Research Article

Organizational Readiness, Adoption and Public Health Implications in Maritime Ecosystems

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Abstract

Maritime ecosystems are increasingly exposed to environmental pressures that can affect ecological integrity and human health, creating a growing need for effective organizational monitoring and technology adoption. This study examines the relationships among Organizational Readiness, Adoption, and Public Health Outcomes in maritime ecosystems, with particular emphasis on the mediating role of Adoption. Data from 245 respondents were analyzed using partial least squares structural equation modeling (PLS-SEM) with ADANCO and 5,000 bootstrap samples. The measurement model demonstrated satisfactory reliability, convergent validity, and discriminant validity. The structural results showed that Organizational Readiness had a strong positive effect on Adoption ($\beta = 0.7958$, $p < 0.001$), while Adoption significantly influenced Public Health Outcomes ($\beta = 0.6856$, $p < 0.001$). Organizational Readiness also had a smaller but significant direct effect on Public Health Outcomes ($\beta = 0.1971$, $p = 0.0053$). Adoption significantly mediated this relationship, with an indirect effect of 0.5456, accounting for approximately 73.5% of the total effect. The study contributes by integrating organizational readiness, implementation, and One Health perspectives. Practically, it highlights the importance of transforming organizational preparedness into actual technology adoption to improve public-health outcomes in maritime ecosystems.

1. Introduction

Maritime ecosystems are increasingly recognized as critical determinants of environmental sustainability, economic activity, food security, and human health. Coastal and marine environments support fisheries, transportation, tourism, livelihoods, and recreation, yet they are simultaneously exposed to pollution, microbial contamination, harmful algal blooms, plastics, chemical pollutants, and other environmental pressures. These hazards can reach human populations through contaminated seafood, recreational exposure, occupational activities, and coastal environments. Landrigan et al. (2020) demonstrate that ocean pollution has substantial implications for human health and argue for stronger surveillance, prevention, and policy responses. Similarly, Fleming et al. (2021) emphasize that closer integration between ocean science and public health can generate important opportunities for disease prevention, environmental protection, and population well-being.

Advances in environmental sensing, digital monitoring, data integration, automated surveillance, and related technologies provide new opportunities for detecting and managing maritime environmental risks. However, technological availability does not necessarily ensure organizational adoption. Maritime authorities, environmental agencies, public-health organizations, research institutions, ports, and other organizations may differ substantially in their technological capabilities, human resources, leadership commitment, financial resources, infrastructure, and willingness to introduce organizational change. Consequently, an important research problem concerns not simply whether suitable technologies exist, but whether organizations are sufficiently prepared to adopt them and whether such adoption ultimately contributes to public-health outcomes.

Organizational readiness provides an important theoretical basis for examining this issue. Readiness represents an organization's collective commitment and perceived capability to implement change. Shea et al. (2014) conceptualize organizational readiness through change commitment and change efficacy and demonstrate that these dimensions can be reliably measured. More recent evidence nevertheless indicates considerable variation in how organizational readiness is conceptualized, operationalized, and connected with implementation outcomes, suggesting that further investigation is needed across different institutional settings (Caci et al., 2025).

Implementation research further indicates that preparedness should be distinguished from actual adoption. Proctor

et al. (2011) identify adoption as a specific implementation outcome reflecting the intention, initial decision, or action to employ an innovation. Thus, an organization may possess favorable resources and capabilities without necessarily translating them into implemented practices. This distinction is particularly important in maritime settings where environmental monitoring frequently requires coordination across scientific, technological, regulatory, and public-health domains.

At the same time, the One Health perspective emphasizes that human health cannot be separated from environmental and ecosystem health. Rüegg et al. (2017) argue that integrated approaches involving multiple disciplines, organizations, and stakeholders can create added value through improved health, sustainability, efficiency, and stewardship. Despite this conceptual recognition, previous studies have largely examined organizational readiness, technology implementation, ocean health, and public health within separate research streams.

