

Safety Culture and Operational Performance Among Philippine Seafarers: A Maritime Safety Management Perspective

Ricardo Alejandro M. Soriano¹, Lourdes Gabrielle F. Mendoza², and Daniel Vincent A. Navarro³

Abstract— The Philippines is the world's leading supplier of seafarers, yet the relationship between safety culture and operational performance among Filipino seafarers remains underexplored. This study assessed the level of safety culture and its influence on operational performance among Philippine seafarers in the context of the International Safety Management (ISM) Code and the Standards of Training, Certification and Watchkeeping for Seafarers (STCW) Convention. Using a descriptive-correlational research design, data were collected from 210 Filipino seafarers holding officer and rating ranks currently serving on international and domestic vessels. A structured questionnaire measured safety culture across six dimensions: management commitment, safety training, incident reporting, risk awareness, regulatory compliance, and safety procedures. Findings revealed that safety culture was rated moderately high overall, with management commitment receiving the highest mean and non-punitive incident reporting the lowest. Operational performance was positively and significantly correlated with safety culture ($r = 0.685, p < 0.001$), indicating that stronger safety culture is associated with better operational outcomes. Multiple regression analysis showed that management commitment, regulatory compliance, and safety procedures were the strongest predictors of operational performance. The study highlights persistent challenges in underreporting, fatigue management, and cultural barriers to safety communication, and proposes recommendations for strengthening safety culture through targeted training, just culture frameworks, and enhanced regulatory enforcement.

Index Terms— Safety culture, operational performance, Philippine seafarers, ISM Code, STCW Convention, maritime safety management

1. Introduction

The Philippines remains the world's leading supplier of seafarers, providing 203,179 officers to the global merchant fleet and ranking first in both the officer and rating categories, according to the Seafarer Workforce Report 2026 [1]. Filipinos are also the leading nationality certified under the Standards of Training, Certification and Watchkeeping for Seafarers (STCW) Convention, surpassing Ukrainians, Indians, Romanians, and Poles [1]. In 2023 alone, approximately 578,626 Filipino seafarers were deployed overseas, contributing over USD 6.8 billion in sea-based remittances to the Philippine economy [2].

Despite this prominence, maritime safety remains a critical concern. The Maritime Industry Authority (MARINA) reported 188 maritime accidents and incidents in 2023, representing a 63 percent increase from the 115 cases recorded in 2022 [2]. The

Philippine Coast Guard monitored an annual average of 993 maritime incident cases between 2019 and 2023, including sinking, collisions, groundings, and equipment failures [2]. These figures underscore the need for a deeper understanding of the human and organizational factors that contribute to maritime safety outcomes.

The International Safety Management (ISM) Code, adopted by the International Maritime Organization (IMO) in 1993, provides an international standard for the safe management and operation of ships and for pollution prevention [3]. The Code requires every shipping company to develop, implement, and maintain a Safety Management System (SMS) that includes a safety and environmental-protection policy, procedures for safe ship operations, defined lines of communication, and procedures for reporting accidents and non-conformities [3], [4]. In the Philippines, MARINA issued Memorandum Circular No. 122 mandating ISM Code compliance for Philippine-registered ships engaged in international voyages, requiring both a Document of Compliance (DOC) for companies and a Safety Management Certificate (SMC) for ships [5].

Safety culture, defined as the shared values, beliefs, and practices that shape crew behavior toward safety, has been identified as a critical determinant of maritime safety outcomes [6], [7]. Research has demonstrated that safety culture significantly mediates the relationship between crew behavior and shipping operational performance, with one study finding that safety culture has a positive and significant effect on operational performance ($\beta = 0.715, p < 0.001$) [6]. However, few studies have examined safety culture specifically among Philippine seafarers, despite their dominant presence in the global maritime workforce.

This study aimed to: (1) assess the level of safety culture among Philippine seafarers across six dimensions, (2) evaluate their operational performance, (3) determine the relationship between safety culture and operational performance, and (4) identify the challenges affecting safety culture development in the Philippine maritime context.

