

When Does Technology Readiness Translate into Digital Transformation? The Roles of Organizational Agility and Digital Transformational Leadership in the Indonesian Navy

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Abstract

Technology readiness provides a foundation for digital transformation, but how preparedness becomes embedded in organizational practices remains insufficiently understood in defence institutions. Drawing on dynamic capabilities theory, this study examines organizational agility as a mediator of the relationship between organizational technology readiness and digital transformation, and digital transformational leadership as a moderator of both the readiness–agility and agility–transformation relationships in the Indonesian Navy. A cross-sectional survey of 977 naval personnel recruited through convenience sampling was analyzed using partial least squares structural equation modeling with 5,000 bootstrap samples. Respondents assessed their current units, with analyses conducted at the individual level. Technology readiness was positively associated with agility and transformation, while agility was positively associated with transformation. Agility partially mediated the readiness–transformation relationship at the mean level of leadership (indirect $\beta = 0.072$). Leadership positively moderated the readiness–agility ($\beta = 0.272$) and agility–transformation ($\beta = 0.443$) relationships, while its conditional direct association with transformation was negative ($\beta = -0.554$). The model explained 57.3% of the variance in agility and 47.9% in transformation. These findings advance a contingent explanation of digital transformation by distinguishing technological preparedness from adaptive resource use and identifying leadership as a condition shaping both capability relationships. For Navy management, the results direct attention to coordinating technology investment with adaptive workflows and sustained implementation support. The cross-sectional evidence supports these conditional associations without establishing causal effects.

1. Introduction

Digital systems become strategically consequential when they change how organizations coordinate people, information, and decisions. Yet the expansion of technological infrastructure can coexist with fragmented organizational practices. Indonesia provides a concrete illustration. At the launch of INA Digital in May 2024, President Joko Widodo highlighted approximately 27,000 central and regional government applications that were unintegrated and overlapping, calling for coordinated interoperability of applications and data (Office of Assistant to Deputy Cabinet Secretary for State Documents & Translation, 2024). This episode exposes a fundamental challenge for digital transformation: substantial technological activity does not necessarily produce integrated organizational change. For the Indonesian Navy, the corresponding question concerns how technological preparedness can support changes in working practices, information sharing, and organizational responsiveness. Addressing this question requires explaining the organizational processes and leadership conditions through which available technologies acquire practical value.

The broader Indonesian defence administration illustrates this implementation challenge in concrete terms. In August 2024, a Ministry of Defence publication described personnel having to prepare and transfer their records repeatedly when reassigned between TNI units or to the Ministry, including through printed documents, flash drives, or WhatsApp. The publication identified the associated administrative

burden, advocated integrated personnel information management, and noted implementation guidance for personnel information systems in both the Army and Navy (Kementerian Pertahanan Republik Indonesia, 2024). Meanwhile, the Indonesian Navy launched Trisula, E-Library, E-Referensi, and the naval historical archive system, Dasal, in August 2025, demonstrating continued investment in digital information services (Dinas Penerangan Angkatan Laut, 2025). Together, these developments motivate investigation of the relationship between technological provision and organizational integration. They also make it necessary to distinguish the introduction of digital applications from changes in the routines through which personnel use information and coordinate their work.

This distinction is consistent with contemporary scholarship. In their systematic review of digitally induced public-sector change, Haug et al. (2024) show that the literature encompasses both incremental adjustments and more extensive organizational transformation. The presence of digital tools therefore provides an incomplete account of the depth of organizational change. Similarly, Ghosh et al. (2022) connect digital transformation with capabilities for sensing, seizing, and reconfiguring, including changes in organizational structures and mindsets. In the present study, digital transformation (DT) concerns the integration of digital technologies into organizational processes, information practices, and task execution. The central explanatory problem is how the availability of technological resources becomes associated with substantive changes in these activities. Organizational technology readiness (OTR), organizational agility (OA), and digital transformational leadership (DTL) offer complementary perspectives on this problem, provided that their theoretical roles are distinguished.

First, research on readiness establishes the importance of technological preparedness but leaves room for a more explicit account of its conversion into organizational change. Aldhi et al. (2026) found no significant relationship between IT capability and organizational change capability, and the proposed mediation through change capability was unsupported. These findings reinforce the need to examine the mechanisms and conditions connecting technological resources with organizational outcomes, while Silva et al. (2025) develop an organizational readiness framework that incorporates the behaviours and organizational conditions needed to benefit from digital transformation. These studies support examining preparedness as an important antecedent. However, a readiness assessment or a direct readiness–transformation relationship does not by itself explain how available resources become embedded in revised working arrangements. Here, OTR refers to the availability of technological resources, and the knowledge and skills required to implement them. Its distinction from realized transformation is essential: personnel may have access to technology and relevant expertise while still relying on established coordination and information practices. The resulting research opportunity concerns the adaptive process linking preparedness with implementation.

OA provides a plausible explanation for this connection because it concerns the capacity to recognize changing requirements and respond through timely adjustments in resources and organizational activities. Werder and Richter's (2022) meta-analysis supports a positive association between IT capability and agility, while Ciampi et al. (2022) discuss the interconnected and potentially reciprocal relationship between digitalization and agility. These contributions establish substantial common ground

between technological capabilities and adaptation. They also highlight the need for precision when specifying the direction and outcome of a particular relationship. The present study therefore asks whether readiness is associated with transformation partly through the capacity to adjust workflows, redeploy resources, and respond to changing organizational requirements. It examines one theoretically motivated pathway within a broader relationship that may evolve over time.

Second, the literature provides compelling reasons to consider leadership, but the role assigned to leadership changes the question being answered. AlNuaimi et al. (2022) associate DTL with OA and DT and identify agility as a mediator of the leadership–transformation relationship. Ly (2024) similarly examines the mediating role of OA between DTL and DT in the public sector. These studies establish an important foundation for understanding leadership as an antecedent. Complementary research by McCarthy et al. (2024) identifies characteristics of leadership for digital transformation through practitioners’ accounts, reinforcing the importance of leadership behaviours in organizational change. Building on this work, the present study examines DTL as a condition that may strengthen the relationships through which technological readiness becomes consequential. This shifts attention toward the circumstances under which existing preparedness and adaptive capacity are associated with greater transformation.

Two distinct leadership contingencies are proposed. DTL may strengthen the OTR–OA relationship by communicating a shared digital vision, encouraging personnel to apply their knowledge, and legitimizing adjustments to established practices. Under these conditions, technological preparedness may be more readily mobilized into coordinated adaptation. DTL may also strengthen the OA–DT relationship by aligning adaptive efforts with organizational priorities and sustaining commitment to changes in working arrangements. Without such alignment, rapid local adjustments may remain isolated and fail to become integrated organizational practices. These arguments distinguish the mobilization of readiness from the consolidation of adaptation into transformation. Examining both relationships therefore offers a more differentiated account of leadership than treating it solely as an additional direct predictor. The proposed moderating roles remain empirical questions, rather than assumptions that leadership invariably increases the value of every technological initiative.

Dynamic capabilities theory provides the conceptual basis for this framework. Teece (2007) explains organizational renewal through sensing opportunities and threats, seizing opportunities, and reconfiguring resources. Recent applications to DT likewise emphasize the organizational capabilities needed to enact technological change (Ghosh et al., 2022). Drawing on this reasoning, the present study distinguishes the technological resource foundation represented by OTR, the adaptive capability represented by OA, the transformation outcome represented by DT, and the leadership condition represented by DTL. This distinction avoids equating the possession of resources with the capacity to renew their use. In a naval setting, the value of reconfiguration is interpreted in relation to mission support and institutional effectiveness. Agility consequently concerns timely, coordinated adaptation within authorized responsibilities, while transformation concerns changes in how digitally enabled work is organized and performed.

The Indonesian Navy makes these relationships particularly consequential because adaptation must operate alongside command accountability, continuity of essential activities, and controlled information access. The institutional importance of data coordination is reflected in TNI Commander Regulation No. 43 of 2025 on Satu Data TNI, which establishes arrangements for data governance encompassing planning, collection, verification, security, dissemination, and storage (Tentara Nasional Indonesia, 2025). This governance agenda suggests that digital change depends on coordinated responsibilities across organizational boundaries. It also raises a contextual question for capability-based explanations: how does an organization develop responsiveness while preserving the controls required for its mission? The naval setting thus provides an opportunity to examine the applicability of readiness, agility, and leadership arguments under demanding coordination requirements. Its theoretical relevance lies in these organizational conditions, beyond its geographical or sectoral distinctiveness.

Accordingly, this study investigates how OTR relates to DT through OA and whether DTL strengthens both the OTR–OA and OA–DT relationships in the Indonesian Navy. The framework comprises six hypotheses covering three direct relationships, the mediating role of OA, and the two moderating roles of DTL. The empirical approach examines personnel’s assessments of their naval units through a cross-sectional analysis. The constructs have an organizational referent, while responses are analysed at the individual level. This approach evaluates associations consistent with the framework through personnel’s reports of technological preparedness, adaptation, leadership, and digital change.

The study offers three contributions. First, it specifies an adaptive explanation for the readiness–transformation relationship, clarifying why technological preparedness and organizational transformation should remain conceptually distinct. Second, it develops a more differentiated account of DTL by examining its moderating roles at two points: the mobilization of technological readiness into agility and the translation of agility into digital transformation. Third, it examines these relationships in a naval organization, connecting capability-based explanations with the coordination and accountability demands of defence administration. Together, these contributions direct attention to how technological resources, adaptive practices, and leadership interact within a common explanatory framework. For naval management, the practical question is where investment in infrastructure and skills needs to be accompanied by changes in coordination, working practices, and leadership support. Such an understanding can inform efforts to turn digital modernization initiatives into sustained improvements in organizational processes.

2. Theoretical background and hypothesis development

2.1 Dynamic capability theory

Dynamic capabilities theory (DCT) explains how organizations renew their resource configurations as their environments change. Teece et al. (1997) conceptualized dynamic capabilities in terms of integrating, developing, and reconfiguring internal and external competences to address changing conditions. Teece (2007) subsequently distinguished the processes of sensing opportunities and

threats, seizing opportunities through resource commitments, and transforming the organizational resource base. This perspective provides a useful explanation for why organizations with comparable technological resources may experience different transformation outcomes. The availability of technology creates opportunities for change, while organizational processes determine how those opportunities are recognized and implemented.