This separation represents the precise research gap addressed by the present study. Existing literature establishes that organizational readiness matters for implementation, that adoption represents a distinct implementation outcome, and that maritime environmental conditions have important human-health consequences. However, limited empirical research has examined these elements simultaneously in a unified causal framework, particularly by testing whether technology adoption acts as the mechanism through which organizational readiness translates into public-health benefits within maritime ecosystems. Addressing this gap matters because investments in organizational capability or monitoring technology may have limited societal value unless organizational readiness is successfully transformed into actual implementation and health-related outcomes.

Accordingly, this study seeks to answer the following research question: How does Organizational Readiness influence Adoption and Public Health Outcomes in maritime ecosystems, and to what extent does Adoption mediate the relationship between Organizational Readiness and Public Health Outcomes?

The study positions Organizational Readiness as the antecedent, Adoption as both an implementation outcome and mediating mechanism, and Public Health Outcomes as the final consequence. Theoretically, it integrates organizational readiness theory, implementation-outcomes research, and the One Health perspective, thereby extending organizational readiness beyond internal implementation performance toward broader societal outcomes. Practically, the framework can help maritime authorities, environmental organizations, ports, research institutions, and public-health agencies understand why investments in infrastructure and technological capability should be accompanied by leadership commitment, workforce preparedness, implementation capacity, and organizational support. The central proposition is therefore that prepared organizations are more likely to adopt appropriate technologies, and effective adoption provides the principal pathway through which organizational readiness can contribute to improved public-health outcomes in maritime ecosystems.

2. Literature Review and Hypothesis Development

2.1 Theoretical Foundation

The present study integrates organizational readiness theory, implementation theory, and the One Health perspective to explain how organizational preparedness can translate into public-health benefits within maritime ecosystems. Organizational Readiness for Change conceptualizes readiness as a shared organizational state reflecting members' commitment to implementing change and their collective confidence in their ability to do so. Shea et al. (2014) operationalized this perspective through the Organizational Readiness for Implementing Change framework, emphasizing change commitment and change efficacy as fundamental conditions for successful implementation. Implementation theory complements this perspective by distinguishing organizational conditions from actual implementation outcomes. Proctor et al. (2011) identify adoption as a distinct implementation outcome representing the intention, initial decision, or action to employ an innovation. Thus, organizational readiness represents a facilitating condition, whereas adoption represents the behavioral or organizational realization of that

preparedness. The One Health framework provides the theoretical connection between maritime ecosystem management and human health. One Health recognizes that environmental, animal, and human health are interconnected and that integrated approaches may generate outcomes that cannot be achieved through isolated sectoral interventions. Rüegg et al. (2017) emphasize coordinated thinking, planning, information sharing, and supportive institutional infrastructures as mechanisms for producing health, welfare, sustainability, and efficiency benefits. Consequently, integrating organizational readiness and implementation theory with One Health provides a coherent theoretical basis for examining the sequence Organizational Readiness → Adoption → Public Health Outcomes.

2.2 Organizational Readiness

Organizational Readiness (OR) refers to the extent to which an organization possesses the commitment, capabilities, resources, skills, infrastructure, and collective confidence required to undertake change. In technology-intensive settings, readiness is particularly important because adoption may require technical expertise, financial investment, organizational coordination, leadership support, and changes in established routines. Existing research consistently recognizes readiness as an important implementation condition, although its effects across contexts are not always uniform. A recent systematic review by Caci et al. (2025) found considerable variation in how organizational readiness is conceptualized and measured and concluded that evidence regarding the conditions through which readiness generates implementation success remains fragmented. Similarly, readiness measures frequently need contextual adaptation because implementation barriers differ across organizational environments. This issue is particularly relevant in maritime ecosystems, where technology adoption may involve environmental sensors, digital surveillance, automated monitoring, data integration, early-warning systems, and interdisciplinary cooperation. Organizations with stronger implementation commitment, adequate resources, and greater implementation efficacy should therefore be better positioned to convert technological opportunities into actual adoption. Accordingly:
H1: Organizational Readiness has a positive effect on Adoption in maritime ecosystems.

