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The Impact of Recruitment Strategies and Crew Competencies on Maritime Operational Performance: A Study of PT Sillo Maritime Perdana Tbk

Baruno Winahyu Aji[1*], Syahdan Tanjung[1], April Gunawan Malau[1], Agung Kwartama[1]
Postgraduate School, Sekolah Tinggi Ilmu Pelayaran Jakarta, North Jakarta, Indonesia

Corresponding email: barunowinahyuaji@gmail.com*

Abstract: *The maritime sector is critical for global trade and economic development, yet challenges in workforce development persist, particularly in tanker operations handling dry bulk cargo like agricultural products. This research investigates the interplay between recruitment strategies, crew competencies, and ship operational performance, with a focus on PT Sillo Maritime Perdana Tbk, a key player in Indonesia's offshore shipping sector. Addressing gaps in aligning workforce development with industry demands, this study explores the effectiveness of recruitment practices and competency development within the operational context of this organization. This study aimed to evaluate the influence of recruitment strategies and crew work competencies, individually and collectively, on improving operational performance at PT Sillo Maritime Perdana Tbk. Using a mixed-methods approach, the research employed Statistical Equation Modeling (SEM) to analyze quantitative data from 117 participants and conducted thematic analysis of qualitative insights from experts, lecturers, graduates, and head workers. The results revealed that recruitment strategies and crew competencies significantly contribute to operational performance, with a combined positive effect observed. Structured recruitment and ongoing skill development tailored to industry demands were identified as critical. The findings also highlighted the transformative role of educational technology in bridging the gap between academic training and operational realities. The study provides actionable insights for PT Sillo Maritime Perdana Tbk and similar organizations, emphasizing the need for collaborative efforts to enhance workforce readiness, operational efficiency, and sustainability in maritime activities.*

Keywords: *PT Sillo Maritime Perdana Tbk, recruitment strategies, crew competencies, maritime operations, educational technology.*

1. INTRODUCTION

The global maritime industry plays a pivotal role in facilitating international trade, supporting economies, and ensuring the efficient transportation of goods and resources (Comtois & Slack, 2017; Karakasnaki et al., 2023). Among its various components, tanker operations hold particular significance in the shipping of critical commodities, including dry bulk cargo such as agricultural products. This sector, however, faces increasing pressures to enhance operational efficiency and sustainability due to rising competition, evolving regulatory requirements, and the challenges posed by workforce quality. Within this context, recruitment strategies and the competencies of tanker crews have emerged as critical determinants of operational performance. Understanding and addressing these factors becomes even more pressing when considering the integration of educational technology into the management of maritime workforce development and innovation (Chen et al., 2025; Vieira et al., 2025). This research explores these dynamics, delving into the intersection of recruitment strategies, crew competencies, and operational outcomes in the maritime sector, with a focus on dry bulk cargo transportation.

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The increasing activities at Indonesian ports and within its expansive waters have amplified the demand for highly efficient maritime operations. PT Sillo Maritime Perdana Tbk, a prominent entity within this sector, has long been at the forefront of offshore shipping services, leveraging its diverse fleet and expertise to meet the industry's needs. However, the organization, like many others, faces ongoing challenges in ensuring that its operations remain competitive, sustainable, and aligned with modern technological and workforce demands. Recruitment strategies and competency development programs must evolve to match the complexities of managing dry bulk cargo operations, particularly agricultural products, which require specialized handling, precision, and adherence to safety standards. Despite the industry's pivotal role, limited research has systematically examined how recruitment and competency development impact the efficiency of tanker operations, particularly through the lens of maritime educational technology (Jamil & Bhuiyan, 2021). This gap in the literature underscores the need for comprehensive, evidence-based insights into workforce development and its influence on operational performance.

The central focus of this research lies in examining the effect of recruitment strategies and crew work competencies on improving ship operational performance at PT Sillo Maritime Perdana Tbk. Specifically, the study aims to address the following questions: How do recruitment strategies influence ship operational performance? What is the impact of crew work competencies on ship operational outcomes? How do these factors interact to collectively enhance the efficiency and effectiveness of tanker operations? These questions are intrinsically linked to broader objectives that include identifying the critical elements of effective recruitment practices, assessing the role of skillsets and competencies in addressing operational challenges, and providing actionable recommendations for integrating educational technology into workforce development initiatives.

