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Institutional Decoupling in Archipelagic Logistics: Why Global Standards Do Not Strengthen Digital Policy Effectiveness in Indonesia

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Abstract

Background: As an archipelagic nation, Indonesia faces complex logistics challenges, including limited connectivity, infrastructure disparities, and high inter regional distribution costs. In response, the government and industry stakeholders have adopted various global best practices in digital logistics transformation, yet their implementation often fails to produce the expected outcomes.
Objective: This study analyses the effect of National Logistics Ecosystem (NLE) policy implementation on logistics service performance, with digitalization, digital ecosystem maturity, and openness to global best practices as moderating variables, and explains why openness to global best practices does not strengthen that effect.
Methods: The study employed a mixed-methods approach with an explanatory sequential design. Quantitative data from 388 respondents were analyzed using SmartPLS 4 and NVivo 14.
Results: NLE policy implementation positively and significantly affects logistics service performance, and this effect is strengthened by digitalization and digital ecosystem maturity. In contrast, openness to global best practices neither moderates the relationship nor exerts a significant direct effect on performance. Qualitative analysis attributes this dual null result to Institutional Decoupling, whereby international standards are formally adopted without operational internalization, driven by inter agency sectoral fragmentation and pronounced infrastructure disparities between western and eastern Indonesia, and compounded by uneven digital literacy and conservative organizational cultures.
Conclusion: These findings indicate that, absent foundational domestic harmonization, international standards remain ceremonial and lose operational relevance. A sequenced, domestic first approach is therefore required, one that couples regulatory measures to dismantle sectoral silos with investment in digital literacy and human resource capacity.

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INTRODUCTION

As an archipelagic nation of thousands of islands separated by sea, Indonesia faces structurally complex logistics challenges. Limited inter regional connectivity produces uneven distribution of goods and dependence on a small number of transport corridors, while

pronounced infrastructure disparities between western and eastern Indonesia widen the accessibility gap, as certain regions possess far more advanced port and transport facilities than others. These conditions elevate distribution costs and ultimately weigh on commodity prices and national economic competitiveness. This inefficiency is visible in Indonesia's global standing. In the 2023 Logistics Performance Index, Indonesia ranked 61st of 139 countries with a score of 3.0, a decline from 46th in 2018 (World Bank, 2023), and continues to trail regional peers such as Singapore, Malaysia, Thailand, and Vietnam. This decline is largely attributed to persistent weaknesses in the soft infrastructure of the national logistics system, particularly in the tracking, tracing, and timeliness dimensions, which reflect deep-seated structural inefficiencies across port ecosystems (Ulkhaq & Pratiwi, 2025).

In response, the government introduced the National Logistics Ecosystem (NLE) through Presidential Instruction No. 5 of 2020 to transform the national logistics system. NLE is designed as a digital ecosystem integrating the flow of goods and documents from vehicle arrival through storage and distribution, structured around pillars such as Carrier Single Submission, Custom Quarantine Single Submission, and Single Billing integration. Its early results are measurable implementation has reduced dwelling time and improved clearance efficiency through joint inspection mechanisms (Coordinating Ministry for Economic Affair, 2023). Yet these gains remain uneven. A substantial gap persists relative to global benchmarks, and integration across ports is far from complete, indicating that the availability of a digital platform is insufficient to raise performance without parallel institutional and operational reform.

The barriers to fuller effect are institutional rather than merely technical. Fragmented authority across numerous ministries and agencies, with overlapping sectoral regulations, produces jurisdictional ambiguity at the operational level and sustains a gap between central policy formulation and regional implementation, where effective communication, adequate resources, implementer dispositions, and structured bureaucratic coordination serve as fundamental determinants of execution success (Edwards III, 1980). Crucially, integration difficulties concentrate benefits in first tier ports on Java, while the digital divide between western and eastern Indonesia leaves less equipped ports unable to absorb the same gains, so that a standardized national policy yields highly uneven improvements across a heterogeneous port network. It is against this backdrop that the adoption of global best practices becomes problematic, since international standards frequently encounter institutional and cultural barriers and do not correspond to the operational realities of traditional ports.

The pressure to align with international standards is neither abstract nor optional. Since January 2024, the electronic exchange of information for ship arrival, stay, and departure through a maritime single window has been mandatory for member states under the Facilitation Convention (IMO, 2024), while successive assessments of maritime transport note that digital systems such as maritime single windows and port community systems have reduced costs and delays in some economies but remain unevenly implemented across developing countries (UNCTAD, 2023). Indonesia therefore faces a dual obligation, namely to satisfy externally defined standards while operating a port network in which the domestic conditions for meeting them are unevenly distributed. This tension is the empirical setting for the present study.

Existing scholarship has largely approached digital logistics through a lens of technological determinism, evaluating such systems primarily in terms of infrastructure readiness and administrative efficiency (Arimbhi et al., 2021; Liu et al., 2024; Mai et al., 2022). This emphasis tends to overlook the institutional factors, such as oligopolistic market structures and bureaucratic cultural resistance, that constitute decisive barriers to implementation in archipelagic settings. In particular, prior work does not adequately explain why exposure to global standards fails to convert formal policy adoption into operational performance in contexts marked by deep internal disparity. This study addresses that gap by examining, through complementary quantitative and qualitative evidence, why openness to global best practices does not strengthen the relationship between NLE implementation and logistics service performance.

Drawing on institutional theory (DiMaggio & Powell, 1983), this study explains that failure through the mechanism of Institutional Decoupling, namely the formal adoption of global standards to secure legitimacy without their internalization into operational routines. The relevance of this lens to the Indonesian setting is reinforced by evidence that institutional quality

is a decisive determinant of national policy reform success in the country (Jazuli et al., 2022), which implies that the effectiveness of a digital policy such as NLE depends less on the standards adopted than on the institutional conditions into which they are introduced. The qualitative phase identifies the sources of this decoupling, notably sectoral fragmentation among ministries and agencies and the divide in infrastructure and digital maturity between western and eastern Indonesia. The study thus contributes to the logistics management and institutional literature by positioning Institutional Decoupling as the explanatory mechanism that links a digital policy intervention to uneven performance outcomes in an archipelagic context, and, as a practical corollary, by pointing toward a domestic first sequencing of reform in which internal capability precedes external standardization.

The moderating construct, Openness to Global Best Practices, is defined as the extent to which logistics actors recognize, accept, and are willing to adopt internationally recognized standards and protocols, such as green port certification, international supply chain visibility frameworks, and globally benchmarked customs procedures, within their operations. Institutional theory motivates the expectation that actors more exposed to international standards face stronger mimetic and normative pressures to translate formal policy adoption into operational gains; accordingly, greater openness was hypothesized to strengthen the effect of NLE implementation on logistics service performance. The empirical test of this expectation, and its unexpected failure, forms the analytical core of this article.

