Maritime Technology and Society
Vol. 5(1): 50-58, February 2026
https://doi.org/10.62012/mp.vi.47055

Regular Research Article

Implementation of Code of Safe Working Practices for Merchant Seafarers towards Engine Crew in MV. Sultan Hasanuddin

Suyuti[1], Musriady[1], Jamaluddin[1], St. Asmayanti[2]*, Marten Rombe[3], and Andi Dirga Noegraha[3]

[1] Politeknik Ilmu Pelayaran, Makassar, Indonesia
[2] Universitas Muhammadiyah Makassar, Indonesia
[3] Akademi Maritim Indonesian AIPI, Makassar, Indonesia

*st.asmayanti@unismuh.ac.id

Abstract: This research aimed at investigating the effectiveness of the implementation of COSWP towards the engine crew and finding out the better recommendation to increase the implementation for future needs. The research applied mixed-method research which combined between qualitative and quantitative approach. The data collected using questionnaires and an in-depth interview to engine crews at MV. Sultan Hasanuddin. Then, the data questionnaires were analyzed using SPSS and the interview data were interpreted using three steps, they were transcribing data, data reduce and data interpretation. The results of the research revealed that the mean score was 27,20 with standard deviation of 3.795. This data showed the implementation of COSWP in MV. Sultan Hasanuddin was in very effective condition. There were recommendations given by the sample of the research such as integration of COSWP to the Safety Management System (SMS) or International Safety Management (ISM) Code, training of Maritime Resource Management (MRM) and Non-Technical, internal auditory and regular evaluation, effective communication, and digital development management.

Keywords: Implementation, COSWP, Engine crew, MV. Sultan Hasanuddin, Safety.

1. Introduction

Code of safety work is one of crucial aspects in maritime industry concerning the working environment on the ship has high risks of accidents. According to report from International Maritime Organization (IMO), Maritime workplace accidents are often the result of inadequate awareness of safe practices and breaches of safety [1]. One of the internationally recognized standards for occupational safety at sea is the Code of Safe Working Practices for Merchant Seafarers (COSWP), which serves as a comprehensive framework for ensuring safe working conditions aboard merchant vessels [2]. The COSWP is specifically designed to provide seafarers with practical guidance on occupational safety, covering various aspects of shipboard operations, risk management, and compliance with international maritime regulations [3]. Its primary objective is to reduce the likelihood of workplace accidents by promoting awareness, standardizing procedures, and fostering a culture of safety among ship crews.

Within the shipboard environment, the engine department represents one of the most high-risk areas, as engine crews are frequently exposed to hazardous working situations [4]. This is particularly evident during machinery maintenance and repair activities, which often involve the use of heavy tools and equipment,

Received: 2025-10-08; Accepted: 2025-12-30

operations in confined and poorly ventilated spaces [5], and the potential exposure to hazardous substances such as fuel, lubricants, and chemicals [6]. These conditions substantially increase the probability of occupational accidents, ranging from minor injuries to severe and even fatal incidents. Consequently, strict adherence to COSWP guidelines and the consistent implementation of safety procedures are essential in minimizing risks and safeguarding the well-being of engine personnel [7].

