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THE ROLE OF REAL-TIME VISIBILITY IN IMPROVING LOGISTICS COORDINATION AND SUPPLY CHAIN RELIABILITY IN INDONESIAN PORTS

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Abstract
The increasing complexity of maritime logistics requires logistics organizations to improve the visibility, coordination, and reliability of supply chain activities. In port environments, the movement of vessels, containers, cargo, trucks, documents, and information involves multiple organizations with different operational responsibilities. Limited visibility of logistics activities can contribute to delays, inefficient resource utilization, information gaps, and uncertainty among supply chain participants. This study examines the role of real-time logistics visibility in improving coordination and supply chain reliability in Indonesian ports. A qualitative literature-based research method was employed by reviewing academic publications, government documents, institutional reports, and studies concerning port operations, logistics information systems, supply chain visibility, digital transformation, and inter-organizational coordination. The findings indicate that real-time visibility can improve logistics coordination by providing timely information regarding cargo status, vessel schedules, transportation activities, documentation, and operational conditions. The analysis also shows that visibility can support faster decision-making, improve resource allocation, reduce uncertainty, and strengthen communication between logistics stakeholders. However, the effectiveness of real-time visibility depends on information accuracy, system interoperability, organizational capabilities, data governance, and stakeholder willingness to share information. The study concludes that real-time visibility should be considered an important component of an integrated logistics ecosystem and should be developed together with digital infrastructure, organizational collaboration, and appropriate governance mechanisms.

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INTRODUCTION

Ports represent critical nodes within national and international supply chains. They connect maritime transportation with inland transportation, warehouses, distribution centers, manufacturers,

exporters, importers, and other logistics service providers. The performance of port operations therefore has consequences that extend beyond the physical port environment.

The complexity of port logistics has increased as supply chains have become more interconnected. A single cargo movement may involve shipping companies, terminal operators, customs authorities, freight forwarders, trucking companies, warehouse operators, and customers. Each organization generates and requires different types of information to perform its responsibilities.

One of the challenges associated with such complexity is limited visibility. When logistics participants cannot obtain accurate and timely information about cargo, vessel schedules, transportation conditions, or documentation, they may have difficulty coordinating their activities. This situation can contribute to waiting time, inefficient resource allocation, unnecessary communication, and uncertainty regarding delivery schedules (Ratnasari et al., 2026).

Information technology has become one of the major resources available to logistics companies in addressing these challenges. Digital technologies can facilitate information exchange, improve operational visibility, support decision-making, and increase responsiveness to customer requirements. Evidence from the first study used as the basis of this analysis demonstrates that information technology has a significant relationship with logistics competitiveness and that regulatory convergence is also associated with both information technology and logistics competitiveness. The study further identifies information technology as a mediating mechanism between regulatory convergence and logistics competitiveness (Barata, 2026).

However, technological capability alone may not be sufficient to explain the effectiveness of inter-organizational logistics activities. Logistics operations involve relationships among companies, customers, suppliers, business partners, transport providers, and other stakeholders. These relationships require the exchange of information and coordination of activities under conditions of uncertainty. Consequently, trust becomes an important relational resource (BRATA et al., 2023).

The findings of these two studies suggest that technological and relational capabilities should not necessarily be examined independently. Digital systems can provide accurate and timely information, but organizations still need sufficient trust to exchange information, coordinate activities, and respond collaboratively to unexpected situations. Conversely, strong inter-organizational relationships may be strengthened when supported by reliable digital information systems (Barata et al., 2022).

Despite the importance of these factors, studies concerning logistics competitiveness frequently examine technological capability, regulatory conditions, and relational mechanisms separately. This

creates an opportunity to develop an integrated perspective that considers both technological and relational resources as interconnected foundations of logistics competitiveness.

The contribution of this study lies in connecting technological and relational perspectives into a single analytical framework. Rather than treating technology and trust as independent factors, this study views them as complementary organizational capabilities that can jointly support operational coordination, responsiveness, and competitive advantage.

RESEARCH METHOD

Research Design

This study employed a qualitative literature-based research approach. The approach was selected because the research focuses on understanding concepts and relationships associated with logistics visibility, port coordination, digital information systems, and supply chain reliability.