2.3 Adoption

Adoption occupies a central position between organizational preparedness and downstream outcomes. Proctor et al. (2011) distinguish adoption from broader organizational or clinical outcomes, emphasizing that successful implementation cannot be assumed simply because an organization has favorable attitudes or resources. A later review of implementation-outcomes research confirms that adoption remains an important intermediate construct linking implementation strategies and contextual conditions with subsequent outcomes (Proctor et al., 2023). Within maritime ecosystems, adoption may involve the organizational utilization of technologies for pollution monitoring, ecological surveillance, contamination detection, environmental-risk assessment, information integration, and health-related decision support. Such adoption is especially important because maritime environmental degradation can have direct and indirect consequences for human populations. Landrigan et al. (2020), for example, demonstrate that ocean pollution represents a significant but insufficiently recognized public-health threat. Marine pollution may expose humans to chemical contaminants, harmful algal toxins, pathogens, plastics, and other hazards through seafood, occupational activity, recreation, and coastal exposure. Accordingly, organizational technologies capable of improving monitoring and early detection can provide a bridge between ecosystem management and health protection.

2.4 Organizational Readiness and Public Health Outcomes

Organizational readiness may also contribute directly to Public Health Outcomes (PHO). Prepared organizations are more likely to possess stronger procedures for risk assessment, stakeholder coordination, information sharing,

emergency response, and evidence-based decision-making. These capabilities can improve the organization's ability to recognize and respond to environmental threats even beyond the effects generated through a particular technology. The One Health literature supports this reasoning because effective health protection requires integrated institutional structures capable of coordinating environmental and human-health knowledge. Rüegg et al. (2017) argue that integrated approaches can produce improvements in effectiveness, efficiency, health, welfare, sustainability, and stewardship. In the maritime context, Fleming et al. (2021) similarly emphasize the opportunity to connect ocean science more directly with public-health research, policy, and action. Therefore:
H2: Organizational Readiness has a positive effect on Public Health Outcomes in maritime ecosystems.

2.5 Adoption and Public Health Outcomes

Technology adoption can strengthen public-health protection by enabling more systematic detection, interpretation, communication, and management of maritime environmental risks. Digital monitoring systems can potentially support earlier identification of hazards, more timely risk communication, improved inter-agency coordination, and evidence-based intervention. This relationship is theoretically consistent with One Health because effective responses to interconnected environmental and human-health threats depend on the generation and integration of information across sectors. The importance of this integration is reinforced by Landrigan et al. (2020), who document multiple pathways through which ocean pollution can affect human health, and by Fleming et al. (2021), who call for greater integration of oceans-and-health knowledge within public-health systems. Thus:
H3: Adoption has a positive effect on Public Health Outcomes in maritime ecosystems.

2.6 Mediating Role of Adoption

The integration of readiness and implementation perspectives suggests that Adoption functions as the principal mechanism through which organizational readiness produces broader outcomes. Organizational readiness establishes the capacity and willingness to act, but preparedness alone does not guarantee that monitoring technologies will be operationalized. Adoption converts organizational resources, commitment, and implementation capability into observable practices.

This distinction is important because implementation research explicitly separates antecedent organizational conditions, implementation outcomes, and downstream service or health outcomes (Proctor et al., 2011). Organizational readiness should therefore enhance public-health outcomes partly because prepared organizations are more capable of adopting technologies that strengthen environmental surveillance and health-risk management. Recent readiness research also highlights the need to examine mediating mechanisms rather than assuming a simple readiness–outcome relationship (Caci et al., 2025). Accordingly:
H4: Adoption mediates the relationship between Organizational Readiness and Public Health Outcomes.

No moderation relationship is proposed in the present model because the theoretical focus is on explaining the mechanism of transmission from readiness to public-health outcomes rather than identifying boundary conditions.

Drawing together the three theoretical perspectives, the proposed framework positions Organizational Readiness as the antecedent, Adoption as both an outcome and mediator, and Public Health Outcomes as the final outcome construct.