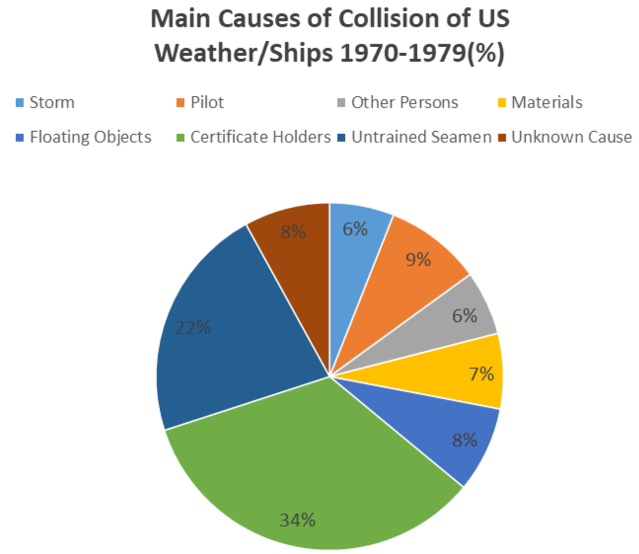

Figure 1. Causes of Maritime Accidents in the U.S in 1970-1979

Several studies have highlighted that crew safety in the maritime sector is influenced by both internal and external factors. Ship crew resources, particularly competence and professional certification, play a crucial role in ensuring maritime safety, as insufficient skills and qualifications may elevate the risk of accidents. In addition, the maintenance of safety equipment has a significant impact on both crew performance and overall shipboard safety. Poorly maintained equipment may hinder the effectiveness of safety management, thereby compromising accident prevention efforts [8]. Weather conditions are another external factor that greatly influences maritime safety. Harsh environments, including high waves and storms, are known to increase the likelihood of accidents during ship operations [9]. Similarly, the physical condition of the vessel also determines the level of safety. An aging fleet, or ships that fail to meet material, construction, and machinery standards, may be more prone to unexpected breakdowns, which not only threaten operational safety but also affect the job satisfaction of seafarers [10]. Furthermore, pilotage plays an essential role in guiding captains with accurate information about local waters to ensure safe navigation. A lack of pilotage support can significantly heighten navigational risks [11]. Technical aspects such as machinery or equipment failure are also a common cause of accidents. Breakdowns in critical components, including the main engine, steering system, or navigation instruments can lead to serious operational failures and increase accident risks [12]. Finally, human error remains one of the most prominent contributors to maritime accidents [13]. Mistakes in navigation, machinery operations, or decision-making, often triggered by insufficient training, fatigue, or negligence, may create hazardous situations on board [14]. Thus, a holistic approach that addresses both human and technical factors is essential in improving occupational safety for ship crews.

Statistical data from the International Maritime Organization (IMO) reveal that, in the United States, 80% of maritime accidents occurring between 1970 and 1979 were attributable to 'Organization and Management Problems,' or human-related factors [15], [16]. Besides, there was also data about ship accidents in global world during the last ten years (2014-2023) according to Insurance Information Institute as follows:

Table 1. Data of Ship Accident Globally 2014-2023

Region	2014–2023	2023
S. China, Indochina, Indonesia and Philippines	184	8
East Mediterranean and Black Sea	115	6
Japan, Korea and N. China	62	3
British Isles, N. Sea, Eng. Channel and Bay of Biscay	54	3
Arabian Gulf and approaches	38	0
West African Coast	26	0
West Mediterranean	29	0
Bay of Bengal	22	0
S. Atlantic and East Coast South America	23	1
West Indies	18	0
All other regions	158	5
Total world	729	26

2. Materials and Methods

The research applied mixed methods which combined between qualitative and quantitative approach [17]. The method used to give a clear description of implementation of COSWP for merchant seafarers in MV. Sultan Hasanuddin and analyze the further recommendation of what to do to enhance the implementation of COSWP [18]. This research was conducted in MV. Sultan Hasanuddin, Makassar with total respondent of 10 engine crew. Here are the crew positions of the respondent:

