CINEFORUM
ISSN: 0009-7039
Vol. 66. No. S2, 2026 (Special Issue 2)

ICT Systems and Maritime Professionals' Workplace Experiences: Exploring Occupational Stress in High-Risk Maritime Operations

Dione A. Baring[1], Siem C. Mayol[2]

[1] College of Maritime Sciences, Cebu Technological University – Carmen Campus, Carmen 6005, Cebu, Philippines.
Email: dione.baring@ctu.edu.ph
[2] College of Maritime Sciences, Cebu Technological University – Carmen Campus, Carmen 6005, Cebu, Philippines.
Corresponding Author:
Dione A. Baring
Email: dione.baring@ctu.edu.ph

Abstract
The increasing digitalization of the maritime industry has transformed shipboard operations through the integration of Information and Communication Technology (ICT) systems that support navigation, communication, and operational management. Despite these technological advancements, limited qualitative research has examined how ICT systems influence maritime professionals' workplace experiences and occupational stress, particularly in high-risk maritime operations. This study explored how ICT systems influence maritime professionals' workplace experiences and occupational stress in high-risk maritime operations. Guided by the Sociotechnical Systems Theory, the study employed an exploratory qualitative research design involving 20 Filipino maritime professionals who had experience working in high-risk maritime environments. Participants were selected using purposive sampling, and data were collected through semi-structured interviews. The interview transcripts were analyzed using Reflexive Thematic Analysis. The findings generated six themes: ICT-Supported Work, Stress Management, Digital Communication, Collaborative Decision-Making, Operational Opportunities, and Technological Challenges. Participants reported that ICT systems enhanced operational efficiency, strengthened communication and teamwork, facilitated collaborative decision-making, improved situational awareness, and supported the management of occupational stress. They also identified opportunities for professional growth through the development of digital competencies. However, technological challenges, including connectivity interruptions, system malfunctions, and varying levels of digital competence, occasionally disrupted operations and increased workplace stress. The study concludes that ICT systems positively influence maritime professionals' workplace experiences when supported by reliable technological infrastructure, continuous digital skills development, and organizational support. The findings provide practical insights for maritime organizations seeking to strengthen digital transformation initiatives while promoting employee well-being, operational resilience, and sustainable maritime operations.
Keywords Information and Communication Technology (ICT), workplace experiences, occupational stress, maritime professionals, high-risk maritime operations

Introduction

The maritime industry has experienced rapid technological advancement through the adoption of Information and Communication Technology (ICT) systems, fundamentally transforming ship navigation, operational management, communication, and maritime safety. Modern vessels increasingly utilize digital technologies such as the Electronic Chart Display and Information System (ECDIS), Automatic Identification System (AIS), Global Maritime Distress and Safety System (GMDSS), satellite communications, and integrated bridge systems to improve navigational accuracy, operational efficiency, and decision-making. The growing digitalization of maritime operations has strengthened information exchange among vessels, ports, and shore-based organizations while enhancing organizational performance and safety management. As digital transformation continues to reshape global shipping, ICT systems have become essential organizational resources for maintaining operational resilience in increasingly complex maritime environments (Lambrou et al., 2019; Surucu-Balci et al., 2024).

Despite these technological developments, maritime professionals continue to encounter significant occupational stress resulting from extended working hours, prolonged isolation, multicultural working environments, demanding operational responsibilities, and extended separation from their families (Lefkowitz et al., 2020; Szafran-Dobrowolska et al., 2023; Janssen et al., 2026). These occupational demands become substantially more

challenging when vessels navigate high-risk maritime operations characterized by piracy, geopolitical conflicts, and hostile security threats. While ICT systems provide real-time information and communication that support operational decision-making, they also require continuous technological adaptation, increased digital competence, and constant interaction with digital systems. Consequently, maritime professionals must balance the benefits of ICT-enabled operations with the additional cognitive and organizational demands associated with digital technologies (Galatas et al., 2025; Surucu-Balci et al., 2024).

Workplace experiences encompass employees' perceptions of organizational communication, teamwork, leadership support, decision-making processes, and the overall work environment. Within maritime organizations, ICT systems facilitate timely communication between shipboard personnel and shore-based management, improve coordination during routine and emergency operations, and enhance collaborative decision-making across geographically dispersed teams. Effective implementation of ICT systems contributes to operational efficiency and strengthens employees' confidence in performing complex maritime tasks. Conversely, technological disruptions, inadequate digital infrastructure, and insufficient ICT training may create communication barriers, increase operational uncertainty, and contribute to occupational stress, particularly in high-risk maritime operations (Robbins & Judge, 2013; Yang, 2020; Surucu-Balci et al., 2024).

