



A Structured Supervision Scheme for Maritime Cadets' Onboard Training Program

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Abstract. This study aims to develop an effective supervision scheme for maritime cadets' sea practice (prala) through a collaborative and integrated digital approach. It adopts an embedded mixed-method design using the Scale, Choice, and Insight (CSI) framework, combining Likert-scale questionnaires and open-ended responses, with participants including lecturers, onboard supervising officers, and cadets. The findings reveal that the current supervision system remains suboptimal, as it primarily relies on general communication platforms such as WhatsApp, Telegram, and Google Forms, which are insufficient for managing large numbers of cadets and tend to emphasize administrative processes such as sign-on and sign-off. Key aspects of comprehensive supervision—including monitoring onboard activities, competency achievement, mentoring processes, Training Record Book (TRB) completion, and authentic evidence through photos and videos—are not systematically implemented, while supervision is also overly centralized within a specific institutional unit. To address these limitations, this study proposes a collaborative supervision model involving both lecturers and onboard officers who jointly review reports, provide guidance, and conduct assessments. The results indicate a strong stakeholder preference for Android-based mobile platforms due to their accessibility and practicality, with an ideal supervision ratio of 5–10 cadets per lecturer and a monthly reporting frequency identified as optimal. Furthermore, cadets demonstrate higher motivation and a stronger sense of control when supervision is conducted collaboratively from pre-departure to sign-off. Overall, the proposed Android-based digital supervision system offers a more structured, collaborative, and efficient approach to enhancing the quality of maritime training supervision.

Keywords: *Maritime education, Sea practice supervision, Android-based system, Onboard training, Embedded mixed methods*

1. INTRODUCTION

The rapid advancement of digital technologies, coupled with the increasing complexity of global maritime operations, has significantly reshaped the competency requirements for maritime professionals. The maritime industry is undergoing a major transformation driven by automation, digitalization, and stricter safety regulations, requiring seafarers to possess not only technical proficiency but also adaptive,

cognitive, and digital competencies. Consequently, Maritime Education and Training (MET) institutions are expected to align their curricula and training systems with international standards, particularly the Standards of Training, Certification, and Watchkeeping (STCW), to ensure the global competitiveness of maritime graduates [1][2]. Within this framework, onboard training programs (Praktek Laut or Prala) play a pivotal role in bridging the gap between theoretical instruction and real-world maritime practices [3]. In this context, sea practice is not merely a compulsory academic requirement but also a critical phase in shaping cadets' professional competence and readiness to operate in complex maritime environments.

Despite its strategic importance, the supervision of onboard training remains a critical challenge across many maritime education systems. Existing supervision practices are often fragmented, involving limited coordination between academic supervisors, onboard ship officers, and institutional administrators. In practice, supervision tends to emphasize administrative compliance—such as verification of embarkation and disembarkation documents—rather than focusing on continuous mentoring, competency-based assessment, and structured feedback processes [4]. Furthermore, the absence of standardized supervision frameworks and the limited integration of digital technologies contribute to inefficiencies, lack of transparency, and inconsistent training outcomes across institutions and shipping companies. In addition to these challenges, the lack of real-time monitoring mechanisms further weakens the ability of institutions to ensure the quality and consistency of cadets' learning experiences during onboard training.

The rapid development of digital technology has opened new opportunities for transforming supervision practices in vocational and maritime education. Digital-based monitoring systems have been increasingly recognized as effective tools to enhance transparency, accountability, and coordination among stakeholders. However, despite these advancements, many existing supervision systems remain conventional and fragmented, lacking integration between lecturers and ship officers as key actors in the training process. This condition indicates that digital transformation in maritime education has not yet been fully optimized, particularly in supporting collaborative supervision.

Previous studies have emphasized the importance of digital transformation in maritime education, particularly in enhancing training effectiveness, monitoring systems, and competency-based assessment [5][6]. However, most existing approaches remain partial and fragmented, focusing on specific aspects such as simulator-based training, administrative digitalization, or isolated monitoring tools [7]. These approaches often fail to address the need for a comprehensive and collaborative supervision framework that integrates multiple stakeholders within a unified system. Moreover, there is still limited research that explores the perspectives and needs of different user groups—such as lecturers, ship officers, and cadets—in designing an effective and integrated supervision system. As a result, there is a significant research gap in developing an integrated supervision model that systematically connects academic institutions, onboard supervisors, and cadets within a technology-enabled ecosystem.

To address this gap, this study aims to examine the existing supervision system of maritime onboard training, identify the expected or ideal supervision framework, and determine the key aspects that should be monitored during its implementation. By

incorporating the perspectives of multiple stakeholders, this study seeks to provide a more comprehensive understanding of current challenges and user needs in supervision practices. Building upon these objectives, this study further proposes a structured supervision model for maritime cadets' onboard training that integrates monitoring, mentoring, and assessment into a unified collaborative framework. The proposed model highlights the synergistic roles of lecturers as academic supervisors and ship officers as operational mentors, supported by a digital platform that facilitates real-time communication, systematic documentation, and continuous performance evaluation [8].

