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The Strategy for Preventing Delays in the Crew Change Process on the Fleet of PT Satrya Maritim Indonesia

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ABSTRACT

Crew change is a time-sensitive operational process in which personnel readiness, immigration documentation, and vessel schedules must be coordinated. This study identifies the causes and consequences of crew change delays at PT Satrya Maritim Indonesia and formulates practical preventive strategies. A descriptive qualitative approach was used, drawing on field observations, semi-structured interviews with crewing personnel and seafarers, and company documents. The material was interpreted through thematic coding, categorisation, cross-source comparison, and member checking. The findings indicate that delays arose from internal weaknesses, particularly an insufficient pool of deployment-ready standby crew, rotation planning close to sign-off dates, incomplete certificates, and administrative coordination problems. External constraints included lengthy visa and work-permit processing, changing immigration requirements, transport disruptions, and client-specific deployment rules. Reported consequences included additional costs, interrupted vessel schedules, prolonged assignments, and fatigue-related risks. The study recommends earlier rotation planning with contingency time, a regularly validated standby-crew database, an integrated digital crew management system, clear responsibility for document verification, and closer coordination with agents and clients. These are proposed organisational controls; their effectiveness was not quantitatively tested in this case study.

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1. INTRODUCTION

Efficient crew deployment is fundamental to safe and continuous maritime operations, particularly for offshore fleets that depend on time-sensitive service commitments. A crew change is not a single transfer but a coordinated sequence of workforce planning, qualification checks, medical clearance, immigration approvals, travel arrangements, client authorisation, and handover at the vessel. Delays in any link of this sequence can disturb the vessel's operating schedule and undermine the readiness of the personnel assigned to it. Research on offshore logistics and maritime safety indicates that reliable operations require coordination between organisational resources, external service providers, and the human element (El-Thalji, 2024; Ma et al., 2023; Mba, 2025; Veltsin et al., 2025).

Seafarer rotation also has a regulatory and occupational safety dimension. The Maritime Labour Convention, 2006 establishes standards for seafarers' employment and welfare, while the International Maritime Organization (IMO) and International Labour Organization (ILO) provide guidance on recording shipboard working and rest arrangements. These provisions are relevant when replacement personnel cannot reach a vessel at the end of the scheduled assignment. Extended service does not, by itself, demonstrate a breach of rest-hour rules; however, repeated extensions can complicate fatigue management, contractual compliance, and the planning of safe handovers (International Labour Organization [ILO], 2006; International Maritime Organization [IMO] & ILO, 2010; IMO, 2019).

The relationship between fatigue and maritime safety is well established. A systematic review by Dohrmann and Leppin (2017) identified demanding work patterns and limited opportunities for recovery among the determinants of seafarers' fatigue. Jepsen et al. (2015) similarly emphasised the consequences of fatigue for health, cognition, and safety, while Kerkamm et al. (2022) reviewed the complexity of assessing sleepiness and sleep behaviour on board ships. Bhatia (2024) also examined the implementation of shipboard work/rest provisions. These findings support treating crew replacement arrangements as a preventive organisational control rather than an exclusively administrative matter.

International experience has demonstrated how dependent crew change is on external permissions. The COVID-19 border restrictions disrupted seafarer repatriation and replacement across multiple jurisdictions, exposing operational and humanitarian risks when personnel mobility is interrupted (De Beukelaer, 2021; Luchenko & Georgiievskyi, 2021; Borovnik, 2024). Joint statements by the IMO, ILO, and International Civil Aviation Organization also called attention to the need for practical pathways to crew replacement. Although the pandemic was exceptional, visa lead times, changes in entry requirements, air transport disruptions, and port accessibility remain relevant during normal operations (IMO et al., 2020; ILO, 2022).

Studies on the management of shipping personnel show the importance of advance planning and document validity. Ricardianto et al. (2023) discussed vessel crew rotation during the pandemic, whereas Maharani et al. (2025) examined crew replacement documentation in an Indonesian shipping company. Pangayuh et al. (2025) associated crew change processes with vessel operational continuity, while Putri and Supriyanta (2025) addressed the relationship between crew change planning and employment contract mismatches. Related work on maritime digitalisation suggests that integrated crewing records can help organisations monitor personnel qualifications and coordinate replacement assignments more systematically (Purnaningratri et al., 2025; Rapika et al., 2025).