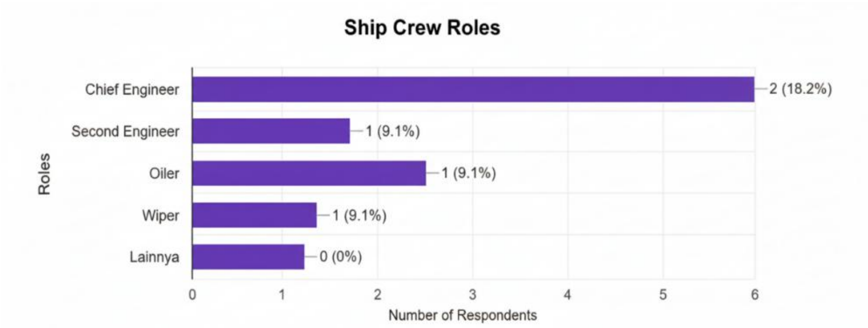

Figure 2. Crew Position in MV. Sultan Hasanuddin

Based on the figure above, the total number of samples obtained consisted of 11 engine crew members from different positions. The number of engine crew depended on the condition and situation of the training ship while berthed at Makassar port during the data collection. It is evident that the position with the highest frequency among the research samples was “Steward or Others,” with a total of six individuals. Meanwhile, the variation in other positions was relatively similar, ranging from one to two individuals on average. The number of engine crew members described here corresponds to the actual condition of the training ship at the time of the study.

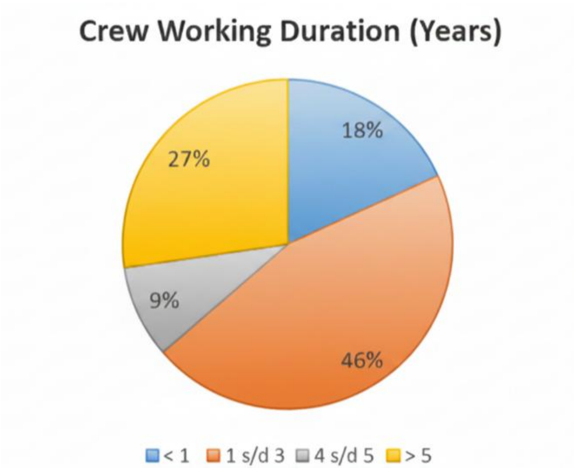

Figure 3. Shore Leave Crew Ages (Years)

In addition to data on crew positions, the range of work experience among the engine crew also needs to be considered to support this research. Based on the data collected, most engine crew members on MV. Sultan Hasanuddin had been working for a period of 1 to 3 years. Only about 9% of them had worked for 4 years, while nearly half of the engine crew had more than 5 years of work experience.

The data were collected using questionnaires and in-depth interviews with engine crew members aboard the MV *Sultan Hasanuddin*. The questionnaire data were analyzed using SPSS, while the interview data were interpreted through three stages: data transcription, data reduction, and data interpretation. The stages of data analysis are as follows:

a. Data TabulationThis stage involves simplifying the questionnaire responses and presenting them in tabular form to facilitate interpretation.
b. Determination of the Mean Value and Total Score [19]

The questionnaire results obtained from the MV *Sultan Hasanuddin* were processed to calculate the mean score for each item as well as the total score for each respondent. The mean value was calculated using the following formula:

$$\text{Mean Value} = \frac{\text{Total Item Score}}{\text{Number of Respondents}} \quad (1)$$

c. Interpretation of the Mean Value and Total Score

Since the mean value may result in fractional values and the total score may exceed the predefined scale, interpretation using the Likert scale requires a linear numerical transformation [20]. The Scale Range (SR) was determined as follows:
For the mean score of each item:

$$SR = \frac{(m-n)}{b} \quad (2)$$

For the total score:

$$SR = \frac{a(m-n)}{b} \quad (3)$$

Where *SR* denotes the scale range, *a* represents the number of items, *b* refers to the number of rating scales used, *m* indicates the highest score on the scale, and *n* denotes the lowest score on the scale.

The level of implementation of each COSWP element on vessels was measured based on the total score obtained from all questionnaire items [21]. The interpretation of COSWP implementation levels for ships and company offices is based on predefined score ranges, as presented in Table 2.