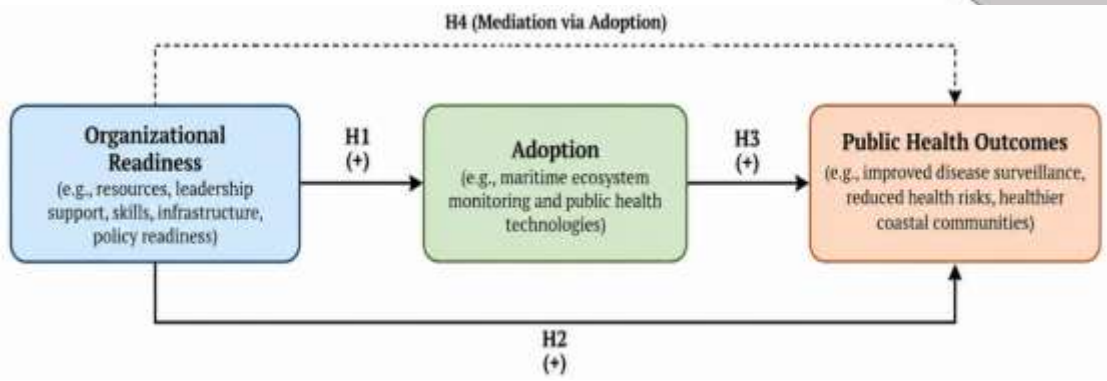


Figure 1: Conceptual Framework

The framework therefore shifts attention from whether maritime organizations merely possess technological resources to whether organizational preparedness can be transformed into actual adoption capable of generating meaningful public-health value.

3. Methodology

This study adopted a quantitative, cross-sectional research design to examine the relationships among Organizational Readiness, Adoption, and Public Health Outcomes within maritime ecosystem contexts. The study focused on professionals and stakeholders associated with maritime ecosystem management, environmental monitoring, public health, fisheries, coastal management, ports, marine research, universities, non-governmental organizations, and relevant government agencies. A purposive sampling technique, supported where necessary by snowball sampling, was employed to identify respondents with relevant knowledge or experience in maritime monitoring, technology adoption, environmental management, or public health. The final usable sample consisted of 245 respondents. This sample size was considered adequate for PLS-SEM because the proposed model contained a limited number of constructs and structural paths and substantially exceeded common minimum requirements for models of comparable complexity. The study measured three latent constructs: Organizational Readiness (OR), Adoption (AD), and Public Health Outcomes (PHO). Organizational Readiness was measured using five items adapted from the Organizational Readiness for Implementing Change framework developed by Shea et al. (2014). Adoption was measured using five items informed by Proctor et al. (2011) and Davis (1989), with wording contextualized to maritime monitoring and related technologies. Public Health Outcomes were assessed using six items developed and adapted from the One Health perspective and related environmental-health literature, particularly Rüegg et al. (2017). All items were measured on a five-point Likert scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree. The questionnaire was developed by adapting established constructs to the maritime ecosystem context while maintaining their underlying conceptual meaning. Items were reviewed for clarity, contextual relevance, and consistency before administration. Data were collected through a structured questionnaire distributed to eligible respondents through professional, academic, institutional, and sectoral networks. The final dataset was analyzed using ADANCO 2.4.1. Measurement and structural models were assessed using PLS-SEM, with 5,000 bootstrap resamples used to evaluate the statistical significance of direct, indirect, and total effects.

4. Results

The final dataset comprised 245 valid observations and was analyzed using ADANCO 2.4.1. The model estimation employed the factor weighting scheme with a stop criterion of (1.0\times10^{-6}) and a maximum of 200 iterations. The algorithm converged after only four iterations, indicating stable model estimation. Casewise deletion was

specified for the treatment of missing values. Statistical inference was based on 5,000 bootstrap samples, all of which were successfully evaluated. The empirical model contained three latent constructs: Organizational Readiness (OR), measured using five indicators; Adoption (AD), measured using five indicators; and Public Health Outcomes (PHO), measured using six indicators. All constructs were estimated using Mode A consistent measurement.

