerance of 0.886 and a VIF of 1.129, as does the loading and unloading delays variable. Since these values satisfy the requirements, multicollinearity cannot exist.

Table 5. Multiple Regression & Hypothesis Test

Variable	B	Std. Error	Beta	t-statistics	Sig.
Constant	10.187	6.243	–	1.632	0.114
Delay in Loading and Unloading (X1)	0.255	0.079	0.427	3.212	0.003
Truck Fleet Readiness (X2)	0.523	0.137	0.509	3.827	0.001

Based on Table 5, the following regression equation is obtained: Y = 10.187 + 0.255 X1 + 0.523 X2. Truck fleet readiness and loading and unloading delays both significantly improve operational performance, according to Table 6's multiple regression analysis results. Reducing loading and unloading delays improves operational performance, according to the coefficient for delay in loading and unloading, which is 0.255 with a t-statistic of 3.212 and a significance level of 0.003. Truck fleet readiness, on the other hand, has a coefficient of 0.523 with a t-statistic of 3.827 and a significance level of 0.001, indicating that increasing fleet readiness greatly improves operational performance. These results emphasize how crucial it is to control operating delays and keep the truck fleet prepared in order to improve performance results.

Table 6. Coefficient of Determination & F test

Model	Value
R	0.744
R^2	0.553
Adjusted R^2	0.520
Std. Error of the Estimate	1.979
F-statistic	16.728>3.354
Sig.	0.000

The multiple correlation analysis and the coefficient of determination are shown in Table 6. The independent variables and operational performance have a strong positive association, as shown by the correlation coefficient (R = 0.744). While the adjusted R^2 of 0.520 takes into consideration the number of predictors in the model, the R^2 value of 0.553 indicates that truck fleet readiness and delay in loading and unloading account for 55.3% of the variation in operational performance. The average difference between the observed and anticipated values is represented by the standard error of the estimate, which is 1.979. The ANOVA test or F test results were the computed F-statistics> F table (16.728 > 3.354) from a sig value of 0.000 < 0.05. Ho is rejected, and Ha is accepted, according to the findings of the basic linear test using the F test. This suggests that operational performance is positively and significantly impacted by the variables truck fleet readiness and loading and unloading delay.

DISCUSSION

According to the study's findings, operational performance is positively and significantly affected by loading and unloading delays, as indicated by a t-statistic of 3.212

and a significance level of 0.003. This result is in line with earlier studies that highlight the importance of loading and unloading procedures' effectiveness and timeliness in supply chain management and logistics. Marzialia et al. (2022) highlighted that timely arrival at loading docks and effective order picking are essential performance indicators that directly influence supply chain outcomes. Similarly, Ayutia et al. (2023) found that delays during container handling reduce overall operational efficiency and can impact revenue generation. In addition, Friswell and Williamson (2019) reported that queuing and waiting times for trucks at loading and unloading points create bottlenecks that compromise distribution effectiveness. In line with these studies, the present research confirms that reducing delays in loading and unloading allows goods to move smoothly through the distribution process, contributing to improved operational performance. Practically, this implies that companies must enhance scheduling, coordination among staff, and monitoring of loading activities to minimize interruptions in the workflow and maximize the efficiency of goods distribution.

Truck fleet readiness was found to have a positive and substantial impact on operational performance in addition to delays, with a significance value of 0.001 and a t-statistic of 3.827. Smooth and timely distribution is made possible by a fleet that is constantly well-kept, roadworthy, and large enough; on the other hand, inadequate capacity or poorly maintained vehicles lead to challenges and inefficiencies. These results align with the findings of Myrzabekov et al. (2025), who demonstrated that the operational efficiency of dump trucks is highly dependent on fleet condition and maintenance frequency. Similarly, Barbashin et al. (2025) highlighted that predictive maintenance and network optimization enhance operational readiness, supporting timely and reliable delivery. Rahman et al. (2021) also emphasized that fleet readiness and driver competence are key factors in ensuring smooth distribution within logistics operations. This suggests that companies must not only maintain their fleets regularly but also expand vehicle capacity and invest in driver training programs to enhance operational performance. Efficient fleet management reduces disruptions and allows companies to meet delivery schedules more reliably, strengthening customer satisfaction and competitiveness.

