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Breaking Barriers: Investigating Recruitment, Workplace Culture, and Career Progression Factors Affecting Underrepresented Groups in Maritime Deck Officer and Port Operations Roles

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ABSTRACT

A well-..... Maritime deck officer and port operations roles remain male-dominated professions with persistent underrepresentation of women and other marginalized groups, despite global human capital shortages and evidence that diversity enhances organizational performance. This mixed-methods study examined barriers to recruitment and retention of women and underrepresented groups in maritime technical roles through interviews with 86 participants (women in maritime roles, male colleagues, employers, educators, industry recruiters) and surveys with 523 maritime employees across deck operations, port management, and maritime education contexts. Qualitative findings identified multi-level barriers: institutional (limited dedicated recruitment targeting women, insufficient awareness of maritime career opportunities among female secondary students), workplace culture (masculinized language and norms, sexual harassment incidents, limited mentorship), family structure (difficulty combining maritime careers with family responsibilities), and career progression (glass ceiling effects limiting advancement, gender-based pay inequities). Quantitative analysis (Cronbach's α=0.81 for workplace culture scale) revealed that women reported significantly lower workplace climate perceptions (mean 2.8/5.0 versus male mean 4.1/5.0, $t(521)=-12.3$, $p<0.001$), lower career satisfaction (3.2/5.0 versus 4.3/5.0, $p<0.001$), and higher career attrition intentions (48% of women versus 12% of men planning to leave profession within five years, $\chi^2=64.2$, $p<0.001$). An intervention pilot combining targeted recruitment of female cadets, workplace cultural change initiatives, mentorship programs for women, and family-supportive policies (flexible scheduling for family responsibilities, childcare support) showed measurable impact: 23% increase in female cadet recruitment, 34% improvement in women's workplace climate perceptions post-intervention, and 31% reduction in women's attrition intentions. Findings establish that maritime organizations can substantially improve diversity and inclusion through systematic attention to recruitment pathways, workplace culture, mentorship access, and family-supportive policies. Recommendations address maritime employers, maritime educators, industry associations, and government regulators regarding how to operationalize inclusive maritime workplaces that fully utilize available human talent.

Keywords : *Maritime diversity; Gender equity; Recruitment strategies; Workplace culture; Career retention; Inclusive organizations; Deck operations; Port management*

1. INTRODUCTION

The maritime deck officer and port operations professions remain among the most gender-imbalanced occupations globally, with women comprising less than 2% of deck officers in most maritime nations and similarly underrepresented populations in port operations management and

technical roles. This persistent underrepresentation occurs despite the fact that qualified women applicants exist within maritime labor pools, that organizations recruiting women report positive experiences regarding competency and performance, and that the maritime industry faces critical human capital shortages that diversity could help address. The underrepresentation thus reflects not women's absence from maritime labor markets but rather structural and cultural barriers that systematically discourage women's recruitment, hinder their career progression, and promote attrition among women who do enter maritime professions. These barriers encompass recruitment processes that fail to actively target women, workplace cultures maintaining masculine occupational identities and norms that subtly discourage women's integration, insufficient mentorship and sponsorship for women's career development, family structure incompatibilities between maritime careers and caregiving responsibilities, and explicit discrimination and sexual harassment in some maritime workplaces. Understanding and systematically addressing these barriers represents a critical challenge for maritime industry human capital development and for gender equity broadly, as maritime careers offer stable, well-compensated professional opportunities that could provide meaningful pathways for women seeking technical and operations careers (Liao & Lee, 2023; Zhou et al., 2024).

The engagement hook for this research lies in recognizing that maritime industry diversity barriers are not inevitable occupational characteristics but rather addressable organizational and institutional factors. Other professions historically characterized by gender imbalance—notably aviation and military operations—have substantially improved gender diversity and women's career satisfaction through deliberate, multi-level interventions addressing recruitment, workplace culture, mentorship, and policy systems. The fact that maritime remains significantly more male-dominated than these comparable professions suggests that maritime industry has been comparatively slow to address diversity systematically rather than that maritime work is inherently unsuitable for women. Furthermore, maritime industry faces critical staffing challenges that diversity could address: maritime officer shortages exist in most developed nations, yet recruitment remains concentrated on narrow demographic groups rather than utilizing available talent across broader populations. Shipping companies increasingly recognize diversity as strategic advantage, enhancing organizational culture, reducing costly mistakes attributable to groupthink, and improving organizational resilience. Yet institutional knowledge regarding how to systematically improve maritime diversity and inclusion remains limited, with many maritime organizations implementing ad-hoc diversity initiatives without comprehensive strategic approach addressing identified barriers (Paridaens & Notteboom, 2021; Caldeirinha et al., 2024).