The reflective measurement model was evaluated in terms of indicator reliability, internal consistency reliability, convergent validity, and discriminant validity. All standardized indicator loadings were satisfactory. The loadings for Organizational Readiness ranged from 0.8821 to 0.9103, those for Adoption ranged from 0.8445 to 0.9170, and those for Public Health Outcomes ranged from 0.8366 to 0.9255. Thus, every indicator exceeded the commonly applied threshold of 0.70, demonstrating adequate indicator reliability.

Table 1. Indicator Loadings

Construct	Indicator	Loading
Organizational Readiness	OR1	0.8904
	OR2	0.8835
	OR3	0.8821
	OR4	0.9103
	OR5	0.8985
Adoption	AD1	0.9170
	AD2	0.8509
	AD3	0.8822
	AD4	0.8445
	AD5	0.8456
Public Health Outcomes	PHO1	0.8736
	PHO2	0.8565
	PHO3	0.8978
	PHO4	0.9255
	PHO5	0.8712
	PHO6	0.8366

Internal consistency was examined using Cronbach's alpha, Dijkstra–Henseler's rho (rho_A), and Jöreskog's composite reliability (rho_c). All three constructs demonstrated excellent reliability. Cronbach's alpha values ranged from 0.9388 to 0.9525, while rho_A ranged from 0.9396 to 0.9531 and rho_c from 0.9388 to 0.9525.

Convergent validity was assessed using average variance extracted (AVE). AVE values were 0.7975 for OR, 0.7543 for AD, and 0.7697 for PHO, substantially exceeding the recommended value of 0.50. The findings therefore demonstrate satisfactory convergent validity.

Table 2. Construct Reliability and Convergent Validity

Construct	Cronbach's α	ρA	ρc	AVE
Organizational Readiness (OR)	0.9516	0.9518	0.9517	0.7975
Adoption (AD)	0.9388	0.9396	0.9388	0.7543
Public Health Outcomes (PHO)	0.9525	0.9531	0.9525	0.7697

Overall, the reliability and convergent-validity results indicate that the indicators consistently represented their respective latent constructs.

Discriminant validity was primarily assessed using the heterotrait-monotrait ratio (HTMT). The HTMT values were 0.7956 between OR and AD, 0.7422 between OR and PHO, and 0.8420 between AD and PHO. All values remained below the conservative threshold of 0.85, although the AD–PHO relationship approached this threshold. Bootstrap-based HTMT inference further supported discriminant validity. The upper 95% bootstrap quantiles were 0.8377 for OR–AD, 0.7946 for OR–PHO, and 0.8783 for AD–PHO, all remaining below 0.90.

Table 3. Discriminant Validity Using HTMT

Construct Pair	HTMT	HTMT2	Assessment
OR – AD	0.7956	0.7953	Established
OR – PHO	0.7422	0.7415	Established
AD – PHO	0.8420	0.8413	Established

The Fornell–Larcker analysis provided additional evidence of construct distinctiveness because the AVE for each construct exceeded its squared correlations with the other constructs. Cross-loadings similarly showed that every indicator loaded most strongly on its theoretically assigned construct.

Indicator-level variance inflation factors were examined to identify potential multicollinearity. Most VIF values were comfortably below 5.0. The values ranged from 3.1711 to 5.1175 for OR, 3.1207 to 3.6873 for AD, and 3.3582 to 4.1769 for PHO. OR4 produced a VIF of 5.1175, which is marginally above the conventional 5.0 benchmark. OR4 demonstrated a strong loading of 0.9103 and the overall construct exhibited excellent reliability and validity, the marginal VIF elevation did not warrant indicator deletion. Nevertheless, this result should be acknowledged as a minor diagnostic consideration.

The estimated model demonstrated a very good fit to the empirical data. The standardized root mean square residual (SRMR) was 0.0190, substantially below conventional thresholds. The discrepancy measures were also satisfactory, with (d_ULS=0.0490) and (d_G=0.1128). Importantly, each observed discrepancy value was below its corresponding HI95 bootstrap value.

