

# DIGITAL LEADERSHIP AND SAFETY CLIMATE ENHANCE OPERATIONAL PERFORMANCE THROUGH ORGANIZATIONAL COMMITMENT IN PUBLIC MARITIME SERVICES

Abdul Wahid<sup>1</sup>, Siti Maria<sup>2</sup>, Anisa Kusumawardani<sup>3</sup>

<sup>1</sup>Universitas Mulawarman, Indonesia

<sup>2</sup>Universitas Mulawarman, Indonesia

<sup>3</sup>Universitas Mulawarman, Indonesia

Email: [siti.maria@feb.unmul.ac.id](mailto:siti.maria@feb.unmul.ac.id), [anisa.kusumawardani@feb.unmul.ac.id](mailto:anisa.kusumawardani@feb.unmul.ac.id)

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## Abstract

This study analyzes the influence of digital leadership and safety climate on operational performance through organizational commitment at the Tanjung Santan Class III Port Operational Unit Office. This study departs from the global debate on the effectiveness of digital transformation and safety strengthening in improving the reliability of high-risk public sector operations. A conceptual model was built by integrating the perspectives of resource-based view, dynamic capability, and social exchange theory to explain the commitment-based causal mechanism. Data were collected through a survey of 33 employees and analyzed using partial least squares structural equation modeling (PLS-SEM). The results show that digital leadership and safety climate have a significant effect on organizational commitment and improve operational performance both directly and indirectly. Commitment acts as a partial mediator that strengthens the relationship between the two exogenous variables and the performance. These findings confirm that operational reliability is supported by the integration of managerial capabilities, a safe work climate, and psychological engagement of employees.

**Keywords:** *Digital Leadership, Safety Climate, Organizational Commitment, Operational Performance, Port Management*

## Introduction

Digital transformation in the global transportation and maritime sector has shifted the logic of operational performance creation from merely procedural efficiency to an integration of technology-based leadership, safety culture, and organizational capabilities. Recent literature shows that digital transformation in the public sector is related to technology adoption and changes in leadership and governance patterns that impact service quality and operational reliability (Hanelt et al., 2021; Vial, 2021). In high-risk organizations such as ports, safety regulatory pressures and demands for public accountability reinforce the need for digital leadership capable of integrating information systems, cross-unit coordination, and data-driven decision-making (Tangi et al., 2021; Wesselink et al., 2023). However, a theoretical debate continues regarding how digital leadership and safety climate simultaneously shape operational performance, particularly through internal employee psychological mechanisms. The literature on digital leadership tends to emphasize its role in driving innovation, organizational agility, and change readiness but has not systematically linked it to measurable operational outcomes in public maritime organizations (Zeike et al., 2019; Philip & Aguinis, 2023). Some studies have found that digital leadership improves productivity through increased competency and clarity of strategic direction, while others suggest that without the support of a strong organizational culture, digitalization triggers role uncertainty and resistance (Li et al., 2021; Li et al., 2023). Simultaneously, research on safety climate has focused more on compliance behavior and accident reduction rather than on the comprehensive integration of safety and operational performance (Smith et al., 2022; Clarke, 2022). This inconsistency indicates the inadequacy of explanatory mechanisms capable of bridging digital leadership and safety climate with operational performance

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through internal employee processes. The social exchange theory framework and resource-based view provide the foundation that leadership and organizational climate are strategic resources that influence employee commitment as a mechanism for shaping performance contributions (Blau, 1964; Barney, 1991). Recent literature confirms that organizational commitment serves as a microfoundation that links managerial practices to organizational outcomes in the digital era (Knies et al., 2024; Lee & Edmondson, 2022). However, most studies position commitment as a dependent variable rather than as a mediating mechanism that explains the causal relationship between digital leadership, safety climate, and operational performance. The lack of testing of this mechanism, particularly in Class III port organizations in developing countries, indicates the untested boundary conditions of the theory in public organizations with bureaucratic structures and limited resources.