METHOD

This research is grounded in the post-positivist paradigm, which treats social phenomena such as NLE implementation as empirically measurable while acknowledging the need for contextual understanding from relevant actors to obtain a comprehensive account. The study adopts a mixed methods approach with an explanatory sequential design (Creswell & Plano Clark, 2018). It was conducted across two of Indonesia's largest integrated logistics organizations, PT Samudera Indonesia Tbk and PT Pelabuhan Indonesia (Persero), selected because both are directly and substantially involved in NLE implementation and together span the private operator and state port dimensions of the National Logistics Ecosystem. Data collection at PT Samudera Indonesia Tbk covered its head office in West Jakarta and its branch offices in Surabaya, Makassar, and Balikpapan, providing representation of NLE implementation across different regional contexts, while data from PT Pelabuhan Indonesia (Persero) were drawn from organic employees across the parent company and its sub holding entities.

Consistent with the explanatory sequential design, the quantitative PLS-SEM phase was conducted first to determine which hypothesized relationships were statistically supported. The rejection of the moderating effect of openness to global best practices served as the explicit point of departure for the qualitative phase, which was designed to explain this unexpected result rather than merely illustrate the quantitative findings. Twenty key informants were selected through purposive sampling based on three criteria, namely direct managerial or technical involvement in NLE implementation, a minimum of three years of relevant experience, and representation across the three stakeholder groups identified in the population. These groups comprised operational and managerial personnel from the two focal organizations, regulatory officials from the relevant ministries and the national single window authority, and executives from national logistics associations. The semi structured interview guide was developed by translating each non-significant or borderline quantitative pathway, together with indicators of digitalization, digital-ecosystem maturity, and openness to global best practices, into open ended questions, and its content validity was established through review by two logistics management academics.

Quantitative and qualitative findings were integrated through a joint display approach, in which qualitative themes were mapped onto quantitative path coefficients in the discussion to explain the mechanisms underlying each result, and in particular the rejection of the global practice moderation. Coding followed an abductive logic consistent with the explanatory sequential design. Rather than proceeding purely inductively, the analysis began from the quantitative anomaly and interrogated the interview data for mechanisms capable of explaining it, while remaining open to themes not anticipated by the hypotheses. The coding process was managed systematically in NVivo 14 to ensure analytical transparency and traceability.

The research was carried out through systematic stages up to November 2025. The preparation stage (June–July 2025) comprised an advanced literature review, instrument development and validation through expert judgement, and administrative approvals. Data collection (July–August 2025) involved questionnaire distribution using stratified random sampling, in depth interviews with the twenty key informants, and secondary data collection. Data processing and analysis (September 2025) applied quantitative analysis in SmartPLS 4 and qualitative thematic coding in NVivo 14. The final stage (November 2025) involved preparation of the research report and validation of findings through member checking.

The target population was defined not as the aggregate of all individuals within the two organizations, but strictly by capacity, relevance, and direct involvement in the phenomenon under investigation. The quantitative population therefore focused on operational and managerial personnel responsible for implementing maritime logistics transformation. Based on the companies' annual reports as of 31 December 2024, the population was determined using explicit inclusion and exclusion criteria:

1) PT Samudera Indonesia Tbk: restricted to permanent employees (2,540) and fixed term (PKWT) employees (595), totalling 3,135. Outsourced workers (1,222) and ship crews (538) were excluded because they perform operational fieldwork and maritime duties without direct access to, or administrative authority over, the NLE system.
2) PT Pelabuhan Indonesia (Persero): restricted to organic employees of the parent and sub-holding entities, totalling 9,183. Non organic and outsourced workers (15,316) were excluded because most perform physical operational activities, such as dock operations, and are not directly relevant to evaluating strategic policy, digital governance, and institutional transformation.

This refinement established an empirical population (N) of 12,318 individuals judged capable of evaluating NLE implementation. The supporting population for the qualitative phase consisted of macro level strategic stakeholders, namely regulatory officials, logistics academics, and industry association representatives, whose involvement was essential for analysing the phenomenon from both public governance and business ecosystem perspectives.

Sampling was conducted sequentially and differently across phases. In the quantitative phase, sample size was determined with attention to the robustness requirements of structural equation modelling rather than by a single mathematical rule. As a starting point, the Slovin formula for finite populations (Yamane, 1973; Poppy & Indrawan, 2024) yielded a minimum of 388 respondents from a population of 12,318 at a 5% margin of error. Because the Slovin formula estimates a sample adequate for population proportion rather than for structural-model estimation, this figure was cross validated against requirements specific to PLS-SEM. Both the inverse square root method and a power analysis based on the maximum number of predictors directed at any single construct indicated a required sample below 388, confirming that the obtained sample exceeds the threshold for stable estimation and adequate statistical power. The model was subsequently estimated using variance-based structural equation modelling (PLS-SEM) in SmartPLS 4.

The 388 respondents were selected through proportionate stratified random sampling, with company affiliation as the stratification variable. PT Samudera Indonesia Tbk contributed 3,135 individuals (25.45%) and PT Pelabuhan Indonesia (Persero) 9,183 (74.55%), applied to the total sample, these proportions yielded 99 and 289 respondents respectively. Within each stratum, respondents were distributed proportionately across the head office and the three branch locations according to each unit share of total employees, and individuals were then selected using a random number generator applied to the company's internal employee directories, ensuring that every eligible employee within each stratum had an equal probability of selection.

Measurement and structural model evaluation followed established guidelines for PLS-SEM reporting (Hair et al., 2019). Convergent validity was assessed through outer loadings and average variance extracted (Fornell & Larcker, 1981). Discriminant validity was established using the heterotrait monotrait ratio of correlations (Henseler, 2015), which offers greater sensitivity in detecting discriminant validity problems than earlier criteria. Because the quantitative data were obtained from a single instrument at one point in time, the potential for common method

bias was addressed both procedurally and statistically. Procedurally, respondent anonymity was guaranteed, items measuring predictor and criterion constructs were separated within the questionnaire, and item wording was reviewed to reduce ambiguity and social desirability. Statistically, a full collinearity assessment was conducted, in which variance inflation factors for all constructs remained below the threshold of 3.3 recommended for detecting method bias in variance-based models (Kock, 2015), indicating that common method bias is unlikely to distort the estimated relationships.