Table 4. Overall Model-Fit Assessment

Fit Measure	Observed Value	HI95	HI99	Assessment
SRMR	0.0190	0.0240	0.0267	Good fit
dULS	0.0490	0.0783	0.0973	Good fit
dG	0.1128	0.1583	0.1844	Good fit

The saturated and estimated models yielded identical fit statistics, providing additional evidence that the structural specification adequately reproduced the observed correlation structure.

The explanatory power of the structural model was assessed using the coefficient of determination (R^2). Organizational Readiness explained 63.33% of the variance in Adoption (R^2=0.6333); adjusted (R^2=0.6318). Organizational Readiness and Adoption jointly explained 72.41% of the variance in Public Health Outcomes (R^2=0.7241); adjusted (R^2=0.7218).

These values indicate substantial explanatory capacity for both endogenous constructs.

Table 5. Explanatory Power of the Structural Model

Endogenous Construct	R^2	Adjusted R^2
Adoption	0.6333	0.6318
Public Health Outcomes	0.7241	0.7218

Bootstrapping with 5,000 resamples was used to determine the significance of the hypothesized structural relationships. Organizational Readiness demonstrated a strong positive effect on Adoption (β = 0.7958, SE = 0.0273, t = 29.1957, p < 0.001, 95% CI [0.7364, 0.8448]). Thus, H1 was supported. Organizational Readiness also exerted a

positive direct effect on Public Health Outcomes (β = 0.1971, SE = 0.0707, t = 2.7881, p = 0.0053, 95% CI [0.0539, 0.3330]), supporting H2. Adoption had a strong positive effect on Public Health Outcomes (β = 0.6856, SE = 0.0679, t = 10.0989, p < 0.001, 95% CI [0.5539, 0.8227]), supporting H3.

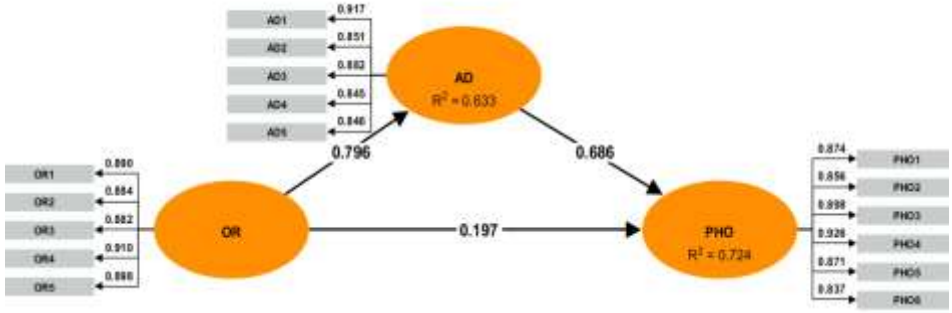


Figure 2. Structural Model Results

Cohen's (f^2) was examined to assess the substantive contribution of each predictor. Organizational Readiness produced a very large effect on Adoption (f^2=1.7270). Adoption also generated a large effect on Public Health Outcomes (f^2=0.6248). In comparison, the direct effect of Organizational Readiness on Public Health Outcomes was relatively small (f^2=0.0517).

Table 7. Effect Sizes

Relationship	f²	Interpretation
OR → AD	1.7270	Very large
OR → PHO	0.0517	Small
AD → PHO	0.6248	Large

The results indicate that Organizational Readiness primarily contributes to Public Health Outcomes through its strong influence on Adoption rather than through its direct effect alone.

H4 proposed that Adoption mediates the relationship between Organizational Readiness and Public Health Outcomes. The indirect effect of OR on PHO through Adoption was 0.5456 and was statistically significant (SE = 0.0567, t = 9.6185, p < 0.001). The 95% percentile bootstrap confidence interval ranged from 0.4389 to 0.6646, excluding zero and therefore confirming the mediating effect.

At the same time, the direct OR → PHO relationship remained statistically significant (\beta=0.1971,\ p=0.0053). Since both the direct and indirect effects were positive and statistically significant, the pattern represents complementary partial mediation.