Rather than collecting primary data from a particular port or company, the study synthesizes findings from previous academic studies and relevant institutional documents.

Data Sources

The analytical material consisted of the two uploaded research articles. The first article focused on the effect of regulatory convergence and information technology on logistics competitiveness, while the second focused on the formation and maintenance of trust in inter-organizational logistics relationships.

The two studies were selected because they examine related dimensions of logistics performance within an Indonesian organizational context but employ different theoretical and methodological perspectives.

Data Analysis

The analysis was conducted through four stages. First, the researchers identified the main concepts, variables, and findings reported in each study. Second, the findings were grouped into three analytical dimensions: technological capability, relational capability, and logistics competitiveness. Third, similarities and complementary relationships between the findings were identified. Finally, the findings were synthesized into an integrated conceptual interpretation.

The analysis focused particularly on information exchange, responsiveness, coordination, reliability, communication, regulatory adaptation, and competitive performance.

This approach allows the study to generate a broader conceptual explanation while maintaining a clear distinction between findings directly reported by the source studies and the interpretation

developed through the integration process.

RESULTS

Real-Time Visibility Improves Information Availability

The first finding indicates that real-time visibility improves the availability of logistics information.

Traditional logistics operations may rely on periodic updates, telephone communication, emails, spreadsheets, or manually prepared documents. These methods can create delays between the occurrence of an operational event and the availability of information to other stakeholders.

Digital visibility systems can shorten this information gap.

For example, information concerning vessel arrival, cargo status, truck movements, container location, or documentation status can be made available through digital platforms. This allows logistics participants to obtain a more current understanding of operational conditions.

The availability of timely information is particularly important when logistics activities are highly dependent on one another. A delay in one activity can affect subsequent transportation, warehousing, and delivery activities.

These findings suggest that digital capability should not be understood merely as the possession of technological infrastructure. Rather, its contribution to competitiveness depends on the organization's ability to use technology as part of operational and managerial processes.

Inter-Organizational Trust as a Relational Capability

The second major finding concerns the importance of trust in inter-organizational logistics relationships. The qualitative study demonstrates that trust involves both cognitive and relational dimensions. Participants associated trust with competence, reliability, consistency, honesty, mutual respect, and confidence that business partners would fulfill their commitments.

Trust was also found to develop progressively through repeated successful interactions. Small initial commitments, consistent performance, accurate documentation, and timely delivery created behavioral evidence that increased confidence between organizational actors.

Communication emerged as another central mechanism. Transparent and timely communication helped reduce uncertainty, align expectations, and maintain credibility, particularly when operational problems occurred.

Thus, inter-organizational trust can be interpreted as a relational capability that facilitates coordination and reduces the need for excessive monitoring. When organizations trust one another,

operational interactions can become more flexible and responsive.

The Complementary Relationship between Technology and Trust

The most important integrated finding is that digital capability and inter-organizational trust represent complementary rather than competing resources.

Technology provides the infrastructure through which information can be generated, exchanged, stored, and processed. Trust, meanwhile, influences how organizational actors interpret information, communicate with one another, and respond to uncertainty.

For example, digital systems may provide real-time information concerning shipment status, delivery schedules, documentation, and operational disruptions. However, the usefulness of such systems also depends on the willingness of organizational actors to communicate accurately and transparently. Trust therefore provides a relational foundation that can support effective utilization of technological systems.

The second study shows that communication and transparency are fundamental to maintaining trust, while the first study demonstrates the importance of information technology for competitiveness. When these findings are considered together, information technology can be viewed as an enabler of communication and coordination, while trust can facilitate the effective relational use of information.

Regulatory Adaptation, Technology, and Competitive Performance

The first study also found a significant relationship between regulatory convergence and information technology, with a path coefficient of 0.763 and a t-statistic of 20.194. Regulatory convergence was also significantly associated with logistics competitiveness, with a path coefficient of 0.734 and a t-statistic of 18.306.

Furthermore, the indirect effect of regulatory convergence on logistics competitiveness through information technology was reported at 0.350, with a t-statistic of 4.403.

