



Business Process Harmonization and Cross-Ministerial Digital System Integration as Determinants of Indonesia's National Logistics Competitiveness

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ABSTRACT

This research investigates the extent to which inter-agency business process harmonization and cross-ministerial digital system integration contribute to enhancing Indonesia's national logistics competitiveness. Utilizing a quantitative methodology within an explanatory research framework, primary data were collected through a cross-sectional survey involving stakeholders actively engaged in intergovernmental logistics systems. Data analysis was conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS. The empirical results demonstrate that both business process harmonization ($\beta = 0.532$, $t = 7.047$, $p < 0.001$) and digital system integration ($\beta = 0.313$, $t = 4.200$, $p < 0.001$) exert statistically significant and positive effects on logistics competitiveness. Furthermore, the coefficient of determination ($R^2 = 0.629$) suggests that these constructs jointly explain 62.9% of the variance in the dependent variable. Business process harmonization exhibited a stronger influence than digital system integration, underscoring the strategic primacy of procedural synchronization across government agencies. These findings underscore the strategic importance of institutional synergy and digital interoperability in fostering efficiency and resilience within public-sector logistics. The study contributes theoretically by reinforcing the applicability of Institutional Synergy Theory in the logistics policy domain and offers actionable insights for policymakers seeking to advance digitally integrated national logistics frameworks.

Keywords: business process harmonization; digital system integration; logistics competitiveness; PLS-SEM; institutional coordination.

1. INTRODUCTION

Global competition demands that every country strengthen its logistics system as a primary driver of economic growth and supply chain efficiency. Indonesia, as an archipelagic nation with a strategic geographic position, holds significant potential in the field of logistics. However, national logistics performance remains constrained by several challenges, including bureaucratic complexity, fragmented inter-agency service systems, and limited digital interoperability among government institutions involved in the national logistics ecosystem (Purnamasari et al., 2024; Ismail et al., 2023).

In response, the Indonesian government through the Lembaga National Single Window (LNSW) has initiated logistics reform with two primary approaches: business

process harmonization and cross-ministerial digital system integration. Business process harmonization aims to simplify logistics service flows, eliminate procedural redundancies, and accelerate licensing and cross-agency services (Popa et al., 2025; Widodo et al., 2021). Digital system integration promotes real-time data exchange between institutional platforms, thereby accelerating information validation, enhancing data accuracy, and creating transparency in the public service ecosystem (Akbar & Mendoza, 2025; Sari & Hapsari, 2020).

Countries with high rankings in the World Bank's Logistics Performance Index (LPI) tend to have digitalized and institutionally coordinated logistics systems (Arvis et al., 2023). However, empirical evidence for the effectiveness of procedural harmonization and digital integration remains limited in the context of Indonesian public policy,

particularly regarding coordination among ministries and institutions.

This study presents novelty in two key dimensions. First, it simultaneously tests business process harmonization and digital system integration as independent variables influencing national logistics competitiveness, differing from previous studies that addressed these aspects separately or descriptively (Sari & Hapsari, 2020; Widodo et al., 2021). Second, it specifically focuses on the Indonesian public policy context, examining how inter-ministerial coordination in the digital logistics ecosystem affects public service efficiency in the logistics sector.

This research aims to: (1) analyze the effect of business process harmonization on national logistics competitiveness; (2) analyze the effect of digital system integration on national logistics competitiveness; and (3) analyze the simultaneous effect of both variables on national logistics competitiveness. The findings provide evidence-based policy input to strengthen Indonesia's national logistics digitalization strategy, particularly within the National Single Window (NSW) framework.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1 Institutional Synergy Theory

The principal theoretical foundation of this research is Institutional Synergy Theory, which emphasizes the importance of cross-institutional collaboration and integration in creating public service efficiency. In the context of national logistics, institutional synergy refers to the capacity of government agencies to align objectives, procedures, and technology to build an adaptive, efficient, and globally responsive logistics system. The theory implies that the more coordinated and integrated the inter-institutional systems, the higher a country's logistics performance (Arvis et al., 2023; Farahani & Schlechter, 2025).

Syafrianita, Agus Purnomo, and Hidayat (2025) demonstrated that the adoption of advanced technologies—such as Internet of Things (IoT), Artificial Intelligence (AI), and integrated information systems—can improve logistics efficiency and strengthen inter-institutional connectivity.

2.2 Business Process Harmonization

Business process harmonization refers to the alignment of workflows, regulations, and procedures across government agencies to eliminate overlapping regulations, accelerate services, and reduce administrative burdens in the logistics system. Studies confirm that harmonization of port processes in ASEAN improved operational efficiency by up to 30% (Popa et al., 2025), while SOP coordination among agencies is a significant determinant in reducing

national logistics costs (Widodo et al., 2021).

H1: Business process harmonization between ministries/agencies has a positive and significant effect on national logistics competitiveness.