Based on these gaps, this study formulates the following research question: How do digital leadership and safety climate influence operational performance through employee organizational commitment? To what extent does commitment serve as a causal mechanism that integrates leadership resources and safety culture in public port organizations? This question requires theoretical answers regarding the process of commitment formation as an internal mechanism that transforms managerial practices into reliable and adaptive operational performances. This study provides a major theoretical contribution by integrating the digital leadership and safety climate literature into a single causal model based on organizational commitment mechanisms, thus extending the application of social exchange theory and resource-based view to the context of public sector digital transformation. The methodological contribution lies in testing a mediation model using a structural equation modeling approach, which allows for the simultaneous estimation of direct and indirect relationships with greater precision than conventional regression approaches. The contextual contribution arises from testing the theory on the Tanjung Santan Class III Port Operator Unit, which faces a combination of high safety risks, pressure from the digitalization of maritime services, and organizational resource constraints. This context tests the limits of the theory in a medium-sized public organization operating in a tightly regulated environment.

The manuscript is systematically structured to support these arguments. The next section outlines the theoretical foundation and development of hypotheses based on relevant grand theories. The methodology section explains the research design and analytical approach used in this study. The empirical results and discussion are presented next, confirming the theoretical contributions and managerial implications. The final section summarizes the main findings and presents an agenda for further research that expands the examination of psychological mechanisms in the digital transformation of the maritime public sector.

## LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

### Digital Leadership as a Strategic Capability

Digital leadership is understood as a leader's ability to direct technology-based change, shape digital strategic direction, and align work processes so that the organization can maintain operational reliability while adapting to uncertainty. Within the resource-based view, digital leadership can be treated as a strategically valuable managerial resource because it mobilizes digital assets, competencies, and organizational routines into a difficult-to-replicate advantage. Within the logic of dynamic capability, digital leadership functions as a mechanism that enables organizations to sense environmental changes, seize data-driven decisions, and reconfigure redesigned work processes. The digital transformation literature emphasizes that the success of digitalization is not determined by technology alone, but by leadership's ability to orchestrate organizational capabilities and work behaviors so that the digital transition produces stable performance, not just a technology project (Vial, 2021; Hanelt et al., 2021; Verhoef et al., 2021). Recent empirical evidence also shows that digital leadership is related to the formation of a digital culture and digital capabilities that strengthen organizational performance, including psychological mechanisms and work behavior (Mollah et al., 2024; Cheng et al., 2025).

Hypothesis: Digital leadership positively affects operational performance.

### Digital leadership and organizational commitment as a social exchange mechanism

Organizational commitment can be strongly explained through social exchange theory, which emphasizes that employees build psychological bonds when the organization provides support, clarity of direction, and perceived fair treatment. Effective digital leadership tends to increase perceptions of support and trust because leaders provide technological resources, clarify work priorities, and reduce ambiguity through system-based coordination. This

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mechanism positions commitment as a rational and affective reciprocal response to an organization's investment in employee work capacity. Recent empirical studies have shown that digital leadership is related to affective commitment and performance outcomes through a mediating pathway, thus positioning commitment as a causal mechanism and not merely a consequence (Mollah et al., 2024). Other findings in the context of digital transformation also emphasize the importance of leaders in shaping organizational readiness and employee engagement in the change agenda, which ultimately strengthens sustainable performance (Cheng et al., 2025; Alakaş, 2024).

Hypothesis: Digital leadership positively affects organizational commitment.

## Safety climate as a social infrastructure for operational reliability

Safety climate is a shared perception of management priorities, practices, and consistency in protecting workplace safety. In high-risk organizations, safety climate is not simply a compliance issue but a foundation for operational reliability, influencing procedural discipline, coordination quality, and decision-making accuracy in risky situations. The safety literature emphasizes that a strong safety climate encourages safe behavior, reduces operational failures, and improves reliability-based performance, making it relevant for explaining operational performance (Smith et al., 2022; Todaro et al., 2023). Evidence from high-risk industrial contexts also suggests that safety is closely linked to human-technology interactions and operational sustainability; therefore, safety climate can be understood as a prerequisite for technology to support safe and consistent operations (Masudin et al., 2024). Thus, safety climate deserves to be positioned as an antecedent of operational performance and not just a safety outcome.

Hypothesis: Safety climate positively affects operational performance.