The simultaneous test results indicate that loading and unloading delays and truck fleet readiness jointly have a significant effect on operational performance. This is evidenced by the F-statistic value of 16.728, which is higher than the F-table value of 3.354, and the significance value of $0.000 < 0.05$, meaning that H3 is accepted. These findings are consistent with previous studies by Marzialia et al. (2022), Friswell and Williamson (2019), and Özcan et al. (2024), which stated that efficient loading-unloading processes and high truck fleet readiness simultaneously improve distribution efficiency, reduce operational delays, and strengthen logistics reliability. Therefore, optimizing loading-unloading coordination and maintaining fleet readiness are essential strategies for improving operational performance.

The findings demonstrate that both the efficiency of loading and unloading processes and the readiness of truck fleets are crucial determinants of operational performance in logistics management. These results have practical implications for logistics companies, emphasizing the need to integrate operational strategies that optimize both human and vehicle resources. Ensuring well-coordinated loading/unloading activities and maintaining a reliable fleet improves distribution smoothness, reduces delays, and enhances overall operational effectiveness in the context of PT. Wahana Multi Logistik, these findings suggest that management should prioritize process optimization, workforce coordination, and fleet maintenance as central components of their operational strategy. Moreover, these insights contribute to the broader logistics literature, reinforcing that operational performance depends on both procedural efficiency and resource readiness, which collectively enhance supply chain reliability and service quality.

CONCLUSION

The results of this study indicate that both loading and unloading delays and truck fleet readiness have a positive and significant impact on operational performance. Properly managed loading and unloading processes, along with a fleet that is consistently in roadworthy condition, significantly enhance the efficiency and effectiveness of goods distribution, confirming that these two factors are critical determinants of the operational success of PT. Wahana Multi Logistik. These findings imply that companies need to improve the planning and coordination of loading and unloading schedules, provide adequate supporting facilities to reduce work process bottlenecks, and ensure that fleet maintenance is carried out regularly and efficiently. In addition, expanding fleet capacity, optimizing route management, and improving driver skills through ongoing training programs are essential to ensure timely and reliable distribution.

Continuous monitoring and supervision of operational procedures are also crucial to maintain consistent performance over time. However, this study has limitations, as it focuses only on two operational factors and does not consider other variables that could influence performance, such as technological integration, employee motivation, or collaboration with supply chain partners. Therefore, future research is recommended to examine additional factors that may affect operational performance, which could provide a more comprehensive understanding and guide companies in developing more effective and strategic operational management practices.

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REFERENCES

[1] Amin, N. F., Garancang, S., & Abunawas, K. (2023). Konsep umum populasi dan sampel dalam penelitian. *Jurnal Pilar*, *14*(1), 15-31.

[2] Anna, A., Nurmalasari, N., & Rohayani, Y. (2021). Penerapan metode waterfall dalam perancangan sistem informasi akuntansi pengiriman barang. *Jurnal Sistem Informasi Akuntansi, 1*(1), 1–9.

[3] Apriyani, R., Riduan, M., & Veronica. (2020). Keselamatan kerja dan penanganan peti kemas terhadap kinerja operasional pada perusahaan pelayaran. *Jurnal Manajemen Bisnis Transportasi dan Logistik, 6(2)*, 115-120.

[4] Asbullah, Ginting, D., & Suparman. (2024). Analisis keterlambatan dan efisiensi kegiatan bongkar muat petikemas di terminal PT Prima Terminal Petikemas Belawan. *Journal of Social Science Research, 4(1)*, 10156–10166.

[5] Asmarajaya, I. K. A., Sanjaya, K. O., Putra, D. M. D. U., Mahendra, G. S., & Hasanah, F. N. U. (2021). Sistem informasi keuangan pada perusahaan kost elit dengan metode waterfall. *Jurnal Swabumi*, *109*(5), 456-459.

[6] Ayutia, Y., Malisan, J., Veronica, V., Marpaung, E., & Samputra, M. N. (2023). Analysis of delays and the effectiveness of containers loading and unloading performance on revenue of KM Logistik Nusantara 4 at PT. Pelni (Persero) Tanjung Priok Branch. *Advances in Transportation and Logistics Research*, *6*(1), 137-147.