RESULTS AND DISCUSSION

Results

Overview of Respondents

Table 1
Respondent Characteristics

Category	Subcategory	Estimated Number	Percentage (%)
Gender	Male	313	80.67%
	Female	75	19.33%
Age	18–25 Years	148	38.14%
	≥60 Years	6	1.55%
Education	Bachelor's (S1)	186	47.94%
	Doctoral (S3)	3	0.77%

Source: Processed Research Data (2026)

Based on the data collection results, 388 valid respondents were obtained for analysis using SEM-PLS. The composition of respondents was dominated by males (80.67%), while females accounted for only 19.33%, indicating a gender imbalance within the research sample. In terms of age distribution, the largest single age group was 18–25 years (38.14%). However, because the inclusion criteria limited the sampling frame to permanent and contract employees in operational and managerial positions with direct administrative access to the NLE system, this group consisted predominantly of junior to mid-level operational staff with one to five years of tenure who routinely execute NLE procedures, rather than newly recruited entry level employees without exposure to relevant policies. Respondents occupying managerial or supervisory positions across all age groups represented 34.5% of the sample.

Furthermore, supplementary cross-tabulation analysis confirmed that the path coefficients for the NLE Policy Implementation construct did not differ substantially between the 18–25 age group and older age groups, suggesting that the age distribution did not materially bias the substantive validity of the survey responses. The oldest age group (≥60 years) represented the smallest proportion of respondents at 1.55%. Meanwhile, regarding educational background, most respondents held a Bachelor's degree (47.94%), whereas the smallest proportion consisted of respondents with doctoral level qualifications (0.77%). These findings indicate that the majority of respondents possessed upper-secondary to tertiary education backgrounds, although only a limited number had attained doctoral level education.

Convergent Validity Test

Before discussing the research findings, an instrument calibration process was conducted for each construct to ensure that all research indicators demonstrated adequate levels of validity and consistency. This process included validity and reliability assessments for each measurement item. Specifically, convergent validity was evaluated based on outer loading values obtained through SmartPLS software. The results of the validity assessment for each construct are presented in Table 2.

Table 2
Results of Outer Loading Testing for Each Indicator

Variable	Indicator	Critical Value	Outer Loading	Description
NLE Policy Implementation	X.1	0.700	0.738	Valid
	X.2	0.700	0.733	Valid

Variable	Indicator	Critical Value	Outer Loading	Description
(X)	X.3	0.700	0.720	Valid
	X.4	0.700	0.734	Valid
	X.5	0.700	0.753	Valid
	X.6	0.700	0.732	Valid
	X.7	0.700	0.725	Valid
	X.8	0.700	0.732	Valid
	X.9	0.700	0.729	Valid
	X.10	0.700	0.736	Valid
	X.11	0.700	0.768	Valid
	X.12	0.700	0.754	Valid
	X.13	0.700	0.751	Valid
	X.14	0.700	0.730	Valid
	X.15	0.700	0.730	Valid
Digitalization (M1)	M1.1	0.700	0.788	Valid
	M1.2	0.700	0.775	Valid
	M1.3	0.700	0.779	Valid
	M1.4	0.700	0.774	Valid
	M1.5	0.700	0.783	Valid
	M1.6	0.700	0.776	Valid
	M1.7	0.700	0.770	Valid
	M1.8	0.700	0.775	Valid
	M1.9	0.700	0.780	Valid
	M1.10	0.700	0.778	Valid
	M1.11	0.700	0.765	Valid
	M1.12	0.700	0.773	Valid
	M1.13	0.700	0.788	Valid
	M1.14	0.700	0.767	Valid
	M1.15	0.700	0.806	Valid
Digital Ecosystem Maturity (M2)	M2.1	0.700	0.865	Valid
	M2.2	0.700	0.861	Valid
	M2.3	0.700	0.855	Valid
	M2.4	0.700	0.883	Valid
	M2.5	0.700	0.866	Valid
	M2.6	0.700	0.879	Valid
	M2.7	0.700	0.850	Valid
	M2.8	0.700	0.864	Valid
	M2.9	0.700	0.862	Valid
	M2.10	0.700	0.871	Valid
	M2.11	0.700	0.860	Valid
	M2.12	0.700	0.868	Valid
	M2.13	0.700	0.863	Valid
	M2.14	0.700	0.870	Valid
	M2.15	0.700	0.852	Valid
Openness to Global Best Practices (M3)	M3.1	0.700	0.733	Valid
	M3.2	0.700	0.755	Valid
	M3.3	0.700	0.758	Valid
	M3.4	0.700	0.773	Valid
	M3.5	0.700	0.744	Valid
	M3.6	0.700	0.746	Valid
	M3.7	0.700	0.751	Valid
	M3.8	0.700	0.760	Valid
	M3.9	0.700	0.763	Valid
	M3.10	0.700	0.762	Valid
	M3.11	0.700	0.768	Valid
	M3.12	0.700	0.763	Valid

Variable	Indicator	Critical Value	Outer Loading	Description
	M3.13	0.700	0.758	Valid
	M3.14	0.700	0.772	Valid
	M3.15	0.700	0.786	Valid
Logistics Service Performance (Z)	Z.1	0.700	0.829	Valid
	Z.2	0.700	0.822	Valid
	Z.3	0.700	0.823	Valid
	Z.4	0.700	0.824	Valid
	Z.5	0.700	0.835	Valid
	Z.6	0.700	0.826	Valid
	Z.7	0.700	0.831	Valid
	Z.8	0.700	0.827	Valid
	Z.9	0.700	0.832	Valid
	Z.10	0.700	0.828	Valid
	Z.11	0.700	0.823	Valid
	Z.12	0.700	0.838	Valid
	Z.13	0.700	0.817	Valid
	Z.14	0.700	0.832	Valid
	Z.15	0.700	0.821	Valid

Source: Processed Research Data (2026)

Based on the convergent validity test results, all indicators for each variable exhibit outer loading values above the critical threshold of 0.700, thereby meeting the recommended validity criteria. These values indicate that all indicators effectively reflect their respective latent constructs in a strong and consistent manner. The research instrument is therefore considered valid and suitable for further analysis. The retention of fifteen indicators per construct, rather than reduction through dimensionality techniques, was a deliberate design choice, since each indicator captures a conceptually distinct facet of a broad construct. The authors nonetheless acknowledge that a reflective model with numerous indicators increases respondent burden, and suggest that future replications consider a second order formative specification to balance conceptual breadth with parsimony.

Discriminant Validity Test

The Average Variance Extracted (AVE) values for each variable are presented in the following table as indicators for assessing the discriminant validity and convergent validity of the constructs. AVE represents the extent to which a latent variable explains the variance of its associated indicators, with higher values indicating stronger construct representation and measurement quality.