The Sociotechnical Systems Theory proposed by Trist and Bamforth (1951) provides an appropriate theoretical lens for understanding the relationship between ICT systems and workplace experiences. The theory posits that organizational effectiveness depends on the successful interaction between technological systems and the social environment in which employees perform their work. Within maritime operations, ICT systems constitute the technological subsystem, whereas maritime professionals, leadership, teamwork, and organizational communication comprise the social subsystem. Effective integration of these components enables organizations to maximize technological capabilities while supporting employee well-being and reducing occupational stress. Conversely, technological advancement without corresponding organizational support may diminish employees' workplace experiences and hinder operational effectiveness.

Previous maritime research has primarily examined occupational stress, resilience, psychological well-being, and safety management among seafarers (Jensen & Oldenburg, 2019; Abila & Acejo, 2021; Szafran-Dobrowolska et al., 2023). Although recent studies have emphasized the growing importance of maritime digitalization and ICT-enabled operations (Lambrou et al., 2019; Surucu-Balci et al., 2024), limited qualitative research has explored how ICT systems shape maritime professionals' workplace experiences and influence occupational stress, particularly in high-risk maritime operations. Existing studies have largely focused on technological implementation and operational performance while giving less attention to employees' lived experiences with ICT systems in demanding operational environments.

Therefore, this study aims to explore how ICT systems influence maritime professionals' workplace experiences and occupational stress in high-risk maritime operations. By examining the lived experiences of maritime professionals, the study seeks to provide practical insights for maritime organizations in strengthening digital infrastructure, enhancing organizational communication, supporting employee well-being, and developing human-centered ICT strategies that contribute to safer, more resilient, and sustainable maritime operations.

Methods

Research Design

This study employed an exploratory qualitative research design to examine how ICT systems influence maritime professionals' workplace experiences and occupational stress in high-risk maritime operations. Qualitative research is appropriate for investigating participants' lived experiences, perceptions, and interpretations of workplace phenomena within their natural settings. The exploratory approach enabled the researchers to obtain rich descriptions of how maritime professionals interact with ICT systems during complex operational conditions, particularly in environments characterized by heightened security risks and demanding work requirements. This design was selected because limited qualitative evidence exists regarding the influence of ICT systems on workplace experiences and occupational stress among maritime professionals operating in high-risk maritime environments (Calaro et al., 2023; Chavez, 2022).

Sampling and Participants

The participants consisted of 20 Filipino maritime professionals representing different occupational positions within the maritime industry. A purposive sampling technique was employed to select participants who possessed extensive experience in utilizing ICT systems during maritime operations. Participants were required to meet the following inclusion criteria: (1) currently employed or previously employed aboard commercial vessels; (2) had at least one deployment involving high-risk maritime operations; (3) regularly utilized onboard ICT systems such as Electronic Chart Display and Information System (ECDIS), Automatic Identification System (AIS), Global Maritime Distress and Safety System (GMDSS), satellite communication systems, or other digital maritime technologies; and (4) were willing to share their workplace experiences during the interview process. Purposive

sampling ensured that participants possessed sufficient knowledge and practical experience to provide meaningful insights into the influence of ICT systems on workplace experiences and occupational stress (Ahmed, 2024).

Instrument

The interview guide consisted of three open-ended questions designed to explore participants' experiences regarding the use of ICT systems in high-risk maritime operations. Follow-up probing questions were employed whenever necessary to obtain deeper explanations and clarify participants' responses. The interview guide was subjected to content validation by three experts with backgrounds in maritime education, information and communication technology, and qualitative research.

Table 1. Research Instrument

Objectives	Interview questions
To explore how ICT systems influence maritime professionals' workplace experiences and occupational stress in high-risk maritime operations.	1. How have ICT systems influenced your ability to manage occupational stress while working in high-risk maritime operations?
	2. How have ICT systems affected communication, decision-making, and teamwork during maritime operations?
	3. What opportunities and challenges have you experienced in using ICT systems while performing your duties in high-risk maritime environments?

Data Gathering Procedure

Prior to data collection, permission to conduct the study was obtained from the appropriate authorities, and eligible participants were invited through email, telephone communication, and professional maritime networks. Participants received an explanation regarding the purpose of the study, voluntary participation, confidentiality, and their right to withdraw at any stage without consequences. Written informed consent was obtained before the interviews commenced.