The significance of this research extends beyond its immediate context, offering valuable contributions to the broader discourse on maritime workforce management and innovation (Christodoulou-Varotsi & Pentsov, 2008). The rationale for this study is rooted in its potential to address a critical need within the industry: bridging the gap between theoretical workforce development models and their practical application in operational contexts. By examining recruitment strategies and crew competencies through a qualitative lens, this research highlights the human and organizational dimensions of maritime operations. Moreover, it underscores the transformative potential of educational technology in fostering skill development, promoting innovation, and ensuring sustainability in maritime operations.

Methodologically, this study adopts a mixed-methods approach, combining quantitative analysis using Statistical Equation Modeling (SEM) with qualitative insights derived from interviews and questionnaires. The qualitative component focuses on gathering perspectives from ten key stakeholders, including maritime experts, lecturers, graduates, and head workers directly involved in port operations. This approach ensures a holistic understanding of the challenges and opportunities associated with recruitment and competency development in the maritime sector. The thematic analysis of qualitative data provides rich, contextual insights into how recruitment strategies and crew competencies shape operational performance, particularly in the handling of dry bulk cargo.

The objectives of this research are multi-faceted. First, it seeks to evaluate the direct and indirect effects of recruitment strategies on ship operational performance. Second, it aims to explore the specific competencies that contribute to operational efficiency, safety, and sustainability in tanker operations. Third, the study endeavors to identify the synergies between recruitment practices and competency development, offering actionable insights for organizations seeking to optimize their workforce management practices. Collectively, these objectives align with the broader goals of advancing research development in maritime educational technology and fostering sustainable innovation in workforce management.

The conceptual framework for this study revolves around two primary variables: recruitment strategy and crew work competence. Recruitment strategy encompasses the processes and criteria used to identify, attract, and select qualified personnel for tanker operations, with a focus on aligning workforce capabilities with organizational goals (House & Saeed, 2016; Sharma et al., 2019; Young, 1995). Crew work competence, on the other hand, refers to the skills, knowledge, and attributes required to perform operational tasks effectively, particularly in the context of dry bulk cargo handling. The interaction between these variables is explored to determine their collective impact on ship operational performance. By linking these variables to outcomes such as efficiency, safety, and sustainability, the study provides a comprehensive framework for understanding and addressing workforce development challenges in the maritime sector (Christodoulou-Varotsi & Pentsov, 2008).

This research not only addresses a critical gap in the literature but also contributes to the advancement of maritime educational technology by integrating insights from management of technology and innovation. By focusing on the qualitative experiences of key stakeholders and the practical realities of tanker operations, it bridges the divide between theoretical models and real-world applications. Furthermore, it highlights the role of educational technology in

enhancing recruitment and training practices, ultimately supporting the industry's transition toward more sustainable and innovative operational paradigms.

This research is driven by the urgency of addressing workforce development challenges in the maritime sector, particularly in the context of increasing operational demands and sustainability goals. By examining the interplay between recruitment strategies, crew competencies, and operational performance, it provides valuable insights for both academic and industry stakeholders. The findings are expected to inform the design and implementation of workforce development initiatives, contributing to the broader goals of research development and innovation in maritime studies. Through its focus on educational technology, the study underscores the transformative potential of aligning workforce development practices with technological advancements, ensuring that the maritime industry remains competitive, resilient, and sustainable in an increasingly complex global landscape.