Table 2. COSWP Implementation Scale Interpretation

Object	Score Type	Score Range (*x*)	Interpretation
Ship	Mean value per item	0.00 – 0.75	Not compliant
Ship	Mean value per item	0.76 – 1.50	Less compliant
Ship	Mean value per item	1.51 – 2.25	Fairly compliant
Ship	Mean value per item	2.26 – 3.00	Compliant
Ship	Total score	0.00 – 31.50	Not compliant
Ship	Total score	31.51 – 63.00	Less compliant
Ship	Total score	63.01 – 94.50	Fairly compliant
Ship	Total score	94.51 – 126.00	Compliant
Company Office	Total score	0.00 – 41.25	Not compliant
Company Office	Total score	41.26 – 82.50	Less compliant
Company Office	Total score	82.51 – 123.75	Fairly compliant
Company Office	Total score	123.76 – 165.00	Compliant

Table 2 provides a clear framework for interpreting the level of COSWP implementation based on both mean item scores and total scores for ships and company offices. The classification enables a standardized assessment of compliance levels, ranging from not compliant to compliant, thereby facilitating consistent comparison across different operational contexts. By applying these predefined score ranges, the study ensures that the evaluation of COSWP implementation is systematic, transparent, and aligned with the Likert-scale measurement approach used in the questionnaire analysis.

3. Results

3.1. The Implementation of Code of Safe Working Practice in MV. Sultan Hasanuddin

This research used questionnaires as an instrument where there were 10 questions to find out the implementation of COSWP for merchant seafarers in MV. Sultan Hasanuddin. Based on the distributed instrument to 11 engine crews, there were 10 valid data taken for this research.

The results of the questionnaire data analysis are summarized in Table 3, which presents the descriptive statistical measures for each research variable, including the number of observations (N), minimum and maximum scores, mean values, and standard deviations.

Figure 5. Engine Crew Filling in the Questionnaires

These statistics provide an initial overview of the distribution and central tendency of the respondents' assessments regarding COSWP implementation and occupational safety performance.

Table 3. Statistics Data Questionnaire

Variabel	N	Minimum	Maximum	Mean	Std. Deviation
Implementasi COSWP	10	18	30	27.2	3.795
Keselamatan Kerja	10	16	20	18.4	1.43
Valid N (listwise)	10				

Based on the descriptive statistics table presented, the following is the interpretation of the data regarding the implementation of COSWP among the engine crew on MV. Sultan Hasanuddin. The total number of respondents (N) was 10, with a minimum score of 18 and a maximum score of 30. The mean value was 27.20 with a standard deviation of 3.795. These results indicate that the average score for the COSWP implementation variable was 27.20, suggesting that, in general, the scores fell within a high range. The standard deviation of 3.795 shows a considerable degree of variation in the respondents' answers, though not excessively extreme. Overall, the data demonstrates that the implementation of COSWP on MV. Sultan Hasanuddin was in very good condition.

Meanwhile, the occupational safety data, with a total of 10 respondents, showed a minimum score of 16 and a maximum score of 20. The mean value was 18.40 with a standard deviation of 1.430. Furthermore, the analysis results indicate that the better the implementation of COSWP on the ship, the higher the occupational safety of the engine crew. This is supported by the data obtained as follows:

Table 4. Correlations Effectiveness of Crew on Duty

		Implementation COSWP	Safety Work
Implementation COSWP	Pearson Correlation	1	0.680
	Sig. (2-tailed)		0.031
	N	10	10
Safety Work	Pearson Correlation	0.680	1
	Sig. (2-tailed)	0.031	
	N	10	10

Maritime Technology and Society
Vol. 5(1): 50-58, February 2026
https://doi.org/10.62012/mp.vi.47055

The analysis of the questionnaire data revealed a statistically significant positive correlation ($r = 0.680$, $p = 0.031$) between the implementation of COSWP and occupational safety. This result, significant at the 95% confidence level, indicates that improved implementation of COSWP is associated with higher levels of workplace safety. These findings highlight that effective COSWP practices can make a substantial contribution to enhancing occupational safety among engine crew members. The mean score of 27.20 (out of a maximum of 30) for COSWP implementation indicates that approximately 90.6% of the safety standards are being met. This places the engine crew of MV. Sultan Hasanuddin in a "very good condition" regarding safety awareness.

3.2. The Recommendation to Increase Implementation of Code of Safe Working Practices

Based on COSWP 2025, released in April 2025, ships are required to provide formal guidelines for occupational risks in the engine room, access to tools, and safety procedures during extreme weather conditions. The integration of COSWP into the Safety Management System (SMS) in accordance with the ISM Code ensures that these procedures are adopted through audits, documentation, and periodic reviews by the Designated Person Ashore (DPA) and ship management.