Recent research extends this reasoning to digital transformation. Ghosh et al. (2022) connect digital sensing, seizing, and reconfiguring with changes in organizational structures, experimentation, and organizational mindsets. Ellström et al. (2022) identify organizational routines through which dynamic capabilities support digital transformation, emphasizing the activities needed to translate strategic intentions into implementation. These studies suggest that technological investment becomes consequential through the organization's capacity to revise established arrangements. Consistently, Konopik et al. (2022) position digital transformation within a broader system of organizational capabilities that includes technological and social elements. Together, these contributions support examining the conversion of technological preparedness into organizational change rather than assuming that technology acquisition produces transformation automatically.

The present study assigns a distinct theoretical role to each construct. Organizational technology readiness (OTR) represents the technological resource foundation from which adaptation becomes feasible. Organizational agility (OA) captures the organizational capacity to recognize changing requirements and implement timely, coordinated responses. We position OA as an adaptive capability through which technological resources can be redeployed. Digital transformation (DT) represents the resulting changes in how organizational activities are integrated and performed through digital technologies. Digital transformational leadership (DTL) constitutes a managerial condition that influences how effectively technological preparedness is mobilized into agility. This specification separates resources, adaptive processes, leadership conditions, and transformation outcomes, avoiding the circular assumption that every favorable organizational attribute is itself a dynamic capability.

Applying DCT to the Indonesian Navy requires interpreting organizational value in relation to mission accomplishment and institutional effectiveness. The theoretical arguments are developed at the naval-unit level. Sensing may involve recognizing changing information requirements or weaknesses in existing support processes; seizing may involve prioritizing feasible digital initiatives; and reconfiguration may involve revising workflows and coordination arrangements. These are proposed applications of the theory, not assumptions that all naval units already perform such activities effectively. Public-sector research reinforces the importance of examining organizational implementation processes alongside technological change (Haug et al., 2024). In the naval setting, agility is therefore understood as timely adaptation within authorized command relationships and information-security requirements. Its connection with dynamic capabilities concerns the capacity to repeatedly modify resource use and workflows, extending beyond faster execution of unchanged routines. DCT provides the basis for explaining whether technological readiness contributes to DT directly and through OA, and why the strength of readiness-to-agility conversion may depend on DTL.

2.2 Organizational technology readiness (OTR) and organizational agility (OA)

OTR is defined in this study as the extent to which a naval unit possesses the technological infrastructure and relevant technical expertise needed to adopt and use digital technologies in its activities. This organizational definition concerns preparedness for technological deployment. It is distinct from an individual employee's willingness to use technology and from the organizational changes already achieved through its use. Recent readiness research also separates preparedness from transformation outcomes. Silva et al. (2025), for example, develop an organizational readiness assessment that extends beyond the technical quality of digital solutions. The present study focuses more narrowly on the technological foundation, allowing leadership and agility to retain separate explanatory roles. OA refers to a unit's capacity to detect changing requirements and adjust its activities promptly and coherently, consistent with the sensing-and-response conception examined by Werder and Richter (2022).

From a DCT perspective, OTR should facilitate agility by reducing the informational and technical constraints on organizational adaptation. Accessible, usable technological resources allow personnel to identify discrepancies between current processes and emerging requirements. Relevant technical expertise helps them interpret available information and assess feasible adjustments. A unit with sufficient preparedness should therefore need less preliminary effort to establish basic technological functionality when a new requirement arises. It can devote more attention to evaluating alternatives and coordinating an organizational response. We argue that this reduction in implementation friction enables readiness to support both the recognition of change and the execution of timely adjustments.

Related empirical evidence supports the technological foundations of agility. In a meta-analysis of 72 empirical studies, Werder and Richter (2022) found positive associations between IT capabilities and organizational agility. Ciampi et al. (2022) similarly explain the relationship between digitalization and agility as an evolving interaction in which technological developments and organizational adaptation influence one another. These studies examine IT capabilities and digitalization rather than the precise OTR construct used here. Their relevance lies in supporting the broader mechanism that technological resources become valuable when they facilitate organizational responsiveness. The proposed OTR-to-OA relationship extends that reasoning to the preparedness of naval units.

For example, a naval unit with suitable information systems and technical expertise may be better positioned to identify delays in administrative or maintenance-support processes and coordinate appropriate adjustments. This expectation does not require unrestricted decentralization. Agility can arise through faster information exchange, clearer escalation, and more timely adjustments within existing authority. However, readiness creates the potential for such responses without guaranteeing their realization, leaving room for differences in leadership and coordination. On this basis, we propose:

H1. Organizational technology readiness positively influences organizational agility in Indonesian Navy units.

2.3 Organizational technology readiness (OTR) and digital transformation (DT)

DT is conceptualized as the extent to which digital technologies are embedded in substantive changes to a naval unit's processes, information flows, and coordination practices. This definition locates transformation in organizational activity rather than in the number of technologies purchased. Haug et al. (2024) distinguish incremental digital changes from broader transformation in the public sector and emphasize the organizational processes through which these changes develop. Accordingly, transferring an unchanged procedure to an electronic platform may represent an initial digital improvement, whereas DT involves more extensive integration and redesign. In the Indonesian Navy, relevant manifestations could include coordinated digital workflows across support functions and the systematic incorporation of digital information into managerial decisions.

OTR is expected to support DT because it provides the technical means needed to implement and sustain digitally enabled organizational changes. Suitable infrastructure enables new applications to operate within the unit, while relevant expertise helps personnel integrate technologies with existing activities and resolve implementation difficulties. These conditions reduce the effort required to make a digital initiative technically workable. They also support continued use after initial deployment, which is important when transformation requires digital practices to become part of ordinary organizational activity. Under DCT, readiness thus supplies an actionable resource base upon which organizational renewal can proceed.

Recent empirical research provides support for this relationship. Bilal et al. (2024), using survey data from manufacturing organizations, identified IT readiness as a positive antecedent of DT. Their findings concern a commercial setting and a related readiness construct, but they support the proposition that preparedness for technological implementation matters for transformation. The capability framework developed by Konopik et al. (2022) further indicates that technology must be considered alongside organizational capabilities when explaining DT. We extend this reasoning to naval units, where the expected value of transformation concerns improvements in organizational integration and mission-support processes rather than commercial growth.

The proposed direct relationship is compatible with an indirect relationship through OA. Some digital changes can be implemented through planned integration, standardization, and staff familiarization without requiring substantial differences in the speed of organizational response. For example, adequate infrastructure and expertise may support the implementation of an already approved integrated administrative workflow. Other changes may depend more strongly on a unit's ability to adapt as requirements evolve. The direct pathway therefore captures the contribution of readiness beyond the adaptive mechanism represented by OA. It does not imply that readiness is sufficient for DT or that agility is unnecessary. We consequently propose: *H2. Organizational technology readiness positively influences digital transformation in Indonesian Navy units.*

2.4 Organizational agility (OA) and digital transformation (DT)

OA should support DT by enabling organizations to revise established routines as they learn about the demands of digital implementation. Digital initiatives often require adjustments beyond their initial technical specifications, including changes to task dependencies, information responsibilities, and patterns of coordination. An agile unit can recognize when an existing arrangement limits a digital initiative and respond before the mismatch becomes entrenched. In DCT terms, OA expresses the capacity to translate information about changing requirements into timely organizational adjustments. This helps explain how digital initiatives can develop into changes in organizational practice.

Recent studies provide direct support for the relationship. Zhang et al. (2023), drawing on data from government employees, reported a positive relationship between OA and digital transformation performance. AlNuaimi et al. (2022) also found that OA positively relates to DT in a public-sector setting. These findings indicate that responsiveness is relevant to transformation in organizations whose objectives extend beyond profitability. At the same time, Ciampi et al. (2022) describe digitalization and agility as potentially co-evolving. The present model focuses on the enabling role of OA in DT while recognizing that a one-directional model does not capture every feedback process that may unfold over time.

We propose that OA supports DT through the capacity to revise implementation choices and coordinate their organizational consequences. When personnel identify an incompatibility between a digital application and an existing workflow, an agile unit can evaluate the problem, involve the relevant functions, and modify the process. Repeated adjustments can also help transfer lessons from an initial implementation to other activities. The significance of such adaptation is that technologies become more closely integrated with how the organization actually works. Ghosh et al. (2022) provide related support by linking digital transformation capabilities to changes in structures and organizational mindsets as well as technological development.

For naval units, these mechanisms may involve adjusting administrative responsibilities, coordinating training with the introduction of new systems, or revising information-sharing procedures within approved access boundaries. The theoretical expectation is that timely and coordinated adjustment helps digital initiatives progress beyond isolated implementation. Agility must nevertheless be understood in relation to the reliability requirements of the setting. A rapid response that undermines procedural consistency would not necessarily advance transformation. We therefore conceptualize OA as purposeful responsiveness that allows a unit to adapt its activities while maintaining authorized standards. This reasoning leads to the following hypothesis: *H3. Organizational agility positively influences digital transformation in Indonesian Navy units.*

2.5 Organizational agility (OA) as mediator

OA is proposed as the mechanism through which technological preparedness contributes to digitally enabled organizational change. The mediation argument follows the distinction between having resources available and using them to alter organizational activity. A technologically prepared unit may possess suitable systems and technical expertise while continuing to rely on established coordination practices. For readiness to contribute through OA, those resources must improve the unit's ability to recognize changing requirements and implement appropriate responses. Those responses can then support the integration of digital technologies into organizational processes. The proposed sequence is therefore OTR, followed by OA, followed by DT.

This argument is consistent with research that locates organizational adaptation between enabling conditions and transformation outcomes. AlNuaimi et al. (2022) found that OA mediates the relationship between DTL and DT, and Ly (2024) reported a similar mediating role in a public-sector study. Although leadership is the antecedent in those models, their findings support agility as an organizational process through which an enabling condition contributes to DT. Evidence from Indonesia also supports the broader logic of capability-based mediation. A related mechanism has been identified in Indonesian municipal government, where managerial digital readiness mediated the relationships of IT capability and digital skills with public-sector performance (Aldhi et al., 2025). Although managerial readiness differs from OA, this evidence supports examining an intervening capability through which technological resources become associated with organizational outcomes.