2. Related Literature

A. Safety Culture in the Maritime Industry

The concept of safety culture originated from the nuclear industry following the Chernobyl disaster and has since been applied across high-reliability organizations, including

*Corresponding author: sorianora.3@yahoo.com

aviation, healthcare, and maritime transport [7], [8]. In the maritime context, safety culture encompasses the values, beliefs, and practices that shape crew behavior toward safety, including procedural compliance, decision-making, and risk perception [6]. It functions as a socio-cognitive infrastructure connecting organizational policy to everyday operational behavior.

The International Safety Management (ISM) Code explicitly states that its application should support and encourage the development of a safety culture in shipping [3], [4]. The Code requires every company to establish a safety and environmental-protection policy, define levels of authority and communication between shore and shipboard personnel, and implement procedures for reporting accidents and non-conformities [4]. In the Philippines, compliance with the ISM Code is enforced through MARINA Memorandum Circular No. 122, which mandates that only companies with a valid DOC may operate Philippine-registered ships for international voyages [5].

Arsilan *et al.* [8] proposed a safety culture assessment and implementation framework consisting of three main levels: safety climate assessment, safety-related key performance indicator assessment, and observation study. Their framework provides a structured approach for shipping companies to identify strengths and weaknesses in their safety culture and develop targeted action plans for improvement [8].

B. Safety Culture Assessment Methods

Several methods have been developed to assess safety culture in the maritime industry. The American Bureau of Shipping (ABS) developed the Safety Culture and Leading Indicators of Safety guidance notes, which include a 40-statement survey instrument measuring eight safety factors: communication, empowerment, feedback, mutual trust, problem identification, promotion of safety, responsiveness, and safety awareness [9]. The ABS framework enables organizations to identify safety factors requiring improvement and track leading indicators of safety performance over time [9].

The Australian Maritime Safety Authority (AMSA) commissioned a study on the determinants and consequences of safety culture in the maritime industry, which found that safety culture is likely to be more developed when seafarers perceive their immediate supervisors as valuing and prioritizing safety [10]. Safety leadership emerged as the strongest predictor of developed safety culture levels, while high work demands were identified as a risk factor that negatively impacts recovery and safety outcomes [10].

Safety culture maturity models offer another assessment approach, typically describing five stages of development: pathological (who cares as long as we are not caught), reactive (safety is important, we do a lot every time we have an incident), calculative (we have systems in place to manage all hazards), proactive (we try to anticipate safety problems before they arise), and generative (safety is built into everything we do) [11], [12]. These models allow organizations to benchmark their safety culture maturity and identify areas for improvement.

C. Filipino Seafarers and Safety Performance

A notable finding in the maritime safety literature is the observation that Filipino seafarers tend to have fewer reported work accidents than other nationalities. Gron and Knudsen [13] examined this phenomenon in a study published in the *International Maritime Health* journal, reviewing 31 studies on the relationship between nationality and safety. The review found no evidence that ethnic or cultural differences in risk-taking behavior account for the lower accident rates among Filipinos, suggesting that underreporting may be a contributing factor [13]. This finding raises important questions about reporting practices and just culture in multicultural crews.

A study on occupational health safety culture among cadet seafarers in the Philippines compared tanker and bulk shipboard safety cultures using a cross-sectional design with 116 respondents [14]. The study found no significant difference between tanker and bulk shipboard safety cultures across eight safety factors, despite more reported unsafe work conditions and on-board health injuries in bulk vessel types [14]. This finding suggests that safety culture may be influenced more by organizational factors than by vessel type.

D. Safety Culture and Operational Performance

Recent studies have examined the direct relationship between safety culture and operational performance in shipping. Mudiyanto *et al.* [15] analyzed the influence of behavior through safety culture on seafarers' performance on merchant ships using structural equation modeling with 100 respondents. The study found that safety culture, acting as a mediator, has a significant influence on the relationship between behavioral variables and seafarer performance, translating behavior into safety actions [15]. Consistent implementation of safety culture was found to form positive behaviors that significantly improve operational performance and reduce accident risk [15].