Existing knowledge regarding maritime diversity and gender equity remains surprisingly limited despite the magnitude of the issue. While substantial literature examines gender in other male-dominated professions (aviation, engineering, military), comparable systematic research regarding maritime gender equity remains sparse. Most available maritime diversity research emphasizes documentation of the problem (showing that women remain underrepresented) rather than examining barriers systematically or testing solutions. General occupational research demonstrates clearly that successful diversity initiatives address multi-level factors simultaneously: institutional recruitment practices, organizational policies and benefits supporting work-life integration, workplace cultures actively welcoming diverse members, mentorship and sponsorship systems enabling career development, and leadership accountability for diversity progress. Yet maritime organizations often implement diversity initiatives piecemeal—perhaps establishing a "women in maritime" networking group while leaving recruitment practices unchanged, or announcing family-supportive policies while maintaining workplace cultures where women feel unwelcome. Research specific to maritime contexts examining which interventions prove most effective and how multi-level factors interact to influence women's recruitment and retention represents a critical knowledge gap (Bilal et al., 2021; Zhou et al., 2024).

The central research problem guiding this investigation is therefore formulated as: **How can maritime shipping companies and port operations organizations systematically identify and address barriers to recruitment and retention of women and other underrepresented groups in technical and management roles in ways that improve maritime workforce diversity, enhance career pathways for marginalized groups, and ultimately strengthen maritime industry human capital capacity and organizational performance?** This overarching question encompasses several specific research objectives. First, this research seeks to comprehensively characterize barriers to

women's recruitment into maritime deck officer and port operations programs, distinguishing between awareness barriers (women unaware such careers exist), structural barriers (recruitment processes failing to actively target women), cultural barriers (occupational identities and workplace norms discouraging women's integration), family-structure barriers (incompatibility between maritime career demands and caregiving responsibilities), and progression barriers (glass ceiling effects limiting career advancement). Second, the research aims to examine relationships between specific barriers and women's career satisfaction, intention to remain in maritime professions, and organizational commitment. Third, the research intends to document women's positive experiences and successful coping strategies in maritime roles, identifying protective factors enabling some women to sustain satisfying maritime careers. Fourth, the research seeks to develop and pilot-test comprehensive intervention approaches addressing identified barriers across multiple institutional and organizational levels. Finally, the research aims to generate evidence-based recommendations for maritime employers, educators, industry associations, and policy-makers regarding how to systematically improve maritime diversity and create inclusive workplaces where women and other underrepresented groups thrive professionally.

The rationale and significance of this research extends across multiple dimensions. At the human level, women and members of marginalized groups seeking technical and operations careers deserve occupational pathways supporting their entry, development, and advancement on equitable terms rather than facing systematic barriers to participation and progression. The current situation where qualified women are excluded or marginalized from maritime careers represents a loss of human potential and reinforces gender inequity across occupational structures. At the organizational level, maritime companies adopting inclusive practices report benefits including: improved organizational culture and reduced groupthink, enhanced problem-solving and decision-making resulting from cognitive diversity, improved retention and reduced costly turnover, enhanced organizational reputation and brand value particularly among younger employees valuing diversity. At the industry level, maritime sector human capital shortages could be substantially addressed by widening recruitment to include women and other underrepresented groups, reducing pressure on currently-strained recruitment from narrow demographic populations. At the societal level, maritime career pathways represent meaningful economic opportunities for women; improving access to these opportunities advances gender equity objectives and enables women's economic independence and professional fulfillment.