## Safety climate and organizational commitment as mechanisms for value internalization.

The relationship between safety climate and organizational commitment can be explained through the pathways of value internalization and social exchange. When an organization demonstrates consistency in safety, employees perceive it as being concerned about their well-being and the sustainability of their work. This signal strengthens trust and a sense of belonging, leading to greater commitment. Recent safety studies have shown that managers' commitment to safety influences employees' safety perceptions, and leadership style plays a role in shaping these perceptions (Levovnik et al., 2025). The literature on safety climate measurement also emphasizes the role of management and supervisory dimensions in creating stable perceptions and impacting psychological processes at work (Todaro et al., 2023). In the context of port operations, this pathway becomes even more important because risky work demands collective compliance and discipline, which typically arise when employees have strong ties to the organization.

Hypothesis: Safety climate positively affects organizational commitment.

## Organizational Commitment as a Driver of Operational Performance

Organizational commitment explains why employees are willing to maintain work standards, maintain coordination quality, and make extra efforts that support operational reliability. From a resource-based perspective, commitment can be understood as an intangible resource that increases process productivity and lowers failure costs because employees are more consistent in carrying out valued routines. Recent empirical evidence confirms that commitment plays a role in explaining performance when organizations face constraints because it increases the willingness to remain proactive and maintain the quality of work results (Turek et al., 2024). In operational organizations, commitment serves as a channel that translates policies and systems into stable work behaviors; thus, operational performance depends not only on procedures but also on employees' psychological bonds to the organization.

Hypothesis: Organizational commitment positively affects operational performance.

## Organizational Commitment as a Mediating Mechanism in the Relationship Between Digital Leadership and Operational Performance

A stronger causal model needs to explain why digital leadership is able to produce operational performance, not just show correlation. Digital leadership creates a support structure, clear priorities, and system-based coordination that strengthen the perception of organizational value. According to social exchange theory, these conditions encourage commitment as a psychological reward that increases disciplined execution, consistent quality, and operational

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reliability. Empirical evidence shows that affective commitment can mediate the influence of digital leadership on performance outcomes, making commitment mediation a theoretically plausible and empirically justifiable mechanism (Mollah et al., 2024; Cheng et al., 2025). [insert references] [insert references] Thus, the theoretical contribution of this study lies in confirming commitment as a microfoundation that links digital leadership capabilities to operational performance in high-risk public organizations.

Hypothesis: Organizational commitment mediates the effect of digital leadership on operational performance.

## Organizational Commitment as a Mediating Mechanism in the Relationship Between Safety Climate and Operational Performance

A strong safety climate can improve operational performance by reducing behavioral variation, strengthening procedural discipline, and improving the quality of cross-role coordination. However, this pathway of influence becomes more convincing when explained through the commitment mechanism. When safety is consistently prioritized, employees perceive the organization as having a long-term orientation and concern for their well-being, which leads to increased commitment. Commitment drives the maintenance of operational standards and service reliability. The safety literature shows that managers' commitment to safety and leadership processes shape safety perceptions, which have implications for safety behaviors, which are critical components of operational reliability (Levovnik et al., 2025; Smith et al., 2022). Findings in the Indonesian context also confirm that safety climate interacts with systems and technology to influence the quality of operational practices, making the role of internal employee mechanisms key to explaining when safety contributes to performance (Masudin et al., 2024).

Hypothesis: Organizational commitment mediates the effect of safety climate on operational performance.

