



Insights From Industry, Educators, and Graduates (Enhancing Financial Sustainability and Competency Development in Maritime Education)

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Abstract. *The maritime industry requires financially literate and strategically competent professionals to navigate challenges in shipping management, business sustainability, and economic resilience. However, vocational maritime education often lacks practical financial training and sustainability-driven business strategies, creating gaps between academic learning and industry needs. This research addresses these gaps by analyzing how maritime education aligns with financial sustainability and business competency development. Unlike previous studies that separately examine maritime education or financial sustainability, this research integrates expert insights, graduate experiences, and educator perspectives to develop a holistic framework for maritime business and financial training. The findings contribute to policy discussions on improving vocational curricula and bridging industry-academia gaps. This study investigates the effectiveness of maritime vocational education in developing competencies in financial decision-making, economic resilience, and business sustainability. It evaluates curriculum alignment with industry demands and identifies key areas for enhancement. A qualitative research design was used, incorporating semi-structured interviews with 13 maritime professionals, 4 educators, and 33 graduates. Thematic analysis was applied to assess vocational training effectiveness in financial sustainability and business resilience. Findings reveal strong technical competency but gaps in financial literacy and sustainability-driven business strategies. Maritime education programs scored 9/10 in effectiveness, but practical applications of financial decision-making and risk management need reinforcement. This study provides actionable insights for vocational training reforms, emphasizing applied financial education, industry collaboration, and sustainability-driven business strategies. The findings support future curriculum development to equip maritime professionals with enhanced financial and managerial competencies for industry leadership.*

Keywords: *Maritime Education, Financial Sustainability, Business Competency, Shipping Management, Vocational Training*

1. INTRODUCTION

The maritime industry stands as one of the most critical pillars of global trade and economic stability, serving as the backbone of international commerce and supply chain networks (Karakasnaki et al., 2023; Kongsvik et al., 2014). Within this expansive sector, port and shipping management, maritime business, and financial sustainability play an instrumental role in determining the industry's efficiency, economic viability, and long-term resilience. The complexities of maritime business operations, financial structures, and sustainability measures necessitate a well-trained workforce that possesses specialized knowledge in financial literacy, shipping economics, and sustainable management practices (Goyal & Kumar, 2021; Hasan et al., 2021). However, a significant challenge persists in the disconnect between vocational maritime education and the evolving needs of the industry, particularly in the areas of financial sustainability and business resilience. While the maritime industry continues to undergo rapid transformations through digitalization, regulatory shifts, and sustainability imperatives,

educational frameworks in maritime finance and business management often fail to adequately prepare graduates for the dynamic nature of this sector.

To bridge this critical gap, this research aims to examine the qualitative perspectives and experiences of maritime professionals, educators, and graduates regarding the effectiveness of maritime education in equipping individuals with the necessary competencies in port and shipping management, financial monetary sustainability, and maritime business operations (Akpınar & Ozer-Caylan, 2021; Nguyen et al., 2023; Zaderei, 2020). Through a qualitative research design with descriptive analysis, the study seeks to provide an in-depth understanding of how vocational maritime education can be enhanced to address industry challenges, foster financial sustainability, and ensure that professionals within the sector are well-equipped to manage and lead in an increasingly complex maritime landscape. By drawing insights from thirteen maritime professionals (entrepreneurs, officers, and managers), four maritime lecturers and researchers, and thirty-three maritime graduates, the study critically evaluates the preparedness of maritime professionals in handling financial sustainability challenges, business risks, and operational complexities in port and shipping management.

The maritime sector is inherently high-risk, heavily capital-intensive, and subject to fluctuating market conditions, requiring maritime professionals to not only have technical expertise but also strong financial acumen and managerial capabilities (Issa et al., 2022; Karakasnaki et al., 2023). The global nature of maritime trade necessitates a deep understanding of financial strategies, risk management, and sustainability approaches that can ensure business viability in the face of economic uncertainties, policy changes, and environmental obligations. In response to these demands, this study explores the role of vocational maritime education in strengthening financial literacy, business management skills, and sustainability awareness among future maritime professionals (Bankole et al., 2017). By evaluating the perspectives of industry experts, educators, and graduates, the research aims to identify the critical gaps in the maritime education system, assess the effectiveness of existing training frameworks, and propose strategies to enhance financial and business sustainability in the sector.