Table 3
Results of AVE (Average Variance Extracted) Test

Variable	Critical Value	AVE	Description
NLE Policy Implementation (X)	0.500	0.544	Valid
Digitalization (M1)	0.500	0.606	Valid
Digital Ecosystem Maturity (M2)	0.500	0.748	Valid
Openness to Global Best Practices (M3)	0.500	0.577	Valid
Logistics Service Performance (Z)	0.500	0.684	Valid

Source: Processed Research Data (2026)

Based on the analysis results of the Average Variance Extracted (AVE) values, all variables have met the convergent validity criteria, as indicated by AVE values above the critical threshold of 0.50. This indicates that each construct is able to adequately explain more than 50% of the variance in its indicators. Therefore, all indicators are considered appropriate for proceeding to the next stage of the analysis.

Reliability Test

The reliability test was conducted to ensure that each variable in this study demonstrated a satisfactory level of internal consistency. Reliability measurement was performed using Cronbach's Alpha and Composite Reliability values. The results of the reliability test for each variable are presented in table 4.

Table 4
Results of Reliability Testing

Variable	Critical Value	Cronbach's Alpha	Composite Reliability	Description
NLE Policy Implementation (X)	0.60	0.940	0.947	Reliable
Digitalization (M1)	0.60	0.954	0.958	Reliable
Digital Ecosystem Maturity (M2)	0.60	0.976	0.978	Reliable
Openness to Global Best Practices (M3)	0.60	0.948	0.953	Reliable
Logistics Service Performance (Z)	0.60	0.967	0.970	Reliable

Source: Processed Research Data (2026)

Based on the reliability test results using Cronbach's alpha and composite reliability, all variables in this study met the reliability criteria, as indicated by the values of each indicator exceeding the minimum threshold of 0.60. This finding indicates that each construct demonstrates a good level of internal consistency.

Multicollinearity Test

The multicollinearity test was conducted to ensure that there was no high correlation among the independent variables in the research model, thereby ensuring that the resulting parameter estimates remained stable and could be interpreted appropriately. This test is generally performed by examining the Variance Inflation Factor (VIF) values, in which VIF values below the critical threshold (generally < 5) indicate the absence of multicollinearity issues.

Table 5
Results of Multicollinearity Testing

Variable	Indicator	Critical Value	VIF	Description
NLE Policy Implementation (X)	X.1	5.000	2.015	No symptoms of multicollinearity
	X.2	5.000	2.110	No symptoms of multicollinearity
	X.3	5.000	1.940	No symptoms of multicollinearity
	X.4	5.000	2.046	No symptoms of multicollinearity
	X.5	5.000	2.125	No symptoms of multicollinearity
	X.6	5.000	2.061	No symptoms of multicollinearity
	X.7	5.000	1.973	No symptoms of multicollinearity
	X.8	5.000	1.988	No symptoms of multicollinearity
	X.9	5.000	1.967	No symptoms of multicollinearity
	X.10	5.000	2.014	No symptoms of multicollinearity
	X.11	5.000	2.222	No symptoms of multicollinearity
	X.12	5.000	2.169	No symptoms of multicollinearity
	X.13	5.000	2.042	No symptoms of multicollinearity
	X.14	5.000	2.034	No symptoms of multicollinearity
	X.15	5.000	1.957	No symptoms of multicollinearity
Digitalization (M1)	M1.1	5.000	2.426	No symptoms of multicollinearity
	M1.2	5.000	2.228	No symptoms of multicollinearity
	M1.3	5.000	2.333	No symptoms of multicollinearity
	M1.4	5.000	2.262	No symptoms of multicollinearity
	M1.5	5.000	2.304	No symptoms of multicollinearity
	M1.6	5.000	2.299	No symptoms of multicollinearity
	M1.7	5.000	2.253	No symptoms of multicollinearity
	M1.8	5.000	2.316	No symptoms of multicollinearity
	M1.9	5.000	2.348	No symptoms of multicollinearity

Variable	Indicator	Critical Value	VIF	Description
	M1.10	5.000	2.310	No symptoms of multicollinearity
	M1.11	5.000	2.404	No symptoms of multicollinearity
	M1.12	5.000	2.279	No symptoms of multicollinearity
	M1.13	5.000	2.409	No symptoms of multicollinearity
	M1.14	5.000	2.208	No symptoms of multicollinearity
	M1.15	5.000	2.654	No symptoms of multicollinearity
Digital Ecosystem Maturity (M2)	M2.1	5.000	3.611	No symptoms of multicollinearity
	M2.2	5.000	3.668	No symptoms of multicollinearity
	M2.3	5.000	3.300	No symptoms of multicollinearity
	M2.4	5.000	4.181	No symptoms of multicollinearity
	M2.5	5.000	3.652	No symptoms of multicollinearity
	M2.6	5.000	4.112	No symptoms of multicollinearity
	M2.7	5.000	3.325	No symptoms of multicollinearity
	M2.8	5.000	3.562	No symptoms of multicollinearity
	M2.9	5.000	3.542	No symptoms of multicollinearity
	M2.10	5.000	4.255	No symptoms of multicollinearity
	M2.11	5.000	3.665	No symptoms of multicollinearity
	M2.12	5.000	3.629	No symptoms of multicollinearity
	M2.13	5.000	3.828	No symptoms of multicollinearity
	M2.14	5.000	4.042	No symptoms of multicollinearity
	M2.15	5.000	3.436	No symptoms of multicollinearity
Openness to Global Practices (M3)	M3.1	5.000	2.044	No symptoms of multicollinearity
	M3.2	5.000	2.088	No symptoms of multicollinearity
	M3.3	5.000	2.154	No symptoms of multicollinearity
	M3.4	5.000	2.237	No symptoms of multicollinearity
	M3.5	5.000	2.159	No symptoms of multicollinearity
	M3.6	5.000	2.101	No symptoms of multicollinearity
	M3.7	5.000	2.164	No symptoms of multicollinearity
	M3.8	5.000	2.137	No symptoms of multicollinearity
	M3.9	5.000	2.263	No symptoms of multicollinearity
	M3.10	5.000	2.202	No symptoms of multicollinearity
	M3.11	5.000	2.176	No symptoms of multicollinearity
	M3.12	5.000	2.175	No symptoms of multicollinearity
	M3.13	5.000	2.212	No symptoms of multicollinearity
	M3.14	5.000	2.244	No symptoms of multicollinearity
	M3.15	5.000	2.325	No symptoms of multicollinearity
Logistics Service Performance (Z)	Z.1	5.000	3.001	No symptoms of multicollinearity
	Z.2	5.000	3.145	No symptoms of multicollinearity
	Z.3	5.000	2.869	No symptoms of multicollinearity
	Z.4	5.000	2.881	No symptoms of multicollinearity
	Z.5	5.000	3.204	No symptoms of multicollinearity
	Z.6	5.000	3.093	No symptoms of multicollinearity
	Z.7	5.000	3.061	No symptoms of multicollinearity
	Z.8	5.000	3.064	No symptoms of multicollinearity
	Z.9	5.000	3.001	No symptoms of multicollinearity
	Z.10	5.000	3.040	No symptoms of multicollinearity
	Z.11	5.000	2.934	No symptoms of multicollinearity
	Z.12	5.000	3.224	No symptoms of multicollinearity
	Z.13	5.000	2.848	No symptoms of multicollinearity
	Z.14	5.000	3.103	No symptoms of multicollinearity
	Z.15	5.000	3.019	No symptoms of multicollinearity