The total effect of Organizational Readiness on Public Health Outcomes was 0.7428 ((t=21.6361,\ p<0.001); 95% CI [0.6707, 0.8042]). The proportion of the total effect transmitted through Adoption can additionally be expressed as: [VAF=73.45%]

Thus, approximately 73.5% of the total influence of Organizational Readiness on Public Health Outcomes operates through Adoption, further illustrating the central mediating role played by technology adoption.

Table 8. Mediation Results

Mediating Relationship	Direct Effect	Indirect Effect	Total Effect	t (Indirect)	95% CI Indirect	Mediation

OR → AD → PHO	0.1971**	0.5456***	0.7428***	9.6185	[0.4389, 0.6646]	Complementary partial mediation

Accordingly, H4 was supported. No moderation hypothesis or interaction construct was specified in the estimated model; therefore, moderation analysis was not applicable.

Several supplementary checks indicate that the substantive conclusions are robust. First, the structural coefficients estimated from the original sample were extremely close to their bootstrap means. For OR → AD, the original estimate was 0.7958 compared with a bootstrap mean of 0.7954. For OR → PHO, the corresponding estimates were 0.1971 and 0.1945, while for AD → PHO they were 0.6856 and 0.6879. This close correspondence suggests limited bootstrap bias. Second, the 95% and 99% bootstrap confidence intervals retained the expected positive signs for all direct paths. For example, the 99% percentile intervals were [0.7164, 0.8587] for OR → AD, [0.0059, 0.3846] for OR → PHO, and [0.5112, 0.8645] for AD → PHO. Thus, the hypothesized effects remained positive even when a more stringent confidence level was considered. Third, the indirect OR → AD → PHO effect remained significant under both the 95% confidence interval [0.4389, 0.6646] and the more conservative 99% interval [0.4073, 0.7008], providing strong evidence that the mediation finding was not sensitive to the conventional 95% criterion. Fourth, the estimated and saturated models returned identical SRMR, (d_{ULS}), and (d_G) statistics. This consistency supports the adequacy of the proposed structural specification. Finally, bootstrap HTMT upper bounds remained below 0.90, indicating that the structural conclusions are unlikely to be attributable to inadequate empirical separation among the latent variables.

Overall, the findings demonstrate that organizational readiness represents an important antecedent of technology adoption in maritime ecosystems, while Adoption emerges as the principal mechanism through which organizational preparedness translates into improved public-health outcomes. Although Organizational Readiness retains a significant direct association with Public Health Outcomes, the substantially larger indirect effect indicates that organizations are more likely to translate their readiness into public-health benefits when preparedness is converted into actual technology adoption.

5. Discussion

The findings demonstrate that organizational readiness is an important antecedent of technology adoption and subsequent public health outcomes in maritime ecosystems. Organizational Readiness (OR) showed a strong positive influence on Adoption (AD) (β = 0.7958), while Adoption strongly influenced Public Health Outcomes (PHO) (β = 0.6856). Organizational Readiness also directly affected Public Health Outcomes, although this relationship was considerably weaker (β = 0.1971). Most importantly, Adoption significantly mediated the OR–PHO relationship (indirect effect = 0.5456), accounting for approximately 73.5% of the total effect. Thus, organizational preparedness appears to generate health-related benefits principally when preparedness is translated into actual adoption and implementation.

These findings are consistent with organizational readiness theory, which argues that collective commitment and implementation efficacy determine an organization's capacity to introduce new practices and technologies. Shea et al. (2014) demonstrate that readiness reflects both organizational commitment to change and confidence in the ability to implement that change successfully. The strong OR–AD relationship found in this study therefore suggests that adequate resources, expertise, leadership support, and implementation confidence can substantially facilitate adoption in maritime monitoring environments.

The findings also reinforce implementation research distinguishing adoption from downstream outcomes. Proctor et al. (2011) conceptualize adoption as an implementation outcome representing the decision or action to employ an innovation. Accordingly, readiness alone should not be expected to produce societal or health outcomes automatically; organizations must convert readiness into operational implementation. This interpretation is also compatible with technology acceptance research, where perceived usefulness and the feasibility of technology use are central to acceptance and subsequent utilization (Davis, 1989).

