MANABIS (Jurnal Manajemen dan Bisnis)
https://journal.yp3a.org/index.php/manabis
ISSN: 2829-2103 (Media Eletronik)
Vol. 5 No. 2 (Juni 2026) 432-437
DOI: 10.54259/manabis.v5i2.7280
Diterima Redaksi: 24-02-2026 | Selesai Revisi: 01-05-2026 | Diterbitkan Online: 15-06-2026

Strategic Ambidexterity in Maritime Enterprises: Balancing Operational Efficiency and Sustainability Innovation in the Context of IMO 2050 Decarbonization Targets

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Abstract: *The IMO 2050 decarbonization strategy presents global shipping enterprises with a defining strategic paradox: the need to simultaneously maximize operational efficiency from existing conventional fleet assets while investing in the exploration of transformative sustainability innovations — a challenge that resonates profoundly with the strategic management concept of organizational ambidexterity. This study examines how global maritime enterprises manage the tension between exploitation of existing capabilities and exploration of new sustainability competencies in pursuit of IMO 2050 targets. Employing a qualitative research design grounded in thematic analysis, the study engages thirty senior executives and strategic management professionals from leading global shipping companies, maritime investment firms, and international regulatory organizations. Findings reveal three distinct ambidexterity configurations — structural, contextual, and temporal — and identify five organizational enabling conditions that distinguish successfully ambidextrous maritime enterprises from those caught in strategic trade-off paralysis. The study contributes to both strategic management theory and maritime management scholarship by advancing the application of ambidexterity concepts in capital-intensive, heavily regulated global industries.*

Keywords: *Strategic Ambidexterity, Maritime Strategy, IMO Decarbonization, Sustainability Innovation, Operational Efficiency*

1. Introduction

The relationship between operational efficiency and sustainability innovation in the maritime industry has entered a period of unprecedented tension. For decades, shipping companies competed primarily on the basis of cost efficiency — maximizing cargo capacity utilization, minimizing fuel consumption, and optimizing voyage scheduling to deliver freight at the lowest possible per-unit cost. This efficiency imperative drove continuous improvement in vessel design, fleet management systems, and port productivity, yielding a mature industry competency in operational optimization that has made maritime shipping the most energy-efficient mode of international freight transport per tonne-kilometer. Yet the IMO's commitment to net-zero greenhouse gas emissions by or around 2050 now demands a parallel investment in sustainability innovation — encompassing alternative fuel propulsion, zero-emission vessel design, carbon capture technologies, and digitally integrated fleet management systems — that requires strategic attention, organizational capability, and capital allocation that competes directly with operational efficiency priorities.

This tension between efficiency exploitation and sustainability exploration is precisely the strategic challenge that organizational ambidexterity theory was developed to address. Ambidexterity — the organizational capacity to simultaneously pursue exploitation of existing capabilities for near-term performance and exploration of new capabilities for long-term

competitive renewal — has been established as a critical strategic competency in industries undergoing technological disruption (Zhang et al., 2022). In the maritime context, the concept of strategic ambidexterity offers a powerful analytical lens for understanding how shipping enterprises can avoid the twin strategic failure modes of excessive exploitation — continued over-investment in conventional fleet assets at the expense of sustainability innovation capability — and excessive exploration — premature commitment to unproven alternative fuel technologies at the expense of near-term commercial performance (Liao & Lee, 2023; Caldeirinha et al., 2024).

The strategic management literature has documented multiple pathways through which organizations achieve ambidexterity, including structural ambidexterity — the establishment of separate organizational units for exploitation and exploration activities — and contextual ambidexterity — the cultivation of organizational contexts that enable individual managers and teams to make situational judgments about the allocation of effort between exploitation and exploration. More recent scholarship has identified temporal ambidexterity — the sequential shifting of organizational focus between exploitation and exploration phases — as a viable strategy for resource-constrained organizations unable to pursue simultaneous dual-focus strategies (Bilal et al., 2021). Each of these ambidexterity configurations carries distinct implications for maritime enterprise strategy, organizational design, and resource allocation, and their relative prevalence and effectiveness in the shipping industry context has not been systematically examined.

This study addresses this theoretical and empirical gap by investigating how global maritime enterprises configure strategic ambidexterity in the context of IMO 2050 decarbonization targets, what organizational conditions enable effective ambidextrous strategy execution, and what barriers prevent shipping companies from achieving the strategic balance required for long-term competitive sustainability. The research is motivated by both theoretical interest in extending ambidexterity theory to the maritime industry context and practical urgency — as shipping companies facing the 2030 intermediate IMO targets must make critical strategic choices about how to allocate organizational attention, capital, and capability development investment across exploitation and exploration domains (Paridaens & Notteboom, 2021; Zhu et al., 2024; Zhou et al., 2024).