[7] Barbashin, V. K., Hashimov, E. G., Talibov, A. M., & Akhundov, R. G. (2025). Enhancement of operational readiness via predictive maintenance and network optimization. *Jurnal Ilmiah Manajemen Kesatuan, 4*(23), 34-39.

[8] Dinka, S. P., Salsabilah, Z. P., & Nilawati, L. (2022). Penerapan metode waterfall dalam rancang bangun sistem informasi penggajian berbasis web. *Artikel Ilmiah Sistem Informasi Akuntansi*, *2*(2), 156-166.

[9] Dmitriev, A. (2025). *Optimizing fleet utilization in a moving logistics company*. Helsinki: Theseus.
[10] Fischer, H. E., Boone, W. J., & Neumann, K. (2023). Quantitative research designs and approaches. In *Handbook of research on science education* (pp. 28-59). London: Routledge.
[11] Fitri, I., & Lubis, S. N. (2025, February). Factors influencing the opening of regional shipping routes in the aceh region to enhance regional development and global connectivity. In *IOP Conference Series: Earth and Environmental Science* (Vol. 1452, No. 1, p. 012046). New York: IOP Publishing.
[12] Friswell, R., & Williamson, A. (2019). Management of heavy truck driver queuing and waiting for loading and unloading at road transport customers' depots. *Safety Science, 120*(2), 194-205.
[13] Ghanad, A. (2023). An overview of quantitative research methods. *International Journal of Multidisciplinary Research and Analysis*, *6*(08), 3794-3803.
[14] Haslindah, A., Haslinah, A., & Rahmatullah, R. (2022). Analisa kesehatan dan keselamatan kerja karyawan Pt. Industri Kapal Indonesia (PT. IKI) Persero Makassar. *Journal Industrial Engineering and Management (JUST-ME)*, *3*(02), 67-74.
[15] Jamari, H. (2023, May). Factors that influence delay time in loading and unloading goods at warehouses: case study at century total logistics Sdn Bhd. In *3rd Universitas Lampung International Conference on Social Sciences (ULICoSS 2022)* (pp. 404-410). New York:Atlantis Press.
[16] Khomenko, Y., Okorokov, A., Matsiuk, V., Zhuravel, I., & Pavlenko, O. (2025). Revealing the causes of delays at transit points along an intermodal grain supply chain. *Eastern-European Journal of Enterprise Technologies, 4*(2), 12-19.
[17] Marzialia, M., Rossit, D.A., & Toncovicha, A. (2022). Order picking and loading-dock arrival punctuality performance indicators for supply chain management. *Engineering Management in Production and Services, 14*(1), 45-49.
[18] Mukhtarov, A. (2023). Challenges and optimisation issues in logistics and truck loading in the connected states. *Economics & Education, 8*(3), 6-11.
[19] Muzondo, P. J., Matowanyika, K., & Chipangamate, N. (2025). Integrating IoT in public transport logistics: A systematic review of fleet management and safety in Zimbabwe's supply chain. *Dibon Journal of Business, 1*(3), 219-242.
[20] Myrzabekov, N. M., Karazhanov, A. A., Murzagaliev, A. Z., Alipbayev, Z. R., & Kokayev, U. S. (2025). Dump truck operational efficiency: A case study of the Don Mining and Processing Plant. *International Journal of Transport Development and Integration, 9*(1), 78-87.
[21] Ndubi, S.O., Iravo, A.M., & Ochiri, G. (2016). Effect of lead time variability on inbound logistics performance. *International Academic Journal of Procurement and Supply Chain Management, 2*(2), 23-29.
[22] Nurfitriana, E., Apriliah, W., Ferliyanti, H., Basri, H., & Ratnawati, R. (2021). Implementasi model waterfall dalam sistem informasi akuntansi piutang jasa penyewaan kendaraan pada Pt. Tricipta Swadaya Karawang. *Jurnal Interkom*, *15*(1), 36-45.
[23] Oszczypała, M., Ziółkowski, J., & Małachowski, J. (2022). Analysis of light utility vehicle readiness in military transportation systems using Markov and semi-Markov processes. *Energies*, *15*(14), 5062.
[24] Oteri, O. J., Onukwulu, E. C., Igwe, A. N., Ewim, C. M., Ibeh, A. I., & Sobowale, A. (2023). Cost optimization in logistics product management: strategies for operational efficiency and profitability. *International Journal of Business and Management Forthcoming*, *5*(2), 67-69.
[25] Özcan, S., Oflaç, B. S., Tokcaer, S., & Özpeynirci, Ö. (2024). Mastering timely deliveries using dynamic capabilities: perspectives from logistics service providers and shippers. *The International Journal of Logistics Management, 35(5)*, 1653-1677.
[26] Paradise, G., & Ginting, D. (2024). Sistem kinerja trucking untuk memperlancar pengiriman barang pada PT. Elang Sriwijaya Perkasa Palembang. *Innovative: Journal Of Social Science Research*, *4*(1), 2279-2289.
[27] Pulungan, E. D. (2024). From archipelago to maritime hub: indonesia's quest to become the world's new maritime axis. *Jurnal Ilmiah Ilmu Sosial*, *10*(2), 106-117.
[28] Rahman, F. F. N., Shabrina, A. N., Samosir, J. R., & Alfaridi, N. (2021). The influence of employee performance and delivery fleet readiness on smooth distribution at PT Rafly Trans Utama. *5778*(2), 623–636.
[29] Rikardo, D., Saleh, S., & Nurrahman, M. H. (2023). Optimalisasi penerapan keselamatan kerja dalam upaya pencegahan kecelakaan kru pada saat bekerja di Kapal MV. Cepat. *Journal Marine Inside*, *8*(2), 46-52.
[30] Samoylov, O.O., & Simanenkov, A.L. (2025). Automation technologies in ship systems maintenance: problems and ways to improve through cross-sector experience. *Journals Uran*, *4*(2), 30-39
[31] Sanchez-Rodrigues, V., & Potter, A. (2010). The impact of logistics uncertainty on sustainable transport operations. *Int. J. of Physical Distribution & Logistics Management, 40*(12), 56-67.
[32] Sibarani, M.H.M., Tampubolon, B.M., & Herawati, S. (2024). Optimizing loading/unloading processes for sustainable transportation management. *Jurnal Abdidas, 4*(1), 88-98.
[33] Singh, V., Sharma, M. P., Jayapriya, K., Kumar, B. K., Chander, M. A. R. N., & Kumar, B. R. (2023). Service quality, customer satisfaction and customer loyalty: A comprehensive literature review. *Journal of Survey in Fisheries Sciences*, *10*(4S), 3457-3464.
[34] Situngkir, F., & Ginting, D. (2023). Skema penanganan alur kegiatan petikemas di depo pada pt. prima indonesia logistik belawan. *Innovative: Journal Of Social Science Research*, *3*(6), 8567-8581.