In the present model, OTR should provide information access and technological means that make adaptation more feasible. OA should then allow the unit to use that preparedness to revise implementation priorities and coordinate changes across its activities. For instance, a technologically prepared naval support unit may be able to obtain more usable information about process delays. Its agility determines whether the information prompts timely adjustments to the relevant workflow. When such adjustments embed digital information and systems into routine coordination, readiness contributes to DT through organizational adaptation. Without this mechanism, technological assets may remain confined to individual tasks, with limited implications for how the unit operates collectively.

The mediation hypothesis does not presume that OA accounts for the entire relationship between OTR and DT. As discussed above, technological preparedness may also support planned digital implementation through mechanisms other than agility. The theoretical claim is that an identifiable portion of readiness's contribution is transmitted through a unit's adaptive capacity. This specification connects the availability of technological resources with the organizational actions needed to realize their transformative potential, while retaining a distinct direct pathway. Accordingly, we propose: *H4. Organizational agility mediates the positive relationship between organizational technology readiness and digital transformation in Indonesian Navy units.*

2.6 Digital transformational leadership (DTL) as moderator

Digital transformational leadership (DTL) refers to leadership that communicates a clear direction for digital change, encourages personnel to question established practices, and supports collective learning

and participation in transformation. AlNuaimi et al. (2022) and Ly (2024) demonstrate the relevance of DTL to organizational agility and digital transformation, including the mediating role of agility in the leadership–transformation relationship. These findings establish a basis for examining leadership as a condition shaping organizational adaptation. Drawing on DCT, the present study proposes that DTL conditions two distinct relationships: the translation of organizational technology readiness (OTR) into organizational agility (OA), and the translation of OA into digital transformation (DT). The first concerns mobilizing technological resources for adaptation, whereas the second concerns directing adaptive capacity toward substantive digital change.

DTL is expected to strengthen the relationship between OTR and OA by helping personnel use available infrastructure and technical expertise to address changing organizational requirements. Under stronger DTL, leaders connect technological possibilities with unit priorities, encourage constructive examination of existing routines, and support collaboration in resolving implementation problems. These behaviors make additional technological preparedness more useful for identifying feasible responses and coordinating adjustments. This argument draws on the managerial role in resource reconfiguration emphasized by Teece (2007). Under weaker DTL, a unit may possess adequate technologies but lack the direction and encouragement needed to apply them adaptively. The contribution of readiness to agility should therefore depend partly on how leadership mobilizes the available resource base. In Indonesian municipal government, digital leadership strengthened the relationships of IT capability and digital skills with managerial digital readiness (Aldhi et al., 2025). This provides a relevant precedent for treating leadership as a condition shaping the mobilization of digital resources. The present study examines a distinct configuration involving technological readiness, organizational agility, and digital transformational leadership in naval units.

In the Indonesian Navy, this mechanism may operate when commanders and managerial leaders encourage personnel to use digital information to identify bottlenecks in administrative or support processes and coordinate authorized improvements. By clarifying priorities, responsibilities, and the scope for initiative, leaders can help technically prepared personnel respond more effectively while maintaining command accountability and information-security requirements. Greater OTR should consequently generate stronger organizational responsiveness when DTL is high. Accordingly, we propose: *H5. Digital transformational leadership positively moderates the relationship between organizational technology readiness and organizational agility in Indonesian Navy units, such that the relationship is stronger when digital transformational leadership is higher.*

DTL is also expected to strengthen the relationship between OA and DT. Agility enables timely adjustment, but the direction and continuity of those adjustments determine whether they contribute to broader digital change. An agile unit may respond effectively to immediate problems through temporary solutions without integrating digital technologies into its enduring coordination practices. Stronger DTL can help align these responses with shared transformation priorities and sustain commitment beyond individual implementation episodes. McCarthy et al. (2024) provide related support by connecting digital transformation leadership characteristics with the actions and enabling conditions needed to advance

transformation. We extend this reasoning to propose that leadership increases the transformative value of a given level of organizational agility.

This second moderating mechanism concerns the consolidation of adaptive action. Leaders who communicate a consistent digital direction can help a unit prioritize adjustments that advance integrated digital workflows. Their support for learning can facilitate the transfer of lessons across functions, while continued attention to implementation can help incorporate successful adjustments into established practices. Under weaker DTL, comparable agility may produce fragmented changes that resolve local problems without substantially altering how the unit operates collectively. A recent study by Chacón-Henao et al. (2026) offers an analogous contingency argument, finding that DTL strengthens the relationship between inbound open innovation and digital open innovation performance. Although that study examines a different pathway, it supports considering leadership as a boundary condition affecting the conversion of organizational inputs into digital outcomes.

For Indonesian Navy units, the proposed interaction may arise when leadership helps consolidate agile responses across interdependent support functions. For example, adjustments prompted by a new digital reporting process may require corresponding changes in staff responsibilities, training, and information-sharing routines. Strong DTL can maintain a common direction across these adjustments and support their incorporation into regular organizational activity. Consequently, agility should contribute more strongly to DT when leadership sustains the coherence and implementation of digital change. This proposition extends existing leadership and agility research to a specific interaction that remains to be tested in the naval context. We therefore propose: *H6. Digital transformational leadership positively moderates the relationship between organizational agility and digital transformation in Indonesian Navy units, such that the relationship is stronger when digital transformational leadership is higher.*

3. Methods

3.1 Research setting, sampling, and unit of analysis

This study employed a quantitative survey design to examine the relationships among organizational technology readiness, organizational agility, digital transformation, and digital transformational leadership in the Indonesian Navy. The survey focused on personnel's assessments of technological readiness, organizational responsiveness, digital practices, and leadership within their respective naval units. Data collection was conducted over three months, from April to June 2026, using a structured questionnaire administered through Google Forms.

A non-probability convenience sampling approach with voluntary self-selection was employed. The questionnaire link was distributed to accessible Indonesian Navy personnel, and participation depended on their access to the link and willingness to complete the questionnaire. Respondents were therefore recruited through accessibility rather than random selection from a personnel sampling frame. This

procedure is consistent with a non-probability approach in which recruitment reflects practical access to the target population (Sarker & Al-Muaalemi, 2022). Consequently, the sample reflects participating personnel and is not assumed to be statistically representative of the entire Indonesian Navy.

Table 1
Respondent characteristic

Characteristic	Category	<i>f</i>	%
<i>Gender</i>	Male	901	92.22%
	Female	76	7.78%
<i>Age</i>	17–27 years	114	11.67%
	28–37 years	126	12.90%
	38–47 years	349	35.72%
	48–58 years	388	39.71%
<i>Highest educational qualification</i>	Senior secondary education	463	47.39%
	Diploma	63	6.45%
	Bachelor's degree	226	23.13%
	Master's degree	211	21.60%
	Doctoral degree	14	1.43%
<i>Length of service in the Indonesian Navy</i>	Less than 5 years	125	12.79%
	5–10 years	34	3.48%
	11–15 years	86	8.80%
	16–20 years	145	14.84%
	More than 20 years	587	60.08%
<i>Tenure in the current unit</i>	Less than 1 year	354	36.23%
	1–3 years	411	42.07%
	4–5 years	66	6.76%
	More than 5 years	146	14.94%
<i>Military rank category</i>	Commissioned officers (<i>Perwira</i>)	773	79.12%
	Non-commissioned officers (<i>Bintara</i>)	176	18.01%
	Other enlisted personnel (<i>Tamtama</i>)	28	2.87%
Total		977	100%

The individual respondent constituted the statistical unit of analysis, while the naval work unit served as the organizational referent. Respondents assessed the conditions and practices of the unit in which they were serving, including the leadership responsible for its digital transformation. The analysis therefore examined individual perceptions of organizational attributes, without aggregating responses into unit-level scores.

Table 1 presents the demographic characteristics of the reported sample of 977 respondents. Men accounted for 92.22% of the sample ($n = 901$), while women represented 7.78% ($n = 76$). The largest age group was 48–58 years (39.71%), followed by 38–47 years (35.72%), 28–37 years (12.90%), and 17–27 years (11.67%). Regarding educational attainment, 47.39% had completed senior secondary education, 23.13% held a bachelor's degree, and 21.60% held a master's degree. Diploma and doctoral qualifications accounted for 6.45% and 1.43%, respectively. The sample was predominantly composed of personnel with extensive military service, with 60.08% reporting more than 20 years in the Indonesian Navy. However, tenure in the current unit was generally shorter: 42.07% had served in their current unit for one to three years, and 36.23% for less than one year. Commissioned officers constituted most of the sample (79.12%), followed by non-commissioned officers (18.01%) and other enlisted personnel (2.87%). Overall, the reported profile was concentrated among male commissioned officers with long military service but comparatively shorter tenure in their current units. This composition provides the demographic context for interpreting the findings.

3.2 Measurement and Data Analysis

The measurement framework comprised 19 indicators across four constructs. Organizational technology readiness was measured using three indicators addressing technological access, IT knowledge, and implementation skills (Oliveira et al., 2014). Organizational agility included five indicators covering technology implementation, resource reconfiguration, strategic adjustment, regulatory responsiveness, and stakeholder needs (Atobishi et al., 2024). Digital transformation comprised five indicators assessing process digitalization, data collection, expanded technology use, task improvement, and information sharing (Ly, 2024). Digital transformational leadership included six indicators addressing inspiration, digital vision, shared goals, encouragement, personnel's beliefs, and idea generation (AlNuaimi et al., 2022). All statements were contextualized to respondents' naval units and their leadership.

Data were analyzed using partial least squares structural equation modeling (PLS-SEM), comprising measurement-model assessment, structural-model estimation, and predictive evaluation (Guenther et al., 2023). Harman's single-factor test provided a preliminary common method variance diagnostic, interpreted cautiously given the limitations of single-source measurement (Podsakoff et al., 2024). Measurement assessment examined indicator loadings, Cronbach's alpha, composite reliability, and average variance extracted, using benchmarks of 0.70 for reliability and 0.50 for convergent validity. Indicator retention considered loading magnitude and construct coverage. Discriminant validity was assessed primarily using HTMT with a conservative threshold of 0.85, supplemented by the Fornell–Larcker criterion (Hair et al., 2021).