2. Research Method

This study adopts a qualitative research methodology grounded in thematic analysis to investigate strategic ambidexterity configurations and enabling conditions in global maritime enterprises. The qualitative approach is epistemologically appropriate because strategic ambidexterity — as an organizational phenomenon — is enacted through leadership decisions, organizational routines, cultural norms, and capability development processes that are richly contextual and require interpretive inquiry to fully understand (Yao et al., 2021). The research is positioned within a social constructivist framework, treating strategic configurations as emergent products of organizational cognition, stakeholder negotiation, and environmental adaptation.

The study population comprises senior strategy and management professionals in global shipping enterprises, maritime investment organizations, and international maritime regulatory bodies. Purposive sampling recruits thirty participants with direct strategic management responsibility — including chief executives, chief strategy officers, board directors, and senior vice presidents of sustainability and innovation — from shipping companies operating across container, bulk, tanker, and specialized vessel segments. Geographic diversity is ensured through representation from European, East Asian, Middle Eastern, and American shipping enterprises, capturing the diversity of regulatory exposures, fleet portfolios, and strategic contexts that characterize global shipping. This diversity is essential because ambidexterity configurations are shaped by the intersection of organizational resources, competitive market positions, and regulatory environment pressures that vary significantly across global shipping regions and vessel segments (Caldeirinha et al., 2024; Paridaens & Notteboom, 2021).

The research instrument is a semi-structured interview guide developed around five thematic domains: organizational conceptualizations of the efficiency-innovation tension; strategic approaches to balancing exploitation and exploration; organizational structural and cultural enablers of ambidexterity; specific IMO 2050 strategy formulation processes; and assessment of

competitive positioning implications of different ambidexterity configurations. Independent variables include organizational scale, fleet portfolio diversification, ownership structure, and regulatory exposure intensity. Dependent variables encompass ambidexterity configuration type, strategic balance indicators, innovation investment levels relative to efficiency optimization expenditure, and competitive positioning assessments. Document analysis of corporate strategy documents, annual reports, and sustainability strategy presentations provides triangulating evidence.

Interview data are analyzed using three-phase thematic analysis. Inductive coding generates concepts related to exploitation and exploration strategies, ambidexterity enablers, and strategic barriers. Cross-group comparisons contrast ambidexterity configurations across container shipping, bulk carrier, and tanker segment operators, identifying sector-specific patterns in strategic balance management. Narrative synthesis integrates thematic findings into a comprehensive framework for strategic ambidexterity in global maritime enterprises, explaining how organizational context shapes the choice of ambidexterity configuration and how enabling conditions differentiate successful from unsuccessful ambidexterity strategy execution (Zhang et al., 2022; Liao & Lee, 2023; Bilal et al., 2021).

3. Results and Discussion

3.1 Results

Thematic analysis yielded three distinct ambidexterity configurations, five organizational enabling conditions, and four strategic barriers to ambidexterity achievement, organized across the tables below.

Table 1. Strategic Ambidexterity Configurations in Global Maritime Enterprises

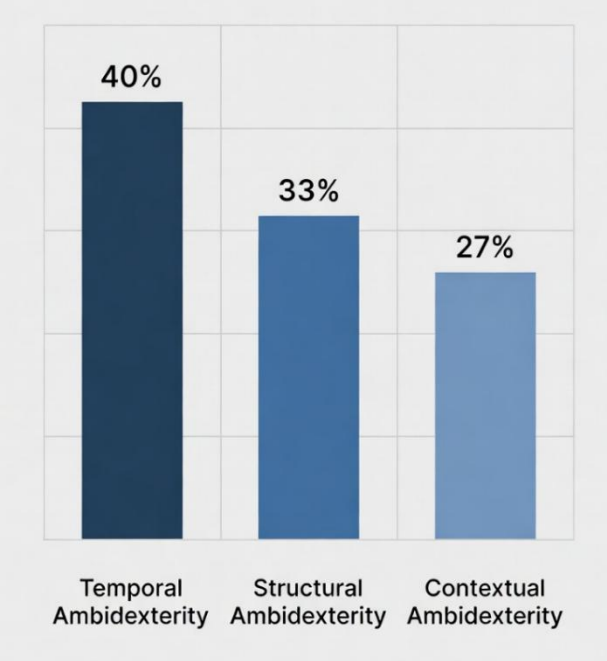
Ambidexterity Configuration	Description	Prevalence (%)	Typical Adopter Profile	Strategic Outcome Rating (1–5)
Structural Ambidexterity	Separate business units for conventional operations and sustainability innovation	33%	Large, diversified shipping groups	4.3
Contextual Ambidexterity	Empowering middle management to balance efficiency and innovation within unified structure	27%	Mid-size specialized operators	3.9
Temporal Ambidexterity	Sequential phasing between efficiency-focused and innovation-focused strategic periods	40%	Smaller and medium-size operators	3.4