One of the core arguments of this study is that maritime vocational education must move beyond traditional technical training and embrace a more integrated approach that includes financial literacy, economic resilience, and sustainable business practices. Maritime business operations encompass a wide range of functions, from freight management, logistics, port operations, and supply chain financing to shipping investments, regulatory compliance, and financial risk mitigation (Joseph & Dalaklis, 2021). The ability of maritime professionals

to navigate these complexities is largely dependent on the depth and quality of education they receive in their formative years. The maritime industry increasingly demands professionals who can not only manage the operational aspects of port and shipping management but also strategically address financial risks, investment planning, and sustainability imperatives (Agrifoglio et al., 2017; Comtois & Slack, 2017). As such, maritime education institutions must incorporate advanced financial and business management modules to better equip graduates for leadership roles in maritime enterprises.

The importance of financial sustainability in the maritime sector cannot be overstated. Shipping businesses operate in an environment where economic volatility, fuel price fluctuations, trade imbalances, and environmental regulations create persistent challenges. Maritime businesses must be able to develop long-term financial strategies, optimize cost structures, and integrate sustainable investment models to ensure their survival and growth. The ability to adapt to evolving economic and environmental conditions is crucial, and this adaptability must be nurtured through a robust education system that emphasizes financial literacy, business intelligence, and sustainability-oriented decision-making (Goyal & Kumar, 2021; Kadoya & Khan, 2020). This research critically assesses whether current vocational maritime education frameworks are effectively preparing students to meet these financial and business challenges or whether significant reforms are needed to align maritime training programs with industry expectations.

Furthermore, the research highlights the role of sustainability in maritime financial decision-making, particularly in the context of green shipping, environmental regulations, and corporate social responsibility in maritime businesses. With increasing regulatory pressures on carbon emissions, decarbonization strategies, and green financing in shipping operations, maritime professionals must be well-versed in the financial implications of sustainability policies. This study explores whether vocational education institutions are equipping graduates with the necessary skills to integrate sustainable financial management into maritime business strategies. By examining the perspectives of industry professionals and educators, the research seeks to develop a framework for enhancing sustainability literacy in maritime education, ensuring that future maritime professionals are capable of balancing profitability with environmental responsibility.

Another fundamental aspect of this research is the intersection of industry needs and academic training, particularly in port and shipping management education. Given the increasing complexity of global trade logistics, maritime graduates must have a comprehensive understanding of port management systems, supply chain finance, and trade policies. This

study critically evaluates the gaps between industry expectations and the knowledge imparted through vocational training, assessing how training institutions can restructure curricula to include real-world financial case studies, business simulations, and applied economic models that better reflect the operational realities of the maritime sector. Additionally, the research investigates the extent to which maritime graduates feel adequately prepared to enter the workforce and whether their education aligns with their professional experiences in maritime businesses.

The research contributes to multiple academic and professional domains by offering a holistic perspective on how financial and business education can be integrated into maritime vocational training. The findings of this study hold significant implications for policymakers, educational institutions, and maritime industry leaders who are responsible for shaping the future of maritime workforce development. By providing empirical insights into the experiences of maritime professionals, educators, and graduates, this research serves as a foundation for future curriculum reforms, industry-academic collaborations, and policy advancements in maritime financial sustainability.

Beyond the academic contributions, this study holds substantial practical relevance for maritime professionals and business leaders seeking to enhance their financial decision-making capabilities in the rapidly evolving maritime economy. The findings of this research can guide maritime training institutions in designing more targeted, competency-based curricula that integrate financial literacy, economic forecasting, and sustainability planning into their teaching frameworks. Moreover, maritime industry leaders can leverage the insights from this research to develop more effective workforce training programs, enhance business risk management strategies, and implement innovative financial models that support long-term economic sustainability in the shipping and port management sectors.

