

The Effect of Digitalization And Technological Innovation On Mediated Competitiveness By Operational Efficiency On PT Hutama Trans Kencana

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Abstrak

Industri pelayaran niaga saat ini menghadapi transformasi digital besar-besaran, di mana efisiensi operasional dan inovasi merupakan kunci untuk mempertahankan posisi pasar yang kompetitif. PT Hutama Trans Kencana, sebagai pemain dalam rantai logistik maritim, menghadapi tantangan peningkatan skala operasional dan kompleksitas kontrol, yang membutuhkan penguatan strategi digital. Studi ini bertujuan untuk menguji pengaruh digitalisasi dan inovasi teknologi terhadap daya saing, dengan efisiensi operasional sebagai variabel mediasi. Penelitian ini dilakukan di PT Hutama Trans Kencana, dengan melibatkan karyawan sebagai responden yang memahami bisnis dan proses operasional perusahaan. Pendekatan penelitian kuantitatif digunakan dengan metode survei, di mana data primer dikumpulkan melalui kuesioner terstruktur yang didistribusikan kepada 54 responden. Data yang dikumpulkan dianalisis menggunakan metode Partial Least Square-Structural Equation Modeling (PLS-SEM) dengan bantuan perangkat lunak SmartPLS untuk menguji hubungan langsung dan tidak langsung antar variabel. Hasil penelitian menunjukkan bahwa digitalisasi dan inovasi teknologi memiliki pengaruh positif dan signifikan terhadap efisiensi operasional dan daya saing perusahaan. Lebih lanjut, efisiensi operasional terbukti memiliki pengaruh signifikan dalam meningkatkan daya saing perusahaan. Uji mediasi mengungkapkan bahwa efisiensi operasional berperan sebagai mediator parsial yang memperkuat hubungan antara digitalisasi, inovasi teknologi, dan daya saing. Temuan ini menekankan pentingnya integrasi sistem digital dan pengembangan inovasi teknologi yang berkelanjutan untuk mengoptimalkan proses kerja dan menciptakan keunggulan kompetitif yang kuat di industri transportasi maritim.

Kata kunci: *Digitalisasi, Inovasi Teknologi, Efisiensi Operasional, Daya Saing Perusahaan, Mediasi, PLS-SEM*

Abstract

The merchant shipping industry is currently facing a massive digital transformation, where operational efficiency and innovation are key to maintaining a competitive market position. PT Hutama Trans Kencana, as a player in the maritime logistics chain, faces the challenge of increasing operational scale and control complexity, which requires strengthening digital strategies. This study aims to examine the effect of digitalization and technological innovation on competitiveness, with operational efficiency as a mediating variable. This research was conducted at PT Hutama Trans Kencana, involving employees as respondents who understand

the company's business and operational processes. A quantitative research approach was used with a survey method, where primary data were collected through structured questionnaires distributed to 54 respondents. The collected data were analyzed using the Partial Least Square–Structural Equation Modeling (PLS-SEM) method with the help of SmartPLS software to test the direct and indirect relationships between variables. The results show that digitalization and technological innovation have a positive and significant influence on operational efficiency and company competitiveness. Furthermore, operational efficiency is proven to have a significant effect in increasing company competitiveness. The mediation test revealed that operational efficiency plays a role as a partial mediator that strengthens the relationship between digitalization, technological innovation, and competitiveness. These findings emphasize the importance of digital system integration and continuous development of technological innovation to optimize work processes and create a strong competitive advantage in the maritime transportation industry .

Keywords: *Digitalization, Technological Innovation, Operational Efficiency, Company Competitiveness, Mediation, PLS-SEM*

Introduction

Background

The global shipping industry has entered a data-driven transformation phase . Operational decisions and customer service no longer rely on manual processes, but rather on system integration and data utilization across the logistics chain. Digitalization in the maritime logistics sector is not simply a transition from physical documents to digital documents, but encompasses fundamental changes in work methods, coordination structures, and process governance between actors such as operators, ports, and *forwarders* . In this competitive landscape, service value is largely determined by information visibility, speed of access, and the ability to reduce operational friction.

