DIJDBM: Dinasti International Journal of Digital Business Management
E-ISSN: 2715-4203
P-ISSN: 2715-419X
https://dinastipub.org/DIJDBM dinasti.info@gmail.com +62 811 7404 455
DINASTI PUBLISHER
DOI:https://doi.org/10.38035/dijdbm.v7i1

Analysis of Service Quality and Occupational Health and Safety Through Customer Satisfaction with the Smooth Operation

Bayurezha Akbar[1], M. Thamrin[2], Aswanti Setyawati[3].
[1]Institut Transportasi dan Logistik Trisakti, Jakarta, Indonesia, bayukoko33@gmail.com.
[2]Institut Transportasi dan Logistik Trisakti, Jakarta, Indonesia, thamrinaroba7@gmail.com.
[3]Institut Transportasi dan Logistik Trisakti, Jakarta, Indonesia, aswantimurgiyanto@gmail.com.

Corresponding Author: bayukoko33@gmail.com[1]

Abstract: Bunkering, as a vital logistics activity, carries high risks such as delays, fuel contamination, and safety incidents that can affect shipping schedules, operational costs, and company reputation. Implementing occupational safety and health (OSH) standards (personal protective equipment, equipment inspections, safe zones, emergency procedures) and international guidelines (ISM Code, SOLAS, ISGOTT, IGF, SIMOP) is necessary to ensure crew safety and build trust among service users. Timely, responsive, safe, and well-documented bunkering services enhance customer satisfaction, which acts as a mediating variable in fostering harmonious cooperation and operational efficiency. The research findings are expected to contribute to improving bunkering service management, customer satisfaction, and operational efficiency of vessels at international ports. Field observations indicate that delays, fuel quality issues, or OSH procedure violations can lead to delays, additional costs, and reputational damage. This study emphasizes the importance of consistent OSH implementation, crew competency enhancement, and optimized coordination among stakeholders to ensure safe, timely, and efficient bunkering services, thereby supporting sustainable vessel operational efficiency. This research employs a quantitative method, SEM-PLS, with 57 respondents. The results indicate that customer satisfaction mediates the relationships between service quality and occupational safety and health, thereby influencing the smooth operation of ships.

Keyword: Service Quality, Occupational Safety And Health, Customer Satisfaction, Smooth Ship Operations.

INTRODUCTION

Occupational Safety and Health (OSH) is a vital aspect in the shipping industry and a top priority for crew members in carrying out their duties on board. The implementation of OSH aims to create a safe working environment, prevent accidents, and protect workers, the environment, and company assets. In practice, OSH covers not only individual safety, but also the safety of others and the working environment. However, the field shows that many crew members work only to fulfill their obligations, without adequate awareness of the importance of their own safety and that of their colleagues. Therefore, the involvement of relevant agencies

and shipping companies is essential to optimizing occupational safety by ensuring that the ship's crew complies with safety procedures and follows applicable operational standards.

In the context of regulations, the implementation of OSH on ships is governed by various national and international regulations. At the national level, there is Minister of Transportation Regulation No. 45 of 2012 concerning Ship Safety Management and Law No. 17 of 2008 concerning Shipping. At the international level, occupational safety standards are regulated through the International Safety Management (ISM) Code and Safety of Life at Sea (SOLAS) 1974. These regulations have the same global objectives: to prevent and reduce maritime accidents and to ensure the safety of all ship crews and the maritime environment. The government, together with the International Maritime Organization (IMO), also encourages shipping companies to focus more on safety through the slogan "Safe, Secure, Efficient Shipping on Clean Oceans," which emphasizes safety, security, efficiency, and protection of the marine environment.