Source: Processed Research Data (2026)

Based on the multicollinearity test results using the Variance Inflation Factor (VIF) values, all indicators for each variable show values below the critical threshold of 5.00. The NLE Policy Implementation variable (X) has a VIF range between 1.940 and 2.222, Digitalization (M1) ranges between 2.208 and 2.654, Digital Ecosystem Maturity (M2) ranges between 3.300 and 4.255, Openness to Global Best Practices (M3) ranges between 2.044 and 2.325, and Logistics Service Performance (Z) ranges between 2.848 and 3.224. These values indicate that there is no high correlation among indicators within each construct. Therefore, the research model is considered free from multicollinearity issues and is suitable for proceeding to the next stage of analysis.

R-square and Q-square

R-square (R^2) and Q-square (Q^2) are important measures in Structural Equation Modelling–Partial Least Squares (SEM-PLS) for evaluating model performance. R^2 indicates the proportion of variance in the endogenous (dependent) construct explained by exogenous (independent) constructs, where higher values represent stronger explanatory power of the model. Meanwhile, Q^2 assesses the predictive relevance of the model using the blindfolding procedure. A Q^2 value greater than 0 indicates that the model has predictive relevance, demonstrating its ability to predict the observed values of the endogenous constructs.

Table 6
Results of R-Square and Q-Square Testing

Variable	R-Square	Q-Square
Logistics Service Performance (Z)	0.747	0.506

Source: Processed Research Data (2026)

Logistics Service Performance recorded an R^2 of 0.747, indicating that the model explains 74.7% of the variance in the principal endogenous construct. Predictive relevance, assessed through blindfolding, returned a Q^2 of 0.506, well above zero, confirming substantial predictive relevance. It should be noted that this R^2 reflects the joint contribution of all predictors; the total effect attributable specifically to NLE policy implementation is more modest at 0.273 ($t = 6.477$; $p < 0.001$), a distinction developed in the discussion.

Hypothesis Testing Results

Table 7
Hypothesis Testing Results

Variable	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
X -> Z	0.112	0.111	0.034	3.284	0.001
X*M1 -> Z	0.135	0.136	0.028	4.865	0.001
X*M2 -> Z	0.065	0.066	0.027	2.424	0.015
X*M3 -> Z	-0.085	-0.086	0.048	1.783	0.075
M3 -> Z	-0.001	-0.003	0.058	0.010	0.992

Source: Processed Research Data (2026)

Based on the structural model estimation results obtained through the bootstrapping algorithm in Partial Least Squares Structural Equation Modelling (PLS-SEM), the findings are presented as follows:

1) Hypothesis 1: NLE Policy Implementation (X) has a Positive Effect on Logistics Service Performance (Z). Based on the hypothesis testing results, the path coefficient (original sample) is 0.112, indicating a positive relationship. The T-statistic value is 3.284 (> 1.96), and the P-value is 0.001 (< 0.05), demonstrating a statistically significant effect. Therefore, H1 is accepted, indicating that NLE Policy Implementation (X) has a positive and significant effect on Logistics Service Performance (Z).
2) Hypothesis 2: The Effect of NLE Policy Implementation (X) on Logistics Service Performance (Z) is Moderated by Digitalization (M1). Based on the moderation hypothesis testing results,

the interaction coefficient is 0.135, indicating a positive direction. The T-statistic value is 4.865, and the P-value is <0.001, confirming that Digitalization strengthens (amplifies) the causal relationship between NLE Policy Implementation and Logistics Service Performance. Therefore, H2 is accepted, indicating that Digitalization (M1) positively and significantly moderates the effect of NLE Policy Implementation (X) on Logistics Service Performance (Z).

3) Hypothesis 3: The Effect of NLE Policy Implementation (X) on Logistics Service Performance (Z) is Moderated by Digital Ecosystem Maturity (M2). Based on the moderation hypothesis testing results, the interaction coefficient is 0.065. The T-statistic value is 2.424, and the P-value is 0.015 (< 0.05), confirming the role of Digital Ecosystem Maturity as a significant strengthening moderator. Therefore, H3 is accepted, indicating that Digital Ecosystem Maturity (M2) positively and significantly moderates the effect of NLE Policy Implementation (X) on Logistics Service Performance (Z).
4) Hypothesis 4: The Effect of NLE Policy Implementation (X) on Logistics Service Performance (Z) is Moderated by Openness to Global Best Practices (M3). Based on the moderation hypothesis testing results, the interaction coefficient is −0.085, indicating a negative direction. The T-statistic value is 1.783 (< 1.96), with a P-value of 0.075 (> 0.05), indicating that the moderating effect is statistically insignificant. Therefore, H4 is rejected, indicating that Openness to Global Best Practices (M3) does not significantly moderate the effect of NLE Policy Implementation (X) on Logistics Service Performance (Z).

Qualitative Findings: An Overview

The qualitative phase followed an abductive logic, beginning from the quantitative anomaly and interrogating interview transcripts from twenty key informants for mechanisms capable of explaining it. The analysis yielded six thematic domains, visualized in the mind map of qualitative findings (Figure 1), which together represent not a mere illustration but a topological account of institutional relationships, technological barriers, sectoral interests, and capability gaps. These domains confirm that NLE implementation cannot be understood solely as a digital-transformation initiative; it must also be read through the institutional interactions occurring at the operational level. The domains most directly relevant to the moderation anomaly, namely the adoption and implementation gap, the expectation of contextual intervention, and bureaucratic pathology, are examined alongside the quantitative results below, while the remaining domains, concerning market structure and transition risk, lie beyond the scope of the present article and are addressed separately.