Structural assessment examined variance inflation factors, path coefficients, bootstrap significance, and explained variance in organizational agility and digital transformation. Mediation was evaluated through the indirect relationship between technology readiness and digital transformation through agility. Moderation was examined using the interactions of digital transformational leadership with technology readiness in predicting agility and with agility in predicting digital transformation. The corresponding leadership main effects were retained in both equations (Hair et al., 2021).

Predictive evaluation included blindfolding-based Q^2 and PLSpredict, examining indicator-level Q^2_{predict} and comparing root mean squared prediction errors against a linear-model benchmark. Importance–performance map analysis assessed the importance and performance of antecedents of digital transformation, with priorities interpreted considering the conditional relationships involving digital transformational leadership (Guenther et al., 2023).

4. Results

4.1 Common Method Bias

Harman’s single-factor test was conducted using unrotated principal axis factoring across all 19 measurement items. The extracted factor explained 27.898% of the total variance, below the conventional 50% benchmark, indicating that a single general factor did not dominate the item variance. Additionally, inner variance inflation factor (VIF) values ranged from 1.000 to 2.013, indicating no substantial collinearity among the structural predictors (Hair et al., 2021). These findings were interpreted cautiously: the single-factor result provided a preliminary diagnostic of common method variance, while the VIF values assessed predictor collinearity. Neither diagnostic establishes the absence of common method bias (Podsakoff et al., 2024).

4.2 Measurement Model Test Results

Figure 1 presents the measurement model and standardized outer loadings of the 19 indicators, which ranged from 0.701 to 0.849. As reported in Table 2, Cronbach’s alpha values ranged from 0.757 to 0.865, while composite reliability values ranged from 0.860 to 0.900, exceeding the recommended minimum of 0.70. Average variance extracted ranged from 0.601 to 0.673, exceeding the 0.50 threshold for all constructs. These results supported internal consistency reliability and convergent validity. Although three digital transformational leadership indicators had loadings close to 0.70, the construct demonstrated satisfactory composite reliability and average variance extracted, supporting their retention (Hair et al., 2021).

Table 2
Results of Convergent Validity and Reliability Testing.

Item	OL	CA	CR	AVE
Organizational Technology Readiness (3-item) (Oliveira et al., 2014)				
OTR1	0.820	0.757	0.860	0.673
OTR2	0.821			
OTR3	0.820			
Organizational Agility (5-item) (Atobishi et al., 2024)				
OA1	0.785	0.849	0.892	0.624
OA2	0.790			
OA3	0.780			
OA4	0.795			
OA5	0.800			
Digital Transformation (5-item) (Ly, 2024)				
DT1	0.785	0.850	0.893	0.625
DT2	0.790			
DT3	0.781			
DT4	0.795			
DT5	0.800			
Digital Transformational Leadership (6-item) (AlNuaimi et al., 2022)				
DTL1	0.849	0.865	0.900	0.601
DTL2	0.849			
DTL3	0.831			
DTL4	0.701			
DTL5	0.702			
DTL6	0.701			
Note: OTR = Organizational Technology Readiness; OA = Organizational Agility; DT = Digital Transformation; DTL = Digital Transformational Leadership; OL = Outer Loading; CA = Cronbach’s Alpha; CR = Composite Reliability; AVE = Average Variance Extracted				

Discriminant validity was supported by the Fornell–Larcker criterion and the heterotrait–monotrait ratio. As shown in Table 3, the square root of each construct's average variance extracted exceeded the

absolute values of its correlations with the other constructs. The heterotrait–monotrait ratios among the four substantive constructs ranged from 0.018 to 0.737, below the conservative threshold of 0.85 (Table 4).

Table 3
Fornell–Larcker criterion.

Variable	DT	DTL	OA	OTR
Digital Transformation	0.790			
Digital Transformational Leadership	-0.389	0.775		
Organizational Agility	-0.005	0.632	0.790	
Organizational Technology Readiness	0.288	-0.010	0.307	0.820

Table 4
Heterotrait–Monotrait Ratio (HTMT).

Variable	DT	DTL	OA	OTR	DTL x OA	DTL x OTR
DT						
DTL	0.453					
OA	0.018	0.737				
OTR	0.359	0.020	0.383			
DTL x OA	0.554	0.044	0.195	0.301	0.554	
DTL x OTR	0.247	0.021	0.297	0.022	0.280	

4.3 Structural equation test results.

The structural model exhibited no substantial predictor collinearity, with inner variance inflation factors ranging from 1.000 to 2.013. The model explained 57.3% of the variance in organizational agility and 47.9% of the variance in digital transformation. Table 5 summarizes the hypothesis tests based on 5,000 bootstrap samples, while Fig. 2 presents the estimated structural relationships.

Table 5
Path Coefficient and Significance Test.

Hypotheses	Path	β	STDEV	t-values	p-Values	Results
H1	OTR $\rightarrow$ OA	0.308	0.023	13.613	< 0.001	Support
H2	OTR $\rightarrow$ DT	0.088	0.026	3.338	0.001	Support
H3	OA $\rightarrow$ DT	0.234	0.035	6.718	< 0.001	Support
H4	OTR $\rightarrow$ OA $\rightarrow$ DT	0.072	0.012	5.844	< 0.001	Support
H5	DTL $\times$ OTR $\rightarrow$ OA	0.272	0.021	13.180	< 0.001	Support
H6	DTL $\times$ OA $\rightarrow$ DT	0.443	0.025	17.932	< 0.001	Support
-	DTL $\rightarrow$ OA	0.638	0.020	31.956	< 0.001	-
-	DTL $\rightarrow$ DT	-0.554	0.030	18.333	< 0.001	-

Organizational technology readiness was positively associated with organizational agility ($\beta = 0.308$, $t = 13.583$, $p < 0.001$), supporting H1. Its direct association with digital transformation was also positive and significant ($\beta = 0.088$, $t = 3.338$, $p < 0.001$), supporting H2, although the corresponding effect size was small ($f^2 = 0.012$). Organizational agility was positively associated with digital transformation ($\beta = 0.234$, $t = 6.718$, $p < 0.001$), supporting H3. The effect sizes for technology readiness in predicting agility and for agility in predicting digital transformation were 0.222 and 0.052, respectively. The indirect relationship between organizational technology readiness and digital transformation through organizational agility was positive and significant ($\beta = 0.072$, $t = 5.844$, $p < 0.001$; 95% confidence interval [0.050, 0.098]), supporting H4. The simultaneous significance of the positive direct and indirect relationships was consistent with complementary partial mediation at the mean level of digital transformational leadership. This qualification reflects the inclusion of leadership interactions in both stages of the indirect relationship. Digital transformational leadership positively moderated the relationship between organizational technology readiness and organizational agility ($\beta = 0.272$, $t = 13.180$, $p < 0.001$), supporting H5. It also positively moderated the relationship between organizational agility and digital transformation ($\beta = 0.443$, $t = 17.932$, $p < 0.001$), supporting H6. The corresponding interaction effect sizes were 0.176 and 0.387.

The interaction plots illustrate these conditional relationships. In Fig. 3, the estimated slope linking technology readiness to agility increased from 0.036 at low leadership to 0.580 at high leadership, defined as one standard deviation below and above the mean. In Fig. 4, the estimated agility–transformation slope changed from -0.209 at low leadership to 0.677 at high leadership. These values describe the direction and magnitude of the plotted slopes; separate significance tests for individual slopes were not available. Leadership also exhibited a positive conditional association with agility ($\beta = 0.638$, $p < 0.001$) and a negative conditional association with digital transformation ($\beta = -0.554$, $p < 0.001$). These main effects refer to the mean levels of the interacting predictors and should be interpreted alongside the interaction terms.

Blindfolding produced positive cross-validated redundancy values for organizational agility ($Q^2 = 0.354$) and digital transformation ($Q^2 = 0.254$), supporting predictive relevance within the blindfolding procedure (Table 6).

Table 6
Blindfolding Test.

Variable	SSO	SSE	$Q^2 (= 1 - SSE/SSO)$
OA	4,885.000	3,155.299	0.354
DT	4,885.000	3,645.299	0.254

The importance–performance map analysis identified organizational agility as having the highest positive reported importance for digital transformation (0.234), with a performance score of 49.509 (Table 7). Organizational technology readiness had an importance score of 0.160 and a performance score of 50.323. Digital transformational leadership had a reported total effect of -0.405 and a performance score of 49.858. Given the model’s interaction terms, these importance estimates were interpreted in conjunction with the conditional structural relationships.

Table 7
IPMA Test.

Variable	Importance (Total Effect on DT)	Performance (0–100 score)	Intervention Priority
OA	0.234	49.509	Top priority among positive-effect constructs
OTR	0.160	50.323	Secondary priority among positive-effect constructs
DTL	-0.405	49.858	Conditional interpretation required

Finally, PLSpredict, using ten folds and ten repetitions, yielded positive indicator-level Q^2_{predict} values ranging from 0.338 to 0.374 for organizational agility and from 0.185 to 0.234 for digital transformation (Table 8). The PLS-SEM model produced lower root mean squared prediction errors than the linear-model benchmark for all ten endogenous indicators. These results indicated a consistent predictive advantage over the benchmark within the cross-validation procedure.

Table 8
PLS-Predict Test.

Endogenous Construct	Indicator	Q ² _predict	RMSE (PLS-SEM)	RMSE (LM)	Predictive Performance (PLS vs. LM)
OA	—	0.569	—	—	High
	OA1	0.374	0.935	0.988	Lower error
	OA2	0.338	0.972	1.006	Lower error
	OA3	0.339	0.937	0.971	Lower error
	OA4	0.365	0.948	0.991	Lower error
	OA5	0.358	0.932	0.973	Lower error
DT	—	0.336	—	—	High
	DT1	0.185	1.028	1.069	Lower error
	DT2	0.226	1.007	1.068	Lower error
	DT3	0.186	1.035	1.077	Lower error
	DT4	0.234	0.997	1.058	Lower error
	DT5	0.216	1.041	1.091	Lower error

5. Discussion

The findings suggest that the organizational value of technology readiness depends partly on how adaptive capacity and leadership operate together. Within personnel's assessments of Indonesian Navy units, technological preparedness was associated with agility, but its direct relationship with digital transformation was comparatively small. More revealingly, the association between agility and transformation varied with digital transformational leadership. This pattern directs attention to two distinct organizational problems: mobilizing available technologies and expertise when requirements change and incorporating adaptive responses into established ways of working. Treating these problems separately helps explain why an organization can appear technologically prepared and responsive while still experiencing uneven progress in digital transformation.