As a result, shipping companies' competitiveness is no longer solely determined by fleet capacity or route coverage. The shifting basis of competition demands more measurable operational process updates. Digitalization is a strategic effort to improve process efficiency and service quality through the use of technology. Therefore, technological innovations in maritime logistics, such as tracking systems , process automation, and analytics, are crucial tools for companies to maintain their market position.

PT Hutama Trans Kencana (HTK2), a player in the shipping and logistics service chain, also faces this dynamic. Based on financial report data, the company experienced significant asset expansion, increasing from USD 51.01 million in 2022

to USD 135.36 million as of September 2025. However, this rapid asset growth was accompanied by changes in the ownership control structure. This condition indicates an increase in operational scale and control complexity, potentially creating challenges in consistent strategy execution and operational process control.

In facing these challenges, operational efficiency is a fundamental element in bridging technology adoption with achieving competitive advantage. Efficiency, including timeliness, cost optimization, and error minimization, is the primary goal of digitalization. Without strong operational efficiency, significant investments in digital technology and innovation will not automatically improve a company's competitiveness.

Although digitalization and technological innovation are considered important, several previous studies have shown contradictory results regarding their impact on competitiveness. Some studies indicate a significant positive impact, while others find an insignificant effect, suggesting that technology effectiveness is highly dependent on a company's internal mechanisms. This variation in research results (*research gap*) reinforces the urgency of examining how digitalization and technological innovation influence competitiveness through the mediating role of operational efficiency.

Based on these considerations, this study aims to examine the influence of digitalization and technological innovation on competitiveness, with operational efficiency as a mediating variable. Focusing on PT Hutama Trans Kencana, this research is expected to provide empirical insights into effective management strategies in facing digital transformation in the national maritime transportation sector.

Research Questions

Based on this background, the problem formulation in this research is as follows:

1. Does digitalization impact operational efficiency?
2. Does technological innovation impact operational efficiency?
3. Does operational efficiency affect competitiveness?
4. Does digitalization affect competitiveness?
5. Does technological innovation affect competitiveness?

6. Does operational efficiency mediate the effect of digitalization on competitiveness?
7. Does operational efficiency mediate the effect of technological innovation on competitiveness?

Literature review

1. Main Theory

This research is based on the Resource-Based View (RBV) and Dynamic Capabilities Theory. RBV theory emphasizes that companies can achieve sustainable competitive advantage by developing valuable, rare, difficult-to-imitate, and organized resources, such as technology and digital systems (Barney, 2001). Meanwhile, Dynamic Capabilities Theory explains an organization's ability to integrate, build, and reconfigure internal and external competencies to face a rapidly changing environment (Teece et al., 1997), which in this context is through digitalization and technological innovation.

2. Digitalization

Digitalization (*Digital Transformation*) is the integration of digital technology into all areas of business that fundamentally changes the way organizations operate and deliver value to customers (Westerman et al., 2014). In the maritime industry, digitalization includes the utilization of data across the logistics chain, integrated information systems, and the use of electronic documents (*e-bills of lading*) to improve visibility and speed of information access (Zeng et al., 2025; Ferrarini et al., 2025).

3. Technological Innovation

Technological innovation is the application of new knowledge that results in the development of new, more efficient products, processes, or services (Rogers, 2003). In shipping operations, this innovation includes the implementation of *Smart Port technology* , real-time tracking systems , *data analytics* for decision-making, and process automation aimed at reducing technical barriers and improving service quality (Nguyen & Pham, 2025; Basulo-Ribeiro & Teixeira, 2024).

4. Operational Efficiency

Operational efficiency is an organization's ability to minimize wasted time, effort, and costs in producing high-quality output or services (Slack et al., 2010). In the shipping sector, efficiency is measured through timeliness (*reliability*), optimization of operational costs, accuracy of administrative processes, and minimization of errors or rework (Prananta, 2025; Gavalas et al., 2022).