Semi-structured interviews were conducted either face-to-face or through secure online communication platforms depending on participants' availability and location. Each interview lasted approximately 45 to 60 minutes and was audio-recorded with participants' permission. The flexible interview format enabled participants to describe their experiences with ICT systems, workplace communication, decision-making, collaboration, and occupational stress in detail. Following each interview, audio recordings were transcribed verbatim to facilitate data analysis.

Data analysis

The collected interview transcripts were analyzed using Reflexive Thematic Analysis following the framework proposed by Braun and Clarke (2019). Initially, the researchers familiarized themselves with the interview transcripts through repeated reading to gain a comprehensive understanding of the participants' narratives. Initial codes representing meaningful units of information related to ICT systems, workplace experiences, communication, teamwork, and occupational stress were then generated. Similar codes were subsequently organized into broader categories, allowing the identification of recurring patterns and themes across participants' responses. The emerging themes were continuously reviewed, refined, and defined to ensure that they accurately represented the participants' lived experiences and addressed the research objective. This systematic analytical process facilitated the development of credible and meaningful interpretations grounded in the participants' narratives.

Results

Research Objective. To explore how ICT systems influence maritime professionals' workplace experiences and occupational stress in high-risk maritime operations.

Interview Question 1. How have ICT systems influenced your ability to manage occupational stress while working in high-risk maritime operations?

Theme 1: ICT-Supported Work

Participants described ICT systems as valuable tools that enhanced their work performance while operating in high-risk maritime environments. They explained that digital navigation systems, electronic monitoring technologies, and communication platforms provided timely operational information, enabling them to complete tasks more efficiently and confidently. Access to real-time data reduced uncertainty during navigation and emergency situations, allowing participants to remain focused on operational responsibilities despite challenging working conditions.

"The navigation systems provide updated information that helps us respond immediately whenever conditions suddenly change. Having reliable information allows us to concentrate on our work instead of worrying about unknown situations."
"ICT systems help us perform our responsibilities more efficiently because operational information is always available whenever we need it."

Theme 2: Stress Management
Participants reported that ICT systems contributed to managing occupational stress by improving situational awareness and facilitating timely communication during critical operations. The availability of accurate information reduced feelings of uncertainty and enabled them to respond systematically to operational challenges. Participants emphasized that reliable ICT systems increased their confidence when performing duties in high-risk maritime environments.
"When communication systems work properly, everyone knows what is happening. That reduces confusion and helps us stay calm during stressful situations."
"Receiving real-time operational updates gives us confidence because we know we are making decisions based on accurate information."

Interview Question 2. How have ICT systems affected communication, decision-making, and teamwork during maritime operations?
Theme 3: Digital Communication
Participants consistently identified ICT systems as improving communication among crew members and between vessels and shore-based management. They explained that digital communication platforms facilitated immediate information sharing, faster reporting, and efficient coordination during both routine operations and emergency situations. Participants believed that timely communication strengthened workplace relationships and minimized misunderstandings among crew members.
"Communication has become much faster because everyone receives the same information through our digital systems. It keeps the entire crew updated."
"We can immediately coordinate with different departments whenever operational concerns arise because our communication systems are always available."

Theme 4: Collaborative Decision-Making
Participants emphasized that ICT systems supported collaborative decision-making by providing shared operational information that could be accessed by different members of the crew. The availability of updated digital data encouraged discussions based on objective information and promoted coordinated responses during complex maritime situations.
"When everyone can see the same operational information, decisions become more accurate because we discuss facts rather than assumptions."
"ICT systems encourage teamwork because every department contributes information before major operational decisions are made."

Interview Question 3. What opportunities and challenges have you experienced in using ICT systems while performing your duties in high-risk maritime environments?
Theme 5: Operational Opportunities
Participants identified numerous opportunities resulting from the integration of ICT systems into maritime operations. They explained that digital technologies improved navigational accuracy, enhanced operational efficiency, supported continuous learning, and strengthened workplace productivity. Several participants also viewed ICT systems as essential tools for adapting to the increasing digitalization of the global maritime industry.
"Modern ICT systems have made our work more efficient. We complete tasks faster while maintaining operational safety."
"Using advanced digital technologies has improved my technical skills and prepared me for modern maritime operations."

Theme 6: Technological Challenges
Although participants acknowledged the benefits of ICT systems, they also described several technological challenges affecting their workplace experiences. These included unstable satellite connectivity, occasional system malfunctions, software updates, equipment failures, and differences in digital competencies among crew members. Participants explained that these technological limitations sometimes increased occupational stress, particularly during high-risk operations where reliable information was critical.