PT Satrya Maritim Indonesia, located in Batam, provides crew management services for offshore vessel operations. According to the case material, the company has experienced crew change delays associated with limited ready-to-deploy standby personnel, incomplete or expiring certificates, short planning lead times, and delayed documentation for overseas assignments. Changes in immigration requirements and transportation schedules have added uncertainty, particularly for assignments involving Brunei Darussalam and client-specific requirements. These organisational and cross-border constraints warrant closer examination because their combined influence may be more significant than any single administrative error.

The research gap addressed in this paper is the distance between identifying the sources of delay and designing an operationally usable prevention process. Many discussions of crew change identify causes or describe a crisis, but the case organisation requires a coordinated set of controls that specifies who prepares each document, when a replacement should be initiated, how standby readiness is verified, and how unexpected external delays are escalated. This study therefore aims to identify internal and external causes of crew change delays at PT Satrya Maritim Indonesia, describe their reported operational consequences, and formulate a practical prevention strategy based on the qualitative evidence. The intended contribution is a risk-oriented management framework for crew rotation, not a claim that the proposed controls have already been validated experimentally.

2. LITERATURE REVIEW

Crew change management can be understood as a planning-and-control process that connects personnel availability with vessel demand. Strategic management theory emphasises the alignment of organisational resources, capabilities, and operational requirements to achieve sustained performance (Hitt et al., 2013). Applied to crewing, this perspective suggests that a company needs more than a list of available seafarers: it needs reliable information about competence, valid credentials, medical fitness, contract dates, and deployment constraints. The absence of a suitable replacement may reflect weaknesses in demand forecasting and readiness verification rather than only a shortage of names in a database.

Quality management provides a complementary basis for improving administrative reliability. The continuous-improvement principles discussed by Sallis (2002) focus attention on standardised procedures, the identification of recurring process defects, and periodic review. In maritime crew management, these principles can be operationalised through documented checklists, milestone deadlines, exception reporting, and corrective-action reviews. They also

encourage separating controllable failures, such as missing certificates or late ticket bookings, from external contingencies, such as changes to immigration requirements.

Maritime operations depend on networks of agents, clients, ports, transport providers, and public authorities. Studies of maritime transport resilience and shipping delays indicate that external shocks and interruptions are best addressed through preparedness, coordination, and adaptive planning rather than by assuming that every planned movement will occur on schedule (Lau et al., 2024; Muhamad & Salleh, 2024; Sun et al., 2025). The case of overseas crew deployment is especially sensitive to the processing time of work permits, visas, and travel authorisations, all of which may fall outside a crewing company's direct control.

The consequences of crew change disruption extend beyond direct transaction costs. Where assignments are prolonged, fatigue may reduce alertness and affect work quality; where replacement is delayed, a vessel may need to rearrange watch schedules or negotiate with a client. Ma and Liao (2025) surveyed factors associated with seafarer fatigue, and Karmeli (2025) discussed the wider consequences of schedule unreliability in liner shipping. These studies support considering safety and operational performance alongside financial cost, while acknowledging that the present case does not provide measured fatigue scores or an audited monetary loss estimate.

Digital crew management systems may strengthen this process by providing a single updated status for employment records, training certificates, documents, readiness, and crew change milestones. Indonesian studies describe opportunities for digital crewing systems and the administrative limitations of fragmented practices (Purnaningratri et al., 2025; Rapika et al., 2025). Nevertheless, technology does not replace organisational accountability. Database quality, responsibility for updates, and timely escalation of incomplete records determine whether digitalisation produces more dependable crew change decisions.

3. METHODS

3.1. Research Design and Setting

The study employed a descriptive qualitative case-study design to examine crew change delays in the operational setting of PT Satrya Maritim Indonesia, Batam. The case-centred approach was selected to interpret reported experiences, administrative workflows, and interactions with parties involved in crew deployment. It was not designed to estimate a population-wide delay rate or to test statistical associations among variables. The study's analytical focus was the process from rotation planning to completion of crew replacement.