Furthermore, research on safety culture in the maritime industry emphasizes that human factors remain the primary cause of accidents. To improve crew safety behavior, Engine-Room Resource Management (ERM) training focusing on communication, leadership, and teamwork is required to minimize operational human error. In addition, the safety culture approach should include strengthening two-way communication, promoting a just culture policy, and granting the right to stop work when unsafe conditions arise. Human resources management and continuous training also play a crucial role in ensuring organizational support and sustaining a strong safety culture.

Figure 6. In-depth interview process

Received: 2025-10-08; Accepted: 2025-12-30

Maritime Technology and Society
Vol. 5(1): 50-58, February 2026
https://doi.org/10.62012/mp.vi.47055

To address the second research question, the researcher conducted open interviews with several engine crew members on MV. Sultan Hasanuddin. This study applied 10 guiding questions to identify the crew's recommendations for improving the implementation of COSWP on board. Based on the distributed instrument, the following questions were used to answer the second research problem:

- How is COSWP integrated into the SMS or ISM Code?
- Do crew members still require Maritime Resource Management (MRM) training? If so, please explain why?
- Have internal audits and regular evaluations been conducted so far?
- How is communication among the engine crew on board?
- Do all engine crew members understand the digital changes?

4. Discussion

The standard deviation of 3.795 suggests that while there is consensus among the crew, some variation exists in how individuals perceive or execute these safety practices. This indicates a generally stable safety culture, though it highlights a need for standardized training to close small gaps. The Pearson Correlation of r = 0.680 demonstrates a strong positive relationship between following the Code and actual safety outcomes. With a p-value of 0.031, this result is statistically significant at the 95% confidence level, proving that the results are not due to chance. Based on the questionnaires and interviews, the researcher concludes the research findings into recommendations for improving the implementation of COSWP on board MV. Sultan Hasanuddin as follows:

Table 5. Recommendations for Improving COSWP Implementation on Board MV. *Sultan Hasanuddin*

Recommendation	Explanation
Integrated COSWP into Safety Management System (SMS) or International Safety Management (ISM) Code	It is imperative to ensure that the provisions of COSWP are explicitly integrated into the ship's Safety Management System, in accordance with the directives set out in the 2020 amendment of COSWP.
Training of Maritime Resource Management MRM and Non-Technical	Engine crew should be trained not only in technical skills, but also in communication, reporting, and decision-making. This can be achieved through computer-based training programs and case study analyses
Internal audit dan gradable evaluation	Clear and measurable improvement objectives shall be set, and periodic reviews shall be carried out to ensure sustainable implementation in accordance with the prevailing risks
Effective Communication: Induction, bulletin, poster, and regular inspection	Safety induction shall include the provision of relevant safety materials, followed by regular updates and safety walks carried out with a structured checMVist (including JSA, hot work, and confined space procedures
Digital Change Management	In the event of digitalization (such as the use of a digital COSWP application), appropriate

Received: 2025-10-08; Accepted: 2025-12-30

Recommendation	Explanation
	training shall be delivered and potential resistance managed to prevent any disruption to crew compliance

The data empirically validates that strict adherence to COSWP is a primary defense against accidents in high-risk areas like the engine room, where crews face hazards from machinery, confined spaces, and chemicals. Since human error is a leading cause of accidents (noted as 80% in some data), the strong correlation proves that COSWP acts as a critical "organizational tool" to reduce mistakes caused by negligence or lack of awareness.

While this research provides empirical evidence of safety compliance, several limitations must be acknowledged. First, the scope of this study is restricted to a single training vessel, the MV. Sultan Hasanuddin, which may not fully represent the varied operational environments of commercial merchant ships. Second, the sample size is relatively small, consisting of 10 valid respondents from the engine department. Although this number accurately reflects the actual manning condition and situational availability of the training ship while berthed at the Makassar port during data collection, it limits the generalizability of the statistical findings to the broader maritime population. Consequently, the results should be interpreted as a micro-level validation specific to this vessel's context, and future research involving multiple vessels and larger cohorts is recommended to further validate these trends across the industry.