This study contributes to the growing body of knowledge in maritime education by offering a novel and integrated approach to onboard training supervision that extends beyond administrative monitoring toward a more holistic, transparent, and outcome-oriented system. The findings are expected to provide both theoretical contributions—particularly in advancing competency-based maritime education frameworks—and practical implications for policymakers, maritime institutions, and industry stakeholders in enhancing the quality and effectiveness of onboard training programs in the digital era.

2. METHODOLOGY

This study adopts a mixed-methods research design, integrating quantitative and qualitative approaches to provide a comprehensive analysis of the supervision scheme in maritime onboard training (*Praktik Laut*). A convergent parallel design is employed, where quantitative and qualitative data are collected concurrently, analyzed separately, and subsequently integrated during the interpretation phase. This design enables methodological triangulation and enhances the validity of findings by combining numerical trends with contextual insights [9][10].

The study was conducted at two maritime education institutions in Indonesia, namely Politeknik Pelayaran Barombong and Politeknik AMI Maritime (POLIMARIM) Makassar. These institutions were selected due to their active implementation of onboard training programs and their relevance to the study context. The research involved key stakeholders in onboard training, including cadets, academic supervisors, and ship officers serving as onboard mentors. A purposive sampling technique was applied to ensure that participants possessed relevant experience and knowledge of supervision practices, thereby enhancing data relevance and analytical depth[4].

Data collection was carried out using a structured questionnaire distributed to cadets. The instrument was designed to measure key dimensions of supervision practices, including supervision frequency, communication effectiveness, feedback availability, and training relevance. Responses were measured using a Likert scale to capture the degree of agreement and perception. In addition to close-ended items, the questionnaire incorporated embedded open-ended questions, allowing respondents to elaborate on their answers in the form of short essays. This embedded approach enables the capture of explanatory narratives directly linked to each scale response, thus strengthening the interpretive depth of the data [11].

Quantitative data were analyzed using descriptive statistical techniques, including frequency distributions, percentages, means, and standard deviations, to identify dominant patterns and trends in supervision practices. This approach emphasizes the distribution and variation of responses across stakeholder groups rather than inferential generalization.

Qualitative data derived from open-ended responses were analyzed using the Scale Choice and Insight (SCI) approach integrated with thematic analysis. The Scale Choice stage examined the alignment between respondents' selected response categories and their accompanying explanations, revealing underlying reasoning patterns. The Insight stage involved systematic coding, categorization, and theme development to generate in-depth interpretations of participants' experiences and perceived challenges.[11] [9].

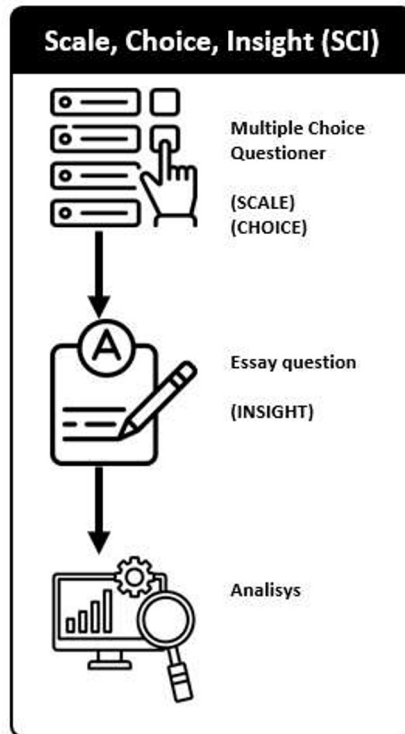


Figure 1. Research Methodology

Data integration was conducted at the interpretation stage using a triangulation strategy, where quantitative trends were compared and enriched with qualitative findings. This process enabled a comprehensive understanding of supervision practices by linking observable response patterns with contextual explanations.

To ensure research rigor, content validity was established through expert review involving maritime education specialists. Data quality was further supported by consistency checks in response patterns and systematic qualitative coding procedures, ensuring coherence between quantitative selections and qualitative justifications.

Ethical considerations were strictly observed. Participants were informed of the study's purpose and provided informed consent prior to participation. Confidentiality and anonymity were maintained throughout the research process to protect participants' identities and responses.