"When communication systems suddenly lose connection, everyone becomes more anxious because information is delayed during critical situations."
"Some crew members are still adjusting to new technologies, so additional training is necessary to maximize the benefits of ICT systems."

Discussion

The findings demonstrate that ICT systems have become integral to maritime professionals' workplace experiences, particularly in high-risk maritime operations where timely access to information and effective communication are essential for operational safety. Participants described ICT systems as valuable resources that supported work performance, reduced uncertainty, and facilitated informed decision-making during demanding operational conditions. These findings reinforce the growing role of digital technologies in modern shipping, where integrated ICT infrastructure enhances operational efficiency and enables real-time coordination between vessels and shore-based organizations (Lambrou et al., 2019). Consistent with Sociotechnical Systems Theory (Trist & Bamforth, 1951), the findings suggest that technological systems contribute positively to workplace experiences when effectively integrated with human interaction, organizational support, and operational practices.

Participants further emphasized that ICT systems contributed to occupational stress management by improving situational awareness and providing accurate operational information during high-risk maritime operations. The availability of real-time communication and monitoring technologies reduced uncertainty and enabled crew members to respond systematically to operational challenges. These findings align with previous maritime research indicating that occupational stress among seafarers is often intensified by uncertainty, prolonged exposure to demanding working environments, and operational risks (Lefkowitz et al., 2020; Szafran-Dobrowolska et al., 2023; Janssen et al., 2026). By facilitating immediate access to information and improving operational awareness, ICT systems functioned as organizational resources that supported employees' confidence and resilience while performing their responsibilities. Similar observations have been reported in digital maritime operations, where technological systems enhance both operational performance and workplace adaptability (Surucu-Balci et al., 2024).

Another important finding was the influence of ICT systems on communication, teamwork, and collaborative decision-making. Participants described digital communication platforms as facilitating timely information sharing among crew members and improving coordination with shore-based personnel. Access to shared operational information encouraged collaborative discussions and enabled departments to make informed decisions based on accurate digital data. These findings support the argument that effective organizational communication is fundamental to workplace effectiveness and employee satisfaction (Robbins & Judge, 2013). Likewise, Yang (2020) emphasized that digital technologies improve communication efficiency and organizational coordination within maritime operations, contributing to safer and more responsive operational environments. The findings therefore suggest that ICT systems strengthen workplace relationships by promoting transparency, cooperation, and collective decision-making during complex maritime operations.

Participants also recognized that ICT systems created opportunities for professional development and operational improvement. Continuous exposure to digital technologies enabled maritime professionals to enhance their technical competencies while adapting to the increasing digitalization of the maritime industry. The findings support previous studies indicating that digital transformation strengthens organizational capability by improving workforce competence, operational flexibility, and technological readiness (Lambrou et al., 2019). As maritime organizations continue investing in digital infrastructure, employees increasingly view ICT competence as an essential professional skill that supports career development and organizational performance.

Despite these advantages, participants also identified technological challenges that affected their workplace experiences. Connectivity interruptions, occasional system failures, software updates, and differences in digital competencies among crew members sometimes disrupted operations and increased occupational stress, particularly during high-risk maritime situations where uninterrupted communication was critical. These findings are consistent with research suggesting that while digital technologies improve operational effectiveness, they may also introduce new organizational challenges related to technological reliability, system integration, and employee digital readiness (Surucu-Balci et al., 2024). Furthermore, inadequate technological support and insufficient ICT training may reduce employees' confidence in utilizing digital systems effectively, thereby limiting the potential benefits of digital transformation.

Viewed through the lens of Sociotechnical Systems Theory, the findings demonstrate that successful ICT implementation extends beyond technological investment alone. The effectiveness of digital systems depends on how well organizations integrate technological capabilities with employee competencies, leadership support, organizational communication, and collaborative work practices (Trist & Bamforth, 1951). ICT systems alone cannot eliminate occupational stress; rather, their effectiveness depends on the presence of supportive organizational structures, continuous professional development, and a workplace culture that encourages

collaboration and digital adaptation. This interaction between technological and social systems explains why participants experienced both significant opportunities and persistent challenges in their use of ICT systems.
Overall, the study highlights the importance of adopting a human-centered approach to maritime digitalization. Maritime organizations should continue investing not only in advanced ICT infrastructure but also in continuous digital skills training, reliable technical support, effective communication systems, and organizational policies that strengthen employee well-being. Such initiatives can maximize the benefits of ICT systems while minimizing technological barriers, ultimately contributing to safer, more efficient, and more resilient maritime operations in increasingly complex and high-risk environments.