2. RESEARCH METHOD

The methodology of this research integrates a mixed-methods approach to comprehensively explore the relationship between recruitment strategies, crew work competencies, and their impact on ship operational performance, particularly in the context of maritime educational technology. The study focuses on obtaining in-depth insights from a targeted population, employing carefully designed instruments for data collection, and conducting a thorough qualitative and thematic analysis to synthesize the findings into actionable conclusions (Bernadtua Simanjuntak et al., 2024; Castleberry & Nolen, 2018; Ferri et al., 2020). The population of this study is carefully defined to include individuals who are directly and indirectly involved in maritime workforce development and operations. The respondents consist of maritime experts, lecturers specializing in maritime education, graduates of maritime programs, and five head workers who actively supervise port operations involving dry bulk cargo, particularly agricultural products. The selection of these groups is purposeful, driven by the specific need to gain diverse yet interconnected perspectives on how recruitment strategies and competency development influence operational efficiency. Experts are included for their strategic oversight and ability to contextualize operational challenges within broader industry trends. Lecturers contribute insights into the alignment between educational curricula and real-world demands, while graduates provide feedback on the applicability of their training in professional environments. Head workers offer a ground-level view of the competencies required for handling and transporting agricultural products, a task that demands precision, safety, and efficiency. This targeted approach ensures that the data collected is both

comprehensive and relevant, capturing the multi-dimensional nature of workforce development in the maritime sector.

The research employs a combination of main and supporting instruments to ensure the robustness of the data collection process (Creswell & Clark, 2011; Smith & Shaw, 2019). The primary instrument is a semi-structured questionnaire, meticulously designed to capture quantitative and qualitative data on recruitment practices, competency frameworks, and operational performance metrics. The questionnaire is complemented by semi-structured interview protocols, which provide the flexibility needed to explore specific themes in greater depth while maintaining consistency across respondents. The independent variables in this study are recruitment strategies and crew work competencies, each operationalized through specific indicators. Recruitment strategies are examined in terms of their effectiveness, alignment with organizational goals, and adaptability to operational demands. Indicators for this variable include selection criteria, training opportunities, and retention practices. Crew work competencies are assessed based on technical skills, problem-solving abilities, and communication effectiveness, all critical for managing the complexities of dry bulk cargo operations. Ship operational performance, the dependent variable, is measured through indicators such as efficiency, safety, and compliance with industry standards. Supporting instruments include observation checklists and document reviews, which provide contextual data to enrich the analysis (Katz, 2015).

Data collection is a multi-step process designed to ensure the reliability and validity of the findings. The process begins with the distribution of questionnaires to the selected population, ensuring that each respondent group is adequately represented. The questionnaire captures both quantitative metrics and qualitative insights, allowing for a nuanced understanding of the variables under study. Following the questionnaire phase, in-depth interviews are conducted with a subset of respondents to explore emerging themes and gather detailed perspectives. The interview process is iterative, with each session informing the subsequent ones, allowing for the exploration of complex issues that may not be fully captured through the questionnaire alone. Observational data is collected during site visits to ports, focusing on the practical application of recruitment strategies and crew competencies in dry bulk cargo operations. Document reviews provide additional layers of data, including organizational policies, training materials, and operational reports, which are analyzed to contextualize the primary data.

The data analysis process is rigorous, employing a combination of thematic analysis, cross-group comparisons, and narrative synthesis to derive meaningful conclusions. Thematic

analysis begins with the coding of qualitative data to identify recurring themes related to recruitment strategies and competency development. These themes are further categorized into overarching domains such as efficiency, sustainability, and innovation in workforce development. Cross-group comparisons are conducted to identify commonalities and distinctions among the perspectives of experts, lecturers, graduates, and head workers. This comparative approach highlights the alignment and gaps between educational frameworks and operational realities, providing a holistic view of the research problem. Finally, narrative synthesis is employed to weave the findings into a coherent narrative that explains the interplay between recruitment strategies, competency development, and operational performance. This narrative approach not only synthesizes the data but also contextualizes it within the broader framework of maritime educational technology and sustainability.

The methodology is designed to not only answer the central research questions but also to provide actionable insights for improving workforce development practices in the maritime sector (Karakasnaki et al., 2023). By focusing on targeted populations, employing robust instruments, and utilizing comprehensive data analysis techniques, this study aims to bridge the gap between theoretical models and practical applications in recruitment and competency development. The findings are expected to contribute to the advancement of maritime educational technology, offering a framework for aligning training programs with the evolving demands of the industry. This approach ensures that the research not only addresses its specific objectives but also contributes to the broader discourse on workforce management, sustainability, and innovation in maritime operations.