5. Competitiveness

Competitive advantage *is* a unique position a company holds compared to its competitors, which allows the company to obtain more value from its resources (Porter, 1985). Competitiveness in the shipping industry today is multidimensional, based not only on physical assets but also on information superiority, responsiveness to customer needs, and service reliability within an integrated logistics ecosystem (Yu et al., 2024; Zhang et al., 2023).

Previous Studies and Research Gaps

Previous research provides evidence that digitalization and technological innovation are key drivers of organizational performance. Digitalization has been shown to enhance a company's core competencies through data transparency (Zhang et al., 2023). Similarly, technological innovation contributes to the creation of sustainable competitive advantage (Pratama & Martono, 2024). However, the effectiveness of this technology depends heavily on how efficiently operational processes are executed (Prananta, 2025).

Several research gaps *underlie* this study. First, contradictory results exist, with some studies finding that digitalization and innovation have no significant effect on competitiveness without other supporting factors (Ketut et al., 2024; Munte et al., 2025). Second, the role of operational efficiency as a mediating variable linking technology and competitiveness has rarely been examined in an integrated manner within a single structural model of the national shipping industry. Third, the rapid changes in asset scale at PT Hutama Trans Kencana provide a unique context to

examine whether efficiency remains intact amidst digital expansion and transformation.

Conceptual Framework and Hypothesis

Based on the literature review and identified problems, the research hypothesis is formulated as follows:

- H1: Digitalization has a positive and significant impact on operational efficiency.
- H2: Technological innovation has a positive and significant impact on operational efficiency.
- H3: Operational efficiency has a positive and significant effect on competitiveness.
- H4: Digitalization has a positive and significant impact on competitiveness.
- H5: Technological innovation has a positive and significant effect on competitiveness.
- H6: Operational efficiency mediates the effect of digitalization on competitiveness.
- H7: Operational efficiency mediates the effect of technological innovation on competitiveness.

Research Methodology

This study adopts an exploratory quantitative research design that aims to examine the causal relationship between variables through hypothesis testing. This study focuses on investigating the influence of digitalization and technological innovation on company competitiveness, with operational efficiency as a mediating variable. The empirical analysis was conducted in the operational context of PT Hutama Trans Kencana (HTK2). The study population consists of all PT Hutama Trans Kencana employees involved in business and operational processes. Due to the specific population size, the sampling technique used resulted in 54 respondents participating in this study.

Primary data were collected directly from respondents through a structured questionnaire designed based on indicators of each research variable, namely digitalization, technological innovation, operational efficiency, and competitiveness.

The collected data were analyzed using the *Partial Least Squares-Structural Equation Modeling* (PLS-SEM) method to examine the direct and indirect relationships between variables in the research model. Prior to hypothesis testing, the research instrument was evaluated through an *outer model evaluation* (convergent validity, discriminant validity, and reliability tests) to ensure measurement accuracy. Statistical analysis was performed using SmartPLS software version 4.0 to determine the significance of causal relationships and the mediating power of operational efficiency in improving company competitiveness.

Research Findings and Discussion

1. Research Findings

The validity assessment of the measurement instrument was conducted using two evaluation stages in the PLS-SEM model, namely the Outer Model and the Inner Model. The results of the convergent validity test show that all indicators for the variables Digitalization (X1), Technological Innovation (X2), Operational Efficiency (Z), and Competitiveness (Y) have loading factor values above 0.70 and Average Variance Extracted (AVE) values above 0.50. This indicates that each indicator is valid and able to accurately represent the variables studied.

In addition to validity testing, reliability testing was conducted using Cronbach's Alpha and Composite Reliability values. The results showed that all variables met the criteria with values above 0.70. This demonstrates that the questionnaire instrument used has a high level of internal consistency and is reliable for collecting data related to digital strategy and competitiveness at PT Hutama Trans Kencana.