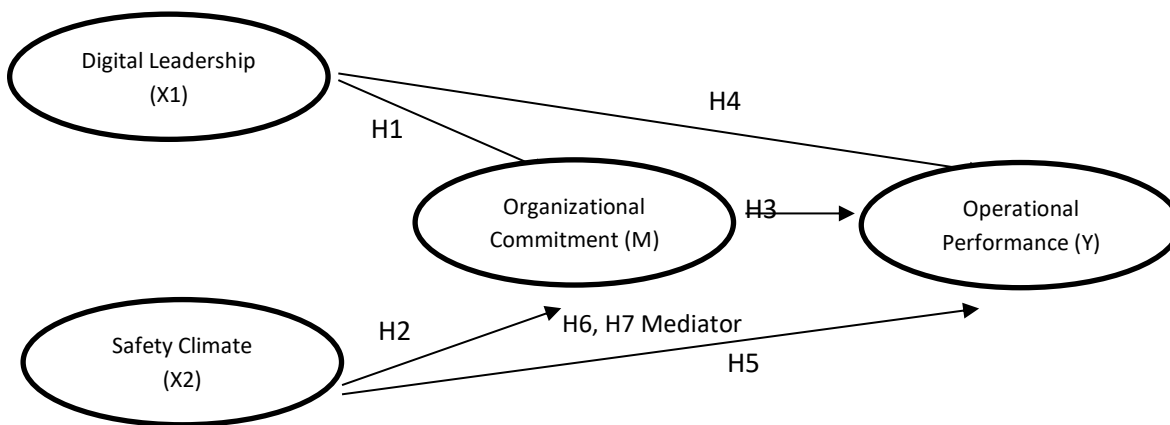


Figure 2. Conceptual Framework of the Research

## RESEARCH METHOD

### Research Design and Theoretical Justification

This study employed a quantitative explanatory design with a cross-sectional survey approach to examine the causal relationship between digital leadership and safety climate on operational performance through organizational commitment. An explanatory design was chosen because the study aimed to explain causal mechanisms rather than simply identify statistical associations. This approach aligns with the need to test latent construct-based structural models that require simultaneous estimation of direct and indirect relationships. The analysis was conducted using partial least squares structural equation modeling (PLS) because this method is suitable for complex models with mediation and focuses on predicting the variance of endogenous constructs. Recent methodological literature confirms that PLS-SEM is relevant for organizational research that emphasizes exploration and prediction in real-life managerial contexts (Hair & Alamer, 2022; Ringle et al., 2023).

### **Population, sampling technique, and sample size**

The study population included all employees of the Tanjung Santan Class III Port Management Unit Office involved in operational and administrative activities. Where the population size permitted, the study employed a census approach to maximize representativeness and minimize sampling error. When the population was larger and heterogeneous, proportionate stratified random sampling was used based on work units to ensure that the sample structure reflected variations in operational functions. Sample size determination followed the PLS-SEM sampling adequacy recommendations, which consider model complexity and path estimation stability, rather than simply relying on a rule-of-thumb based on the number of indicators. This approach ensured the accuracy of the estimates and statistical power of the model (Hair & Alamer, 2022; Sarstedt et al., 2022).

### **Measurement Instruments and Adaptation Process**

The research instrument was a structured questionnaire with a five- or seven-point Likert scale. Digital leadership was measured using a digital transformation leadership scale validated in the context of public organizations and businesses, with adaptations to the dimensions of digital vision, technology orchestration, and employee capability building (Abbu et al., 2025; van Roekel et al., 2025). Safety climate was measured using indicators of policy perceptions, management consistency, and safety practices that reflect modern measurement standards in high-risk industries (Shea et al., 2021). Organizational commitment was measured using a three-component framework encompassing affective, normative, and continuance dimensions as a form of psychological attachment to the organization (Meyer & Allen, 1991). Operational performance was measured using indicators of process reliability, service timeliness, output quality, and coordination effectiveness, which are commonly used in public infrastructure sector performance evaluations (Du et al., 2023). The instrument adaptation process was carried out through forward and back translation, evaluation of meaning equivalence, and limited trials to ensure suitability for the port context and content validity based on expert assessments. Validity and Reliability Testing: The measurement model was evaluated through internal reliability testing using composite reliability and Cronbach's alpha to ensure indicator consistency. Convergent validity was examined using outer loading values and average variance extracted to ensure that each construct adequately explained the indicator variance. Discriminant validity was assessed using the heterotrait-monotrait ratio (HTMT2) to ensure that the different constructs did not overlap empirically. This approach aligns with recent developments in reflective model evaluation in PLS-SEM and is recommended to improve the accuracy of latent construct interpretation (Roemer et al., 2021; Ringle et al., 2023).

### **Structural Model Evaluation**

After the measurement model meets the criteria, the structural model is evaluated by checking for collinearity through VIF values, testing the significance of path coefficients using a bootstrapping procedure, and assessing the ability to explain the variance of the endogenous construct through the R-squared value. The f-squared effect size was used to assess the practical contribution of each predictor to the endogenous construct. If the focus of the research is predictive ability, the analysis is expanded with an out-of-sample prediction evaluation using predictive procedures recommended in the contemporary PLS-SEM literature (Hair & Alamer, 2022; Ringle et al., 2023).