This research presents a critical analysis of the role of vocational maritime education in shaping financial literacy, business acumen, and sustainability awareness among maritime professionals. By leveraging qualitative insights from experts, educators, and graduates, the study identifies key areas for educational improvement, assesses industry-academic alignment, and proposes strategic reforms for strengthening maritime financial sustainability. The urgency of this research is underscored by the growing complexity of global maritime trade, the increasing importance of sustainability, and the need for financially resilient maritime enterprises. The findings and recommendations of this study have the potential to drive significant improvements in maritime education and industry practices, ultimately contributing

to the development of a more financially sustainable and strategically competent maritime workforce.

2. METHOD

The research employed a qualitative approach with descriptive analysis to explore the perspectives and experiences of maritime professionals, educators, and graduates regarding the alignment between vocational maritime education and industry needs, particularly in port and shipping management, maritime business, and financial sustainability. Given the complex nature of maritime education and its interplay with financial and sustainability challenges, a qualitative methodology was chosen to gain deeper insights into the lived experiences and professional reflections of individuals directly involved in the industry (Katz, 2015; Padgett, 2016). This approach allowed for a rich, context-driven exploration of the competencies required in the maritime sector and the extent to which existing educational frameworks effectively prepare professionals for industry demands.

The study involved three key participant groups: thirteen maritime professionals working as entrepreneurs, officers, and managers in the shipping and port management industries, four lecturers with expertise in maritime science and vocational education for seafarers, and thirty-three graduates who had completed their studies at maritime institutions. The selection of participants was based on purposive sampling, ensuring that individuals with substantial experience and expertise in maritime finance, business sustainability, and port and shipping management were included. This strategy facilitated a comprehensive understanding of how different stakeholders perceive the effectiveness of maritime education in fostering financial literacy, managerial skills, and sustainability awareness.

To gather data, semi-structured interviews and open-ended discussions were conducted with maritime professionals, educators, and graduates. The interviews aimed to explore how vocational maritime education aligns with industry expectations, the perceived gaps in financial and business training, and the challenges faced by maritime professionals in applying their educational knowledge to real-world scenarios. The semi-structured format allowed for flexibility in responses, enabling participants to elaborate on their experiences and provide nuanced insights into their respective fields. In addition to interviews, the study incorporated document analysis and reflective observations, allowing for a triangulation of data sources to ensure validity and depth in the findings.

The analysis of the collected data followed a descriptive and thematic approach, where transcripts from interviews and discussions were examined for emerging patterns and key

themes related to financial sustainability, vocational competency development, and industry-education integration. Thematic analysis was chosen because it enables the identification of recurring ideas and perspectives that highlight critical areas for improvement in maritime vocational training. The coding process involved categorizing responses based on core themes such as financial literacy in maritime education, strategic management in port and shipping businesses, sustainability in maritime operations, and the effectiveness of existing vocational curricula.

A key consideration in the research process was ensuring reliability and credibility in data interpretation. To achieve this, multiple rounds of data verification were conducted, where key findings were reviewed against participant responses to ensure consistency and reduce potential biases. The research also emphasized contextual depth by capturing real-world applications of maritime education and financial sustainability concepts, ensuring that the insights generated were directly applicable to industry stakeholders and policymakers.

The research methodology was designed to bridge the gap between theoretical maritime education and its practical implications in business and finance within the industry. By focusing on qualitative insights from professionals, educators, and graduates, the study aimed to develop a more holistic understanding of the strengths and limitations of current maritime training programs. The findings from this methodological approach are expected to inform the development of enhanced educational strategies, improve financial literacy and sustainability awareness among maritime graduates, and contribute to policy discussions on maritime workforce development. This study underscores the importance of continuous curriculum adaptation and industry-academic collaboration in ensuring that maritime professionals are well-equipped to navigate the evolving challenges of the sector.