One of the main activities in ship operations that requires strict K3 implementation is bunkering, the process of refueling ships. Bunkering is an integral part of ship logistics and plays a crucial role in maintaining smooth shipping operations. Minor disruptions in the bunkering process, such as delays, distribution errors, or fuel quality discrepancies, can significantly impact ship port stay times, shipping schedules, and operational cost efficiency. Delays in bunkering services, long queues, and poor coordination among fuel suppliers, port operators, and ship operators often lead to decreased operational efficiency and increased direct and indirect costs, such as demurrage and voyage rescheduling (Nguyen et al., 2022).

The dimensions of service quality in bunkering activities include reliability, responsiveness, tangibles, and assurance. Reliability reflects the service's ability to deliver fuel on time and in accordance with specifications. Responsiveness refers to the speed with which officers handle requests and respond to changes in circumstances. Tangibles include the condition of port facilities, fuel transfer equipment, and the cleanliness of the work area, while assurance covers the competence and compliance of officers with safety procedures. In practice, common problems include supply delays due to ship congestion, substandard fuel quality, and slow administrative documentation, all of which slow the clearance process. These conditions lower users' perception of the quality of bunkering services and may encourage ship operators to switch to other ports or suppliers (Daniel, 2018).

Bunkering activities also carry high potential risks, including fire hazards, fuel spills, exposure to hazardous vapors, and workplace accidents during fuel transfer. Cases such as disregard for safety procedures to speed up work processes, lack of coordination among ships, barges, and ports, and limited emergency facilities demonstrate the weak implementation of OHS management systems. Therefore, implementing international safety guidelines, such as the International Safety Guide for Oil Tankers and Terminals (ISGOTT), the International Code of Safety for Ships using Gases or other Low-flashpoint Fuels (IGF Code), and the Simultaneous Operations (SIMOPs) Guidelines, is essential to minimize risks. Risk assessments such as Hazard Identification (HAZID) and Quantitative Risk Assessment (QRA) are also recommended to identify potential hazards and formulate mitigation strategies.

Implementing an occupational health and safety (OHS) management system is not only a legal obligation but also part of a company's social responsibility. Standards such as ISO 45001:2018 emphasize that OHS encompasses systematic efforts to ensure and protect worker safety by preventing accidents and occupational diseases. In addition, the Minister of Manpower Decree No. 463/Men/1993 emphasizes the importance of the safe and efficient management of production resources, while Law No. 13 of 2003, Article 87, requires every company to implement an OHS management system integrated into company management. However, challenges in the field remain significant. Some workers do not understand occupational risks, do not use personal protective equipment (PPE), or ignore safety procedures due to insufficient training and limited self-awareness.

In the context of port and bunkering services, customer satisfaction (especially among ship owners, operators, and agents) is an important mediating variable between service quality and OSH implementation, supporting the smooth operation of ships. Customer satisfaction is achieved when the services provided meet or exceed expectations, both in technical terms (timeliness, fuel quality) and non-technical terms (communication, staff attitude, administrative speed, and information transparency). High customer satisfaction creates trust and loyalty, encouraging continued use of the same port services. In the long term, this improves operational efficiency, streamlines sailing schedules, and strengthens the company's reputation.

Smooth ship operations are the main objective of implementing K3 and improving service quality. This smoothness is measured by indicators such as bunkering service time, delays in arrival and departure schedules (ETA/ETD), the frequency of technical disruptions, and the number of post-bunkering incidents. If one factor fails such as fuel delays, contamination, or workplace accidents the entire sailing schedule can be disrupted, costs can increase, and the company's reputation can decline. Therefore, operational smoothness must be maintained through integrated supply chain management, stakeholder coordination, and a work culture oriented towards safety and efficiency.

For example, the Port of Singapore has become a model international port by implementing the highest standards in safety and efficiency of bunkering services. Bunker vessels at this port are designed with high safety systems and technical equipment to minimize the risk of collisions and fuel spills. The types of fuel supplied include Marine Fuel Oil (MFO), Marine Diesel Oil (MDO), and Lubricating Oil (LO). These advantages make the Port of Singapore one of the world's best-reputed ports, as well as a concrete example that implementing K3, service quality, and high customer satisfaction can go hand in hand to achieve operational efficiency and ship safety. Overall, integrating K3 implementation, service quality improvement, and customer satisfaction initiatives is key to maintaining smooth ship operations. Success in these areas not only ensures work safety and shipping efficiency but also strengthens the competitiveness of shipping companies in the increasingly competitive global maritime industry, which demands high safety standards.