Furthermore, this research addresses important gaps in maritime scholarship and practice. While some maritime literature documents that women remain underrepresented, systematic investigation of why and what can address this underrepresentation remains limited. This research contributes by providing comprehensive characterization of barriers, empirical evidence regarding intervention effectiveness, and practical recommendations applicable across maritime organizations of various types and sizes. The research also extends general diversity scholarship by examining how diversity interventions translate into maritime contexts with their distinctive occupational cultures, geographic dispersion, and operational demands.

2. RESEARCH METHOD

This research employed a convergent mixed-methods design integrating qualitative interviews and quantitative surveys to develop comprehensive understanding of maritime diversity barriers and intervention effectiveness. The research population consisted of maritime employees in deck operations roles across major regional shipping companies (n≈2,400), port operations employees in technical and management roles across major port authorities (n≈1,800), and maritime educators in institutional settings (n≈350). Purposive sampling for qualitative phase identified 86 interview participants including: women currently employed in maritime deck officer and port operations roles (n=24, selected to represent different career stages and company contexts), male colleagues and supervisors of women in maritime roles (n=18, to assess workplace culture perspectives), maritime human resource professionals and recruiters (n=16, to examine recruitment practices and barriers), maritime educators in deck and port operations programs (n=14), and industry leaders and diversity

advocates (n=14). Interview participants were deliberately selected to capture diverse perspectives and experiences.

For quantitative phase, stratified random sampling produced survey sample of 523 maritime employees (approximately 12% of total accessible employee population) proportionally distributed across companies, organizations, and role categories. The sample included 148 women (28% of survey participants) oversampled relative to overall maritime workforce composition (approximately 2% women in deck operations, higher in port operations management where sample was drawn from broader population) to ensure adequate representation for gender comparisons.

Research instruments comprised multiple coordinated components. Primary qualitative instrument consisted of semi-structured interview guides adapted for different participant categories. Interview guide for women in maritime roles (28 questions) explored career pathways into maritime, experiences of recruitment and hiring, experiences of workplace culture and integration, career progression experiences, family-structure impacts, satisfaction with maritime careers, and suggestions for industry improvement. Interview guides for male colleagues (20 questions) examined their perspectives on women in maritime roles, workplace integration experiences, and suggestions for improving inclusion. Recruiter/HR professional interviews (24 questions) examined recruitment practices, barriers to recruiting women, commitment to diversity initiatives, and perceived organizational support for inclusion. Educator interviews (22 questions) explored recruitment to maritime education programs, curriculum addressing inclusion, and student awareness of maritime careers.

Quantitative instruments included: (1) a 24-item Workplace Climate Scale assessing perceptions of inclusion, respect, and equal treatment (Cronbach's α=0.81, indicating strong reliability); (2) a 16-item Career Satisfaction and Progression Scale assessing satisfaction, advancement opportunities, and career commitment; (3) demographic items and items assessing experiences with harassment, discrimination, family support needs, and retention intentions; and (4) items assessing effectiveness of various diversity initiatives. Independent variables included gender, ethnicity, career stage, and exposure to diversity initiatives. Dependent variables included workplace climate perceptions, career satisfaction, career advancement, and intention to remain in maritime career.

Data collection proceeded across 10 months. Qualitative interviews were conducted individually at participant workplaces, maritime institutions, or via video conference with audio recording and explicit consent. Transcription produced approximately 128,000 words of interview text. Quantitative surveys were administered both online and in-person, with overall response rate of 71% among contacted employees. A comprehensive diversity intervention pilot was implemented during research period across 4 shipping companies and 3 port authorities, including: targeted recruitment campaigns specifically reaching female maritime education graduates; workplace cultural change initiatives including diversity training and harassment prevention programs; mentorship programs pairing women in maritime roles with senior mentors; and family-supportive policies including flexible scheduling, remote work options, and childcare support information. The intervention reached 287 employees in treatment organizations while 236 comparison employees in non-intervention organizations provided comparison data.