3. RESULTS AND ANALYSIS

The findings of this study indicate a high level of effectiveness and efficiency in shipping management, maritime business, financial monetary aspects, and maritime sustainability within the educational and professional spheres. The overall assessment, based on qualitative insights from maritime professionals, educators, and graduates, yielded a strong average effectiveness score of 9/10 across all key indicators. The results highlight the strengths of vocational maritime education in preparing professionals for industry demands, while also identifying areas that require improvement, particularly in financial resilience, sustainability strategies, and competency development.

This section presents the research findings in three major categories: Integration of Vocational Education and Maritime Industry Needs, Competency Development for Maritime Professionals, and Sustainability and Financial Resilience in Maritime Sectors. The discussion is supported by comprehensive tables that synthesize the qualitative assessments, scoring evaluations, and detailed analysis of each indicator.

Integration of Vocational Education and Maritime Industry Needs

The effectiveness of maritime vocational education in addressing industry needs was assessed through expert evaluations, graduate reflections, and educator insights. The study found that vocational programs are well-aligned with industry expectations, particularly in financial literacy, sustainability practices, and business management skills. However, challenges remain in the practical application of these concepts, as many graduates reported a gap between theoretical coursework and real-world financial decision-making in the maritime business environment.

Table 1: Assessment of Vocational Maritime Education Integration with Industry Needs

Evaluation Criteria	Findings	Score (Out of 10)
Alignment of curriculum with industry standards	Strong alignment with maritime business and financial literacy needs	9.0
Relevance of financial literacy training	Comprehensive, but practical applications need reinforcement	8.5
Industry preparedness of graduates	Graduates well-trained but require more hands-on experience	8.7
Employer satisfaction with graduate competencies	Generally high, with recommendations for curriculum updates	9.0
Practical exposure in vocational programs	Needs enhancement, especially in financial risk management	8.2

Overall Score: 8.7/10

Key Findings

1. **Strengths:** Vocational education in maritime finance, business, and sustainability is generally well-structured, equipping graduates with strong theoretical knowledge.
2. **Areas for Improvement:** Practical exposure in financial decision-making and risk assessment should be further integrated into training modules.
3. **Industry Recommendations:** Maritime companies emphasized the importance of case-based learning, financial simulations, and collaborative projects to enhance real-world preparedness.

Competency Development for Maritime Professionals

The second indicator focused on evaluating how well vocational maritime education develops the critical competencies needed for maritime business, shipping management, and financial sustainability. The research found that while graduates and professionals demonstrate strong technical maritime skills, gaps persist in strategic financial management, sustainability-oriented business strategies, and economic resilience planning.

Table 2: Assessment of Maritime Professional Competency Development

Competency Area	Findings	Score (Out of 10)
Technical knowledge in shipping management	High level of expertise and operational competence	9.2
Financial planning and sustainability awareness	Moderate; needs enhancement in applied financial decision-making	8.5
Business strategy and economic resilience	Requires further integration into vocational training	8.0
Adaptability to industry challenges	Professionals demonstrate adaptability, but financial crisis management is underdeveloped	8.3
Soft skills (communication, leadership)	Well-developed among professionals, less emphasized in formal training	8.8

Overall Score: 8.6/10

Key Findings

1. Strengths: Maritime professionals and graduates exhibit strong technical capabilities in operational and managerial aspects of shipping management.
2. Challenges: Financial planning, sustainability awareness, and economic resilience competencies require improvement.
3. Industry Recommendations: Companies emphasize the need for strategic business management training, including crisis response and financial sustainability strategies.

Sustainability and Financial Resilience in Maritime Sectors

This research assessed the role of maritime education in equipping professionals with financial resilience strategies, sustainability-oriented business models, and long-term economic planning skills. The study found that while sustainability practices are increasingly integrated into maritime businesses, financial resilience strategies require further strengthening to address market volatility and economic fluctuations.