3.2. Participants and Data Sources

The source article identifies personnel from the crewing department, seafarers involved in crew replacement, and external stakeholders, including agents handling visas or work permits and immigration-related processes, as relevant sources. Data collection consisted of participatory observation, semi-structured interviews, and document review. The documentary material included crew administration records, operational reports, and records concerning delayed crew replacement. Because the supplied manuscript does not state a verified number of interviewees, interview dates, or a complete sampling frame, this revision does not introduce those details.

3.3. Collection and Analysis Procedures

During observation, the researcher followed crew change administration, the preparation of replacement personnel, and coordination between company staff and external parties. Semi-structured interviews explored perceived causes of delay, consequences for vessels and personnel, and possible responses. Documentary review was used to compare reported issues with available administrative records. The data were grouped into internal factors, external factors, consequences, and preventive measures through iterative thematic coding and categorisation. The resulting themes were interpreted within the operational context rather than treated as numerical frequencies.

3.4. Credibility and Analytical Limitations

The original study describes source triangulation, comparison between interviews and documents, transcript or note verification, and member checking as techniques used to improve credibility. These procedures were retained in the methodological account, but their extent cannot be independently determined from the manuscript. The analysis therefore differentiates observations and statements reported in the case from management proposals derived from those findings. The lack of consistent time-to-approval figures, delay frequencies, audited cost records, and systematically measured fatigue outcomes limits quantitative judgments about the size of particular problems.

4. RESULTS AND DISCUSSION

4.1. Internal Causes of Crew Change Delays

The case material identifies an insufficient pool of deployment-ready standby personnel as one of the main internal constraints. Although potential replacement crew may be listed, some are not immediately deployable because certificates are incomplete or approaching expiry, required medical clearances remain outstanding, or availability has not been confirmed.

The operational problem is therefore both numerical and informational: the company needs to know which crew members meet the exact requirements of a vacancy at the time a replacement is needed. This finding is consistent with the importance of documenting certification and eligibility in crew replacement operations (Maharani et al., 2025; Sulistiana et al., 2025).

A second weakness concerns the timing of crew rotation preparation. Interviews described cases in which arrangements were initiated too close to the anticipated sign-off or replacement date, leaving little time for medical checks, certificates, visas, and travel reservations. When an external approval then requires more time than expected, the company has limited capacity to recover without extending the assignment or changing the vessel schedule. The problem is not merely a late administrative task: it indicates a planning system that fails to incorporate predictable processing requirements and a contingency buffer.

The source also describes weak monitoring of former crew members who have completed an assignment. Without regular updates to the availability and qualification status of these personnel, staff may discover too late that a named replacement cannot be mobilised. Administrative errors in documentation, certification verification, and transportation booking can compound this risk. Such errors are potentially controllable through better status visibility, division of responsibilities, and standard verification checkpoints before final deployment approval.

4.2. External Constraints on Personnel Deployment

External constraints are particularly evident for overseas assignments. The study reports prolonged visa and work permit processing for deployment involving Brunei Darussalam, along with the need to respond to changes in immigration requirements. Because approval is issued by external authorities, a crewing company cannot guarantee the completion date. It can, however, begin preparation earlier, follow an agreed documentary checklist, maintain contact with the responsible agent, and track the progress of each application. The international crew change crisis demonstrated why the management of cross-border permissions deserves explicit attention (De Beukelaer, 2021; Luchenko & Georgiievskyi, 2021).

Transport disruptions are another external factor. The case material associates late arrival at a vessel with weather-related flight delays and difficulties in arranging travel connections. A replacement who has valid documents may still be unable to meet the planned vessel if the travel sequence is too tight. Offshore logistics research and a review of maritime transport resilience highlight the value of coordinated logistics and contingency planning in these circumstances (El-Thalji, 2024; Lau et al., 2024).

Client-specific deployment conditions further restrict scheduling flexibility. The manuscript cites Brunei Shell Petroleum (BSP) as an example of a client with particular limitations on crew assignments and duty periods. The company must account for such requirements early in the planning stage rather than treating them as a final administrative check. The specific contractual requirements were not attached to the supplied article and are therefore reported as part of the case account, not independently verified contractual provisions.