Conclusion

This study explored how ICT systems influence maritime professionals' workplace experiences and occupational stress in high-risk maritime operations. The findings revealed that ICT systems play a significant role in enhancing workplace experiences by improving operational efficiency, facilitating timely communication, supporting collaborative decision-making, and reducing uncertainty during complex maritime operations. Participants perceived digital technologies as valuable organizational resources that strengthened their ability to perform operational responsibilities while contributing to occupational stress management through improved situational awareness and access to real-time information. Furthermore, ICT systems created opportunities for professional development by enhancing digital competencies and preparing maritime professionals to meet the evolving technological demands of the maritime industry.
Despite these positive contributions, the study also found that technological limitations, including connectivity disruptions, system malfunctions, and differences in digital competencies among crew members, continue to present challenges that may affect workplace experiences and contribute to occupational stress. These findings suggest that the successful implementation of ICT systems requires more than technological advancement alone. Maritime organizations should complement digital transformation initiatives with continuous ICT training, reliable technological infrastructure, responsive technical support, and organizational policies that promote collaboration and employee well-being. Future qualitative studies may further explore ICT adoption across different maritime sectors and cultural contexts to expand understanding of how digital technologies can strengthen organizational resilience, workplace experiences, and sustainable maritime operations in increasingly complex environments...

References

1. Abila, S. S., & Acejo, I. L. (2021). Mental health of Filipino seafarers and its implications for seafarers' education. International Maritime Health, 72(3), 183-192.
2. Ahmed, S. K. (2024). The pillars of trustworthiness in qualitative research. Journal of medicine, surgery, and public health, 2, 100051.
3. Balcı, G. (2021). Digitalization in container shipping services: Critical resources for competitive advantage. Journal of ETA Maritime Science.
4. Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. Qualitative research in sport, exercise and health, 11(4), 589-597.
5. Calaro, M. F., Vicente, M. B., Chavez, J. V., Reyes, M. J. D., Delantar, S., Jorolan, A., ... & Torres, J. (2023). Marketing campaigns leading to the purchase of accommodation products: A content analysis. Journal of Namibian Studies: History Politics Culture, 33, 4221-4236.
6. Chavez, J. (2022). Narratives of bilingual parents on the real-life use of English language: Materials for English language teaching curriculum. Arab World English Journals, 13(3).
7. Galatas, B. G. R. J., Cbrn, H., & Filippi, A. M. (2025). Emergency medical operations in open seas. Medical, 12.
8. Janssen, W., Jensen, H. J., Harth, V., & Oldenburg, M. (2026). Resilience of seafarers depending on occupational groups. BMC Public Health, 26(1), 1171.
9. Jensen, H. J., & Oldenburg, M. (2019). Potentially traumatic experiences of seafarers. Journal of Occupational Medicine and Toxicology, 14(1), 17.
10. Lambrou, M., Watanabe, D., & Iida, J. (2019). Shipping digitalization management: conceptualization, typology and antecedents. Journal of Shipping and Trade, 4(1), 11.
11. Lefkowitz, R., Null, D., Slade, M., & Redlich, C. (2020). Injury, illness, and mental health risks in United States domestic mariners. Journal of Occupational & Environmental Medicine. https://doi.org/10.1097/JOM.0000000000001968

12. Lincoln, Y. (1980). Guba. E.(1985). Naturalistic inquiry. Beverly Hills: Sage. LincolnNaturalistic Inquiry1985.
13. Robbins, S.P., & Judge, T.A. (2013). Organisational behavior (15th edn.). Upper Saddle River, NJ: Prentice Hall.
14. Surucu-Balci, E., Iris, Ç., & Balci, G. (2024). Digital information in maritime supply chains with blockchain and cloud platforms: Supply chain capabilities, barriers, and research opportunities. Technological Forecasting and Social Change, 198, 122978.
15. Szafran-Dobrowolska, J., Grubman-Nowak, M., Renke, M., & Jeżewska, M. (2023). The psychosocial burden and stress coping strategies among seafarers. International Maritime Health, 74(2), 122-128. https://doi.org/10.5603/IMH.2023.0018
16. Trist, E. L., & Bamforth, K. W. (1951). Some social and psychological consequences of the longwall method of coal-getting: An examination of the psychological situation and defences of a work group in relation to the social structure and technological content of the work system. Human relations, 4(1), 3-38.
17. Yang, C. S. (2019). Maritime shipping digitalization: Blockchain-based technology applications, future improvements, and intention to use. Transportation Research Part E: Logistics and Transportation Review, 131, 108-117...