A related study by Hidayat *et al.* [6] examined how crew behavior affects shipping operational performance when maritime safety culture is used as a mediating variable. The results showed that maritime safety culture has a positive and significant effect on shipping operational performance ($\beta = 0.715$, $t = 8.239$, $p < 0.001$), and that safety culture significantly mediates the relationship between crew behavior and performance (indirect $\beta = 0.669$, $p < 0.001$) [6]. These findings indicate that safety-oriented behavior enhances performance primarily through a strong safety culture.

E. Regulatory Framework and Training Standards

The STCW Convention, adopted in 1978 and significantly revised through the 1995 and 2010 Manila amendments, establishes minimum standards for training, certification, and watchkeeping for seafarers [16]. The Manila amendments, adopted on 25 June 2010 and entering into force on 1 January 2012, introduced new requirements for marine environment awareness training, leadership and teamwork training, security training, and updated proficiency in basic safety skills every five years [16], [17]. The Philippines, as the host country of the diplomatic conference that produced the Manila amendments,

has committed to full compliance with these standards [16].

Despite these regulatory frameworks, challenges persist in their implementation. A study on basic training effectiveness among seafarers found that while STCW-mandated courses provide foundational safety knowledge, the effectiveness of training diminishes over time without regular reinforcement and practical application [18]. This finding highlights the need for continuous professional development and refresher training to maintain safety competence throughout a seafarer's career.

3. Methodology

A. Research Design

This study employed a descriptive-correlational research design using a quantitative survey approach. The descriptive component characterized the level of safety culture and operational performance among Philippine seafarers, while the correlational component examined the relationship between safety culture dimensions and operational performance indicators. This design was appropriate for identifying patterns and associations without experimental manipulation.

B. Participants and Sampling

The study involved 210 Filipino seafarers holding officer ranks (masters, chief officers, chief engineers, and second engineers) and rating positions (able seafarers, oilers, and motormen) currently serving on international and domestic vessels. Purposive sampling was used to select participants with at least two years of sea service experience. No specific shipping companies or maritime institutions were named to maintain confidentiality and focus on systemic findings. The sample included 120 officers and 90 ratings, with sea service experience ranging from 2 to 28 years ($M = 11.4$, $SD = 6.2$).

C. Instrumentation

A structured questionnaire was developed based on the ABS Safety Culture framework [9], the AMSA safety culture determinants study [10], and the dimensions identified in the maritime safety culture literature [6], [15]. The instrument comprised three sections: (1) safety culture across six dimensions (management commitment, safety training, non-punitive incident reporting, risk awareness, regulatory compliance, and use of safety procedures), rated on a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree); (2) operational performance across five indicators (punctuality, fuel efficiency, accident rates, technical disruption rates, and loading productivity), rated from 1 (very poor) to 5 (excellent); and (3) challenges affecting safety culture, rated from 1 (not a challenge) to 5 (severe challenge). The questionnaire was validated by three maritime safety experts and pilot-tested with 30 respondents, yielding a Cronbach's alpha of 0.91 for the overall safety culture scale.

D. Data Collection and Analysis

Data were collected through both online and printed questionnaires distributed over a period of twelve weeks, primarily through seafarer manning agencies and maritime associations. Responses were analyzed using descriptive

statistics (means and standard deviations), Pearson product-moment correlation, and multiple linear regression. Mean scores for safety culture and operational performance were interpreted using the following scale: 1.00 to 1.79 (very low), 1.80 to 2.59 (low), 2.60 to 3.39 (moderate), 3.40 to 4.19 (high), and 4.20 to 5.00 (very high).

4. Results and Discussion

A. Level of Safety Culture

Table I presents the mean scores for safety culture across its six dimensions. The overall safety culture mean was 3.71 ($SD = 0.54$), interpreted as high. Management commitment received the highest rating ($M = 4.05$, $SD = 0.61$), indicating that seafarers generally perceive their company leadership as valuing and supporting safety. This finding aligns with the AMSA study, which identified safety leadership as the strongest predictor of developed safety culture levels [10].