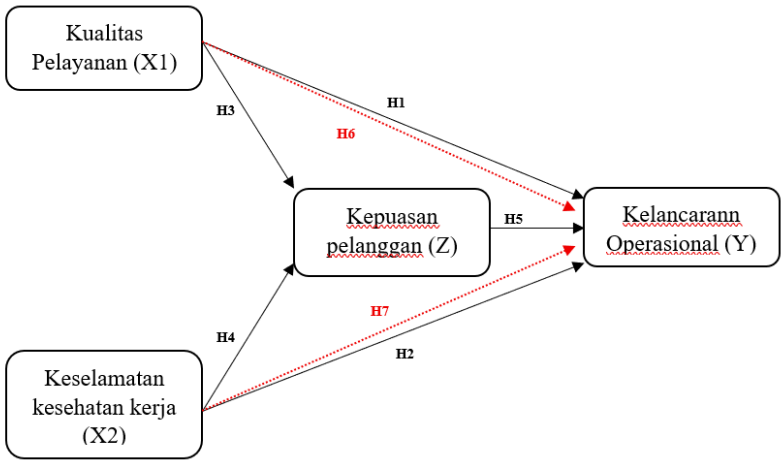


Figure 1 Constellation Of Variable Relationships

Hypotheses

1. Service quality has a significant effect on the operational smoothness of the MT Savvy during bunkering.
2. Occupational health and safety (OHS) has a significant effect on the operational smoothness of the MT Savvy during bunkering.
3. Service quality has a significant effect on MT Savvy customer satisfaction during bunkering.

4. Occupational health and safety (OHS) has a significant effect on MT Savvy customer satisfaction during bunkering.
5. MT Savvy customer satisfaction has a significant effect on the smooth operation of the ship during bunkering.
6. Service quality has a significant effect on the smooth operation of the ship through the satisfaction of MT Savvy customers during bunkering.
7. Occupational health and safety (K3) has a significant effect on the smooth operation of the ship through the satisfaction of MT Savvy customers during bunkering.

METHOD

This research was conducted on board the MT Savvy, which was conducting bunkering services in Singapore's waters and ports from May to July 2025. The location was chosen for its high level of bunkering activity in the Singapore port area, one of the world's busiest international maritime hubs. The research period was aligned with the ship's operational schedule to avoid interfering with bunkering activities, covering the initial observation stage, data collection via questionnaires and interviews, and data processing and analysis to produce a comprehensive research report.

The population in this study comprised 67 respondents directly or indirectly involved in the bunkering process, including captains, ship officers, crew members (ABK), and bunker officers from fuel supply companies. The sampling technique used was purposive sampling, which involves selecting respondents based on specific criteria, such as having at least one experience bunkering the MT Savvy ship and understanding the applicable operational procedures. Based on calculations using the Slovin formula (Ramadhani & Bina, 2021) with a 5% margin of error, the sample size was determined to be 57 respondents. This technique was chosen to ensure that the data obtained were accurate, relevant, and representative of field conditions.

In collecting data, the researchers used three main techniques: observation, literature review, and questionnaires. Observations were made to directly record behavior, work situations, and the implementation of bunkering activities in the field. Literature research was conducted to establish a theoretical basis using scientific references, including journals, books, and related literature. Meanwhile, questionnaires were used to collect quantitative data from respondents, both directly and via an online platform (Google Forms), in coordination with the port terminal to ensure efficient, targeted distribution.