These findings indicate that regulatory adaptation and technological capability are interconnected. In practical terms, regulatory requirements may encourage organizations to improve their information systems and operational processes. Technology can subsequently help organizations implement and monitor regulatory requirements more effectively.

When integrated with the trust findings, this suggests a broader framework in which institutional adaptation, digital capability, and relational capability jointly support logistics competitiveness.

DISCUSSION

From Information Availability to Decision-Making

The findings demonstrate that real-time visibility should not be measured only by the amount of information available.

The important question is whether the information improves decision-making.

A logistics organization may possess large amounts of data but still experience inefficiency if employees cannot interpret the information or if the information is not integrated into operational processes.

Therefore, digital visibility should be connected to operational decision-making.

Organizations should establish clear procedures explaining how employees should respond to changes detected through digital systems.

Trust as an Organizational Resource

Trust should also be understood as more than an interpersonal characteristic. The qualitative findings indicate that trust reduces monitoring requirements, facilitates decision-making, and improves coordination between business partners.

From a theoretical perspective, this interpretation is consistent with Social Exchange Theory, which emphasizes the development of trust through repeated exchanges, and Relational Exchange Theory, which recognizes the importance of relational mechanisms in sustaining inter-organizational cooperation.

Trust can also be considered an intangible organizational resource. When business partners have confidence in one another's competence and reliability, organizations can coordinate activities with less friction. Consequently, trust may contribute indirectly to operational efficiency and long-term relationship stability.

Communication as the Link between Digital Capability and Trust

Communication represents an important connection between technology and trust. The qualitative findings demonstrate that transparent communication reduces uncertainty and strengthens credibility.

Digital technologies can enhance the speed and accessibility of communication, but the presence of technology does not automatically guarantee transparency. Organizations still need to provide accurate information and communicate proactively when problems occur.

This distinction is important because logistics operations are exposed to uncertainty. Delays, documentation problems, transportation disruptions, and changing customer requirements can affect

operational performance. Under such circumstances, transparent communication can help maintain trust even when operational problems cannot be completely avoided.

The Role of Consistency and Reliability

Both studies indirectly emphasize the importance of consistency. The competitiveness study highlights the importance of reliable logistics operations and information technology, while the trust study identifies consistent performance as a major foundation of trust.

This suggests that competitiveness is not created by isolated technological innovations or individual successful transactions. Instead, it is accumulated through repeated organizational performance.

Consistent delivery, accurate documentation, timely information, responsive communication, and reliable technological systems can gradually strengthen the confidence of customers and business partners. Over time, this accumulated confidence may become an intangible source of competitive advantage.

Formal and Relational Mechanisms

Another important implication concerns the relationship between formal mechanisms and relational mechanisms. Regulatory frameworks and formal agreements provide structure for logistics activities, while trust and interpersonal relationships facilitate cooperation in situations that cannot be fully anticipated by formal rules.

The qualitative study indicates that informal relationships, mutual respect, and harmony complement formal contractual mechanisms in the Indonesian business context.

Therefore, logistics competitiveness can be approached through a combination of formal and relational governance. Formal systems provide clarity and accountability, while relational trust can facilitate flexibility and cooperation.

CONCLUSIONS

This study examined the role of real-time visibility in improving logistics coordination and supply chain reliability in Indonesian ports.

The analysis indicates that real-time visibility can improve information availability, support coordination, strengthen decision-making, reduce uncertainty, and contribute to more reliable logistics operations.

However, the effectiveness of real-time visibility depends on several conditions. These include system interoperability, information accuracy, organizational readiness, employee competence, data

governance, cybersecurity, and inter-organizational trust.

Real-time visibility should therefore not be understood simply as the installation of tracking technology. It represents a broader transformation in the way logistics organizations collect, share, interpret, and use information.

For Indonesian ports and logistics service providers, the integration of digital information systems with organizational collaboration and appropriate governance can contribute to more responsive and reliable supply chain operations.

Future research should empirically investigate the effect of real-time visibility on specific performance indicators such as vessel turnaround time, cargo dwell time, truck waiting time, delivery reliability, resource utilization, and logistics service quality.

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