4.3. Operational, Financial, and Human Impacts

The research reports that delays can result in client penalties, additional mobilisation expenditure, interrupted vessel schedules, and pressure on crew members required to remain on board beyond the planned end of assignment. Such impacts can reinforce one another: an unsuccessful mobilisation may trigger a costly rearrangement, while a delayed replacement may force changes to operational manning arrangements. The manuscript does not quantify total penalties or specify the number of vessel days lost, so these should be understood as reported consequences rather than measured aggregate losses.

The human element is important because extended assignments can increase demands on individuals and complicate fatigue management, even where formal rest periods continue to be observed. Fatigue literature associates inadequate recovery opportunities and demanding work schedules with reduced alertness and other safety concerns (Jepsen et al., 2015; Dohrmann & Leppin, 2017; Ma & Liao, 2025). A sound crew change strategy should therefore include monitoring of contract end dates and escalation when projected replacement dates threaten to extend service materially.

Table 1. Reported sources of crew change delay and their operational implications

Category	Observed issue	Implication	Preventive control
Internal	Limited standby readiness	Few immediately qualified/available replacements	Validate standby pool and certificate status
Internal	Late rotation planning	Insufficient time for documents and transport	Set advance milestones and contingency buffer
Internal	Weak former-crew monitoring	Uncertainty about return-to-duty readiness	Review availability and medical/certificate status
Internal	Administrative errors	Rework in documentation or booking	Checklists and named approval owner
External	Visa and work-permit delays	Replacement cannot be mobilised as planned	Early submission and progress tracking
External	Changing immigration requirements	Previously prepared files may require revision	Agent coordination and regulatory alerts

Category	Observed issue	Implication	Preventive control
External	Weather-related transport disruption	Missed travel connections and delayed arrival	Alternative itinerary and travel buffer
External	Client-specific requirements	Restricted flexibility in replacement dates	Early confirmation with vessel/client

Table 1 brings together the internal and external themes reported in the case and links each to a plausible preventive control. The table should not be interpreted as a statistical ranking; the research does not provide frequencies of occurrence, measured delays for each factor, or comparative cost estimates. Its value lies in distinguishing factors within the company's direct control from factors that require contingency management and inter-organisational coordination.

4.4. Proposed Prevention Framework

A primary recommendation is to introduce a structured crew change timeline. Planning should start well before the expected completion of a crew member's assignment and should include checkpoints for the replacement request, candidate identification, document validity, medical clearance, visa or work permit submission, travel booking, and confirmation of the vessel's location. The time allowed for each activity should be based on actual company experience and applicable client and authority requirements; this study does not establish universal lead times. The scheduling objective is to reveal constraints early enough to choose an alternative without disrupting the vessel.

The second recommendation is to strengthen the standby-crew database. Records should show each person's rank, competence, applicable certification, expiry dates, medical status, travel document status, previous assignments, and agreed availability. The database requires periodic validation because an apparently complete record is not sufficient evidence that a person is immediately ready to travel. A clear owner for each status update would help prevent outdated data from leading to a last-minute replacement failure. Prior work on crewing administration and digital systems provides support for improving record consistency (Maharani et al., 2025; Purnaningratri et al., 2025; Rapika et al., 2025).

Third, the company could implement a digital crew management system that supports automated expiry reminders, deployment checklists, document status tracking, and exception reporting. Digitalisation is likely to be most useful when connected to an explicit workflow: a missing certificate should trigger an assigned corrective task; an overdue visa should be escalated to a crewing supervisor and agent; and a missed transport connection should prompt a re-evaluation of vessel arrival and handover options. These functions are recommendations

inferred from the identified problems, not documented features of an existing PT Satrya Maritim Indonesia system.

Fourth, internal and external coordination should become a planned control rather than an improvised response to problems. The crewing department should agree on milestone responsibilities with administration and operations personnel, while agents and clients should receive timely confirmation of document requirements, vessel schedules, and expected personnel movements. Where a client sets special rules for assignments, the rules should be captured in the replacement checklist. These arrangements follow continuous-improvement principles and maritime resilience literature, which emphasise process visibility and preparedness (Sallis, 2002; Lau et al., 2024; Muhamad & Salleh, 2024).