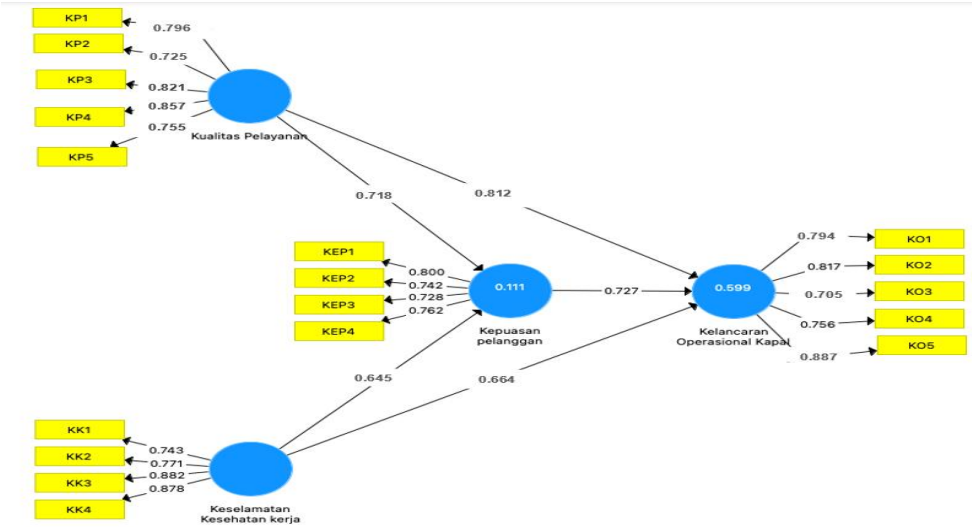
The data analysis used a quantitative approach with Smart PLS (Partial Least Squares) software. This method was chosen because it offers high flexibility in analyzing the relationships among latent variables and does not require the assumption of normal data distribution. Smart PLS can handle models with small sample sizes and both reflective and formative indicators simultaneously. The analysis was carried out using two main models: the outer model (measurement model) and the inner model (structural model). In the outer model, convergent validity was tested (using a factor loading > 0.7 as the criterion), discriminant validity was tested (using cross-loadings and Average Variance Extracted [AVE] values), and construct reliability was tested using Cronbach's Alpha and Composite Reliability, with a minimum limit of 0.7. Meanwhile, in the inner model, the relationship between latent variables was assessed using R-square and Q-square values, and path significance (t-statistics) was used to determine direct and indirect effects

Table 1 Instrument Grid

No	Variables	Indicator	Item Number	Quantity
1	Service Quality	*Reliability*	1	5
		Responsiveness	2	

	(Berry & Parasuraman, 1998)	*Assurance*	3	
		Empathy	4	
		Tangibles	5	
2	Occupational Health and Safety (Rosento et al., 2021)	Provision of safety training	1	4
		Lighting	2	
		Availability of safety equipment	3	
		Workplace regulations	4	
3	User Satisfaction (Kusuma et al., 2015)	Satisfaction with access to services	1	4
		Satisfaction with ease of obtaining services	2	
		Satisfaction with the service process	3	
		Satisfaction with services	4	
4	Smooth Ship Operations (Subagyo et al., 2022)	Process Timeliness	1	5
		Document and Administrative Readiness	2	
		Safety and Procedure Compliance (Safety Compliance)	3	
		Coordination and Communication	4	
		Minimal Operational Disruptions	5	

RESULTS AND DISCUSSION



Source: Data processing results, using SmartPLS 4 software.