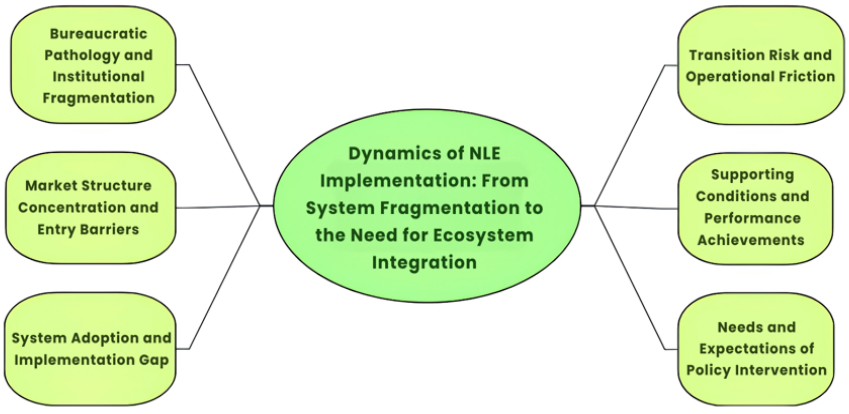

Figure 1. Mind Map of Qualitative Findings on NLE Implementation
Source: Processed Research Data (2026)

Discussion

As an archipelagic nation with an extensive geographical span, Indonesia faces highly complex logistics challenges. Persistent operational inefficiencies, gaps in human resource competencies, rigid bureaucratic procedures, and slow infrastructure equalization have contributed to a high-cost logistics economy, further compounded by resistance within operational level organizational cultures, and reflected in Indonesia's stagnant standing at 61st in

the 2023 Logistics Performance Index. In response, the government introduced the National Logistics Ecosystem (NLE) as a structural intervention conceived not merely as an application portal but as a governance orchestration mechanism intended to integrate digital processes and synchronize cross ministerial regulation. Yet its benefits remain unevenly distributed, concentrated in first tier ports while smaller and more remote ports experience persistent operational friction, indicating that a centralized digitalization policy cannot deliver uniform impact without attention to the institutional and infrastructural conditions governing its local absorption.

The Direct Effect of NLE Implementation on Logistics Service Performance

NLE implementation has a positive and significant effect on logistics service performance ($\beta = 0.112$; $t = 3.284$; $p = 0.001$), indicating that the intervention under Presidential Instruction No. 5 of 2020 functions as more than an administrative formality. By integrating data across customs authorities, terminal operators, shipping agents, and transport providers, NLE reduces information asymmetry and the redundant documentation that has historically inflated logistics costs. The implementation of such integrated management information systems acts as a primary catalyst for reducing operational waste and accelerating service productivity (Hafiz & Nasution, 2024), consistent with evidence that smart-logistics policies generate systemic performance gains (Liu et al., 2024) and that e-logistics capability strongly predicts operational performance (Mai et al., 2022). The total effect of NLE, however, is modest at 0.273, signalling that the policy is necessary but not sufficient as performance depends substantially on complementary institutional and infrastructural conditions, which the moderation analysis specifies.

Digital Readiness as an Amplifying Condition

Two of the three moderators significantly strengthen the relationship between policy and performance. Digitalization amplifies the effect ($\beta = 0.135$; $t = 4.865$; $p < 0.001$). A sophisticated policy design yields substantial gains only where implementing entities possess adequate digital capability, whereas entities with limited capacity instead experience integration requirements as administrative burden. Digital ecosystem maturity likewise strengthens the effect ($\beta = 0.065$; $t = 2.424$; $p = 0.015$), operating at the collective regional level, where ports enjoy stable connectivity and higher digital literacy, NLE translates quickly into responsive service, whereas fragile digital ecosystems produce bottlenecks. This pattern, consistent with evidence that digital capability and ecosystem maturity moderate the effectiveness of logistics policy (Mai et al., 2022; Zhou et al., 2023), and it corresponds directly to the disparity between the west and the east of the country Assessing digital transformation maturity in an archipelagic context reveals that regions with inadequate broadband infrastructure are inherently constrained in their ability to adopt smart logistics platforms (Utama et al., 2024). and this technological disparity is compounded by digital workforce gaps that limit the equitable distribution of policy benefits (Gayatri et al., 2023). The analytical significance of this pattern is comparative. Because digital readiness conditions demonstrably amplify the policy effect, the failure of a third moderator becomes theoretically informative rather than a mere null result.

The Moderation Anomaly: Openness to Global Best Practices

Against that backdrop, openness to global best practices does not significantly moderate the policy performance relationship ($\beta = -0.085$; $t = 1.783$; $p = 0.075$) and, more decisively, its direct effect on performance is statistically negligible ($\beta = -0.001$; $t = 0.010$; $p = 0.992$). This dual null result provides a boundary condition for institutional theory (DiMaggio & Powell, 1983). The mechanism of mimetic isomorphism, which assumes that domestic ecosystems automatically gain advantage by imitating international standards such as green port protocols and global certifications, does not operate effectively in the Indonesian context. The pursuit of international legitimacy alone is insufficient to strengthen policy effectiveness at the operational level.

Analytically, this failure reflects a decoupling between formally adopted standards and actual operational routines. The Project Map for the adoption and implementation gap (Figure 2) shows that systems are connected to the central platform while processes at the field level remain substantially unchanged, and that interoperability with other technical ministries persists as a

barrier. International standards are thus adopted formally to secure legitimacy but not internalized into practice, because the domestic conditions for internalization are absent. A regulator articulated this directly:

> *"We are forced to comply with international standards, yet on the ground even the electricity frequently cuts out and the signal comes and goes. It would be better to fix the basic infrastructure first."* (Informant 5, regulator)

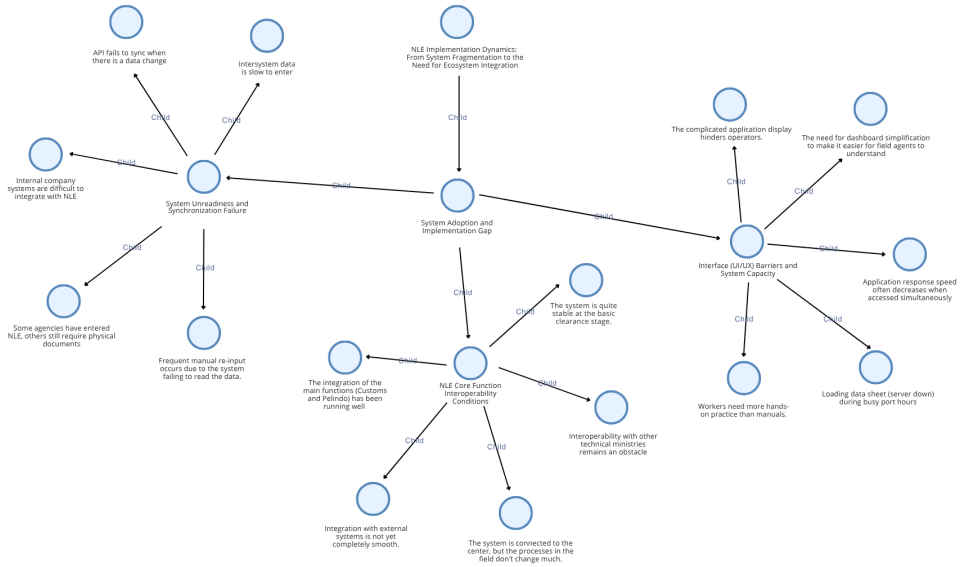

Figure 2. Project Map: Adoption and Implementation Gap
Source: Processed Research Data (2026)