Non-punitive incident reporting received the lowest rating ($M = 2.88$, $SD = 0.72$), interpreted as moderate. This finding is consistent with observations by Gron and Knudsen [13] regarding underreporting of work accidents among Filipino seafarers, suggesting that cultural and organizational barriers continue to discourage open reporting of near-misses and incidents. The other dimensions—safety training ($M = 3.85$, $SD = 0.58$), risk awareness ($M = 3.78$, $SD = 0.63$), regulatory compliance ($M = 3.92$, $SD = 0.55$), and safety procedures ($M = 3.86$, $SD = 0.59$)—were all rated high, reflecting the influence of STCW-mandated training and ISM Code requirements on safety practices [3], [16].

TABLE I. SAFETY CULTURE DIMENSIONS AND OPERATIONAL PERFORMANCE

Dimension	Mean	SD	Interpretation
Management Commitment	4.05	0.61	High
Safety Training	3.85	0.58	High
Incident Reporting	2.88	0.72	Moderate
Risk Awareness	3.78	0.63	High
Regulatory Compliance	3.92	0.55	High
Safety Procedures	3.86	0.59	High
Overall Safety Culture	3.71	0.54	High

Table I. Safety Culture Dimensions (rated 1–5)

B. Operational Performance

The overall operational performance mean was 3.68 ($SD = 0.57$), interpreted as high. Among the five indicators, punctuality and schedule compliance received the highest rating ($M = 3.95$, $SD = 0.52$), followed by accident rate performance ($M = 3.82$, $SD = 0.61$), where lower accident rates corresponded to higher scores. Technical disruption rates ($M = 3.55$, $SD = 0.64$) and loading productivity ($M = 3.48$, $SD = 0.66$) received moderate to high ratings, while fuel efficiency received the lowest rating ($M = 3.42$, $SD = 0.69$). These results indicate that while safety-related performance indicators are generally strong, operational efficiency metrics have room for improvement.

C. Correlation Between Safety Culture and Operational Performance

Pearson correlation analysis revealed a strong, positive, and statistically significant relationship between safety culture and operational performance ($r = 0.685$, $p < 0.001$). This finding is consistent with the results of Hidayat et al. [6], who found that

maritime safety culture has a positive and significant effect on shipping operational performance ($\beta = 0.715$, $p < 0.001$), and with Mudiyanto *et al.* [15], who demonstrated that safety culture significantly mediates the relationship between crew behavior and seafarer performance.

Multiple regression analysis was conducted to identify which safety culture dimensions are the strongest predictors of operational performance. The model was statistically significant, $F(6, 203) = 34.27$, $p < 0.001$, $R\text{-squared} = 0.503$, indicating that the six safety culture dimensions collectively explain 50.3 percent of the variance in operational performance. Management commitment ($\beta = 0.298$, $p < 0.001$), regulatory compliance ($\beta = 0.245$, $p < 0.001$), and safety procedures ($\beta = 0.198$, $p = 0.003$) emerged as the strongest predictors. These findings align with the ABS framework, which identifies management commitment and safety procedures as core safety factors [9], and with the AMSA study's emphasis on safety leadership [10].

D. Challenges Affecting Safety Culture

The study identified several significant challenges affecting safety culture development among Philippine seafarers. Underreporting of incidents and near-misses ($M = 4.12$, $SD = 0.58$) was rated as the most severe challenge, consistent with the findings of Gron and Knudsen [13] regarding reporting practices among Filipino seafarers. The fear of blame, disciplinary action, and reputational damage continues to discourage transparent reporting, highlighting the need for just culture frameworks that distinguish between honest errors and willful violations [7], [10].

Fatigue and workload ($M = 3.89$, $SD = 0.64$) was the second most pressing challenge, with respondents citing long working hours, irregular sleep patterns, and pressure to meet schedules as factors compromising safety. This finding echoes the AMSA study's observation that high work demands negatively impact recovery and safety outcomes [10]. The STCW Manila amendments introduced revised requirements on hours of work and rest to address this issue [16], but enforcement remains a challenge.