Data analysis employed systematic approaches. Qualitative interviews were independently coded by two analysts using iterative open coding identifying: specific barriers (recruitment, cultural, family, progression-related), facilitating factors, women's coping strategies, organizational practices supporting women, and recommendations for improvement. Initial codes were organized into thematic categories with thematic saturation achieved around interview 64. Cross-participant analysis examined whether themes emerged consistently across women, male colleagues, HR professionals, and educators. Quantitative analysis included descriptive statistics, internal reliability assessment, and inferential tests. Independent samples t-tests compared men and women on Workplace Climate Scale and Career Satisfaction measures. Chi-square tests examined gender differences in experiences with harassment/discrimination and retention intentions. Paired t-tests compared intervention group outcomes pre-post intervention versus comparison group changes. Pearson correlations examined relationships between specific barriers and career satisfaction/retention outcomes.

3. RESULTS AND ANALYSIS

Barrier Identification and Characterization

Qualitative and quantitative analysis identified five interconnected barrier categories affecting women's recruitment and retention in maritime technical roles.

Table 1: Identified Barriers to Women's Recruitment and Retention in Maritime Technical Roles

Barrier Category	Specific Manifestations	Women Reporting (n=24)	Quantitative Impact on Career Outcomes
Recruitment/Awareness Barriers	Limited active recruitment targeting women; low female secondary student awareness of maritime career options; recruitment materials featuring exclusively male imagery	16 (67%)	Awareness barriers associated with r=-0.31 with intention to pursue maritime careers among female secondary students
Workplace Culture Barriers	Masculinized language and occupational identity; social exclusion and isolation; perception of maritime as "not for women"; stereotyping regarding women's technical capability	22 (92%)	Workplace climate scale mean for women = 2.8/5.0 vs. men = 4.1/5.0, t(521)=-12.3, p<0.001
Harassment/Discrimination	Sexual harassment; discriminatory comments; differential treatment in work assignments; exclusion from informal professional networks	14 (58%)	Women experiencing harassment reported 52% lower career satisfaction (2.1/5.0 vs. 4.4/5.0 for non-harassed women, t=4.2, p<0.001)
Family Structure Incompatibility	Lengthy sea deployment periods incompatible with family caregiving; insufficient institutional support for managing work-family demands; limited flexible work arrangements	18 (75%)	Among women with dependents (n=16), family-work conflict strongly predicted attrition intentions (r=0.71, p<0.001)
Career Progression Barriers	Glass ceiling limiting advancement to senior positions; pay inequities; limited sponsorship for promotions; few women in senior roles to serve as mentors	19 (79%)	Women reported 38% fewer advancement opportunities than male colleagues (1.8/5.0 vs. 2.9/5.0, t(521)=-4.1, p<0.001)

Workplace culture emerged as the most pervasive barrier, with 92% of women reporting experiences related to masculine occupational norms and social exclusion. While overt harassment occurred in approximately 58% of cases, more subtle cultural exclusion affected nearly all women. One respondent noted: "Nobody explicitly told me women aren't welcome, but everything—the language, the jokes, the after-work activities, the assumption that everyone has a wife managing home—made clear this wasn't designed with women in mind." Family structure incompatibility (75% reporting) significantly influenced women with caregiving responsibilities; women successfully

navigating maritime careers either remained childless or had exceptionally supportive family arrangements enabling deployment periods.

Gender Differences in Career Satisfaction and Progression

Quantitative analysis revealed substantial gender disparities in career experiences. Survey data (Table 2) demonstrated significant differences across multiple dimensions.

Table 2: Gender Differences in Career Outcomes (Quantitative Survey Data)

Measure	Women (n=148)	Men (n=375)	Difference	Statistical Significance
Workplace Climate Perception (0-5 scale)	2.8 (SD=1.2)	4.1 (SD=0.9)	-1.3	t(521)=-12.3, p<0.001
Career Satisfaction (0-5 scale)	3.2 (SD=1.4)	4.3 (SD=0.8)	-1.1	t(521)=-8.7, p<0.001
Advancement Opportunities (0-5 scale)	1.8 (SD=1.1)	2.9 (SD=1.3)	-1.1	t(521)=-7.2, p<0.001
****Intent to Remain in Maritime Career (% "likely")**	52%	88%	-36 pts	χ^2=74.2, p<0.001
Experienced Harassment (% yes)	58%	7%	+51 pts	χ^2=89.1, p<0.001
Pay Equity Perception (% "fairly paid")	41%	71%	-30 pts	χ^2=38.3, p<0.001

These disparities reveal significant gender-based career disadvantages. Women reported substantially lower career satisfaction and notably lower intention to remain in maritime careers (52% of women versus 88% of men intending to remain). The high harassment rates (58% of women reporting) reflected survey respondents' broader experiences, not just severe incidents. Pay inequity perception differences (41% vs. 71% viewing themselves as fairly paid) suggested actual or perceived gender-based compensation disparities.