### **Data analysis procedures and software**

Data were analyzed using the latest version of SmartPLS software or equivalent PLS SEM software that supports reflective model estimation and mediation testing. Initial steps included missing data checks, anomalous response detection, and procedural and statistical common method bias testing. Results reporting followed modern PLS SEM reporting guidelines by presenting tables of outer loadings, composite reliability, average variance extracted, HTMT, path coefficients, t-values, R-squared, and effect sizes. These reporting standards ensure methodological transparency and replicability of findings (Hair & Alamer, 2022; Sarstedt et al., 2022).

### **Research ethics and bias control**

The research was conducted with ethical principles that ensure the confidentiality of respondents' identities and the use of data solely for academic purposes. Each respondent received information about the study and voluntarily consented to participate. Bias control was achieved through anonymity, randomization of item order, and construct separation within the questionnaire to minimize the tendency for socially desirable responses. Collinearity and

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discriminant validity checks were also part of the structural bias mitigation strategy to provide more reliable interpretations of causal relationships (Shea et al., 2021; Ringle et al., 2023)..

## RESULTS AND DISCUSSION

### Respondent Demographic Profile

A total of 33 employees participated in this study. Demographic profiles were presented to ensure context for interpreting the results, particularly since age, tenure, and position can influence perceptions of digital leadership, safety climate, organizational commitment, and operational performance. The respondent structure showed a predominance of male employees and a significant proportion of employees with medium-to long-tenure, making it relevant for assessing port operational dynamics.

Table 1. Demographic Profile of Respondents (n = 33)

Variables	Category	Frequency	Percentage
<b>Gender</b>	Man	26	78.8
	Woman	7	21.2
<b>Age</b>	< 30 years	4	12.1
	30–39 years	12	36.4
	40–49 years	10	30.3
	≥ 50 years	7	21.2
<b>Education</b>	High School/Vocational School	9	27.3
	Diploma	7	21.2
	S1	15	45.5
	Masters/Doctoral Degree	2	6.1
<b>Length of working</b>	< 5 years	6	18.2
	5–10 years	14	42.4
	> 10 years	13	39.4
<b>Position</b>	Technical implementer	17	51.5
	Administrative staff	6	18.2
	field supervisor	5	15.2
	Certain functionalities	5	15.2

Most respondents were in the productive age group and had more than five years of service, indicating a level of operational experience mature enough to assess leadership effectiveness and work safety.

### Evaluation of Measurement Model

A measurement model evaluation was conducted to ensure construct validity and reliability before causal relationship analysis. The assessment included convergent validity, discriminant validity, and internal reliability.

### Convergent Validity

Convergent validity was assessed using outer loading values, Cronbach's alpha, composite reliability, and average variance extracted. All indicators had outer loadings above 0.80, indicating a strong contribution to their respective construct.

Table 2. Summary of Outer Loading and Reliability

Construct	Outer Loading Range	Cronbach Alpha	Composite Reliability	AVE
<b>Digital Leadership</b>	0.808–0.857	0.937	0.948	0.695
<b>Safety Climate</b>	0.810–0.872	0.929	0.943	0.702
<b>Organizational Commitment</b>	0.813–0.855	0.929	0.942	0.700
<b>Operational Performance</b>	0.826–0.872	0.952	0.959	0.723

The AVE values for all constructs were above 0.50, thus meeting the convergent validity criterion. Internal reliability was also strong.

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**Discriminant Validity**

Discriminant validity was evaluated using the Fornell-Larcker criterion.

Table 3. Fornell Larcker Criterion

Construct	M	X1	X2	Y
Commitment (M)	0.837			
Digital Leadership (X1)	0.392	0.834		
Safety Climate (X2)	0.502	0.033	0.838	
Operational Performance (Y)	0.647	0.470	0.399	0.850

The diagonal value is higher than the correlation between constructs; therefore, the constructs are empirically different, and there is no overlap.