Figure 2 Output of the Partial Least Squares (PLS) program processing on the appendix page

Table 2 Testing the Direct & Indirect Output Effects of Partial Least Squares

	Original Sample	*Standard Deviation*	*T Statistics*	*P-values (1 Tail)*	Conclusion

Service Quality -> Ship Operational Smoothness **H1**	**0,812**	0,14	8,803	**0**	H1 Accepted/supported
Occupational Health and Safety -> Ship Operational Smoothness **H2**	**0,664**	0,101	7,633	**0**	H2 Accepted/supported
Service Quality -> Customer Satisfaction **H3**	**0,718**	0,173	8,601	**0**	H3 Accepted/supported
Occupational Health and Safety -> Customer Satisfaction **H4**	**0,645**	0,146	7,989	**0**	H4 Accepted/supported
Customer satisfaction -> Ship Operational Smoothness **H5**	**0,727**	0,091	8,008	**0**	H5 Accepted/supported
Service Quality -> Customer satisfaction -> Ship Operational Smoothness **H6**	**0,715**	0,13	8,552	**0**	H6 Accepted/supported
Occupational Health and Safety -> Customer Satisfaction -> Ship Operational Smoothness **H7**	**0,605**	0,115	6,914	**0**	H7 Accepted/supported

The Effect of Service Quality on Ship Operational Smoothness

Based on the study's results, Service Quality has a positive and significant effect on Ship Operational Smoothness. This means that the better the quality of service provided, the smoother the ship's operational activities will be. Fast, accurate, friendly, and procedural services can minimize work obstacles, speed up operational processes, and ensure that ship activities run according to schedule and safety standards.

This confirms that service quality is an important factor in supporting the efficiency and effectiveness of ship operations. These results align with Siahaan's (2015) findings, which indicate that the quality of ship services significantly affects dock productivity, such that optimal bunker services not only improve safety but also ensure ships' readiness for subsequent operations.

The Effect of Occupational Health and Safety on the Smooth Operation of Ships

The results of the study show that Occupational Health and Safety (OHS) has a positive and significant effect on the smooth operation of ships. The better the implementation of OHS, such as compliance with safety procedures, the use of personal protective equipment (PPE), and adequate training and supervision, the smoother the ship's operational processes will be. Optimal implementation of OSH has been proven to reduce the risk of workplace accidents,

maintain crew health, and create a safe working environment, enabling activities such as loading, unloading, and refueling to proceed without significant obstacles.

Thus, OSH not only serves as a preventive measure against potential hazards but also plays a key role in increasing efficiency, maintaining operational stability, and boosting overall ship productivity. These findings align with a study (Murtadha & Ratni, 2024) that shows that implementing K3 through the HIRADC method in the tugboat bunker process enhances ships' readiness to operate effectively and safely.

The Effect of Service Quality on Customer Satisfaction

The study's results show that Service Quality has a positive and significant effect on Customer Satisfaction. This means that the higher the service provider's quality of service, the greater the level of customer satisfaction. Fast, accurate, friendly, and customer-oriented service can create a positive experience, increase trust, and strengthen customer loyalty to the company. These findings confirm that service quality is a significant factor in building and sustaining customer satisfaction, so companies need to maintain consistent service standards to sustain long-term customer relationships. These results also align with research (Fitriani et al., 2024), which shows that the Responsiveness dimension has the most significant influence on consumer satisfaction, followed by Assurance, Tangibles, Empathy, and Reliability, confirming the importance of speed and responsiveness in service delivery for overall customer satisfaction.

The influence of occupational health and safety on customer satisfaction

The results of the study show that Occupational Health and Safety (OHS) has a positive and significant effect on Customer Satisfaction. The better the implementation of the OHS system, such as compliance with international safety standards, the use of personal protective equipment (PPE), and the implementation of safe work procedures, the higher the level of customer satisfaction.

Optimal OSH implementation not only protects workers from potential hazards but also creates a sense of security, comfort, and trust among customers in the services they receive. This shows that safety aspects play an important role in shaping customers' positive perceptions of overall service quality. Thus, companies need to maintain consistent OSH implementation to improve service reliability and strengthen customer relationships. These findings are in line with research (Murtadha & Ratni, 2024) that indicates that implementing K3 through the HIRADC method in the tugboat bunker process significantly reduces potential work risks, increases a sense of safety, and positively impacts the level of satisfaction of bunker service users.