3. RESULT AND DISCUSSION

This study highlights critical gaps and emerging needs in the supervision scheme of maritime cadets' sea training (prala), emphasizing the roles of lecturers, onboard supervising officers, and cadets as key stakeholders within a fragmented supervisory ecosystem. Current practices reveal that supervision is predominantly conducted by institutional prala management units, relying on limited media such as basic communication platforms, with cadet reporting largely confined to administrative milestones, particularly sign-on and sign-off documentation. This narrow approach indicates the absence of a comprehensive supervision framework that encompasses the full training cycle, from pre-departure preparation to onboard activities and post-training evaluation. Furthermore, the findings underline the necessity of actively involving lecturers in the supervision process; however, such involvement must be supported by formal legal authorization to ensure accountability and institutional legitimacy. In parallel, the study underscores the importance of establishing a collaborative supervision model that integrates the roles of lecturers and onboard officers, supported by the selection of an effective and accessible digital supervision medium. Additional considerations include determining an optimal supervision ratio to ensure effective guidance, establishing appropriate reporting frequency throughout the 12-month training period, and defining standardized documentation requirements—such as Training Record Books (TRB), activity logs, and multimedia evidence—to enhance the validity and transparency of cadet performance assessment. Collectively, these aspects point toward the urgent need for a structured, collaborative, and technology-driven supervision scheme capable of addressing existing limitations and aligning maritime training practices with contemporary educational and industry demands.

Based on empirical observations, the current supervision practices in maritime sea training (prala) remain predominantly reliant on chat-based communication platforms such as WhatsApp and Telegram, along with basic data collection tools like Google Forms. While these approaches offer flexibility and ease of communication, the resulting system is largely ad hoc, unstructured, and lacking systemic integration. The absence of real-time tracking mechanisms, standardized documentation, and competency-based evaluation frameworks leads supervision processes to be oriented more toward administrative compliance than toward the assessment of authentic learning outcomes. Furthermore, the fragmentation of data across multiple platforms hinders effective information consolidation, reduces the reliability of performance assessment, and limits data-driven decision-making. Consequently, the existing supervision practices do not yet reflect the principles of digital governance in education, which emphasize integration, accountability, and sustainability, thereby underscoring the need for a more systematic approach that integrates monitoring, evaluation, and feedback within a unified digital ecosystem.

Based on the results of a questionnaire administered to 21 lecturers, 45 ship officers and 41 cadets, the data obtained are presented as follows:

a. Perceptions of the currently implemented onboard training supervision system.

The questionnaire results on the current implementation of onboard training supervision indicate a predominance of critical perceptions among respondents. A total of 38.10% of participants stated that the existing supervision system still requires improvement, highlighting significant gaps in its effectiveness. Meanwhile, 28.57% emphasized the need for a more collaborative supervision model, suggesting that the current approach lacks sufficient integration among key stakeholders, particularly between academic supervisors and onboard ship officers. An equal proportion (28.57%) indicated that the current system should be further developed, implying that although a foundational structure exists, it has not yet reached an optimal level of functionality. In contrast, only a small fraction of respondents (4.76%) perceived the current supervision practices as adequate or well-established. These findings collectively suggest that while the supervision framework is operational, it remains largely transitional and requires both structural enhancement and collaborative reinforcement to effectively support maritime cadets' onboard training.

Interview results with lecturers indicate that: *"In the supervision of sea training, coordination between shipping companies and academic institutions is essential"* (L1).

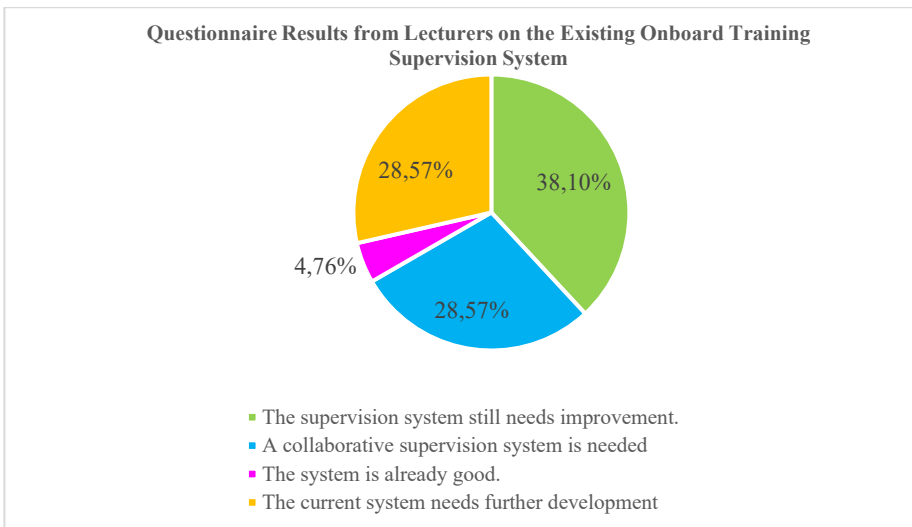


Figure 2. Diagram of the existing onboard training supervision system

A critical issue identified in this study is the lack of comprehensive monitoring of key training components, including onboard activities, mentoring processes, TRB completion, and authentic performance evidence. This finding reinforces earlier studies highlighting that existing TRB-based systems are often limited in capturing holistic learning dimensions, particularly cognitive and affective competencies, which are increasingly required in modern maritime professions. The absence of systematic

documentation and validation mechanisms further weakens the reliability of competency assessment and undermines the overall quality of training.