**Structural Model Evaluation**

The structural model was evaluated through R R-squared, effect size f-square, Q-square, and bootstrapping path coefficients.

**Coefficient of Determination**

Table 4. R Square Value

Endogenous Construct	R Square	R Square Adjusted
Organizational Commitment	0.392	0.386
Operational Performance	0.493	0.485

The model explained 39.2 percent of the variation in commitment and 49.3 percent of the variation in operational performance. This explanatory power is moderate.

**Effect Size**

Table 5. f Square Value

Connection	f Square	Interpretation
X1 → M	0.232	Currently
X2 → M	0.393	Big
M → Y	0.246	Currently
X1 → Y	0.132	Small to medium
X2 → Y	0.037	Small

Safety climate makes the largest contribution to employees' commitment. Commitment has a moderate effect on operational performance.

**Predictive Relevance**

Table 6. Q Square

Construct	Q Square
Organizational Commitment	0.271
Operational Performance	0.352

A positive Q-square value indicates that the model has predictive ability.

**Path Coefficients and Hypothesis Testing**

Table 7. Bootstrapping Results

Track	Coefficient	t	p	Decision
X1 → M	0.376	7,111	0,000	Significant
X2 → M	0.489	9,311	0,000	Significant
M → Y	0.453	7,801	0,000	Significant
X1 → Y	0.287	5,155	0,000	Significant
X2 → Y	0.163	3,049	0.002	Significant
X1 → M → Y	0.170	4,976	0,000	Partial mediation
X2 → M → Y	0.222	5,671	0,000	Partial mediation

Digital leadership positively and significantly impacted organizational commitment. This means that the more effective leadership is in managing digital transformation, the stronger the employee engagement with the organization. Safety climate had a positive and significant effect on organizational commitment, with the strongest effect in the model. Consistent safety perception increases employee ownership and loyalty. Organizational commitment positively and significantly affects operational performance. Employees with high engagement demonstrate consistency and reliability in performing their duties. Digital leadership has a direct impact on operational performance, but its power increases with commitment. Safety climate has a direct effect on operational performance with a small intensity but becomes stronger when mediated by commitment. Both mediation pathways showed a partial mediation pattern, such that organizational commitment acts as a psychological mechanism that connects managerial conditions and the work environment with operational results.

**DISCUSSION**

The key findings indicate that digital leadership has a significant positive effect on operational performance, both directly and indirectly through organizational commitment. Safety climate exhibits a smaller direct effect on operational performance but has the strongest effect on organizational commitment (OC). This pattern is consistent with the argument that digital transformation, resulting in operational reliability, is not driven by technology but rather by the orchestration of capabilities and alignment of work behaviors at the individual and unit levels. The digital transformation literature emphasizes that successful digitalization requires leadership capable of building alignment between organizational strategy, processes, and learning, allowing performance impacts to emerge through a combination of structural and behavioral channels (Hanelt et al., 2021; Verhoef et al., 2021; Vial, 2021). Furthermore, recent studies have shown that digital leadership often results in more stable performance outcomes when employees perceive digital change as tangible organizational support rather than simply a change in work systems (Qiao et al., 2024; Braojos et al., 2024).

The positive relationship between digital leadership and organizational commitment reinforces the *social exchange theory*, which states that organizational investment through leadership that provides direction, support, and role clarity triggers psychological rewards in the form of bonding and loyalty. Effective digital leadership tends to reduce work ambiguity through data-driven coordination, accelerate operational problem-solving, and increase perceptions of procedural justice due to transparent decisions. This pathway aligns with the literature that demonstrates commitment as a response to leadership relevant to the digital era and as a crucial channel bridging technological change with performance-driven work behaviors (Mollah et al., 2024; Qiao et al., 2024; Braojos et al., 2024). These findings extend the digital leadership literature by positioning commitment not only as an attitudinal outcome but also as a causal mechanism that explains why digital leadership can transform the quality of operational execution.