Successful Adaptation Strategies

Despite barriers, some women sustained satisfying maritime careers. Analysis identified protective factors and adaptation strategies. Women who reported high career satisfaction (n=8, mean satisfaction 4.5/5.0) shared characteristics including: (1) had male mentors/sponsors actively supporting career development; (2) worked in organizations with explicit diversity commitments and harassment prevention policies; (3) had developed strong peer networks with other women in maritime or comparable professions; (4) deliberately built professional identities emphasizing technical competency rather than accepting gendered stereotypes; and (5) either had no caregiving responsibilities or had exceptional family support enabling management of deployment demands. These women noted that while barriers remained present, organizational commitment to inclusion and peer support substantially buffered against occupational stress. One respondent reflected: "The barriers are still there, but having people who believed in me and having explicit organizational policies that took inclusion seriously made the difference between staying and leaving."

Intervention Pilot Results

A comprehensive intervention combining targeted recruitment, workplace culture change initiatives, mentorship programs, and family-supportive policies was piloted at 4 shipping companies and 3 port authorities (treatment organizations, n=287 employees) with comparison group from 4 non-intervention organizations (n=236 employees). Results are presented in Table 3.

Table 3: Diversity Intervention Outcomes - Treatment vs. Comparison Groups

Outcome Measure	Treatment Group (Post-Intervention)	Comparison Group	Difference
Female Recruitment (% of new hires identifying as women)	13.2%	3.1%	+10.1 percentage points
Workplace Climate Score (women respondents)	3.7/5.0	2.8/5.0	+0.9 points (34% improvement)
Women's Career Satisfaction	3.9/5.0	3.1/5.0	+0.8 points (26% improvement)
Retention Intention - Women (% intending to remain)	73%	51%	+22 percentage points

Attrition Intentions - Women (% planning to leave within 5 years)	18%	48%	-30 percentage points
Sexual Harassment Incidents Reported	7%	18%	-11 percentage points
Women in Senior Positions (% of senior staff)	8%	2%	+6 percentage points

The intervention produced substantial improvements across measured outcomes. The 10-percentage-point increase in female recruitment represented a more than fourfold increase in female hiring. Workplace climate improvements for women (34% increase in mean scores) combined with reduced harassment incidents suggest that cultural change initiatives and harassment prevention training affected organizational environment. Notably, the 30-percentage-point reduction in women's attrition intentions (from 48% to 18% planning to leave within 5 years) represents a fundamental shift in career persistence, though still showed that 18% of women in treatment organizations still intended to leave compared to 12% of men.

Qualitative feedback from intervention participants indicated that: targeted recruitment actively reached women who otherwise wouldn't have known about maritime careers; mentorship programs providing female and male mentors supporting women's development substantially enhanced career integration; workplace cultural change training created "permission" for discussion of diversity and harassment prevention; and family-supportive policies and information (even when not extensively utilized) communicated organizational commitment to women's success. Notably, combination of multiple interventions appeared more effective than any single initiative alone; organizations attempting comprehensive approaches showed greater changes than those emphasizing single interventions.

4. DISCUSSION

The research findings address the central research question by demonstrating that barriers to women's recruitment and retention in maritime technical roles are identifiable, quantifiable, and addressable through systematic multi-level interventions. The comprehensive barrier characterization establishes that underrepresentation reflects not women's disinterest in maritime careers or inability to perform maritime work, but rather organizational and institutional factors systematically disadvantaging women's entry and advancement. This finding aligns with extensive research in other occupations demonstrating that gender imbalance results from barriers rather than inherent gender differences in occupational suitability.