3. RESULTS OF THE RESEARCH

The findings of this study present a comprehensive analysis of the relationship between recruitment strategies, crew work competencies, and their combined impact on ship operational performance. These results are based on quantitative and qualitative analyses that integrate insights from stakeholders across various levels of maritime operations. The structured thematic analysis, combined with statistical modeling, demonstrates the overall effectiveness of recruitment strategies and competency development practices in ensuring efficient and sustainable ship operations, particularly for dry bulk cargo management.

Quantitative Results

The quantitative component of this research involved Statistical Equation Modeling (SEM) using SMART PLS to evaluate the relationships between the independent variables

(recruitment strategies and crew competencies) and the dependent variable (ship operational performance). The results are presented in the following table and explained comprehensively:

Tabel 1. The results are presented in the following table and explained comprehensively

Variable Relationship	Path Coefficient	Significance (p-value)	Interpretation
Recruitment Strategies → Ship Operational Performance	0.415	<0.05	Recruitment strategies have a moderate positive impact on operational performance.
Crew Work Competencies → Ship Operational Performance	0.466	<0.05	Crew work competencies have a stronger positive impact on operational performance.
Recruitment Strategies + Crew Work Competencies → Ship Operational Performance	0.581	<0.05	The combined effect of recruitment strategies and competencies significantly enhances operational outcomes.

Analysis of Quantitative Results

The path coefficients reveal a strong and significant relationship between crew work competencies and operational performance, indicating that skillsets, knowledge, and training are pivotal for handling the complexities of dry bulk cargo operations. Recruitment strategies also demonstrate a substantial positive impact, emphasizing the importance of targeted selection and retention practices. The combined influence of these variables underscores the synergistic effect of aligning recruitment and competency development to optimize operational outcomes.

Qualitative Results

The qualitative findings are derived from thematic analysis, categorizing data into key themes relevant to recruitment strategies, competency development, and operational performance. These themes are analyzed and compared across stakeholder groups, including experts, lecturers, graduates, and head workers. The insights are summarized in the following table:

Tabel 2. The insights are summarized in the following

Theme	Stakeholder Insights	Commonalities	Distinctive Observations
Recruitment Effectiveness	Experts emphasize industry-specific selection criteria; lecturers focus on	All stakeholders recognize the need for a structured and adaptive recruitment process.	Graduates highlight challenges in matching job expectations with training received.

	alignment with training frameworks.		
Competency Development	Head workers prioritize technical skills; experts emphasize problem-solving and safety awareness in dry bulk operations.	Consistent emphasis on technical, communication, and decision-making skills across all groups.	Lecturers stress the importance of integrating soft skills into maritime education.
Operational Challenges	Experts note the need for real-time adaptability; head workers highlight logistical constraints in dry bulk cargo.	Stakeholders agree on the critical role of collaboration and technological tools in addressing issues.	Graduates identify gaps in technology-related training during their academic preparation.

Thematic Narratives

The qualitative narratives reveal a nuanced understanding of the operational realities in the maritime sector. Recruitment strategies are perceived as effective when they incorporate both technical qualifications and soft skills assessments, ensuring a well-rounded workforce. Competency development is viewed as a continuous process, with a need to bridge the gap between academic training and real-world demands. Operational challenges highlight the importance of adaptability and collaborative problem-solving, emphasizing the role of technology in enhancing efficiency.

Comprehensive Analysis and Scoring

To provide a deeper understanding of the findings, the following table presents a scoring system based on the indicators of recruitment strategies, competency development, and operational performance. Each indicator is rated on a scale of 1-5, with 5 indicating the highest level of effectiveness or relevance.

Tabel 3. Each indicator is rated on a scale of 1-5, with 5 indicating the highest

Indicator	Recruitment Strategies	Competency Development	Operational Performance	Overall Score
Alignment with Operational Goals	4.5	4.7	4.6	4.6
Technical Skill Emphasis	4.3	4.8	4.7	4.6
Adaptability to Industry Changes	4.4	4.6	4.5	4.5
Collaboration and Communication	4.2	4.7	4.6	4.5
Technological Integration	4.1	4.5	4.4	4.3

Interpretation of Scoring

The scores indicate a high level of effectiveness across all indicators, with competency development showing the strongest performance. This aligns with the quantitative findings, which highlight the critical role of skillsets in driving operational efficiency. Recruitment strategies also score highly, reflecting their importance in building a workforce capable of meeting the demands of dry bulk cargo operations.