The Effect of Customer Satisfaction on Ship Operational Smoothness

The results of the study indicate that customer satisfaction has a positive and significant effect on ship operational smoothness. This means that the higher the level of customer satisfaction with the services provided, the smoother the ship's operational processes will be. High customer satisfaction reflects trust, comfort, and practical cooperation between service users and service providers, enabling various activities such as administration, loading and unloading, and bunker filling to be carried out more efficiently and without significant obstacles.

These findings confirm that customer satisfaction plays an important role in creating a harmonious working climate and supports the achievement of overall operational effectiveness and efficiency of ships. Thus, increasing customer satisfaction not only improves service relationships but also directly contributes to the stability and smooth running of operational activities. These results align with research (Basri et al., 2024), which indicates that improving service quality and customer satisfaction are key drivers of the Company's performance and productivity.

The Effect of Service Quality through Customer Satisfaction on Ship Operational Smoothness

The results of the study show that Service Quality has a positive and significant effect on Ship Operational Smoothness through Customer Satisfaction as a mediating variable. This means that improving service quality not only has a direct impact on operational smoothness, but also creates a more substantial indirect effect when the quality of service is able to increase customer satisfaction first. Customer satisfaction acts as a bridge, strengthening the relationship between service providers and service users, encouraging better communication, and reducing potential operational obstacles. These results align with research (Hakim et al., 2023) showing that service quality positively affects customer satisfaction, and that customer satisfaction plays an important role in improving operational efficiency in the shipping sector. Thus, it can be concluded that customer satisfaction is a mediating factor that strengthens the relationship between service quality and ship operational smoothness.

The Effect of Occupational Health and Safety through Customer Satisfaction on Ship Operational Smoothness

The results of the study show that Occupational Health and Safety (OHS) has a positive and significant effect on ship operational smoothness through Customer Satisfaction as a mediating variable. This means that the optimal implementation of OHS not only has a direct impact on operational smoothness but also exerts a more substantial indirect effect by first increasing customer satisfaction.

A safe working environment, the implementation of safety procedures in accordance with standards, and the protection of crew and personnel involved in the service process create a sense of security, comfort, and trust from customers. Customers who feel confident in the company's commitment to safety tend to be more satisfied with the services provided, and this satisfaction directly contributes to the smooth operation of ships. The results of this study are in line with (Murtadha & Ratni, 2024), which states that the implementation of K3 through the HIRADC method in the tugboat bunker process can significantly reduce work risks, increase the sense of security of service users, and have a positive impact on operational smoothness through increased customer satisfaction with the services provided.

CONCLUSION

Based on the study's results, Service Quality and Occupational Health and Safety (OHS) have a positive and significant effect on the smooth operation of ships, both directly and indirectly through Customer Satisfaction as a mediating variable. Fast, accurate, friendly, and procedure-compliant services have been proven to minimize operational obstacles, increase time efficiency, and ensure that ship activities run according to schedule and safety standards. Meanwhile, the optimal implementation of OSH not only protects the crew from workplace accidents but also creates a safe, comfortable working environment, ultimately increasing productivity and customer trust.

In addition, customer satisfaction is an important factor that strengthens the relationship between service quality and OSH in enhancing ship operational smoothness, as satisfied customers tend to trust and support the Company's operational continuity.

In terms of policy implications, this study emphasizes the importance of implementing service standardization, strict K3 regulations, a continuous performance evaluation system, and integrating customer satisfaction surveys as key indicators in vessel operational management policies.

On a practical level, the results of this study guide shipping companies in improving service quality, strengthening OSH implementation, proactively managing customer satisfaction, and building synergy between operational and administrative teams. Theoretically,

this study reinforces the causal model in SERVQUAL and customer satisfaction theories in the maritime sector, showing that customer satisfaction acts as a significant mediator between service, OSH, and operational smoothness. Furthermore, this research enriches academic understanding by integrating perspectives on occupational safety and service quality into a more comprehensive theoretical framework for the development of operational management in the shipping industry.