Hypothesis testing was conducted using the bootstrapping technique to evaluate direct and indirect relationships in the structural model. Based on the T-statistics (threshold > 1.96) and P-values (< 0.05), the findings are as follows:

- **Digitalization (X1) → Operational Efficiency (Z):** The analysis shows a positive and significant effect. This is supported by respondents' perceptions that system integration and document digitization accelerate administrative workflows. Therefore, the hypothesis is accepted.
- **Technological Innovation (X2) → Operational Efficiency (Z):** The analysis shows a positive and significant relationship. The use of tracking and analytics

technology helps companies minimize operational errors, thereby increasing time and cost efficiency. Therefore, the hypothesis is accepted.

- **Operational Efficiency (Z) → Competitiveness (Y):** Operational efficiency has been shown to have a significant impact on competitiveness. Respondents agreed that timely service and reduced operational costs are the main factors that differentiate the company from its competitors. Therefore, the hypothesis is accepted.
- **Digitalization (X1) → Competitiveness (Y):** The test results show that digitalization directly increases the company's competitiveness by improving the quality of information and responsiveness of service to customers. Therefore, the hypothesis is accepted.
- **Technological Innovation (X2) → Competitiveness (Y):** Technological innovation has a positive and significant influence on competitiveness. The company's ability to adopt new technology creates added value for shipping service users. Therefore, the hypothesis is accepted.
- **Mediation Analysis (Digitalization → Operational Efficiency → Competitiveness):** The results of the mediation test indicate that Operational Efficiency significantly mediates the relationship between Digitalization and Competitiveness. This means that digitalization will be much more effective in increasing competitiveness if it can create more efficient operational processes. Therefore, the hypothesis is accepted.
- **Mediation Analysis (Technological Innovation → Operational Efficiency → Competitiveness):** Operational Efficiency is shown to act as a significant mediator between Technological Innovation and Competitiveness. Technological innovation provides a tool for efficiency that ultimately strengthens the company's competitive position. Therefore, the hypothesis is accepted.

2. Discussion

This study examines the interaction between digital technology, innovation, efficiency, and competitiveness at PT Hutama Trans Kencana.

- **The Impact of Digitalization and Innovation**

Unlike static industries, in the dynamic shipping sector, digitalization (X1) and technological innovation (X2) are key drivers. This aligns with the Dynamic Capabilities theory, which emphasizes the importance of technological configuration to address market changes. The company's drastic increase in assets (expecting to reach USD 135 million by 2025) demands robust digital systems to maintain operational control.

- **The Strategic Role of Operational Efficiency**

The significant impact of Operational Efficiency (Z) supports Prananta's (2025) findings, which state that competitiveness is not only about having advanced technology, but also about how that technology reduces costs and dwelling time. At PT Hutama Trans Kencana, efficiency is a clear demonstration of the success of digital transformation.

- **Efficiency as a Mediator**

Our findings demonstrate that Operational Efficiency is the "bridge" that transforms technological potential into actual competitive advantage. Without efficiency, innovation becomes a cost burden. The results show a Predictive Relevance (Q-Square) value of 0.931, meaning this model is able to explain 93.1% of the competitiveness phenomenon.

- **Competitive Advantage**

With the majority of respondents being of productive age (26-30 years old) and having a university degree, the company's adoption of digital technology has been remarkably successful. This ensures that any implemented technological innovations can be optimally utilized to achieve the service standards expected by the global shipping market .

Conclusion

Based on the findings of this study, the following conclusions can be drawn:

1. There is a positive and significant influence between digitalization and operational efficiency at PT Hutama Trans Kencana.
2. There is a positive and significant influence between technological innovation and operational efficiency at PT Hutama Trans Kencana.

3. There is a positive and significant influence between operational efficiency and company competitiveness.
4. There is a positive and significant influence between digitalization and company competitiveness directly.
5. There is a positive and significant influence between technological innovation and company competitiveness directly.
6. Operational efficiency has been shown to act as a significant mediating variable in linking the influence of digitalization on company competitiveness.
7. Operational efficiency has been shown to play a significant role as a mediating variable in linking the influence of technological innovation on company competitiveness.