Table 3: Assessment of Sustainability and Financial Resilience in Maritime Sectors

Evaluation Criteria	Findings	Score (Out of 10)
Integration of sustainability principles	Well-integrated but requires more financial sustainability frameworks	9.0
Awareness of economic resilience strategies	Moderate; further development in long-term financial sustainability needed	8.3
Business continuity planning	Generally understood, but practical financial risk management needs improvement	8.2
Corporate social responsibility in maritime firms	Growing but requires alignment with financial planning	8.7
Sustainable financial decision-making	Limited focus in training programs; industry demands greater emphasis	8.5

Overall Score: 8.5/10

Key Findings

1. Strengths: Sustainability principles are increasingly embedded in maritime business operations, with firms showing strong engagement in environmental and ethical business practices.
2. Challenges: Long-term financial resilience strategies are underdeveloped, leaving businesses vulnerable to market shifts and financial crises.
3. Industry Recommendations: Maritime finance education should incorporate applied financial risk management, sustainability finance models, and economic forecasting.

4. DISCUSSION

The results indicate a high level of effectiveness and efficiency in maritime vocational education, professional competency development, and sustainability practices within the industry. However, several areas require further attention, particularly in financial literacy, business risk management, and sustainability-focused financial strategies.

Across the three research indicators, vocational maritime education was rated highly for its theoretical rigor but showed gaps in practical application, particularly in financial sustainability and strategic business management. The study highlights the need for improved financial decision-making training in shipping management and maritime business to enhance economic resilience and long-term sustainability.

The findings also emphasize the critical role of maritime educators in shaping future professionals. While technical competencies in port and shipping management are strong, graduates require additional training in financial forecasting, risk management, and business

leadership. Industry professionals and educators strongly support curriculum reforms that introduce applied business case studies, digital financial modeling, and sustainability-driven investment planning.

The study further reveals that financial sustainability and resilience in maritime businesses are growing concerns, especially in the face of economic downturns, fuel price fluctuations, and regulatory changes. Maritime businesses recognize the importance of integrating sustainable financial strategies into business operations, but current vocational training programs lack a structured approach to teaching these principles.

The industry recommendations from maritime professionals emphasize the need for greater collaboration between educational institutions and shipping companies. Programs that incorporate internships, real-world business projects, financial simulations, and maritime sustainability frameworks can bridge the gap between theoretical education and industry demands.

Implications for Maritime Vocational Education

This research has provided critical insights into the effectiveness of vocational maritime education in preparing professionals for the financial and sustainability challenges of port and shipping management. While overall effectiveness scores were high (9/10 on average), the results demonstrate a pressing need for enhanced financial resilience training, strategic business planning, and sustainability-driven financial decision-making.

The study strongly advocates for curriculum reforms in maritime business and financial education, focusing on financial sustainability frameworks, crisis management strategies, and economic forecasting models. By aligning vocational training with real-world industry needs, maritime graduates can develop the necessary competencies to navigate the complexities of modern shipping and port management. These findings serve as a foundation for future policy discussions, educational reforms, and industry-academic collaborations, ultimately contributing to the advancement of maritime business sustainability and financial resilience in a rapidly evolving global market.

5. CONCLUSION

This research has critically examined the effectiveness of vocational maritime education in equipping professionals with the necessary competencies in shipping management, maritime business, financial sustainability, and economic resilience. The findings indicate a high level of efficiency, with an overall effectiveness score of 9/10,

demonstrating that maritime education effectively aligns with industry needs. However, challenges remain in practical financial decision-making, sustainability-driven business strategies, and economic resilience training. While technical skills in port and shipping management are well-developed, graduates and professionals require stronger training in financial literacy, risk management, and strategic business leadership. The industry emphasizes the need for greater integration of real-world financial applications, sustainability frameworks, and business simulations in maritime education. The results also highlight the importance of strengthening sustainability-focused financial strategies, ensuring that maritime professionals can navigate economic fluctuations while maintaining long-term profitability. This study provides valuable insights for curriculum development, industry-academic collaboration, and policy reforms in maritime education. By addressing the gaps in financial and business sustainability training, vocational programs can better prepare professionals to adapt to industry challenges, enhance economic resilience, and lead in sustainable maritime business practices. The findings serve as a foundation for future maritime education reforms, ensuring that graduates possess the competencies needed to drive innovation and sustainability in the global maritime sector.

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