The strong influence of safety climate on organizational commitment reinforces the view that safety in high-risk organizations serves as the most readily observable signal of organizational values for employees. When safety procedures are consistently enforced, safety training and oversight are evident, and incident reporting is handled fairly, employees are more likely to perceive the organization as having a long-term orientation and concern for employee well-being. Recent safety climate literature emphasizes that a mature safety climate is not simply a collection of procedures but a social infrastructure that establishes norms of coordination and discipline execution (Todaro et al., 2023; Shea et al., 2021). Research in safety-critical organizations also shows that management safety commitment and leadership style shape employee safety perceptions through psychological mechanisms, making it reasonable to assume

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that safety climate is a significant driving force for organizational commitment (Levovnik et al., 2025). The smaller direct effect of safety climate on operational performance, compared to its effect through commitment, provides important insights into performance mechanisms. Safety climate enhances operational reliability, particularly when safety values are internalized into commitment, which manifests as procedural compliance, cross-functional coordination, and consistent service quality. This finding strengthens the argument that safety climate does not always translate directly into operational outputs without psychological channels binding employees to organizational goals. Contemporary safety literature positions safety climate as a predictor of safety behavior and organizational outcomes but also emphasizes the need to understand the mechanisms and boundary conditions that explain when safety influences strengthen or weaken (Shea et al., 2021; Todaro et al., 2023; Levovnik et al., 2025). Thus, this research model does not challenge safety theory but extends it by demonstrating organizational commitment as an explanatory pathway that enhances the predictive power of operational performance outcomes.

The strong influence of organizational commitment on operational performance confirms that reliable port operations are produced through a combination of formal routines and employees' psychological readiness to maintain standards. This finding aligns with the logic of the *resource-based view* that intangible assets, such as commitment, improve execution quality and reduce the costs of process failures. Recent literature suggests that commitment helps employees maintain performance under challenging circumstances because it encourages proactive work-improvement initiatives and behavioral adaptations (Turek et al., 2024). While commitment acts as a partial mediator in the pathways from digital leadership and safety climate to performance, a theoretical contribution that can be emphasized is strengthening the *microfoundations perspective*, which positions employee attitudes and psychological bonds as mechanisms that transform managerial resources and climate into organizational outcomes. This argument aligns with the digital transformation literature, which calls for a more nuanced explanation of the human pathway as the primary link between technology and performance (Hanelt et al., 2021; Qiao et al., 2024; Vial, 2021).

The context of the Tanjung Santan Class III Port Operation Unit provides a contextual contribution that tests the boundaries of theory in high-risk, resource-constrained public organizations. In such a setting, digital leadership serves not only as a driver of innovation but also as a governance mechanism that maintains service reliability, cross-role coordination, and rapid response to dynamic conditions. Simultaneously, the safety climate serves as an anchor of legitimacy as public organizations face pressures of accountability, regulatory compliance, and high safety expectations. The digital transformation literature emphasizes that the impact of digitalization is highly dependent on boundary conditions such as organizational structure, process complexity, and capability readiness, making the Class III port context a relevant testbed for how leadership and climate operate in a rigorous and risk-prone operational environment (Verhoef et al., 2021; Hanelt et al., 2021; Vial, 2021).

Managerial and policy implications can be concretely formulated through two intervention pathways that are consistent with the findings. The first pathway focuses on strengthening operations-oriented digital leadership, namely, establishing data-driven decision-making governance, clarifying daily operational priorities, and providing rapid feedback mechanisms from the field to leadership. These practices need to be linked to strengthening *continuous learning* so that employees perceive digitalization as a competency-enhancing tool, thereby fostering commitment and strengthening its impact on performance (Braojos et al., 2024; Qiao et al., 2024). The second pathway emphasizes strengthening a measurable safety climate through consistent supervision, fair incident reporting, and regular safety training relevant to actual work risks, as safety climate has been shown to be the most significant lever for commitment and subsequently performance enhancement (Todaro et al., 2023; Shea et al., 2021; Levovnik et al., 2025). At the policy level, organizations need to integrate safety and operational performance indicators into a process-based assessment system so that performance targets do not encourage shortcuts that undermine safety but instead promote sustainable service reliability.