The problem lies not in disregard for international practice but in the gap between global requirements and basic domestic capacity. The Project Map for expectations of policy intervention (Figure 3) reinforces this: informants voiced concern that global standards could disadvantage local actors not yet ready, and pointed to disparities in internet quality between ports in Java and those beyond it. An IT practitioner corroborated the uneven readiness:

> *"Technical disruptions such as errors and server downtime often occur, especially in regions where digital infrastructure is uneven. This slows down services."* (Informant 15, IT practitioner)

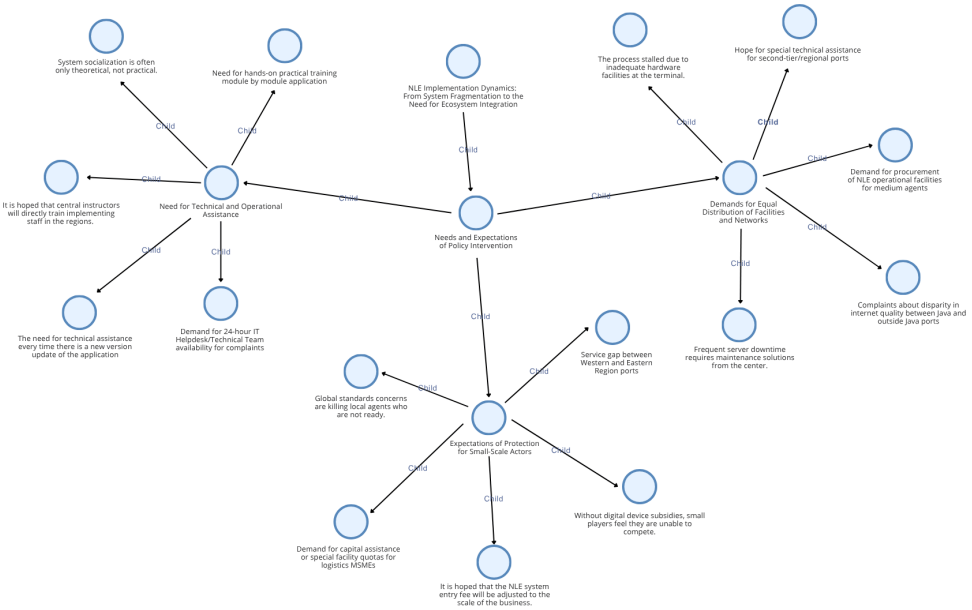

Figure 3. Project Map: Expectations of Policy Intervention
Source: Processed Research Data (2026)

This interpretation aligns with scholarship on institutional duality, which holds that organizations subject simultaneously to global norms and local institutional environments tend toward symbolic rather than substantive adoption (Kostova & Roth, 2002), and with accounts of Indonesian bureaucratic reform in which entrenched sectoral interests and fragmented authority repeatedly obstruct implementation (Turner et al., 2022). The Project Map for bureaucratic pathology (Figure 4) makes these conditions explicit, foregrounding strong sectoral egos, resistance to relinquishing manual authority, asymmetric implementer capacity, and uneven digital readiness. For most secondary ports, adopting global standards offers limited immediate value while fundamental challenges such as network instability and rigid local procedures persist. Locally adaptive capabilities contribute more to performance than the direct adoption of external standards. As Song et al. (2024) emphasize, a smart port ecosystem cannot rest on software availability alone but requires fundamental harmonization of procedures and organizational change management.

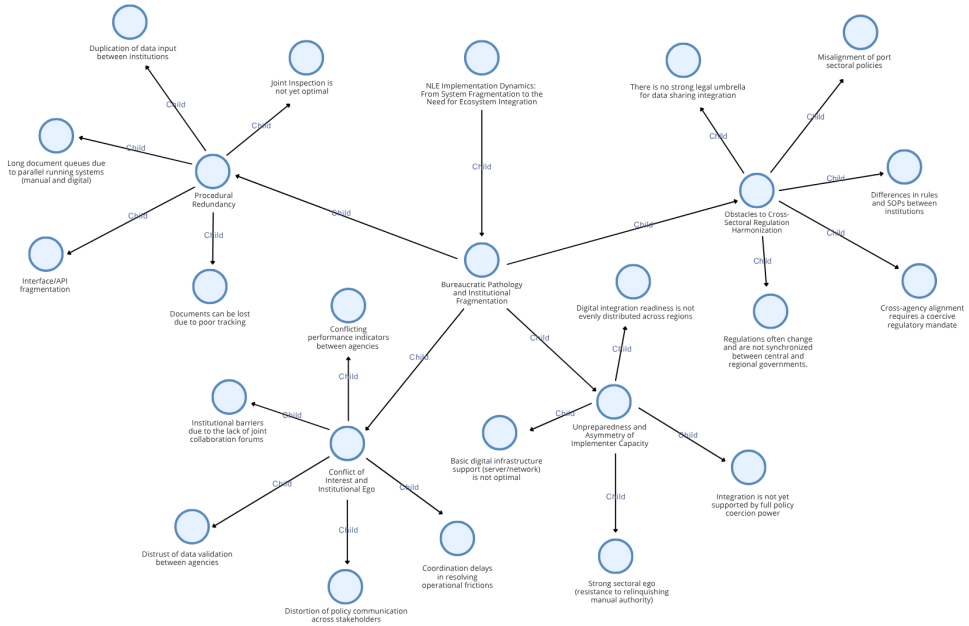

Figure 4. Project Map: Bureaucratic Pathology
Source: Processed Research Data (2026)

The integration of findings converges on the conclusion that NLE is more than a software platform or a set of digital regulations. A regulator noted that although complex bureaucracy still hinders system integration, the shift to online document processing and payment under NLE has drastically reduced physical interaction with officials and, with it, the scope for illicit charges (Informant 12, regulator). This confirms that collaborative governance restructuring is the principal mechanism through which policy is converted into tangible performance, a mechanism that global standardization, absent domestic readiness, cannot substitute for. These bureaucratic pathologies underscore the reality that national cultural contexts, including organizational conservatism and high-power distance within local authorities, act as formidable barriers to logistics performance and cannot be bypassed simply by mandating international compliance (Kesavan & Deif, 2021).