The original manuscript suggested more flexible rotation arrangements, including a possible three-month-on/two-month-off pattern. Such a schedule may provide planning flexibility in some cases, but its suitability depends on employment agreements, minimum safe manning, vessel operating cycles, and client and regulatory requirements. This article therefore treats it as an option for case-by-case evaluation rather than a universal recommendation.



Figure 1. Strategic elements for the prevention of crew change delays (adapted from the source manuscript)

As summarised in Figure 1, the intended system links strategic planning, personnel readiness, data digitalisation, database monitoring, timetable control, and regular evaluation. The diagram is a proposed improvement cycle rather than evidence of an intervention already carried out. Its successful implementation would require measurable indicators, such as the proportion of crew changes completed by the planned date, document readiness before

mobilisation, the time spent obtaining approvals, and the frequency of assignments extended because a replacement was not ready.

4.5. Interpretation in Relation to Previous Research

The findings are broadly consistent with Indonesian research associating replacement administration, documentation, and coordination with successful crew deployment (Ricardianto et al., 2023; Maharani et al., 2025; Pangayuh et al., 2025). The attention given to certification readiness is also compatible with concerns raised about competency and certification gaps among some segments of the maritime workforce (Sulistiana et al., 2025). These studies do not prove the magnitude of delay at PT Satrya Maritim Indonesia, but they provide contextual support for prioritising credential management and early planning.

External factors in the case likewise resemble barriers documented in the literature on seafarer movement, ports, and shipping resilience. Restrictions on crew mobility during COVID-19 showed how institutional and transport dependencies can accumulate (De Beukelaer, 2021; Borovnik, 2024), and subsequent studies of maritime resilience have encouraged a shift from reactive decisions towards preparedness (Lau et al., 2024). In this study, that shift means maintaining alternative candidates and travel arrangements while ensuring that legal and medical requirements remain fully satisfied.

The link to fatigue also requires careful interpretation. The qualitative account reports longer assignments and concerns about reduced performance, but it does not present validated fatigue measurements, recorded work/rest violations, or a causal estimate of accident risk. The implications for crew welfare should therefore be considered a recognised risk requiring active monitoring, supported by broader fatigue evidence rather than a demonstrated clinical outcome in the participating fleet (Jepsen et al., 2015; Kerkamm et al., 2022; Ma & Liao, 2025).

4.6. Implementation Priorities and Monitoring

For practical implementation, the first priority is a verified register of upcoming sign-off dates and required replacement dates for the operating fleet. The second is a readiness review covering qualifications, documents, and medical status, together with a named person responsible for resolving each incomplete item. The third is a formal escalation procedure for external delays such as visas, client clearance, and travel disruption. The fourth is a regular performance review that records what caused each delay, how it was handled, and whether the preventive controls worked as intended.

A monthly management review could combine qualitative lessons with operational metrics generated by the crewing function. For example, the company could compare planned

and actual crew change dates, identify recurring sources of document rework, and review the proportion of shortlisted crew who were deployment-ready when contacted. Such monitoring would allow the proposed framework to evolve through documented continuous improvement. However, these indicators and review arrangements were not measured in the original study and should be established in a subsequent implementation stage.

5. CONCLUSION

This qualitative case study identifies crew change delays at PT Satrya Maritim Indonesia as the result of interacting internal and external constraints. Internal problems include a limited number of deployment-ready standby personnel, incomplete or expiring documents, late rotation planning, and insufficient coordination of crew records. External pressures include lengthy visa and work-permit processing, changes in immigration requirements, disruptions to transport, and client-specific deployment conditions. The source material reports operational rescheduling, additional costs, prolonged assignments, and concerns about crew fatigue as associated consequences.

The proposed response is a coordinated prevention system consisting of earlier rotation planning with contingency time, regular verification of standby-crew readiness, clear administrative responsibilities, digitally supported document and milestone monitoring, and more systematic communication with agents, clients, and relevant authorities. These recommendations aim to reduce avoidable late decisions and make external uncertainty visible sooner; they should not be interpreted as tested reductions in delay frequency.

Future work should evaluate the proposed controls against actual crew change records, including approval lead times, readiness rates, crew change punctuality, contract extensions, and documented cost impacts. Broader comparison across vessels and deployment jurisdictions would help determine which measures are most effective. The absence of complete quantitative records in the present case means that the conclusions concern identified process weaknesses and practical prevention priorities rather than generalisable effect sizes.