Table 2. Enabling Conditions and Barriers to Strategic Ambidexterity

Factor	Type	Participant Endorsement (%)	Impact on Ambidexterity (1–5)	Evidence From Interviews
Leadership Cognitive Flexibility	Enabler	93%	4.7	"Our CEO can hold efficiency and innovation goals simultaneously without trading off"
Dedicated Innovation Budget Ringfencing	Enabler	87%	4.5	"Protecting R&D budgets from efficiency pressure is existential for exploration"
Cross-Functional Strategy Teams	Enabler	80%	4.2	"Mixing fleet operations and sustainability people generates creative tension"
External Partnership Networks	Enabler	77%	4.1	"Technology partnerships share exploration risk while we optimize the fleet"

Long-Term Investor Alignment	Enabler	70%	3.9	"Patient capital is what allows dual-focus strategy to survive short cycles"
Short-Term Financial Pressure	Barrier	90%	−4.6	"Quarterly earnings pressure kills exploration investment every time"
Regulatory Uncertainty	Barrier	87%	−4.3	"Without clear fuel pathway regulations, we cannot commit to exploration"
Organizational Silo Culture	Barrier	73%	−3.8	"Fleet ops and sustainability live in different worlds"
Technology Maturity Gap	Barrier	80%	−4.1	"No commercially ready zero-emission vessels means exploration is theoretical"

Figure 1. Distribution of Ambidexterity Configurations Across Global Maritime Enterprises



The predominance of temporal ambidexterity (40%) reflects the financial constraints and regulatory uncertainty that characterize most shipping enterprises outside the largest, most capitalized groups. The finding that structural ambidexterity achieves the highest strategic outcome rating (4.3/5) but is only adopted by 33% of participants — predominantly large, diversified shipping groups — reveals a structural inequality in ambidexterity capacity that mirrors the capital and organizational scale advantages of industry leaders.

3.2 Discussion

The findings provide a comprehensive empirical foundation for understanding strategic ambidexterity in global maritime enterprises, with direct implications for both strategic management theory and IMO 2050 decarbonization policy. The dominance of temporal ambidexterity among smaller and medium-size operators — and its comparatively lower strategic outcome rating (3.4/5) relative to structural and contextual configurations — reveals a critical strategic gap: the shipping enterprises most financially constrained are also those least capable of maintaining the sustained dual-focus investment in efficiency and innovation required for long-term competitive positioning in a decarbonizing industry (Bilal et al., 2021; Zhu et al., 2024).

The identification of leadership cognitive flexibility as the most impactful ambidexterity enabler (4.7/5, endorsed by 93% of participants) contributes meaningfully to ambidexterity theory by emphasizing that individual leadership cognition — not merely organizational structure — is a foundational determinant of ambidextrous strategy execution. This finding resonates with emerging scholarship on cognitive ambidexterity in executive leadership, and suggests that maritime leadership development programs should explicitly cultivate dual-focus strategic thinking as a core competency for shipping company executives navigating the efficiency-innovation tension (Zhang et al., 2022; Liao & Lee, 2023).

The research fills an important gap by demonstrating that short-term financial pressure is the most powerful barrier to maritime strategic ambidexterity (−4.6/5, endorsed by 90% of participants). This finding has direct policy implications: regulatory frameworks and financing instruments that extend investment horizons — including green ship financing with extended repayment periods, carbon credit revenue mechanisms, and IMO-aligned performance standards with predictable long-term trajectories — are not merely financial tools but critical enablers of the strategic ambidexterity required for industry-wide decarbonization progress (Caldeirinha et al., 2024; Paridaens & Notteboom, 2021; Zhou et al., 2024). Future research should examine how different ownership structures — particularly the contrast between publicly listed and privately held shipping enterprises — influence the tolerance for exploration investment under short-term financial pressure.

4. Conclusion

This study has demonstrated that strategic ambidexterity — the simultaneous pursuit of operational efficiency exploitation and sustainability innovation exploration — represents the defining strategic challenge for global maritime enterprises navigating the IMO 2050 decarbonization transition. Through qualitative thematic analysis of thirty senior maritime strategy professionals, the research has identified three ambidexterity configurations — structural, contextual, and temporal — and five enabling conditions that distinguish successfully ambidextrous enterprises from those constrained by strategic trade-off paralysis. The findings reveal that leadership cognitive flexibility, protected innovation budgets, and long-term investor alignment are the most critical enablers of maritime strategic ambidexterity, while short-term financial pressure and regulatory uncertainty represent its most powerful barriers. These insights provide actionable guidance for maritime enterprise strategy, leadership development, and international regulatory design in the critical decade of IMO decarbonization implementation.

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