Another significant finding is the centralized nature of supervision within institutional administrative units, which reduces flexibility and limits direct engagement between lecturers and cadets. This structural limitation contributes to weak coordination between academic institutions and onboard training environments. Prior studies emphasize that effective maritime training requires strong collaboration between stakeholders, including educators, industry practitioners, and regulatory bodies, to ensure alignment between theoretical instruction and practical application. The lack of such collaboration results in fragmented supervision and missed opportunities for meaningful mentoring

b. Onboard training activities that require supervision

The findings reveal that the majority of respondents (80.95%) identified disembarkation as the primary stage at which supervision by lecturers is conducted, indicating a strong concentration of supervisory activities at the final phase of onboard training (Prala). In contrast, only 14.29% of respondents perceived supervision as encompassing the full process, ranging from pre-onboard training through onboard placement to post-disembarkation, suggesting that a comprehensive supervision approach is less commonly implemented. Meanwhile, a minimal proportion (4.76%) indicated that supervision occurs only during embarkation and disembarkation stages. Overall, these results suggest that current supervision practices tend to be limited in scope and are predominantly focused on the end phase, highlighting the need for a more continuous and integrated supervision system throughout the entire training cycle.

In conclusion, the findings indicate that current supervision practices in onboard training remain predominantly end-focused and lack continuity, underscoring the urgent need for a more holistic and integrated supervision framework that spans the entire training cycle from pre-departure to post-disembarkation.

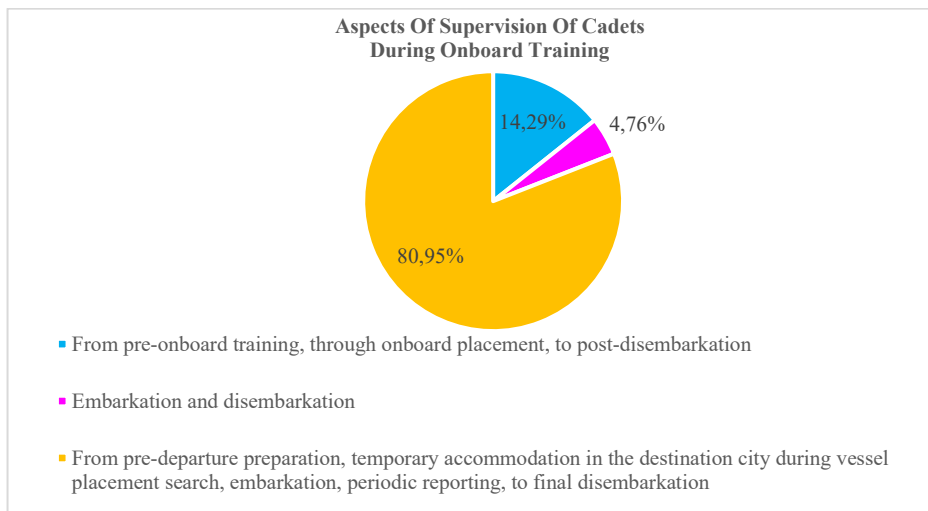


Figure 3. Aspects requiring supervision in onboard training

Based on interview with lecturers indicate that: *“The supervision of cadet activities during onboard training must encompass all onboard activities to ensure that cadets remain safe, compliant, and adhere to the required timelines”* (L2).

c. Onboard training supervision scheme.

The findings indicate that a dominant majority of respondents (85.71%) emphasized the importance of collaborative supervision between ship officers and institutional lecturers, highlighting a strong preference for an integrated supervisory approach. In contrast, only 14.29% of respondents identified supervision conducted solely by ship officers as sufficient. These results suggest that effective supervision of cadets during onboard training (Prala) is perceived to require coordinated involvement between academic and onboard personnel, ensuring comprehensive guidance and monitoring across both institutional and operational contexts.

These findings reinforce the argument that the effective supervision in onboard training is strongly contingent upon a collaborative framework involving both institutional lecturers and ship officers, highlighting the necessity of an integrated supervisory model to ensure comprehensive guidance across academic and operational settings. By enabling joint evaluation, feedback, and monitoring, the model promotes a more holistic and authentic assessment of cadet performance.