Cultural barriers to safety communication ($M = 3.65$, $SD = 0.68$) was also identified as a significant challenge, reflecting the hierarchical nature of shipboard culture where junior crew members may hesitate to raise safety concerns to senior officers. Language and communication difficulties in multicultural crews further compound this challenge [13]. Inadequate safety training reinforcement ($M = 3.42$, $SD = 0.71$) and insufficient shore-based support ($M = 3.28$, $SD = 0.74$) were rated as moderate challenges, suggesting that while initial STCW training is effective, ongoing reinforcement needs improvement [18].

5. Conclusion

This study assessed the level of safety culture and its influence on operational performance among Philippine seafarers. The findings reveal that safety culture is generally high, with management commitment receiving the highest ratings and non-punitive incident reporting the lowest. The

strong positive correlation between safety culture and operational performance ($r = 0.685$, $p < 0.001$) confirms that investments in safety culture translate directly into better operational outcomes, supporting the findings of previous studies [6], [15].

The regression analysis identified management commitment, regulatory compliance, and safety procedures as the strongest predictors of operational performance, accounting for over half of the variance in performance scores. This finding underscores the critical role of leadership and systematic safety management in driving both safety and operational excellence in the maritime industry.

The persistent challenges of underreporting, fatigue, and cultural barriers to safety communication highlight the need for targeted interventions. The study recommends: (1) implementing just culture frameworks that protect seafarers who report honest errors from punitive action, consistent with ISM Code principles [3], [4]; (2) strengthening fatigue management through stricter enforcement of STCW hours of work and rest requirements [16]; (3) providing continuous safety training reinforcement beyond initial STCW certification [18]; and (4) promoting a speak-up culture that empowers all crew members to raise safety concerns regardless of rank or nationality.

Future research should examine the effectiveness of specific safety culture interventions on accident reduction among Filipino seafarers, and explore the influence of vessel type, trade route, and crew nationality composition on safety culture development. Longitudinal studies tracking safety culture maturity over time would provide valuable insights into the sustainability of safety culture improvement initiatives.

References

- [1] B. Cariaso, "Philippines remains top supplier of seafarers," *The Philippine Star*, Jul. 12, 2026. [Online]. Available: <https://www.philstar.com/headlines/2026/07/12/2541521/philippines-remains-top-supplier-sea-farers>
- [2] Maritime Industry Authority, "2023 MARINA Statistical Report," MARINA, Manila, Philippines, 2024. [Online]. Available: <https://marina.gov.ph/wp-content/uploads/2025/02/MARINA-Stat-Report-2023-adjusted.pdf>
- [3] International Maritime Organization, "The International Safety Management (ISM) Code," IMO Resolution A.741(18), adopted 1993. [Online]. Available: <https://www.imo.org/en/ourwork/humanelement/pages/ismcode.aspx>
- [4] International Association of Ports and Harbors, "International Safety Management Code for Safe Operation of Ships and for Pollution Prevention," IAPH Legal Database. [Online]. Available: <https://www.iaphworldports.org/n-iaph/wp-content/uploads/legal-db/A-17-INTERNATIONAL-SAFETY-MANAGEMENT.pdf>
- [5] Maritime Industry Authority, "Memorandum Circular No. 122: Rules and Regulations Implementing the ISM Code for Philippine-Registered Ships Engaged in International Voyages," MARINA, 1998. [Online]. Available: <https://marina.gov.ph/wp-content/uploads/2018/07/mc122.pdf>
- [6] Hidayat *et al.*, "Ship crew behavior, maritime safety culture, and shipping operational performance," *J. Maritime Park*, vol. 6, no. 1, pp. 1–14, Feb. 2026. [Online]. Available: <https://journal.unhas.ac.id/index.php/maritimepark/article/view/47535>
- [7] P. Hudson, "Human factors and safety culture in maritime safety," *TransNav: Int. J. Marine Navig. Safety Sea Transport.*, 2014. [Online]. Available: [https://www.transnav.eu/files/Human_Factors_and_Safety_Culture_in_Maritime_Safety_\(revised\),443.pdf](https://www.transnav.eu/files/Human_Factors_and_Safety_Culture_in_Maritime_Safety_(revised),443.pdf)