The small direct relationship between organizational technology readiness and digital transformation qualifies an interpretation centred on technological provision. Although the relationship was statistically significant, its effect size was limited ($f^2 = 0.012$). This result is compatible with Bilal et al.'s (2024) positive readiness–transformation finding, while indicating that readiness contributes relatively little additional explanatory power for transformation after the other model terms are considered. It therefore matters how technological access, knowledge, and implementation skills are used. The stronger readiness–agility association is consistent with adjacent evidence linking IT capability to organizational

agility (Werder & Richter, 2022), although readiness and IT capability should remain conceptually distinct. A plausible interpretation is that readiness expands the options available for adaptation, whereas organizational processes determine whether those options become changes in everyday work. The findings do not establish readiness as either a necessary or sufficient condition for transformation.

The indirect relationship through agility gives this interpretation greater specificity. The positive indirect relationship also provides an informative comparison with Aldhi et al. (2026), who found no mediation through organizational change capability in the relationship between IT capability and government performance. The difference invites closer examination of which adaptive capabilities connect technological resources with particular outcomes. Because the constructs, settings, and analytical designs differ, it should be interpreted as a basis for comparative inquiry rather than a direct contradiction. Ellström et al. (2022) identify both the decomposition of transformation into manageable projects and the creation of unified digital infrastructure as relevant organizational routines. Their findings illuminate an important tension: change must be sufficiently flexible to address local requirements while remaining coherent across interdependent activities. Evidence from public-service collaboration similarly shows that digital platforms can intensify existing difficulties when implementation is disconnected from users' working practices and interests (van Duijn et al., 2026). Viewed against this literature, agility may help explain how technological resources become workable organizational arrangements. The remaining positive direct relationship also indicates that the specified agility pathway provides only a partial account of the readiness–transformation association.

A particularly informative result concerns the contrast between the near-zero bivariate correlation of agility with transformation ($r = -0.005$; Table 3) and the positive conditional relationship in the structural model. At the individual level, Wardhani et al. (2026) similarly found that lecturer agility strengthened the relationship between techno-adaptability and lecturer performance. This provides a complementary perspective on the joint relevance of technological and adaptive capabilities. The present findings concern a different configuration, in which organizational agility operates as an intervening capability and its relationship with transformation varies with leadership. These estimates answer different questions: the correlation summarizes their unadjusted association, whereas the structural coefficient incorporates the other predictors and the leadership interaction. Together with the positive interaction, this contrast cautions against assuming that a single average association captures the organizational value of agility. Ciampi et al. (2022) discuss the evolving and reciprocal relationship between digitalization and agility, making a universally beneficial, one-directional interpretation too restrictive. The present findings suggest that the implications of adaptation depend on the conditions under which it is exercised. Responding rapidly to changing requirements and establishing integrated digital practices are related accomplishments, but they need not coincide in every leadership context.

The first leadership interaction concerns the mobilization of preparedness. Figure 3 indicates that the readiness–agility relationship becomes more positive as digital transformational leadership increases. A plausible explanation is that a shared digital vision helps personnel connect their technological expertise with collective priorities, while encouragement gives them greater confidence to propose adjustments

within their responsibilities. Leadership may consequently influence whether available knowledge remains concentrated in individual expertise or becomes part of coordinated organizational action. This interpretation extends the antecedent perspective developed by AlNuaimi et al. (2022) and Ly (2024), who connect digital transformational leadership with agility and transformation. Here, leadership also changes the relationship between technological preparedness and adaptive capacity. The substantive insight concerns how leaders help personnel use an existing resource foundation, alongside their role in encouraging change more generally.

The second interaction concerns how adaptive capacity relates to transformation. The interaction between leadership and agility had a larger reported effect size than the interaction between leadership and readiness, although this descriptive difference was not subjected to a formal comparative test. Figure 4 indicates that the agility–transformation relationship becomes more positive under stronger leadership. This pattern is consistent with a role for leaders in aligning adaptive initiatives, maintaining shared direction, and encouraging their incorporation into routine work. Such an interpretation complements McCarthy et al.'s (2024) account of leadership characteristics for digital transformation and Haug et al.'s (2024) distinction between incremental adjustments and more extensive organizational change. Agility may generate local solutions, while leadership helps connect those solutions across activities. The negative plotted slope at low leadership remains descriptive because confidence intervals for the individual slopes were not reported; it does not establish that agility becomes significantly harmful under weak leadership.

The negative conditional coefficient linking digital transformational leadership directly to transformation ($\beta = -0.554$) is equally consequential and should be incorporated into the substantive interpretation. The pattern cautions against equating stronger advocacy of digital change with greater realized transformation. As Busenbark et al. (2022) explain, a main coefficient in an interaction model must be interpreted at the reference value of the interacting variable. In the present specification, the coefficient concerns leadership's direct association with transformation at the reference level of agility, with the remaining model terms held constant. It is not the total leadership association across all agility levels. Nevertheless, the negative bivariate leadership–transformation correlation also means that the finding cannot simply be dismissed as a sign reversal introduced by statistical adjustment. One possible explanation is a mismatch between the leadership effort devoted to mobilizing change and the organizational capacity to consolidate it. Another is that leaders intensify their digital change efforts where transformation is lagging. Neither explanation was directly tested. The result therefore warrants investigation of implementation conditions and temporal ordering, rather than a recommendation to reduce leadership support.

The mediation finding also needs to be understood in this conditional setting. The positive indirect relationship in Table 5 pertains to the model's reference level of leadership. With both component paths moderated, comparable technological preparedness may be associated with different transformation outcomes depending on how leadership supports adaptation and its implementation. This is a substantive possibility emerging from the model, rather than a demonstrated pattern across all

leadership levels. Conditional indirect estimates and bootstrap confidence intervals are required to establish where the mediated relationship is significant and how its magnitude varies (Cheung & Cheung, 2024).

The naval setting gives these findings a specific organizational meaning. Adaptation in this context must coexist with command accountability, continuity of essential functions, and controlled information access. The relevant form of agility is therefore coordinated adjustment within authorized responsibilities. For example, revising a digital personnel or maintenance workflow would have organizational value when the adjustment improves how relevant actors exchange information and perform interdependent tasks. The leadership interactions are consistent with the proposition that direction and adaptation can operate as complements within such arrangements. However, command structure and information-security practices were not modelled as explanatory variables, so they cannot be identified as the causes of the observed interactions. The evidence concerns personnel's unit-referenced perceptions and offers a basis for investigating how these relationships operate within specific naval workflows.

The additional analyses reinforce the need to interpret managerial relevance conditionally. The importance–performance map identifies agility as the most important positive contributor at the reported reference conditions (Table 7), but the interactions prevent this ranking from becoming a universal intervention priority. In particular, the negative reported leadership total effect does not imply that reducing leadership would improve transformation. The predictive assessment provides a different form of support: the model produced lower prediction errors than the linear benchmark for all endogenous indicators (Table 8). This consistent but modest advantage supports its relative predictive performance within the stated cross-validation procedure, while leaving causal interpretation and transfer to other organizational settings unresolved. These distinctions are consistent with Guenther et al.'s (2023) emphasis on aligning PLS-SEM evaluation with the explanatory and predictive claims being made.

The study's contribution to dynamic capabilities theory lies in specifying the conditions under which adaptive capacity is associated with digital change. Teece's (2007) account of reconfiguration and Ghosh et al.'s (2022) application to digital transformation provide the basis for this interpretation. The additional insight is that leadership may shape the relationships between these elements while displaying different direct associations with adaptation and transformation. This directs future inquiry toward when leadership-supported change becomes embedded in shared practices and when it remains an effort whose organizational benefits have yet to materialize. Longitudinal evidence and independently assessed process outcomes would help distinguish these possibilities. For the Indonesian Navy, the findings make the coordination of technological preparedness, adaptive activity, and leadership a substantive question, beyond the availability of digital systems.

6. Theoretical contributions

This study contributes to dynamic capabilities theory by specifying how technological preparedness relates to adaptive capacity and its organizational realization. Building on Teece (2007) and Ghosh et al. (2022), the framework assigns separate explanatory roles to technology readiness, agility, and digital transformation. Their distinction matters because the availability of resources, the ability to redeploy them, and changes in organizational work represent different accomplishments. The positive indirect relationship is consistent with agility providing one connection between preparedness and transformation, while the remaining direct association leaves scope for additional mechanisms. This specification identifies the adaptive use of technological resources as a distinct explanatory link between possessing them and realizing changes in organizational work.

The study also extends leadership research by examining how digital transformational leadership conditions two distinct capability relationships. Prior research connects leadership with agility and transformation, including agility as an intervening mechanism (AlNuaimi et al., 2022; Ly, 2024). The present model additionally identifies leadership as a condition associated with the strength of both the readiness–agility and agility–transformation relationships. This suggests that leadership theory should distinguish support for mobilizing available resources from support for integrating adaptive activity into organizational practices. The negative conditional direct leadership coefficient further qualifies an exclusively positive, additive account. Leadership’s association with transformation depends on which relationship is examined and the reference conditions of the model. This differentiation provides a basis for investigating when leadership effort accompanies organizational progress and when the two diverge, without presuming that the observed associations establish a temporal sequence.

Finally, the study extends capability-based inquiry into naval administration, where organizational value is interpreted through mission support and institutional effectiveness. It connects public-sector research on digitally induced organizational change (Haug et al., 2024) with personnel’s assessments of preparedness, adaptation, and leadership in a defence institution. The contextual contribution concerns the applicability of these relationships to work conducted within command responsibilities and information controls. It does not establish that hierarchy or security requirements caused the observed relationships, because these conditions were not directly tested.