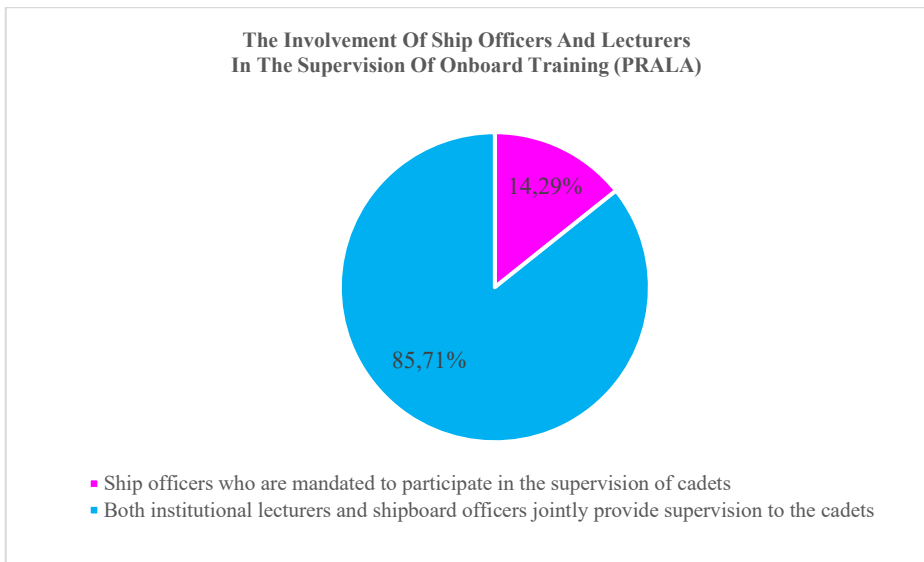


Figure 4. The envolvement of ship officers and lecturers in supervision of onboard training program

Findings from interviews with academic supervisors indicate that: *“Collaboration between lecturers and onboard ship officers represents an appropriate and strategic partnership in enhancing the effectiveness of the supervision process.”* (L3)

d. Platform of digital system

Furthermore, the strong preference for Android-based mobile platforms among stakeholders highlights the importance of accessibility and usability in digital system design. Mobile-based supervision systems allow real-time reporting, multimedia documentation, and continuous communication regardless of geographical constraints. This finding is consistent with research on digital transformation in maritime education, which demonstrates that integrated digital systems improve efficiency, reduce administrative errors, and enhance monitoring capabilities. The use of mobile technology is particularly relevant in maritime contexts, where mobility and connectivity are critical factors.

The findings indicate that the majority of respondents (71.43%) preferred the supervision system to be designed as a mobile-based application on smartphones, reflecting a strong inclination toward flexible and accessible digital platforms. In contrast, only 9.52% of respondents indicated a preference for supervision systems implemented through laptops or PCs, suggesting limited support for more conventional, stationary technologies. Meanwhile, 19.05% of respondents favored a system developed based on chat or messaging platforms, highlighting the perceived importance of real-time communication in supervision practices. Overall, these results demonstrate a clear preference for mobile and communication-driven technologies, underscoring the need for a supervision system that is adaptable, accessible, and responsive to the dynamic conditions of onboard training (Prala).

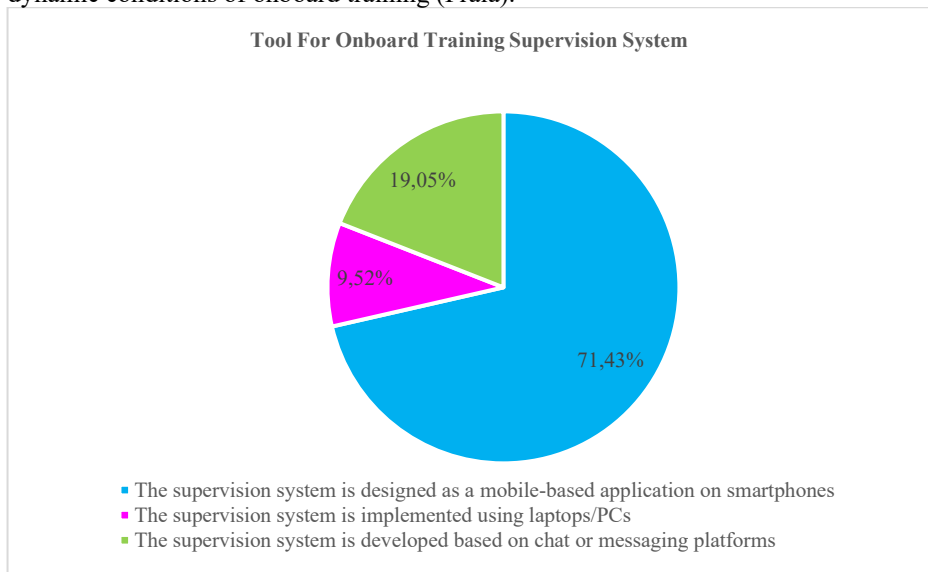


Figure 5. Tool/media for onboard training supervision system

Findings from interviews with lecturers indicate that: “*The use of Android-based mobile devices in supervision would enable cadet onboard training reports to be accessed anytime and anywhere.*” (L4).

e. Optimal supervision ratio

The findings indicate that a substantial majority of respondents (85.71%) perceived the ideal supervision ratio for lecturers during cadets' onboard training (Prala) to be 5–10 cadets per supervisor, suggesting a preference for more focused and manageable supervision. In contrast, only 14.29% of respondents considered a class-based supervision model to be appropriate. These results highlight a clear tendency toward smaller supervision groups, which may enhance the effectiveness of monitoring, guidance, and individualized support for cadets during onboard training.