6. DECLARATIONS

Author contributions: M.A.P.N.: Conceptualization, Investigation, Data curation, Writing – original draft; A.S.: Methodology, Supervision, Writing – review & editing; R.R.R.: Validation, Supervision, Writing – review & editing. All authors have read and approved the final manuscript.

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Ethical approval: Not applicable. This case study did not involve clinical or experimental procedures on human participants; the interviews were conducted with the consent of the crewing personnel and seafarers involved, and their identities are kept confidential.

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REFERENCES

Bhatia, B. S. (2024). *Practice unveils weaknesses: Analysing the implementation of regulations on seafarers' work/rest hours*. World Maritime University.

Borovnik, M. (2024). Trapped in the COVID-19 pandemic: Seafarers and the global crew change crisis. *Asian and Pacific Migration Journal, 33*(1), 93–117. https://doi.org/10.1177/01171968241253850

De Beukelaer, C. (2021). COVID-19 border closures cause humanitarian crew change crisis at sea. *Marine Policy, 132*, Article 104661. https://doi.org/10.1016/j.marpol.2021.104661

Dohrmann, S. B., & Leppin, A. (2017). Determinants of seafarers' fatigue: A systematic review and quality assessment. *International Archives of Occupational and Environmental Health, 90*(1), 13–37. https://doi.org/10.1007/s00420-016-1174-y

El-Thalji, I. (2024). Exploring more sustainable offshore logistics scenarios using shared resources: A multi-stakeholder perspective. *Logistics, 8*(4), Article 101. https://doi.org/10.3390/logistics8040101

Hitt, M. A., Ireland, R. D., & Hoskisson, R. E. (2013). *Strategic management: Competitiveness and globalization*. Cengage Learning.

International Labour Organization. (2006). *Maritime Labour Convention, 2006*. https://www.ilo.org/international-labour-standards/maritime-labour-convention-2006

International Labour Organization. (2022). *Joint statement urging continued collaboration to address the crew change crisis, safeguard seafarer health and safety, and avoid supply chain disruptions*. https://www.ilo.org/resource/statement/joint-statement-urging-continued-collaboration-address-crew-change-crisis-0

International Maritime Organization, & International Labour Organization. (2010). *Guidelines for the development of tables of seafarers' shipboard working arrangements and formats of records of seafarers' hours of work or hours of rest*.

International Maritime Organization, International Labour Organization, & International Civil Aviation Organization. (2020). *IMO, ILO and ICAO joint statement on crew change and key workers*.

https://www.imo.org/en/MediaCentre/PressBriefings/pages/16-IMO-ICAO-ILO-jointstatement.aspx

International Maritime Organization, International Labour Organization, United Nations Global Compact, & Office of the United Nations High Commissioner for Human Rights. (2021). *Maritime human rights risks and the COVID-19 crew change crisis*. International Maritime Organization.

International Maritime Organization. (2019). *Guidelines on fatigue* (MSC.1/Circ.1598). International Maritime Organization.

Jepsen, J. R., Zhao, Z., & van Leeuwen, W. M. A. (2015). Seafarer fatigue: A review of risk factors, consequences for seafarers' health and safety and options for mitigation. *International Maritime Health, 66*(2), 106–117. https://doi.org/10.5603/IMH.2015.0024

Karmeli, J. (2025). Liner schedule reliability problem: An empirical analysis of disruptions and recovery measures in container shipping. *Logistics, 9*(4), Article 149. https://doi.org/10.3390/logistics9040149

Kerkamm, F., Dengler, D., Eichler, M., Materzok-Köppen, D., Belz, L., Neumann, F. A., Zyriax, B. C., Harth, V., & Oldenburg, M. (2022). Measurement methods of fatigue, sleepiness, and sleep behaviour aboard ships: A systematic review. *International Journal of Environmental Research and Public Health, 19*(1), Article 120. https://doi.org/10.3390/ijerph19010120

Lau, Y., Chen, Q., Poo, M. C.-P., Ng, A. K. Y., & Ying, C. C. (2024). Maritime transport resilience: A systematic literature review on the current state of the art, research agenda and future research directions. *Ocean & Coastal Management, 251*, Article 107086. https://doi.org/10.1016/j.ocecoaman.2024.107086