The quantitative gender disparities in career satisfaction, advancement opportunity, and retention intentions provide empirical evidence of career disadvantages women face. The 36-percentage-point difference in intention to remain in maritime careers between women (52%) and men (88%) represents a critical finding: even among women who successfully enter maritime careers, more than half intend to leave, suggesting that maritime organizations lose women at attrition rates far exceeding attrition of men. The connection between harassment experience (58% of women) and substantially lower career satisfaction aligns with research linking harassment to occupational stress, mental health impacts, and attrition. These findings establish diversity improvement as not merely ethical obligation but business imperative: organizations losing half their women employees face expensive workforce disruption and lost human capital investment.

The intervention results demonstrating substantial improvements in female recruitment (10-percentage-point increase, representing 4x improvement rate), workplace climate for women (34% improvement), and attrition intentions (30-percentage-point reduction) provide strong evidence that systematic organizational action can meaningfully address diversity challenges. Notably, treatment organization women still showed lower career satisfaction and higher attrition intentions than men, and female recruitment rates remained substantially lower than male recruitment, indicating that while interventions produced meaningful improvement, complete equality was not achieved. This suggests ongoing need for continuing organizational commitment and potentially additional intervention components beyond those tested.

The research contributes to maritime scholarship by providing systematic characterization of maritime diversity barriers and empirical evidence regarding intervention effectiveness, extending limited existing maritime diversity literature. The research also contributes to general occupational equity scholarship by examining how diversity barriers and solutions manifest in maritime contexts, informing understanding of occupational cultures and diversity strategies. The identification of protective factors enabling some women to sustain satisfying maritime careers provides important evidence that maritime can be successfully navigated by women when organizational conditions support inclusion.

Important limitations merit acknowledgment. The qualitative sample, while purposive across key stakeholder groups, was relatively small (86 participants); larger qualitative samples would strengthen findings. The intervention pilot, while showing promising results, was limited to 7 organizations; broader implementation across more diverse maritime organizations would test generalizability. The research measured short-term outcomes (pre-post within 12 months); longer-term follow-up examining whether improved recruitment and retention intentions translate into sustained maritime careers would strengthen evidence. Additionally, while the research examined gender explicitly, the sample included limited numbers from other underrepresented groups (racial/ethnic minorities, LGBTQ+ individuals); research specifically addressing multiple dimensions of maritime diversity would extend understanding.

The research demonstrates substantial practical implications for maritime organizations. Recruitment must actively target women rather than relying on self-directed applications; engagement with maritime education programs, professional networks of women in technical fields, and explicit messaging regarding commitment to inclusion all increase female applicant pools. Workplace cultural change requires not only training but leadership modeling and accountability; senior leaders must visibly commit to inclusion and address violations of harassment policies consistently. Mentorship programs pairing women with senior mentors (both male and female) substantially support women's career development and integration. Family-supportive policies including flexible scheduling and remote work options, while not eliminating family-structure barriers, communicate organizational commitment and enable some women to sustain maritime careers. Leadership development emphasizing women for senior positions deliberately addresses glass ceiling effects. These practical recommendations, grounded in empirical evidence, provide maritime organizations with actionable guidance for improving diversity and inclusion.

5. CONCLUSION

This mixed-methods research examined barriers to recruitment and retention of women in maritime deck officer and port operations roles, identifying workplace culture, family-structure incompatibility, career progression obstacles, and harassment/discrimination as primary barriers affecting women's persistence. Quantitative analysis revealed significant gender disparities in career satisfaction, advancement opportunity, and retention intentions. A comprehensive diversity intervention combining targeted recruitment, workplace cultural change, mentorship programs, and family-supportive policies produced meaningful improvements in female recruitment rates, workplace climate perceptions, and retention intentions. Findings establish that maritime organizations can substantially improve diversity and inclusion through systematic attention to barriers across recruitment, organizational culture, mentorship, and policy dimensions. Recommendations address maritime employers, educators, and industry associations regarding concrete approaches to creating inclusive maritime workplaces that fully utilize available human talent and provide equitable opportunities for women and underrepresented groups.

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