- [8] V. Arslan, R. E. Kurt, O. Turan, and L. De Wolff, "Safety culture assessment and implementation framework to enhance maritime safety," in *Proc. Int. Conf. Maritime Safety*, 2016. [Online]. Available: <https://www.sciencedirect.com/science/article/pii/S2352146516304847>
- [9] American Bureau of Shipping, "Guidance Notes on Safety Culture and Leading Indicators of Safety," ABS, Houston, TX, USA, 2012. [Online]. Available: <https://maritimesafetyinnovationlab.org/wp-content/uploads/2016/03/abs-safety-culture-and-leading-indicators-of-safety.pdf>
- [10] Australian Maritime Safety Authority, "Assessing the determinants and consequences of safety culture in the maritime industry," AMSA, Canberra, Australia, 2018. [Online]. Available: <https://www.amsa.gov.au/sites/default/files/assessing-the-determinants-consequences-of-safety-culture-in-maritime-ind.pdf>
- [11] P. Hudson, "Safety culture maturity model," in *Human Factors and Safety Culture in Maritime Safety*, TransNav, 2014. [Online]. Available: [https://www.transnav.eu/files/Human_Factors_and_Safety_Culture_in_Maritime_Safety_\(revised\),443.pdf](https://www.transnav.eu/files/Human_Factors_and_Safety_Culture_in_Maritime_Safety_(revised),443.pdf)
- [12] University of Strathclyde, "Development of a safety culture assessment and improved framework to enhance maritime safety," Ph.D. dissertation, Univ. Strathclyde, Glasgow, UK, 2018. [Online]. Available: <https://pureportal.strath.ac.uk/en/studentTheses/development-of-a-safety-culture-assessment-and-improved-framework-3>
- [13] S. Grøn and F. Knudsen, "Why do Filipinos have fewer reported work accidents than other nationals? Findings from literature," *Int. Maritime Health*, vol. 63, no. 2, pp. 96–101, 2012. [Online]. Available: https://journals.viamedica.pl/international_maritime_health/article/download/26145/20939
- [14] Open University Repository, "Occupational health safety culture among cadet seafarers in the Philippines," UPOU Repository, 2023. [Online]. Available: <https://repository.upou.edu.ph/items/aa5fd7fe-0269-43a8-b413-2be9c4da082e>
- [15] Mudiyanto, E. F. Anggraeny, and F. J. U. Widodo, "The influence of behavior through safety culture on seafarers' performance on merchant ship," *Kapal: J. Ilmu Pengetahuan dan Teknologi Kelautan*, vol. 23, no. 2, Jun. 2026, doi: 10.14710/kapal.v23i2.71852. [Online]. Available: <https://ejournal.undip.ac.id/index.php/kapal/article/view/71852>
- [16] International Maritime Organization, "International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), 1978, as amended," IMO, London, UK. [Online]. Available: [https://www.imo.org/en/About/Conventions/Pages/International-Convention-on-Standards-of-Training-Certification-and-Watchkeeping-for-Seafarers-\(STCW\).aspx](https://www.imo.org/en/About/Conventions/Pages/International-Convention-on-Standards-of-Training-Certification-and-Watchkeeping-for-Seafarers-(STCW).aspx)
- [17] INSB Class, "Manila amendments to the STCW Convention and Code," INSB Technical Notice, Apr. 2016. [Online]. Available: <https://insb.gr/technicalnotice/manila-amendments-to-the-stcw-convention-code/>
- [18] Universiti Malaysia Terengganu, "The impact of basic training on seafarers' safety knowledge and competency," *J. Sustain. Sci. Manag.*, vol. 15, no. 6, 2020. [Online]. Available: https://jssm.umt.edu.my/wp-content/uploads/2020/10/12-_15.6.pdf