[35] Suriani, N., & Jailani, M. S. (2023). Konsep populasi dan sampling serta pemilihan partisipan ditinjau dari penelitian ilmiah pendidikan. *IHSAN: Jurnal Pendidikan Islam*, *1*(2), 24-36.

[36] Syamil, A., La Ode, N., Rosariana, B. C., Aristy, L. M., & Liesl, R. (2025). The roles of agility, supply chain sustainability, and risk management on operations performance in manufacturing industry. *Jurnal Ilmiah Manajemen Kesatuan*, *13*(3), 1387-1398.

[37] Vieira, J.G.V., & Fransoo, J.C. (2015). How logistics performance of freight operators is affected by urban freight distribution issues. *Transport Policy, 37*(2), 201–210.

[38] Wang, M. (2018). Impacts of supply chain uncertainty and risk on the logistics performance. *Asia Pacific Journal of Marketing and Logistics, 30*(2), 123-129.

[39] Waruwu, M. (2023). Pendekatan penelitian pendidikan: metode penelitian kualitatif, metode penelitian kuantitatif dan metode penelitian kombinasi (Mixed Method). *Jurnal pendidikan Tambusai*, *7*(1), 2896-2910.

[40] Widyawati, N., & Hinriyani, E. (2020). Analisis keterlambatan dan efektifitas kinerja bongkar muat petikemas terhadap pendapatan terminal mirah. *Majalah Ilmiah Bahari Jogja*, *18*(1), 103-115.

[41] Zakharov, N. S., Sapozhenkov, N. O., & Nazarov, V. P. (2025). The impact of maintenance frequency on the service life of internal combustion engines. *Architecture, Construction, Transport, 5(2)*, 109-117.

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