7. Implications for Navy management

For Navy management, the findings support assessing technological provision together with the work that technology is expected to improve. Commanders, process owners, and information-system personnel could jointly review a selected administrative workflow, documenting available systems and skills alongside information handovers, repeated data entry, and unresolved responsibilities. Such reviews would help distinguish limitations in access or expertise from difficulties in coordinating their use. Investment proposals could then connect each requested technology or training activity to a defined process problem and an observable improvement. The small direct readiness–transformation relationship makes this a more defensible starting point than assuming that additional technological provision will yield proportional organizational gains.

Leadership development should address both the mobilization of expertise and the consolidation of revised working practices. At the first point, leaders can clarify digital priorities, invite personnel to identify practical difficulties, and define the scope within which adjustments may be tested. At the second, they can resolve disagreements over responsibilities, coordinate dependencies between sections, and ensure that successful changes are documented and supported. Training could use implementation cases that require officers to address these tasks jointly. The negative conditional leadership association calls for closer examination of how leadership effort corresponds to implementation needs. Where strong advocacy accompanies limited progress, an implementation review may be more useful than simply increasing the frequency of digital transformation messages.

Agility could be developed through limited, authorized pilots involving users, process owners, and technical personnel. Suitable applications include personnel administration, training records, or maintenance documentation, with each pilot addressing a clearly specified workflow problem. Evaluation should consider compatibility with shared information requirements and the continuity of the activity being improved. Before extending a pilot, managers could assess whether the revised process works for the personnel who maintain records, those who receive them, and those who use them for decisions. This approach directs attention to whether a local improvement remains useful across connected activities. It is an evidence-informed proposal for evaluation, rather than an intervention whose effectiveness the present study has established.

Continuity deserves particular attention because the sample combines extensive military service with comparatively short tenure in current units. Although the study did not test the effects of personnel rotation, this profile makes the retention of implementation knowledge a relevant management consideration. Digital initiatives could include documented process ownership, handover procedures, and explanations of why particular workflow changes were introduced. Responsibility for maintaining an improvement should be attached to an organizational role and supported by accessible documentation. These arrangements would make it possible to assess whether improvements persist when their original sponsors or experienced users move to other assignments. Leadership development and succession planning could consequently incorporate responsibility for sustaining digital working practices.

Monitoring should connect implementation activity with changes in work. Depending on the process, useful indicators could include completion time, rework, duplicate data entry, record accuracy, and continued use after initial deployment. Baseline and follow-up observations would help distinguish adoption from sustained process improvement. The importance–performance results can inform priorities when interpreted alongside local leadership conditions, documented workflow needs, and implementation costs. Reviews could also track whether benefits persist after the pilot ends and whether the revised process creates additional work elsewhere. These observations would help managers decide which initiatives to extend, revise, or discontinue.

8. Limitations and future research

The cross-sectional design limits interpretation of the proposed relationships as a developmental process. Technological readiness may facilitate adaptation, but existing transformation may also improve readiness or stimulate further changes in working practices. Leadership effort may likewise increase in response to implementation difficulties. Future research could measure readiness and leadership before a digital initiative, assess subsequent changes in agility, and observe transformation outcomes at a later point while accounting for their baseline levels. Where feasible, phased implementation with credible comparison groups could provide stronger evidence about temporal ordering and alternative explanations. Such designs would be particularly useful for investigating the negative conditional leadership association.

The constructs were assessed through reports from the same respondents, creating potential shared-method and response biases. Harman's test and structural collinearity diagnostics do not establish their absence, consistent with the methodological concerns discussed by Podsakoff et al. (2024). Future studies could combine personnel's leadership assessments with independently collected process records and observations of implementation. Measurement coverage also requires further development. The readiness indicators primarily address technological access, knowledge, and skills, while the transformation indicators concern digital practices and task processes. They do not directly establish interoperability, strategic renewal, or mission effectiveness. Broader measurement and independent operational indicators could clarify which dimensions of transformation the proposed relationships explain.

The organizational referent of the survey should also be distinguished from its statistical level of analysis. Responses represent individuals' assessments of their units, without aggregation into validated unit-level measures. If multiple participants belonged to the same unit, dependence among their responses could affect uncertainty estimates and the interpretation of between-unit differences. Future research should record appropriate unit identifiers, examine within-unit agreement and intraclass correlations, and adopt multilevel models or cluster-adjusted inference where justified. Matched assessments from leaders, technical personnel, and other staff could help distinguish individual perceptions from shared organizational conditions. Such evidence would allow a more direct examination of the unit-level arguments underlying the framework.

Convenience recruitment and voluntary participation constrain population generalizability despite the substantial number of respondents. The sample was concentrated among commissioned officers, men, and personnel with long military service, and the extent to which nonparticipants differed remains unknown. Future studies could recruit systematically across commands, ranks, work functions, and unit-tenure groups, with an explicit sampling frame where available. Replication should also examine variation across administrative, training, and technical support settings. These comparisons would help determine whether the relationships are stable across different forms of naval work or depend on features of particular assignments. Measurement equivalence should be established before interpreting differences between respondent groups.

The interaction findings require more extensive conditional inference. The plotted simple slopes were not accompanied by separate confidence intervals, and the reported indirect relationship was evaluated at the model's reference level of leadership. Following Busenbark et al. (2022) and Cheung and Cheung (2024), subsequent analyses should estimate marginal relationships, conditional indirect effects, and their uncertainty across substantively meaningful moderator values. Because leadership moderates both component paths, variation in the indirect relationship need not be linear. Alternative explanations for the negative leadership coefficient should also be examined through replication and measures of implementation stage, coordination demands, and change burden. These possibilities remain research questions rather than established mechanisms. pure.psu.edu

Finally, the predictive results concern the reported cross-validation procedure rather than transfer to entirely new units or later periods. If respondents from a common unit appeared in both training and validation folds, shared organizational conditions could make prediction easier than it would be in an unfamiliar setting. Future validation should therefore separate whole units where unit identifiers are available and include temporal or external samples. Comparisons with simpler additive specifications would also clarify whether the interaction terms contribute useful predictive information. This would extend the distinction between explanatory support and predictive performance emphasized by Guenther et al. (2023), while assessing the framework's relevance beyond the observed sample.

9. Conclusion

The study indicates that technology readiness relates to digital transformation both directly and through organizational agility at the model's reference level of leadership. Higher digital transformational leadership scores were associated with stronger estimated readiness–agility and agility–transformation relationships in personnel's assessments of Indonesian Navy units. The negative conditional direct leadership association qualifies any assumption that stronger leadership advocacy uniformly corresponds to greater transformation. The study's central contribution is to distinguish the availability of technological resources from their adaptive use and incorporation into organizational work. Its cross-sectional, perceptual evidence supports a conditional explanation rather than a causal prescription. For Navy management, this directs attention to the coordination of systems, working practices, and implementation support, with progress assessed through sustained improvements in the processes that digital modernization is intended to serve.

Declarations

ETHICS APPROVAL

Ethical approval for this study was granted by the Postgraduate School, Universitas Airlangga, on October 7, 2025 (Approval No. 3655/B/UN3.SPS/I/PT.01.04/2025). The approved study involved Indonesian Navy personnel participating voluntarily in a structured survey and met the institution's declaration and guidelines concerning human respondents.

INFORMED CONSENT

Informed consent was obtained from participants before they completed the questionnaire. Consent was documented through two procedures: electronic agreement in Google Forms and signed written consent forms. Participants received study information before indicating their agreement to take part. Participation was voluntary. The questionnaire was administered online between April and June 2026, and the analysis included responses from 977 Indonesian Navy personnel.

DATA AVAILABILITY STATEMENT

Requests for access to the de-identified data underlying this study should be directed to the corresponding author. Any disclosure is subject to applicable ethical, confidentiality, and institutional requirements and to the scope of participants' consent.

CONFLICT OF INTEREST

The authors declare no competing interests.

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AUTHOR CONTRIBUTIONS

Conceptualization, S., I.F.A., B.T., and F.S.; methodology, I.F.A., B.T., F.S., N.F.A.R., and A.A.; software, I.F.A.; validation, B.T., F.S., N.F.A.R., and A.A.; formal analysis, S. and I.F.A.; investigation, S.; resources, S.; data curation, S. and I.F.A.; writing, original draft preparation, S. and I.F.A.; writing, review and editing, S., I.F.A., B.T., F.S., N.F.A.R., and A.A.; visualization, I.F.A.; supervision, B.T. and F.S.; project administration, S. and I.F.A. All authors have read and agreed to the final version of the manuscript.

References

1. Aldhi IF, Suhariadi F, Rahmawati E, Supriharyanti E, Hardaningtyas D, Sugiarti R, Abbas A (2025) Bridging digital gaps in smart city governance: The mediating role of managerial digital readiness and the moderating role of digital leadership. *Smart Cities* 8(4) Article 117. <https://doi.org/10.3390/smartcities8040117>
2. Aldhi IF, Sukoco BM, Chen JV, Suhariadi F, Supriharyanti E (2026) Determinant factors of government change capability towards smart cities: A dynamic capability perspective. *J Clean Prod* 542:147376. <https://doi.org/10.1016/j.jclepro.2025.147376>