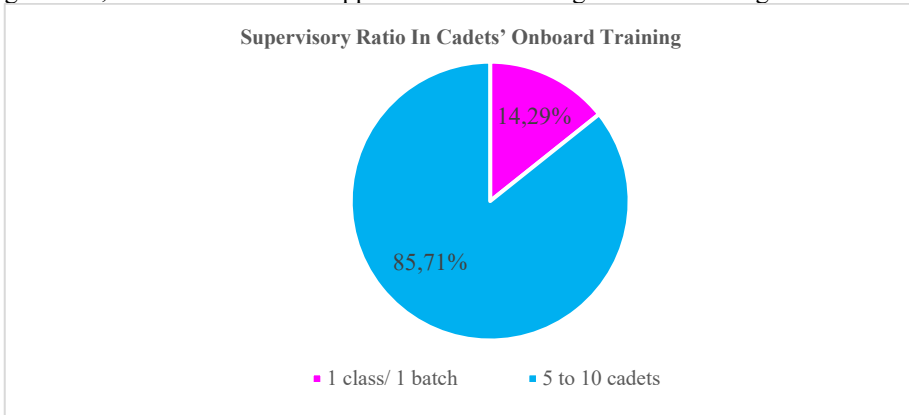


Figure 6. Ratio of supervisory in cadets' onboard training

Findings from interviews with lecturer: *“Supervising 5 to 10 cadets is considered sufficient for effective sea training guidance, given the complexity of issues that may arise during the onboard training process”*. (L5)

The identification of an optimal supervision ratio (5–10 cadets per lecturer) and structured monthly reporting also provides important practical implications. These parameters ensure a balance between supervision quality and workload, enabling more personalized guidance and effective monitoring. This aligns with competency-based training principles, which emphasize continuous assessment and individualized feedback as key drivers of learning effectiveness.

Importantly, the study also reveals that collaborative and continuous supervision significantly enhances cadet motivation and sense of control over their learning process. This finding supports broader educational theories suggesting that learner engagement increases when feedback is timely, supervision is structured, and learning environments are interactive. It also reinforces the need to shift from purely administrative supervision toward learner-centered and competency-oriented approaches.

The proposed collaborative supervision model addresses these limitations by integrating the roles of lecturers and onboard officers in a unified digital platform. This approach reflects the principles of mentorship-based learning, where continuous interaction and knowledge exchange between experienced practitioners and learners significantly enhance skill acquisition and professional readiness.

- f. How often supervision is conducted in onboard training

The findings indicate that the majority of cadets (76.19%) reported their onboard training (Practical) activities on a monthly basis, suggesting that periodic reporting is the most commonly adopted practice. In comparison, 14.29% of cadets reported their activities weekly, while only 9.52% indicated a daily reporting frequency. These results suggest that reporting practices tend to favor less frequent, consolidated submissions rather than continuous monitoring, which may have implications for the timeliness and effectiveness of supervision during onboard training.

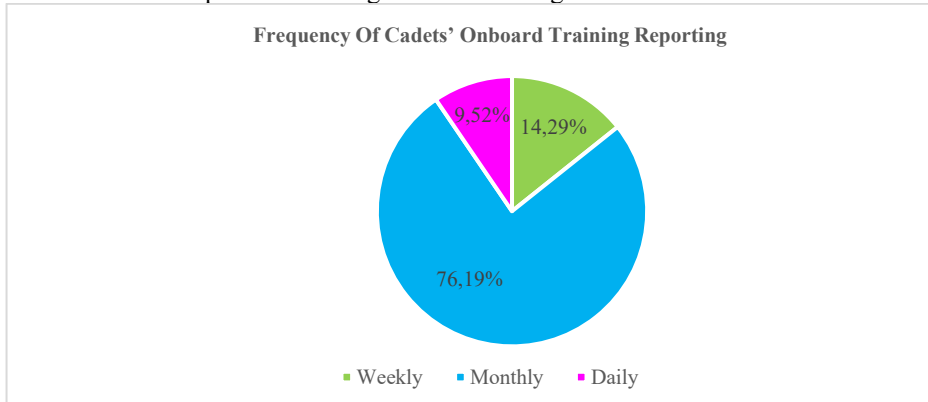


Figure 7. Frequency of cadets' onboard training reporting

Findings from interviews with lecturer indicate that: *“Conducting sea training reports on a monthly basis allows cadets sufficient time to carry out and systematically document their activities on a regular basis”*. (L6)

g. The Legal Basis For Lecturers In Conducting Onboard Training Supervision

Effective supervision of maritime cadets' onboard training by lecturers necessitates formal institutional authorization in the form of an official assignment letter issued by the university. Such legal recognition serves as a fundamental basis for legitimizing lecturers' supervisory roles, ensuring that their responsibilities are formally acknowledged within the institutional framework. Moreover, the presence of an official mandate not only enhances accountability and clarity of duties but also enables lecturers to receive adequate administrative and managerial support from the institution. This formalization is essential to strengthen coordination, improve supervision quality, and ensure that supervisory activities are aligned with institutional policies and standards in maritime education.