The strong link between Adoption and Public Health Outcomes is particularly meaningful within maritime ecosystems. Marine environmental deterioration can expose populations to pathogens, harmful algal toxins, microplastics, heavy metals, persistent pollutants, and contaminated seafood (Landrigan et al., 2020; Bhuiyan et al., 2026). Effective monitoring and technology-enabled surveillance can therefore strengthen the identification, assessment, and management of environmental threats relevant to coastal communities. The findings also correspond with the One Health perspective, which emphasizes interconnected relationships among environmental, animal, and human health and encourages integrated monitoring and cross-sectoral action (Rüegg et al., 2017).

A noteworthy finding is the comparatively small direct effect of Organizational Readiness on Public Health Outcomes despite its strong total effect. Rather than weakening the proposed framework, this result clarifies the mechanism involved. Organizational resources, managerial commitment, or technical capability do not themselves produce health improvements. Their value becomes substantially greater when they facilitate actual adoption. The significant direct and indirect effects consequently indicate complementary partial mediation, suggesting that readiness contributes to public health both independently and, more importantly, through adoption.

The study contributes theoretically by connecting organizational-readiness and implementation perspectives with the emerging literature on ocean and human health. Previous research has often considered organizational implementation, environmental monitoring, and public health as separate domains. The present model integrates them into a sequential mechanism: Organizational Readiness → Adoption → Public Health Outcomes. This extends readiness research beyond internal organizational performance by demonstrating how organizational capabilities may ultimately contribute to broader societal and health outcomes.

For maritime authorities, environmental agencies, ports, research institutions, fisheries organizations, and public-health agencies, the findings suggest that investment in technology alone may be insufficient. Managers should simultaneously strengthen technical infrastructure, workforce competencies, leadership commitment, financial resources, inter-organizational coordination, and implementation capacity. Particular attention should be given to converting organizational preparedness into routine technology use. Integrated environmental and health surveillance may enable earlier identification of threats and more timely public-health responses, consistent with calls for stronger connections between ocean science and public health (Fleming et al., 2021).

Several limitations should be acknowledged. The cross-sectional design limits causal interpretation, while purposive sampling may restrict generalizability across geographical and institutional contexts. Public Health Outcomes were measured through respondents' perceptions rather than objective epidemiological indicators. Future studies should therefore employ longitudinal and multi-country designs, compare different maritime organizations, and incorporate objective indicators such as contamination alerts, response times, disease incidence, seafood-safety measures, or environmental-risk detection. Future models could also examine technological capability, institutional pressure, environmental uncertainty, inter-agency collaboration, regulatory support, and organizational culture as moderators or additional mediators. Such extensions would provide a more comprehensive explanation of how technology-enabled maritime management can contribute to sustainable ecosystem and human-health outcomes.

6. Conclusion

This study examined how Organizational Readiness influences Adoption and Public Health Outcomes in maritime ecosystems, with particular attention to the mediating role of Adoption. The findings show that Organizational Readiness has a strong positive effect on Adoption, while Adoption significantly improves Public Health Outcomes. Organizational Readiness also exerts a significant direct effect on Public Health Outcomes; however, the indirect effect through Adoption is substantially stronger, confirming complementary partial mediation. The study contributes theoretically by integrating organizational readiness, technology adoption, and public health perspectives within a unified maritime ecosystem framework. It demonstrates that organizational preparedness alone is not sufficient to generate meaningful public-health benefits unless such readiness is converted into actual

adoption and implementation. This extends organizational readiness theory beyond internal implementation outcomes toward broader environmental and societal consequences. Practically, the findings suggest that maritime authorities, environmental agencies, public-health institutions, ports, and research organizations should strengthen leadership commitment, technical capacity, workforce skills, infrastructure, and implementation support to facilitate effective adoption. Overall, the study highlights a clear pathway: organizational readiness creates the conditions for adoption, and adoption serves as the principal mechanism through which readiness translates into improved public-health outcomes in maritime ecosystems.

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