Cross-Group Comparisons

The cross-group comparisons provide additional insights into the perspectives of different stakeholders. Experts and head workers demonstrate a strong alignment in their emphasis on practical skills and real-world adaptability. Lecturers and graduates, on the other hand, focus more on the alignment between academic training and industry requirements. This comparison highlights the need for greater integration between educational frameworks and operational realities.

Narrative Synthesis

The findings of this study reveal a cohesive narrative that underscores the interconnectedness of recruitment strategies, competency development, and operational performance. Recruitment strategies serve as the foundation for building a competent workforce, while continuous skill development ensures that crew members can adapt to the complexities of maritime operations. Together, these factors contribute to the overall efficiency and sustainability of ship operations, particularly in the management of dry bulk cargo.

The qualitative narratives further highlight the importance of collaboration between educational institutions and industry stakeholders. By aligning training programs with operational needs, the maritime sector can address gaps in workforce readiness and promote a culture of innovation and adaptability. This alignment is particularly critical in the context of educational technology, which offers tools and platforms for enhancing the recruitment and training processes.

Tables for Data Presentation

Table 4. Path Coefficients and Significance Levels

Variable Relationship	Path Coefficient	Significance (p-value)
Recruitment Strategies → Ship Operational Performance	0.415	<0.05
Crew Work Competencies → Ship Operational Performance	0.466	<0.05
Recruitment Strategies + Crew Work Competencies → Ship Operational Performance	0.581	<0.05

Table 5. Stakeholder Themes and Insights

Theme	Stakeholder Insights	Commonalities	Distinctive Observations
Recruitment Effectiveness	Experts emphasize industry-specific selection criteria; lecturers focus on alignment with training frameworks.	All stakeholders recognize the need for a structured and adaptive recruitment process.	Graduates highlight challenges in matching job expectations with training received.

Table 6. Scoring System Based on Indicators

Indicator	Recruitment Strategies	Competency Development	Operational Performance	Overall Score
Alignment with Operational Goals	4.5	4.7	4.6	4.6

These results collectively demonstrate the effectiveness and efficiency of the recruitment strategies and competency development initiatives in improving ship operational performance. The findings highlight the value of integrating educational technology into workforce development, offering actionable recommendations for both academic and industry stakeholders. Through its comprehensive analysis, this study contributes to the advancement of maritime operational practices and underscores the critical role of a well-prepared workforce in ensuring sustainable and efficient maritime operations.

4. CONCLUSION

This research has demonstrated the significant impact of recruitment strategies and crew work competencies on ship operational performance, particularly in the context of managing dry bulk cargo operations in the maritime sector. The findings underscore that effective recruitment strategies, characterized by well-defined selection criteria, training opportunities, and retention practices, contribute to building a workforce capable of meeting operational demands. Crew work competencies, including technical expertise, problem-solving abilities, and communication skills, have been identified as pivotal in ensuring operational efficiency, safety, and sustainability. Quantitative analysis using Statistical Equation Modeling (SEM) revealed a moderate to strong positive relationship between these variables and operational performance, with a combined synergistic effect further enhancing outcomes. The qualitative insights, derived from thematic analysis, emphasized the alignment between educational frameworks and industry requirements, highlighting the critical role of collaboration among

experts, lecturers, graduates, and head workers in bridging gaps between theory and practice. This study also revealed the transformative potential of educational technology in workforce development, offering tools to enhance recruitment and training processes. By aligning recruitment strategies and competency development with technological advancements, the maritime industry can address workforce challenges, foster innovation, and ensure sustainable operational practices. These contributions provide actionable insights for academic and industry stakeholders, advancing the discourse on workforce management and maritime educational technology while promoting operational excellence in the shipping industry.

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