3. AlNuaimi BK, Singh SK, Ren S, Budhwar P, Vorobyev D (2022) Mastering digital transformation: The nexus between leadership, agility, and digital strategy. *J Bus Res* 145:636–648.
<https://doi.org/10.1016/j.jbusres.2022.03.038>
4. Anggraeni SA, Suhariadi F, Nadia FND, Aldhi IF, Rahmawati E, Hardaningtyas D, Sugiarti R, Abbas A (2026) Organizational capacity for change as a driver of sustainable competitive advantage in secondary level hospitals in Indonesia. *Discover Sustain* 7:1165. <https://doi.org/10.1007/s43621-026-03543-9>
5. Atobishi T, Abu Bakir SM, Nosratabadi S (2024) How do digital capabilities affect organizational performance in the public sector? The mediating role of the organizational agility. *Administrative Sci* 14(2). Article 37. <https://doi.org/10.3390/admsci14020037>
6. Bilal M, Xicang Z, Jiying W, Sohu JM, Akhta S (2024) Navigating the manufacturing revolution: Identifying the digital transformation antecedents. *Manag Decis* 62(6):1775–1805.
<https://doi.org/10.1108/MD-09-2023-1722>
7. Busenbark JR, Graffin SD, Campbell RJ, Lee EY (2022) A marginal effects approach to interpreting main effects and moderation. *Organizational Res Methods* 25(1):147–169.
<https://doi.org/10.1177/1094428120976838>
8. Chacón-Henao J, Arias-Pérez J, López-Zapata E (2026) Rethinking the drivers of digital open innovation performance: A contingent perspective on agility, inbound open innovation, and digital transformational leadership. *Management Research: The Journal of the Iberoamerican Academy of Management*. Advance online publication. <https://doi.org/10.1108/MRJIAM-05-2025-1735>
9. Cheung SF, Cheung S-H (2024) manyome: An R package for computing the indirect effects, conditional effects, and conditional indirect effects, standardized or unstandardized, and their bootstrap confidence intervals, in many (though not all) models. *Behav Res Methods* 56:4862–4882.
<https://doi.org/10.3758/s13428-023-02224-z>
10. Ciampi F, Faraoni M, Ballerini J, Meli F (2022) The co-evolutionary relationship between digitalization and organizational agility: Ongoing debates, theoretical developments and future research perspectives. *Technol Forecast Soc Chang* 176:121383.
<https://doi.org/10.1016/j.techfore.2021.121383>
11. Dinas Penerangan Angkatan Laut (2025), August 12 *Kasal resmikan aplikasi Trisula, E-Library, E-Referensi, Dasal, dan monumen pesawat Nomad Puspenerbal di Mabesal* [Chief of Naval Staff inaugurates the Trisula, E-Library, E-Referensi, and Dasal applications and the Puspenerbal Nomad aircraft monument at Navy headquarters]. TNI Angkatan Laut.
<https://www.tnial.mil.id/berita/84982/>
12. Ellström D, Holtström J, Berg E, Josefsson C (2022) Dynamic capabilities for digital transformation. *J Strategy Manage* 15(2):272–286. <https://doi.org/10.1108/JSMA-04-2021-0089>
13. Ghosh S, Hughes M, Hodgkinson I, Hughes P (2022) Digital transformation of industrial businesses: A dynamic capability approach. *Technovation* 113 Article 102414.
<https://doi.org/10.1016/j.technovation.2021.102414>

14. Guenther P, Guenther M, Ringle CM, Zaefarian G, Cartwright S (2023) Improving PLS-SEM use for business marketing research. *Ind Mark Manage* 111:127–142.
<https://doi.org/10.1016/j.indmarman.2023.03.010>
15. Hair JF Jr., Hult GTM, Ringle CM, Sarstedt M, Danks NP, Ray S (2021) Partial least squares structural equation modeling (PLS-SEM) using R: A workbook. Springer. <https://doi.org/10.1007/978-3-030-80519-7>
16. Haug N, Dan S, Mergel I (2024) Digitally-induced change in the public sector: A systematic review and research agenda. *Public Manage Rev* 26(7):1963–1987.
<https://doi.org/10.1080/14719037.2023.2234917>
17. Kementerian Pertahanan Republik Indonesia (2024), August 27 *Pentingnya Sisfopers TNI yang terintegrasi guna efektifitas Binpers* [The importance of an integrated TNI personnel information system for effective personnel management].
<https://www.kemhan.go.id/batekhan/2024/08/27/pentingnya-sisfopers-tni-yang-terintegrasi-guna-efektifitas-binpers.html>
18. Konopik J, Jahn C, Schuster T, Hoßbach N, Pflaum A (2022) Mastering the digital transformation through organizational capabilities: A conceptual framework. *Digit Bus* 2(2) Article 100019.
<https://doi.org/10.1016/j.digbus.2021.100019>
19. Ly B (2024) The interplay of digital transformational leadership, organizational agility, and digital transformation. *J Knowl Econ* 15(1):4408–4427. <https://doi.org/10.1007/s13132-023-01377-8>
20. McCarthy P, Sammon D, Alhassan I (2024) The characteristics of digital transformation leadership: Theorizing the practitioner voice. *Bus Horiz* 67(4):411–423.
<https://doi.org/10.1016/j.bushor.2024.03.005>
21. Office of Assistant to Deputy Cabinet Secretary for State Documents & Translation (2024), May 27 *President Jokowi launches INA Digital*. Cabinet Secretariat of the Republic of Indonesia.
<https://setkab.go.id/en/president-jokowi-launches-ina-digital/>
22. Oliveira T, Thomas M, Espadanal M (2014) Assessing the determinants of cloud computing adoption: An analysis of the manufacturing and services sectors. *Inf Manag* 51(5):497–510.
<https://doi.org/10.1016/j.im.2014.03.006>
23. Podsakoff PM, Podsakoff NP, Williams LJ, Huang C, Yang J (2024) Common method bias: It's bad, it's complex, it's widespread, and it's not easy to fix. *Annual Rev Organizational Psychol* Organizational Behav 11:17–61. <https://doi.org/10.1146/annurev-orgpsych-110721-040030>
24. Ramadhani GWA, Suhariadi F, Suyanto B, Aldhi IF, Supriharyanti E, Hardaningtyas D, Abbas A (2025) Forming innovative work behavior prospective police investigator through self-efficacy and job crafting in the post-COVID-19. *Discover Sustain* 6:21. <https://doi.org/10.1007/s43621-025-00811-y>
25. Sarker M, Al-Muaalemi MA (2022) Sampling techniques for quantitative research. In M. R. Islam, N. A. Khan, & R. Baikady (Eds.), *Principles of social research methodology* (pp. 221–234). Springer.
https://doi.org/10.1007/978-981-19-5441-2_15

26. Silva RP, Mamede HS, Santos V (2025) A new proposed model to assess the digital organizational readiness to maximize the results of the digital transformation in SMEs. *J Innov Knowl* 10(1). Article 100644. <https://doi.org/10.1016/j.jik.2024.100644>
27. Teece DJ (2007) Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strateg Manag J* 28(13):1319–1350. <https://doi.org/10.1002/smj.640>
28. Teece DJ, Pisano G, Shuen A (1997) Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), 509–533. [https://doi.org/10.1002/\(SICI\)1097-0266\(199708\)18:7<509::AID-SMJ882>3.0.CO;2-Z](https://doi.org/10.1002/(SICI)1097-0266(199708)18:7<509::AID-SMJ882>3.0.CO;2-Z). Wiley Online Library
29. Tentara Nasional Indonesia (2025) *Peraturan Panglima Tentara Nasional Indonesia Nomor 43 Tahun 2025 tentang Satu Data Tentara Nasional Indonesia* [Regulation of the Commander of the Indonesian National Armed Forces No. 43 of 2025 concerning One Data for the Indonesian National Armed Forces]. <https://peraturan.bpk.go.id/Details/334097/peraturan-panglima-tni-no-43-tahun-2025>
30. van Duijn S, Bannink D, van Doorn M (2026) Are digital platforms a remedy for collaborative challenges? Unpacking the socio-political complexities of digital transformations. *Int J Public Sector Manag* 39(2):227–245. <https://doi.org/10.1108/IJPSM-03-2025-0106>
31. Wardhani PS, Handoyo S, Suhariadi F, Aldhi IF (2026) Enhancing lecturer performance: The role of agility in techno-adaptability for distance education. *Turkish Online J Distance Educ* 27(1):196–211. <https://doi.org/10.17718/tojde.1631752>
32. Werder K, Richter J (2022) A meta-analysis on the effects of IT capability toward agility and performance: New directions for information systems research. *PLoS ONE* 17(10) Article e0268761. <https://doi.org/10.1371/journal.pone.0268761>
33. Zhang H, Ding H, Xiao J (2023) How organizational agility promotes digital transformation: An empirical study. *Sustainability* 15(14) Article 11304. <https://doi.org/10.3390/su151411304>