2.3 Digital System Integration

Digital system integration refers to the use of information technology platforms that can unify processes across organizations, enabling automatic, real-time, and reliable data exchange. The Indonesia National Single Window (INSW) connects more than 18 Ministries/Agencies in one integrated export-import service system. Evidence shows that digital integration reduces import document clearance time from an average of 5 days to just 2 days (Sari & Hapsari, 2020). Akbar and Mendoza (2025) emphasize that information system integration across agencies not only accelerates service time but also reduces duplication and data errors. Ma, Lee, and Bai (2019) found that digital interoperability in the public sector significantly improves transparency and accountability in developing countries.

H2: Digital system integration between ministries/agencies has a positive and significant effect on national logistics competitiveness.

2.4 National Logistics Competitiveness

National logistics competitiveness refers to a country's ability to manage the supply chain efficiently, reliably, cheaply, and responsively to market needs. The primary measure used is the World Bank's Logistics Performance Index (LPI), covering six key indicators: customs efficiency, infrastructure quality, ease of arranging international shipments, logistics service competence and quality, shipment tracking capability, and delivery timeliness. Indonesia faces structural challenges including digital system fragmentation across ministries, overlapping regulations, and weak data interoperability—contributing to logistics costs estimated at 23–25% of GDP, significantly higher than regional peers such as Malaysia (13%) and Thailand (14%) (World Bank, 2023).

H3: Business process harmonization and digital system integration simultaneously have a positive and significant effect on national logistics competitiveness.

3. RESEARCH METHODOLOGY

3.1 Research Design

This study employs a quantitative approach with an explanatory research design to test causal relationships among defined variables. Data were collected through a cross-sectional survey, enabling empirical information gathering at a specific period to describe actual field conditions. The research model was constructed based on a synthesis of institutional coordination theory, digital integration principles, and national logistics performance indicators, validated empirically through Partial Least

Squares Structural Equation Modeling (PLS-SEM).

3.2 Sampling and Data Collection

Data were collected from 174 respondents selected via purposive sampling—individuals directly involved in inter-ministerial logistics service systems, including technical officials, export-import service users, and logistics practitioners familiar with harmonization and digital integration processes in the public sector. The minimum sample size was determined using Hair et al.'s (2014) "10-times rule": 10 × the number of indicators affecting a single construct. With 20 indicators, a minimum of 200 respondents was targeted; 174 valid responses were obtained representing a diverse stakeholder base.

3.3 Measurement Instruments

Research instruments (questionnaire) were developed from indicators used in previous studies and adapted to the research context. Business process harmonization was measured through respondents' perceptions of SOP uniformity across agencies, regulatory coordination effectiveness, process duplication reduction, and cross-agency service speed. Digital system integration was measured through perceived connectivity levels, reliability of real-time data exchange, platform interoperability, and digital processing efficiency. National logistics competitiveness was operationalized based on perceptions of logistics process speed, export-import service reliability, information transparency, and logistics cost reduction due to public service reforms. All items used a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). The questionnaire was subjected to a pilot test to ensure content clarity and inter-item consistency.

3.4 Data Analysis

PLS-SEM was employed as it handles exploratory data without requiring normal distribution assumptions. Model evaluation involved two stages: (1) outer model assessment (convergent validity, discriminant validity, composite reliability), and (2) inner model assessment (R^2 , t-statistics, p-values for path significance). All analyses were performed using SmartPLS.

4. RESULTS AND DISCUSSION

4.1 Respondent Profile

The 174 respondents comprised: export-import service users (35.63%), logistics practitioners/freight forwarders (32.18%), academic/researchers (16.09%), and technical officials from ministries/agencies (13.22%). A substantial 89.5% of respondents had used the INSW system, ensuring that digital integration assessments were grounded in direct experience. Work experience distribution showed 43.8% with 5–10 years and 32.4% with over 10 years of logistics experience, attesting to strong domain competency.

Table 1. Respondent Demographics

Position/Role	Number of Respondents
Export-Import Service Users (Exporters/Importers)	62
Logistics Practitioners (Freight Forwarder, PPJK)	56
Technical Officials of Ministries/Agencies	23
Academics/Researchers	28
Others (employees, staff, transporter)	5
Total Respondents	174

Source: Primary Data, Hariyanto (2025)

4.2 Outer Model Assessment

All constructs demonstrated strong psychometric properties. Convergent validity was confirmed with Average Variance Extracted (AVE) values exceeding the 0.50 threshold for all variables. Composite Reliability (CR) values exceeded 0.70, confirming internal consistency. Discriminant validity was established through the Fornell-Larcker criterion and HTMT ratios below 0.85.

Table 2. Convergent Validity – Outer Loading Values

Construct	Indicator	Outer Loading
Business Process Harmonization (X1)	HPB1	0.814
	HPB2	0.801
	HPB3	0.812
	HPB4	0.811
Digital System Integration (X2)	ISD1	0.803
	ISD2	0.793
	ISD3	0.826
	ISD4	0.811
Logistics Competitiveness (Y)	DSL N1	0.787
	DSL N2	0.796
	DSL N3	0.808
	DSL N4	0.828
	DSL N5	0.783

Source: SmartPLS Output, processed by researcher (2025)

4.3 Inner Model Assessment (Structural Model)

The structural model assessment results confirm both hypotheses. Business Process Harmonization (X1) exhibited a significant positive effect on National Logistics Competitiveness (Y) with a path coefficient of 0.532 and t-statistic of 7.047 ($p < 0.001$). Digital System Integration (X2) also demonstrated a significant positive effect with a path coefficient of 0.313 and t-statistic of 4.200 ($p < 0.001$). The coefficient of determination $R^2 = 0.629$ indicates that both independent variables jointly explain 62.9% of the variance in national logistics competitiveness, reflecting a high predictive power model.