5. Conclusions

Based on the data collected and analyzed, the researcher found that the mean value was 27.20 with a standard deviation of 3.795. These results indicate that the average score for the COSWP implementation variable was 27.20, suggesting that, in general, the scores fell within a high range. The standard deviation of 3.795 shows a considerable degree of variation in the respondents' answers, though not excessively extreme. Overall, the data demonstrates that the implementation of COSWP on MV. Sultan Hasanuddin was in very good condition. Meanwhile, the occupational safety data, with a total of 10 respondents, showed a minimum score of 16 and a maximum score of 20. The mean value was 18.40 with a standard deviation of 1.430. Furthermore, the analysis results indicate that the better the implementation of COSWP on the ship, the higher the occupational safety of the engine crew.

This study is in accordance with previous studies [22], [23], lies in the fundamental conclusion that adherence to structured safety frameworks is paramount for enhancing maritime occupational safety. The present study empirically validates this principle on a micro-level by demonstrating a clear positive correlation, where the "very good condition" implementation of the Code of Safe Working Practices for Merchant Seafarers (COSWP) on MV. Sultan Hasanuddin directly corresponds to a higher level of occupational safety among the engine crew. This specific finding strongly supports the broader theoretical argument in, which establishes that effective implementation of Safety Management Systems (SMS) and the promotion of a robust safety culture to which COSWP compliance is a crucial component are essential requirements for mitigating risks and improving overall safety performance across the maritime industry. For a training ship, these results provide a benchmark for maritime education, showing that integrating safety frameworks early in a seafarer's career directly correlates to safer shipboard environments.

References

[1] J. Sánchez-Beaskoetxea, I. Basterretxea-Iribar, I. Sotés, M. De Las, and M. M. Machado, “Human error in marine accidents: Is the crew normally to blame?,” *Maritime Transport Research*, vol. 2, p. 100016, 2021.

[2] International Maritime Organization (IMO), “International Maritime Organization - IMO net-zero shipping talks to resume in 2026,” https://www.imo.org/. Accessed: Nov. 17, 2025.

[3] International Maritime Organization (IMO), “The International Safety Management (ISM) Code,”