REFERENCE

Basri, R., Said, M., & Yunus, Muh. K. (2024). PENGARUH KEPUASAN PELANGGAN DAN KUALITAS PELAYANAN TERHADAP KINERJA PERUSAHAAN PADA PT PLN (PERSERO) ULP MATTIROTASI. Indonesian Journal of Business and Management, 7(1), 95–100. https://doi.org/10.35965/jbm.v7i1.5241

Berry, L. L., & Parasuraman, A. (1998). SERVQUAL: A Multiple-Item Scale for Measuring Consumer Perceptions of Service Quality.

Daniel, C. O. (2018). EFFECTS OF MARKETING STRATEGIES ON ORGANIZATIONAL PERFORMANCE. Www.Ijbmm.Com International Journal of Business Marketing and Management, 3, 2456–4559. www.ijbmm.com

Fitriani, R., Fashandika, E., Putra, E., Nailah, H., Ma'ruf, & Permana, R. (2024). Pengaruh Kualitas Pelayanan Kapal Reguler terhadap Kepuasan Pelanggan pada Pelabuhan Bakauheni. Bisman:, 7(2), 315.

Hakim, M. F. A., Ardansyah, & Patmarina, H. (2023). Pengaruh Kualitas Pelayanan dan Lingkungan Kerja Terhadap Kepuasan Pelanggan Kapal Mutiara Berkah 1. Jurnal EMT KITA, 7(3), 688–695. https://doi.org/10.35870/emt.v7i3.1188

Kusuma, N. W., Poli, S., & Setiono, B. A. (2015). Pengaruh Kualitas Pelayanan Jasa Pemanduan Terhadap Kepuasan Pelanggan di PT Pelabuhan Indonesia III (Persero) Cabang Tanjung Perak Surabaya. Jurnal Aplikasi Pelayaran Dan Kepelabuhanan.

Murtadha, M. D., & Ratni, N. (2024). Analisis Risiko Keselamatan dan Kesehatan Kerja (K3) pada Proses Bunker Kapal Tunda (Tug Boat) di PT. Pelindo Marine Service. Venus: Jurnal Publikasi Rumpun Ilmu Teknik, 2(1), 184–199. https://doi.org/10.61132/venus.v2i1.112

Nguyen, T. Q., Ngo, L. T. T., Huynh, N. T., Le Quoc, T., & van Hoang, L. (2022). Assessing port service quality: An application of the extension fuzzy AHP and importance-performance analysis. PLoS ONE, 17(2 February). https://doi.org/10.1371/journal.pone.0264590

Ramadhani, R., & Bina, N. S. (2021). Statistika Penelitian Pendidikan: Analisis Perhitungan Matematis dan Aplikasi SPSS. Prenada Media. https://www.google.co.id/books/edition/Statistika_Penelitian_Pendidikan_Analisi/0WFHEAAAQBAJ?hl=en&gbpv=0

Rosento, Y., R., H., E. P., & Nursanty, S. (2021). Pengaruh Keselamatan Dan Kesehatan Kerja (K3) Terhadap Produktivitas Kerja Karyawan. JURNAL SWABUMI, 9(2).

Siahaan, W. J. (2015). THE QUALITY OF SHIP SERVICES AND LOADING / UNLOADING TIME DUE TO CONTAINER HARBOR PRODUCTIVITY AT THE PORT OF MAKASSAR. Warta Penelitian Perhubungan, 27(5).

Subagyo, H., Ketut, I., Adnyana, R., & Setiawan, E. B. (2022). Pengaruh Implementasi Sap Dan Pengelolaan Persediaan Terhadap Kelancaran Operasional Kapal Melalui Kinerja Pembelian. Jurnal Bisnis, Ekonomi, Manajemen, Dan Kewirausahaan, 2. https://abnusjournal.com/jbemk.