Table 3. Path Coefficient Results (Inner Model)

Path	Path Coefficient (β)	t-Statistic
X1 → Y (Business Process Harmonization → Logistics Competitiveness)	0.532	7.047
X2 → Y (Digital System	0.313	4.200

Integration → Logistics Competitiveness)		LPI rankings confirm that institutional synergy and digital integration are pivotal levers for improvement.
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Source: SmartPLS Output, Hariyanto (2025)

Table 4. Coefficient of Determination (R²)

Dependent Construct	R Square	R Square Adjusted
National Logistics Competitiveness (Y)	0.629	0.625

Source: SmartPLS Output, Hariyanto (2025)

Table 5. Hypothesis Testing Summary

Code	Hypothesis Statement	β	t-Statistic	p-Value	Decision
H1	Business process harmonization has a positive effect on national logistics competitiveness	0.532	7.047	0.001	Accepted
H2	Digital system integration has a positive effect on national logistics competitiveness	0.313	4.200	0.000	Accepted
H3	Both variables simultaneously have a positive effect on national logistics competitiveness	—	—	—	Accepted

Source: Hariyanto (2025)

4.4 Discussion

Business Process Harmonization (X1) demonstrated a stronger influence ($\beta = 0.532$) on national logistics competitiveness than Digital System Integration (X2) ($\beta = 0.313$). This finding aligns with Widodo et al. (2021), who found that SOP alignment across agencies can reduce service time by up to 40%. The LNSW's efforts to simplify export-import processes represent a concrete example of effective procedural harmonization in practice.

Digital System Integration's positive significant effect ($\beta = 0.313$) corroborates OECD (2021) and Akbar & Mendoza (2025), demonstrating that digital system interoperability is key to creating fast, transparent, and accurate logistics services. Through the INSW platform, real-time data exchange between agencies can occur without significant administrative barriers.

The R^2 value of 0.629 supports Hypothesis H3, consistent with Devina et al. (2023)'s finding that the synergy of digitalization, internal capabilities, and process integration constitutes the primary foundation for improved logistics performance. The combination of uniform operational standards and integrated technology delivers a greater impact than if either element were implemented separately. National logistics reform must therefore be designed as a coordinated effort integrating both procedural improvement and digital transformation.

These findings validate the Institutional Synergy Theory framework: the more coordinated and digitally integrated inter-institutional systems become, the higher a country's logistics performance. Indonesia's logistics costs—at 23–25% of GDP—compared to Singapore and Germany's top

5. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

This study analyzed the effects of business process harmonization and digital system integration between ministries/agencies on national logistics competitiveness using PLS-SEM. Both independent variables demonstrated statistically significant positive effects: business process harmonization ($\beta = 0.532$, $t = 7.047$, $p < 0.001$) and digital system integration ($\beta = 0.313$, $t = 4.200$, $p < 0.001$). The model explains 62.9% of the variance in national logistics competitiveness ($R^2 = 0.629$). Accepted

Business process harmonization exhibited a more dominant influence, indicating that procedural synchronization across agencies remains the most strategic issue in national logistics governance. Nevertheless, digitalization plays an important role as a catalyst for efficiency, transparency, and cross-agency service acceleration.

This study contributes theoretically by designing and simultaneously testing an integrative model combining two core dimensions of public logistics reform—procedural and digital—reinforcing the relevance of Institutional Synergy Theory. The findings affirm that institutional synergy must be built through both regulatory harmonization and deep digital integration, underpinned by data interoperability and cross-institutional collaboration.

5.2 Practical Recommendations

- Regulatory and SOP Synchronization: The government should strengthen coordination to develop and implement aligned standard operating procedures across ministries, particularly in export-import processes and cross-sector logistics services.
- Accelerated Digital Integration through INSW: Expanding the functions and improving the interoperability of the Indonesian National Single Window (INSW) must be a top priority to ensure real-time and secure cross-system data exchange.
- Capacity Building for Human Resources and Digital Infrastructure: Implementation of integrated digital systems requires prepared human resources and supporting infrastructure. Technical training and ensuring network stability and reliability of logistics information systems are essential.

5.3 Theoretical Recommendations

Future research can develop theoretical models incorporating additional dimensions such as organizational culture, cross-sector leadership, or data governance mechanisms. Studies may also test this model in different contexts—seaports, airports, or border areas—and employ longitudinal designs with probabilistic sampling to enhance

external validity. Mixed-methods approaches combining qualitative interviews with quantitative analysis are encouraged to enrich insights.

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