https://www.imo.org/. Accessed: Nov. 17, 2025.
[4] S. Layuk *et al.*, "Physical environment and work fatigue among ship engine room crew," *Int J Health Sci (Qassim)*, vol. 6, no. 3, pp. 1556–1564, Oct. 2022.
[5] R. Yudo Wicaksono, P. S. Studi, K. Masyarakat, and F. Kesehatan Masyarakat, "Risk Management Keselamatan Dan Kesehatan Kerja pada Engine Room Kapal Feri Selat Madura II Surabaya," *Journal of Public Health Research and Community Health Development*, vol. 1, no. 1, pp. 39–47, Jul. 2017.
[6] D. Suryani and L. Lusiani, "Peran Teknologi Alat Keselamatan Terhadap Kinerja Awak Kapal MV. Mochtar Prabu Mangkunegara," *Saintara: Jurnal Ilmiah Ilmu-Ilmu Maritim*, vol. 9, no. 2, pp. 172–184, Sep. 2025.
[7] S. Huda, P. Pranyoto, D. Rikasari, and P. Ilmu Pelayaran Semarang, "Implementation Permit To Work System As A Work Accident Prevention On Board Ship," *RSF Conference Series: Engineering and Technology*, vol. 3, no. 1, pp. 244–250, Oct. 2023.
[8] R. B. Sitorus, W. Tamba, D. Setyobudi, B. Sumali, and S. Tinggi Ilmu Pelayaran, "Peran Keselamatan Awak Kapal Memediasi Perawatan Peralatan Keselamatan Terhadap Kinerja Awak Kapal SK Offshore Marine Di Pelabuhan Labuan – Malaysia," *Jurnal Ilmiah Manajemen, Ekonomi, & Akuntansi (MEA)*, vol. 8, no. 2, pp. 726–752, Jun. 2024.
[9] Nahush Paranjpye, "Steamship Mutual - Work Safety - Adverse Weather," https://www.steamshipmutual.com/. Accessed: Nov. 17, 2025. [Online].
[10] MI News Network, "Global Shipping Records Lowest Vessel Losses In 2024 But Faces New Threats," https://www.marineinsight.com/. Accessed: Nov. 17, 2025. [Online].
[11] P. N. F. L. Batu, W. Cahyaningrum, and S. Bewafa, "Enhancing maritime pilotage: exploring the role of negotiation of meaning strategies in training and operations," *Journal of Education and Learning (EduLearn)*, vol. 19, no. 1, pp. 72–80, Feb. 2025.
[12] Z. I. Awal and K. Hasegawa, "Analysis of Ship Accidents due to Marine Engine Failure - Application of Logic Programming Technique (LPT)," *Marine Engineering*, vol. 50, no. 6, pp. 744–751, Nov. 2015.
[13] T. Bielic, J. Čulin, M. znanstveni časopis POMORSTVO, T. Bielić, and N. Hasanspahić, "Preventing marine accidents caused by technology-induced human error Interpenetrating Polymer Networks View project SCIENTIFIC JOURNAL OF MARITIME RESEARCH Preventing marine accidents caused by technology-induced human error A RT I C L E I N F O," *Scientific Journal of Maritime Research*, vol. 31, pp. 33–37, 2017.
[14] I. Che Ishak, M. F. Azlan, S. B. Ismail, and N. Mohd Zainee, "A Study of Human Error Factors On Maritime Accident Rates In Maritime Industry," *Asian Academy of Management Journal*, vol. 24, no. Supp. 2, pp. 17–32, Oct. 2019.
[15] P. Sáez Álvarez, "From maritime salvage to IMO 2020 strategy: Two actions to protect the environment," *Mar Pollut Bull*, vol. 170, p. 112590, Sep. 2021.
[16] T. Xu, Y. Xiao, and Z. Jiang, "Maritime Pilots' Risky Operational Behavior Analysis Based on Structural Equation Model," *Discrete Dyn Nat Soc*, vol. 2021.
[17] R. B. Johnson and A. J. Onwuegbuzie, "Toward a Definition of Mixed Methods Research," *J Mix Methods Res*, vol. 1, no. 2, pp. 112–133, 2007.
[18] J. Maming, J. Maming, K. Toring, K. Toring, E. Toring, and E. Toring, "Charting a New Course: A Research Methodology Guide for the Maritime Industry," *Psychology and Education: A Multidisciplinary Journal*, vol. 39, no. 6, pp. 713–722, Jun. 2025.
[19] G. Norman, "Likert scales, levels of measurement and the 'laws' of statistics," *Advances in Health Sciences Education 2010 15:5*, vol. 15, no. 5, pp. 625–632, Feb. 2010.
[20] S. Jamieson, "Likert scales: how to (ab)use them," *Med Educ*, vol. 38, no. 12, pp. 1217–1218, Dec. 2004.
[21] X. Wang, Z. Liu, Z. Zhao, J. Wang, S. Loughney, and H. Wang, "Passengers' likely behaviour based on demographic difference during an emergency evacuation in a Ro-Ro passenger ship," *Saf Sci*, vol. 129, p. 104803, Sep. 2020.
[22] M. H. Dewan and R. Godina, "Roles and challenges of seafarers for

implementation of energy efficiency operational measures onboard ships," *Mar Policy*, vol. 155, p. 105746, Sep. 2023.

[23] Z. Wan, Y. Liu, Y. Jiang, J. Chen, and Z. Wang, "Burnout and work ability: A study on mental health of Chinese seafarers from the job demand resource model perspective," *Ocean Coast Manag*, vol. 237, p. 106517, Apr. 2023.