The strategic implication is a sequenced approach that prioritizes domestic needs. Rather than emphasizing global standardization while soft infrastructure remains underdeveloped, national priorities should first strengthen internal capabilities by improving bureaucratic governance, raising human resource competencies, and developing a mature domestic digital ecosystem. Only once these prerequisites are met can adherence to international standards translate into operational performance, consistent with the view that global knowledge transfer depends on the maturity of internal organizational and institutional capabilities (Beamish & Chakravarty, 2021). In this sense, Institutional Decoupling is not merely a diagnostic label but a directional principle. Domestic capability precedes external standardization.

Theoretical Implications

This study contributes to institutional theory by identifying Institutional Decoupling as a boundary condition on the mechanism of isomorphism in the context of digital logistics transformation in archipelagic developing economies. Classical formulations hold that organizations facing uncertainty imitate practices perceived as legitimate, and that such imitation confers both legitimacy and, ultimately, performance advantage (DiMaggio & Powell, 1983). The present findings qualify that expectation. Where domestic institutional and infrastructural prerequisites are absent, the pursuit of global best practices and international legitimacy remains ceremonial rather than substantive, echoing the classical observation that formal structures may be adopted as myth and ceremony while operational activity proceeds along separate lines (Meyer & Rowan, 1977).

Subsequent scholarship has refined this insight by distinguishing decoupling between policy and practice, in which adopted policies are not implemented, from decoupling between means and ends, in which policies are implemented but fail to produce their intended outcomes (Bromley & Powell, 2012; Wijen, 2014). The present findings correspond to the former, since international standards are formally adopted yet are not translated into routines at the field level. Organizations do not, however, respond uniformly to institutional pressure. Available responses range from acquiescence through compromise and avoidance to defiance and manipulation (Oliver, 1991). Where domestic capacity is weak, avoidance in the form of ceremonial conformity becomes the least costly response, since substantive compliance would demand resources that many actors do not command. First, it specifies the conditions under which such decoupling persists in a policy ecosystem rather than within a single organization, namely fragmentation across agencies and pronounced infrastructure disparity within the nation, thereby extending a body of work that has concentrated on the organizational level. Second, it demonstrates that a decoupled condition is detectable not only through qualitative inquiry but as a dual null effect in a structural model, where an externally oriented construct exerts neither a moderating nor a direct influence on performance. This second contribution offers a measurable signature of decoupling that future quantitative work may apply in other policy settings.

The study also extends the literature on institutional duality, originally developed in the context of multinational subsidiaries facing simultaneous home and host institutional pressures (Kostova & Roth, 2002). In the present case, the competing pressures arise not from two national jurisdictions but from the tension between international standardization regimes and a domestic institutional environment that is itself internally uneven, suggesting that duality may be generated within a single national setting where institutional capacity is unevenly distributed. Finally, it contributes to public-policy implementation scholarship by showing that external standardization cannot substitute for internal ecosystem readiness. Evidence that institutional quality conditions the success of national policy reform in Indonesia (Jazuli et al., 2022) supports this reading, and the present study specifies the mechanism through which that conditioning operates, namely that a digital logistics policy translates into superior service performance only when grounded in integrated local governance, operational efficiency, and competence of human resources.

Managerial Implications

The findings direct policymakers, regulators, and logistics stakeholders toward a sequenced approach that establishes domestic readiness before pursuing external standardization. Rather than enforcing global standardization prematurely, which produces Institutional Decoupling where local capacity is absent, intervention should proceed in three stages.

In the first stage, governance harmonization should take priority. This requires a single legal framework that consolidates sectoral regulations governing port logistics, supported by mandatory application programming interface integration between ministerial systems and the NLE platform, so that inter agency fragmentation is addressed structurally rather than through coordination appeals. The Coordinating Ministry for Economic Affairs, as policy orchestrator, and the National Single Window authority, as platform manager, are the actors positioned to lead this consolidation.

In the second stage, capability building should be pursued alongside infrastructure equalization. Human resource competence can be strengthened through nationally standardized digital competency certification, progressively positioned as a prerequisite for logistics business licensing, while investment should prioritize second tier and eastern ports where connectivity gaps are most severe. Because the moderation analysis shows that digital readiness governs whether policy translates into performance, this stage is not preparatory but causal: without it, subsequent measures cannot work.

In the third stage, and only after the preceding prerequisites are met, compliance instruments may be tightened. Service access restrictions or administrative penalties for entities that remain unintegrated are defensible once infrastructure has been equalized, but applying them earlier would penalize ports for conditions beyond their control. This sequencing constraint is itself a finding of the study rather than an administrative preference.

Progress can be monitored through indicators aligned with the mechanisms identified here: the proportion of ministerial systems fully integrated through the platform, the gap in system reliability between first tier and second tier ports, and the share of operational personnel holding digital competency certification. Establishing internal operational readiness in this sequence allows the subsequent adoption of international standards to translate into genuine performance improvement rather than formal compliance alone.

CONCLUSION

This study demonstrates that implementation of the National Logistics Ecosystem (NLE) policy exerts a positive and significant effect on logistics service performance, and that this effect is amplified by organizational digitalization and regional digital-ecosystem maturity, both of which function as significant strengthening moderators. In contrast, openness to global best practices does not significantly moderate performance, and its direct effect is statistically negligible. Qualitative analysis attributes this anomaly to Institutional Decoupling, driven by structural impediments such as inter agency sectoral egos and pronounced infrastructure disparities between ports in western and eastern Indonesia. The finding confirms that, absent foundational domestic bureaucratic harmonization, international standards remain ceremonial and lose operational relevance in the local context. The practical implication is a sequenced intervention that prioritizes domestic readiness, coupling regulatory measures to dismantle sectoral silos with systematic investment in digital literacy and human resource capacity, so that internal capability is established before external standardization is pursued. In this sense, Institutional Decoupling functions not only as a diagnosis but as a directional principle for reform in archipelagic logistics systems.

This study has several limitations. Its scope is confined to the Indonesian logistics ecosystem, and both the quantitative sample and the qualitative informants are drawn predominantly from large, established organizations, which warrants caution in generalizing the findings to smaller actors and to other national contexts. In addition, the assessment of cultural variables and bureaucratic resistance rests on qualitative and interpretive judgement. Future research should employ longitudinal designs, broaden the empirical sample to include smaller operators and a wider range of stakeholders, and examine the effect of digital logistics policy across specific industry segments or regions marked by severe infrastructure disparity. Such work would support the development of a more comprehensive and adaptive intervention model for archipelagic supply chains.

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AUTHOR CONTRIBUTION STATEMENT

Ibnu Romadhona contributed to the conceptualization, research design, literature review, data analysis, and preparation of the original manuscript. Rully Indrawan contributed to the development of the theoretical framework, methodology, validation, and critical review of the manuscript. Euis Saribanon contributed to data interpretation, research refinement, and manuscript editing. Siti Maemunah contributed to supervision, technical evaluation, and final manuscript review.

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