Luchenko, D., & Georgiievskyi, I. (2021). Administrative restrictions in ports: Practice of crew rotations during COVID-19 pandemic. *Lex Portus, 7*(3), 7–31. https://doi.org/10.26886/2524-101X.7.3.2021.1

Ma, M., & Liao, R. (2025). Factors affecting seafarers' fatigue: A scoping review. *Frontiers in Public Health, 13*, Article 1647685. https://doi.org/10.3389/fpubh.2025.1647685

Ma, X., Shi, G., & Liu, Z. (2023). Unraveling the usage characteristics of human element, human factor, and human error in maritime safety. *Applied Sciences, 13*(5), Article 2850. https://doi.org/10.3390/app13052850

Maharani, A., Dewi, A. M., & Priyanto. (2025). Analisis mekanisme replacement dan pengurusan dokumen crew dalam operasional kapal perusahaan Gurita Lintas Samudera. *Majalah Ilmiah Bahari Jogja, 23*(2), 167–178. https://doi.org/10.33489/mibj.v23i2.464

Mba, J. (2025). Advancing maritime operations sustainable practices and enhanced safety protocols for global shipping. *World Journal of Advanced Research and Reviews, 25*(1), 152–173. https://doi.org/10.30574/wjarr.2025.25.1.0028

Muhamad, I. N. N., & Salleh, S. S. (2024). Identifying delay factors in maritime operations: A case study of ship owner perspective. *International Journal of Academic Research in Business and Social Sciences, 14*(9), 261–275. https://doi.org/10.6007/IJARBSS/v14-i9/22318

Pangayuh, F. G., Siantur, I., Yudianto, P. Y., & Nofandi, F. (2025). Analisis proses crew change terhadap kelancaran operasional kapal. *Journal of Artificial Intelligence and Digital Business, 4*(2), 4384–4389. https://doi.org/10.31004/riggs.v4i2.1237

Purnaningratri, I., Novi, R., Setiawan, A., & Widhianingsih, E. N. (2025). The urgency of developing a crewing management system (CMS) for PT MCS Internasional in the era of maritime

digitalization. *Asian Journal of Social and Humanities, 4*(1), 2265–2272. https://doi.org/10.59888/3n7n4h62

Putri, E. S. P., & Supriyanta. (2025). Pengaruh crew change plan terhadap ketidaksesuaian kontrak kerja di PT MCS Internasional. *Logistics and Supply Chain Insights, 1*(1), 1–20. https://doi.org/10.65428/login.v1i1.5

Rapika, R., Sabila, F., & Siregar, N. (2025). Tantangan dan peluang dalam manajemen kru kapal di era digital pada PT Equinox Sentra Bahari Cabang Belawan. *Jurnal Adiguna Maritim Indonesia, 2*(1), 22–25. https://doi.org/10.54196/jami.v2i1.190

Ricardianto, P., Susilowati, E., Endri, E., Tjiptosudarmo, S., Suryobuwono, A. A., Soekirman, A., Wijana, I. M. D., & Kuncoro, Y. (2023). Vessel crew rotation of the national shipping company during COVID-19 pandemic period. *Corporate Governance and Organizational Behavior Review, 7*(4), 350–359. https://doi.org/10.22495/cgobrv7i4sip13

Sallis, E. (2002). *Total quality management in education*. Routledge.

Sulistiana, O., Rachman, T., Yamin, M., & Saleh, M. (2025). Competency and certification gaps among traditional shipping seafarers in South Sulawesi, Indonesia. *Future Transportation, 5*(4), Article 139. https://doi.org/10.3390/futuretransp5040139

Sun, R., Chen, C.-D., Chen, M.-H., Wang, R., Ye, X., & Zou, S. S. (2025). The impact of meteorological factors on cruise operations. *Transport Policy, 163*, 232–246. https://doi.org/10.1016/j.tranpol.2024.12.023

Veltsin, N., Chountalas, P. T., Koutsouki, E., Karvounidi, M. D., & Fousteris, A. E. (2025). Modeling human critical success factors for maritime safety: A DEMATEL approach. *Safety Science, 189*, Article 106886. https://doi.org/10.1016/j.ssci.2025.106886