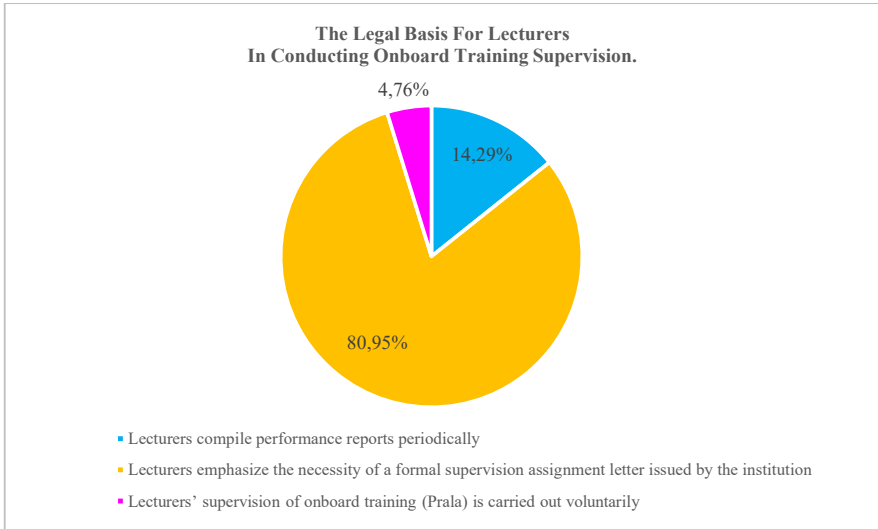


Figure 8. Legal authorization for lecturers to conduct onboard training supervision

Lecturers compile performance reports periodically: 14,29%; Lecturers emphasize the necessity of a formal supervision assignment letter issued by the institution: 80,95%; Lecturers' supervision of onboard training (Prala) is carried out voluntarily: 4,76%.

Findings from interviews with lecturers indicate that: “*The appointment of lecturers as sea training supervisors must be formally documented in an official decree or letter to provide legal validity and serve as the basis for the execution of their supervisory duties*”. (L7)

h. A system designed to establish collaborative supervision between lecturers and ship officers.

The findings derived from the ship officers questionnaire are further corroborated by the results of a survey involving 45 onboard training supervisors, which indicate a clear preference for the development of a dedicated maritime training (prala) supervision platform. Specifically, 46.67% of respondents emphasized the need for an integrated communication feature that enables direct interaction between onboard supervisors and prala administrators. Additionally, 37.78% advocated for the implementation of a digital supervision system based on the Android platform, reflecting the demand for mobility and accessibility in operational contexts. Meanwhile, 15.56% of respondents suggested the development of a supervision system accessible via laptop or PC-based media. These findings collectively underscore the necessity of a technologically integrated and user-centered supervision system to enhance the effectiveness and efficiency of maritime training oversight.

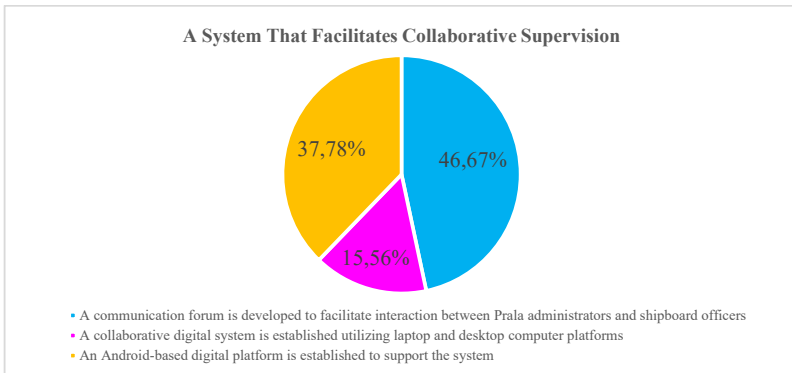


Figure 9. System that facilitates collaborative supervision of onboard training

Findings from interviews with lecturers : “So that we can contact the institution if any issues arise involving the cadet, and report to the institution if the cadet is unwilling to learn or fails to maintain discipline”. (L8)

Overall, this study contributes to the growing body of literature on digital transformation in maritime education by proposing a structured, collaborative, and technology-driven supervision model. Unlike previous approaches that focus primarily on administrative digitalization or theoretical learning, the proposed system integrates monitoring, mentoring, and assessment into a single platform. This integrated approach not only addresses existing gaps in supervision but also aligns with the evolving demands of the maritime industry, which increasingly requires digitally competent, adaptive, and well-supervised professionals. It's can be shown as diagram below:

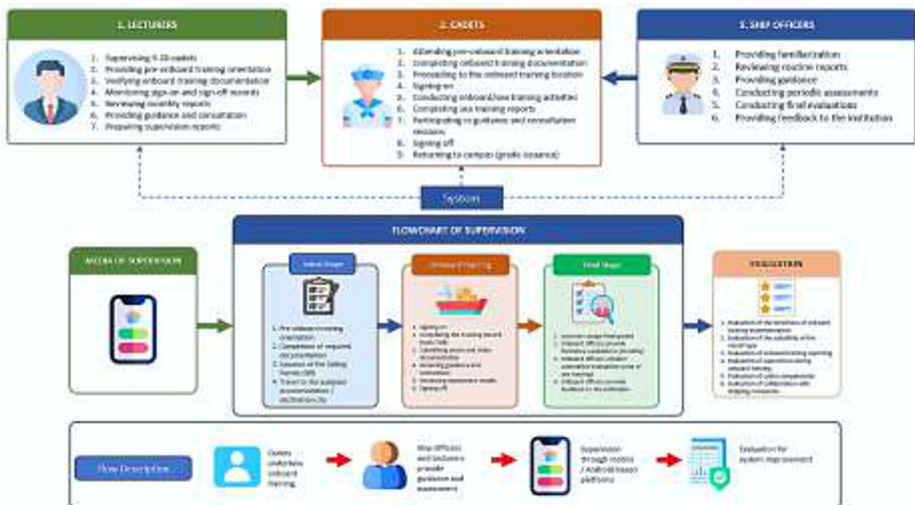


Figure 10. Diagram of supervision system of cadets' onboard training program

The diagram presents a comprehensive and integrated supervision scheme for maritime cadets' onboard training, highlighting the coordinated roles of lecturers, onboard ship officers, and cadets within a structured, technology-supported framework. This model signifies a transition from fragmented and administratively driven supervision practices toward a more systematic, collaborative, and competency-based approach. Lecturers are positioned as academic supervisors responsible for pre-onboard orientation, verification of documentation, continuous monitoring, report evaluation, and provision of guidance, with an optimal supervision ratio of 5–10 cadets to ensure effectiveness and individualized attention. Concurrently, onboard officers play a pivotal role in operational supervision by delivering familiarization, mentoring, routine monitoring, and both formative (monthly) and summative (end-of-training) assessments, thereby ensuring alignment between theoretical knowledge and practical application. The cadet training process is organized into three sequential phases—initial preparation, onboard training implementation, and final evaluation—encompassing activities such as documentation completion, sign-on/sign-off procedures, Training Record Book (TRB) completion, multimedia reporting, and performance assessment. Central to this framework is the integration of a mobile/Android-based supervision system that facilitates real-time communication, continuous monitoring, and structured documentation across geographically dispersed environments. Additionally, the inclusion of multidimensional evaluation indicators, including timeliness, vessel suitability, reporting quality, supervision effectiveness, competency achievement, and institutional collaboration, reinforces alignment with competency-based education and quality assurance standards. Overall, the proposed scheme offers a holistic, scalable, and digitally enabled supervision model that enhances accountability, transparency, and the overall effectiveness of maritime onboard training programs.

4. CONCLUSION

In conclusion, the findings of this study reveal that the current supervision practices of maritime cadets' onboard training are still predominantly fragmented, administratively oriented, and lack systemic integration across key stakeholders. The limited involvement of lecturers, absence of formal legal authorization, reliance on minimal reporting indicators such as sign-on and sign-off, and the use of non-integrated communication media collectively hinder the effectiveness of supervision in ensuring competency-based learning outcomes. These limitations underscore the urgent need for a paradigm shift toward a more structured and comprehensive supervision framework that encompasses the entire training lifecycle, including pre-departure preparation, onboard training implementation, and post-training evaluation. The study highlights that effective supervision must not only ensure compliance and monitoring but also facilitate continuous guidance, structured assessment, and meaningful feedback mechanisms.

Furthermore, the proposed supervision scheme demonstrates that integrating lecturers and onboard ship officers within a collaborative, digitally supported ecosystem significantly enhances the quality, accountability, and transparency of the supervision process. The adoption of a mobile/Android-based platform enables real-

time monitoring, systematic reporting, and improved accessibility, while the establishment of an optimal supervision ratio, regular reporting frequency, and standardized documentation—such as Training Record Books (TRB) and multimedia evidence—ensures more reliable and valid performance evaluation. The inclusion of multidimensional evaluation criteria, including timeliness, vessel suitability, supervision effectiveness, competency attainment, and institutional collaboration, further aligns the model with competency-based education and quality assurance standards. Overall, this study provides a robust and scalable supervision framework that not only addresses existing gaps but also contributes to advancing maritime education practices in line with global industry demands...

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