Figures

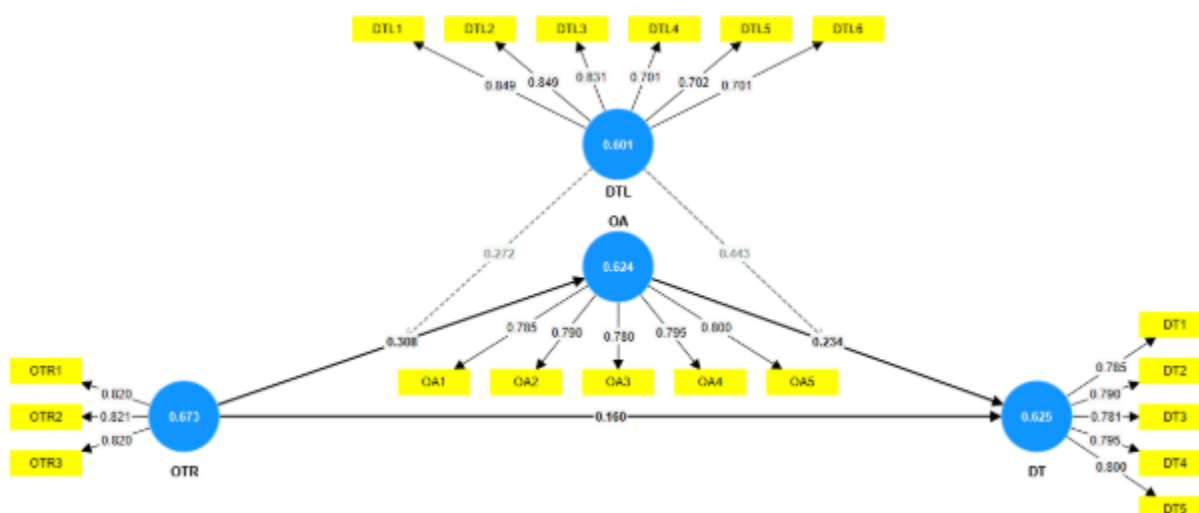


Figure 1

Outer Loading Test Result

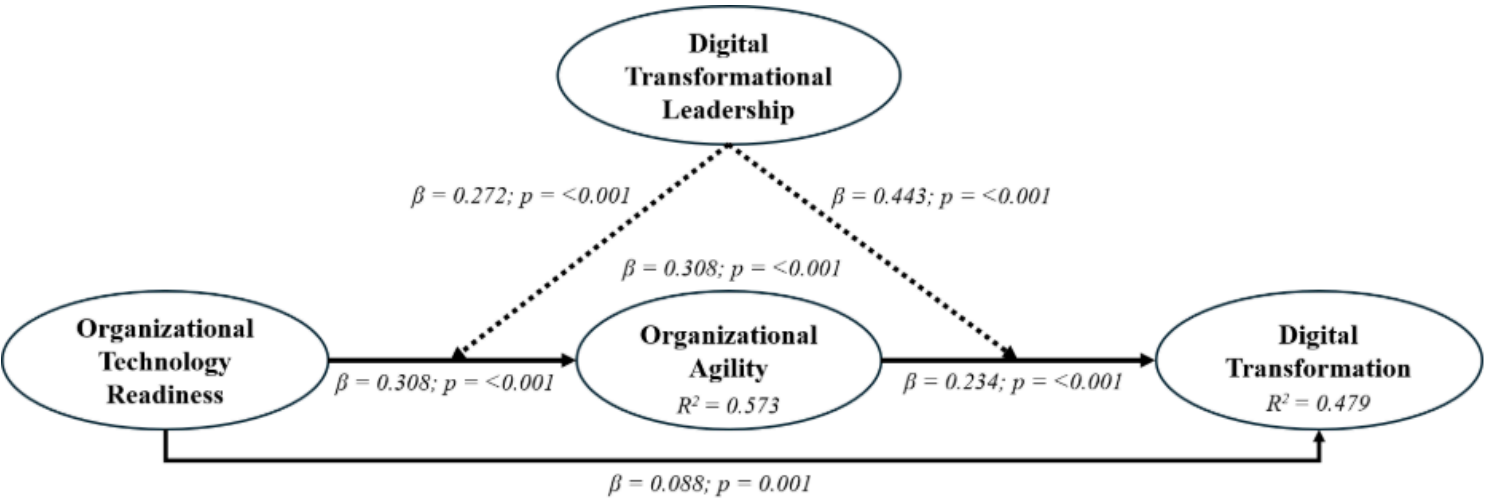


Figure 2

Structural Equation Test Result

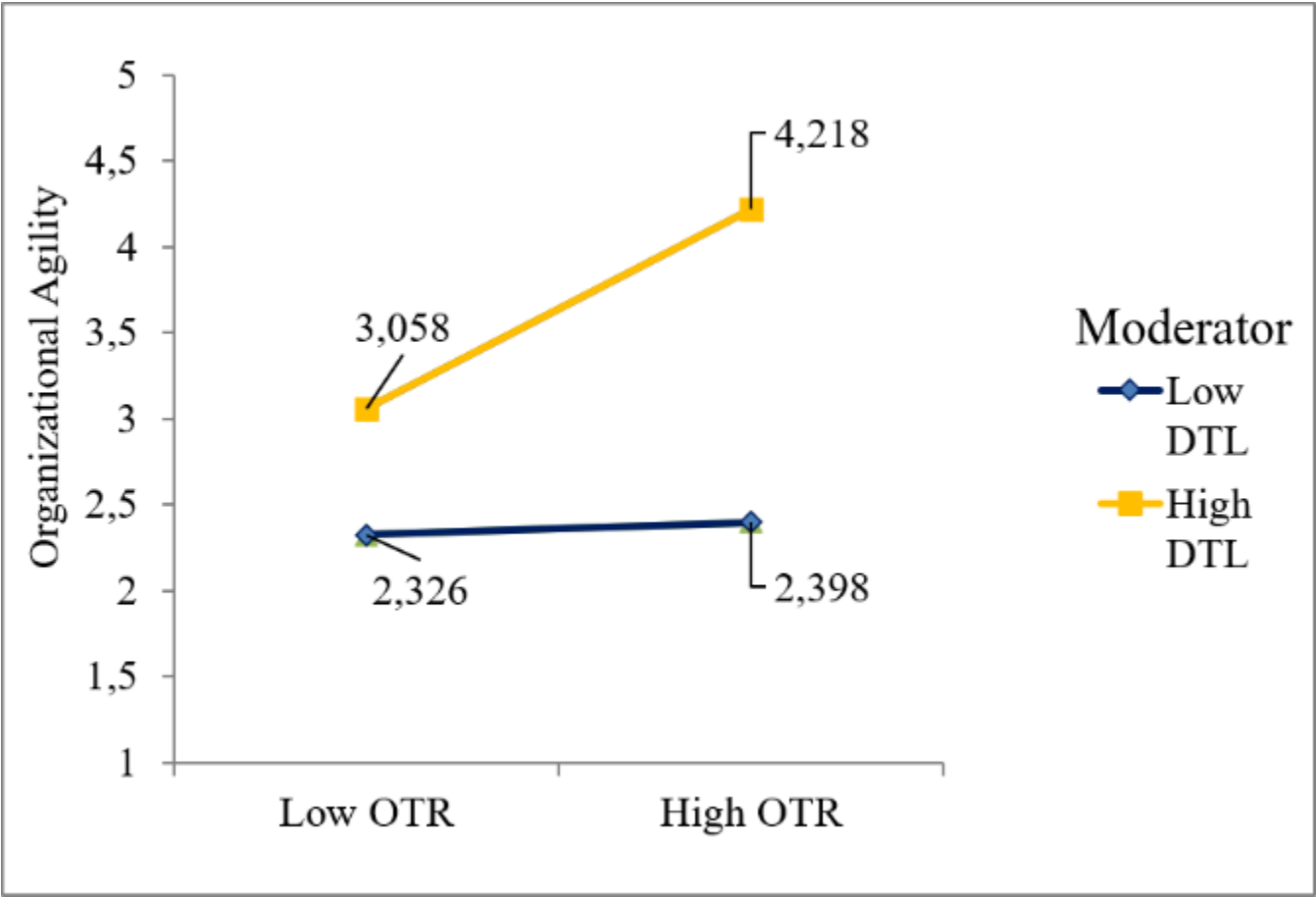


Figure 3

DTL moderating effect on the relationship between OTR and OA

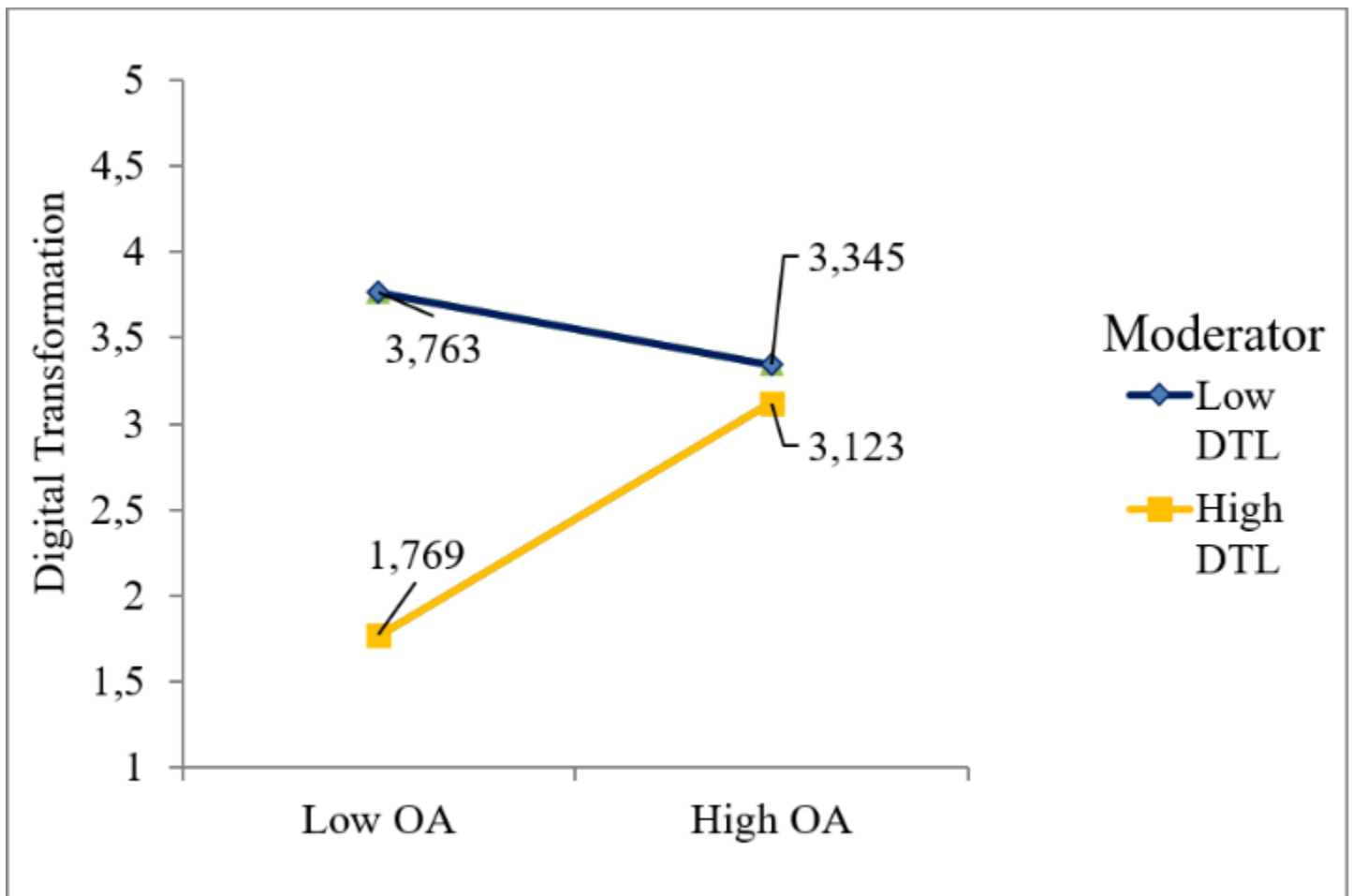


Figure 4

DTL moderating effect on the relationship between OA and DT