## CONCLUSIONS

This study confirms that the operational performance of public port service organizations is determined not only by formal systems and procedures but also by the configuration of digital leadership, safety climate, and organizational commitment as key psychological mechanisms. Digital leadership has been shown to improve operational performance both directly and by strengthening commitment, thus demonstrating that effective digital transformation operates through two pathways: a structural pathway based on process governance and a behavioral pathway based on employee engagement. Safety climate exhibited the strongest influence on organizational

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commitment, which, through commitment, resulted in increased reliability and quality of operational implementation. This pattern demonstrates that safety serves as a normative foundation that strengthens loyalty and work discipline before it impacts operational results. The primary theoretical contribution of this study lies in the integration of the resource-based view, dynamic capability, and social exchange theory perspectives into a single causal model that explains how managerial resources and organizational climate translate into performance through the microfoundation of organizational commitment. This study extends the digital leadership literature by demonstrating that its impact on operational performance in high-risk public organizations is stronger when it is mediated by commitment. Simultaneously, these findings enrich the safety climate literature by confirming that the influence of safety on performance is more effective when safety values are internalized into employees' psychological attachments. Conceptually, this study positions organizational commitment as a connecting mechanism that explains how digital leadership and safety climate transform into operational reliability in the context of a Class III port. Thus, the scientific contribution of this study goes beyond confirming the relationship between variables and offers a deeper causal explanation of the internal processes that drive operational performance in public organizations facing high safety demands and simultaneous digital transformation pressures.

## Research Limitations and Agenda

This study has several limitations that need to be acknowledged to maintain the accuracy of the theoretical interpretation. First, the cross-sectional design limits the ability to draw long-term causal inferences because the relationships between the variables are observed at a single point in time. Although the structural model demonstrates logical and empirical consistency, the dynamics of changes in organizational commitment and operational performance in the context of digital transformation are evolutionary. The digital transformation literature emphasizes that changes in capabilities and work behaviors develop gradually through iterative adaptation processes; therefore, longitudinal studies are needed to capture the process of commitment formation and performance stabilization over time.

Second, the relatively limited sample size and focus on a single port unit limit the generalizability of the findings to other public organizations with varying operational complexities. Class III port organizations are characterized by leaner structures, specific technology intensity, and operational risk levels. These conditions may influence the intensity of the relationships among digital leadership, safety climate, and commitment. Therefore, the results of this study need to be retested in higher-class ports, other transportation organizations, or public sectors with different risk exposures to ensure the consistency of relationship patterns and identify contextual variations.

Third, this study positions organizational commitment as the sole mediating mechanism. This approach enriches the literature from a microfoundations perspective, but leaves room for the exploration of other psychological mechanisms. Recent literature suggests that variables such as trust in leadership, readiness for digital change, psychological safety, and organizational identification also have the potential to bridge the relationship between leadership and performance. Thus, the research model can be expanded by integrating multiple mediating mechanisms to explain more complex internal processes in the future.

Fourth, this study did not explicitly test the boundary conditions or moderating variables that could strengthen or weaken the relationship between the variables. From a dynamic capability perspective, the effectiveness of digital leadership is strongly influenced by an organization's technological readiness, process complexity, and institutional policy support. Similarly, the influence of safety climate on commitment may be stronger in high-risk organizations than in traditional administrative ones. Further research should examine moderating factors such as task complexity, digital maturity, and organizational culture to assess the model's validity.

Fifth, this study used an individual perception-based approach to measure operational performance. While this approach is common in organizational behavior research, integrating objective data, such as service time indicators, operational error rates, or safety incident records, would strengthen external validity and enrich the interpretation of the results. Future research could combine survey and actual operational data in a multi-source design to reduce potential perception bias and increase the robustness of the findings. Based on these limitations, the further research agenda is directed toward three main developments. First, we tested a longitudinal model to capture the dynamics of commitment formation and performance changes during the digitalization and safety reform processes. Second, exploring new mechanisms such as organizational trust, digital readiness, or psychological safety as alternative or parallel mediators to deepen understanding of the causal process. Third, testing boundary conditions through moderating variables such as operational risk level, technological complexity, or other leadership types that interact with digital leadership is

recommended. By broadening the theoretical scope, deepening the causal mechanisms, and examining contextual variations, future research has the potential to develop a more comprehensive integrative model of how digital leadership and the safety climate contribute to operational reliability in high-risk public organizations. This agenda is crucial for enriching the public management and operations management literature and providing a more precise policy basis for the transformation of public service organizations in the digital era.

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