Recommendation

Based on the results of this study, several strategic recommendations can be given to company management and further researchers:

1. For Companies

Optimizing Comprehensive Digital Integration: Given the significant impact of digitalization on operational efficiency and competitiveness, PT Hutama Trans Kencana's management must continue to expand the scope of digital system integration across all business lines. The digitization of documents and information workflows must not stop at the administrative level but must also be integrated in real time with the port and logistics ecosystem to further reduce operational friction.

2. Accelerating Operational Technology Innovation

Companies need to continuously adopt and update operational technologies, such as AI-based tracking systems and predictive data analytics. Continuous innovation will help companies anticipate logistics challenges more quickly, minimize human error, and maintain a competitive edge in the dynamic shipping market.

3. Strengthening Capabilities through Operational Efficiency

Because operational efficiency has proven to be a key driver, every technology investment should be evaluated based on its ability to create time and cost efficiencies. Companies are advised to prioritize innovations that directly reduce

operational costs and improve service timeliness, as these are the aspects customers will most benefit from.

4. Improving Digital Competence of Human Resources

To support the sustainability of digital transformation, companies must conduct regular employee training programs on the use of the latest information systems. Ensuring that all staff have adequate digital literacy will accelerate the technology transition process and minimize adaptation barriers within the organization.

5. Data-Based Performance Monitoring and Evaluation

Management is advised to implement a data-driven performance monitoring dashboard to regularly evaluate the effectiveness of digitalization. With accurate data, companies can make continuous improvements to business processes deemed inefficient, thereby consistently maintaining their competitiveness.

For Future Research

1. Development of a Broader Conceptual Model

Future researchers are encouraged to develop more comprehensive conceptual models by incorporating additional variables that may influence firm competitiveness. Variables such as digital organizational culture, human resource capabilities, transformational leadership, or cybersecurity could provide a broader understanding of the factors that strengthen the effectiveness of digitalization.

2. Application of Longitudinal Research Design

Future studies could consider implementing a longitudinal research design to observe the evolving impact of digitalization and technological innovation over time. By collecting data at multiple points in time, researchers can identify trends, changes in efficiency, and the sustainability of a company's competitiveness after the technology has matured and been implemented.

3. Integration of Qualitative Methods

Further research could also integrate qualitative methods, such as in-depth management interviews or operational case studies, to complement quantitative findings. This approach could provide deeper insights into contextual barriers,

employee adaptation challenges, and strategic decision-making processes not fully captured through questionnaire analysis.

4. Expansion of Research Object Scope

Future research could expand the scope of the study by involving respondents from other merchant shipping companies or different maritime logistics sub-sectors. This broader scope would increase the generalizability of the findings and provide a more comprehensive picture of the digital maturity level of the national shipping industry in general.

5. Moderating Variable Analysis

Researchers could also examine potential moderating variables such as government regulations, business environment uncertainty, or port infrastructure readiness. Understanding how these external factors moderate the relationship between technological innovation and competitiveness would provide a more nuanced theoretical contribution to strategic management in the maritime sector.

Daftar Pustaka

- Barney, J. B. (2001). Resource-based theories of competitive advantage: A ten-year retrospective on the resource-based view. *Journal of Management* , 27(6), 643-650.
- Basulo-Ribeiro, J., & Teixeira, L. (2024). Industry 4.0 Supporting Logistics Towards Smart Ports: Benefits, Challenges and Trends Based on A Systematic Literature Review. *Journal of Industrial Engineering and Management* , 17(2), 492–515.
- Ferrarini, L., Filippopoulos, Y., & Lajic, Z. (2025). Digital Transformation in the Shipping Industry: A Network-Based Bibliometric Analysis. *Journal of Marine Science and Engineering* , 13(5), 1–25.
- Gavalas, D., Syriopoulos, T., & Roumpis, E. (2022). Digital adoption and efficiency in the maritime industry. *Journal of Shipping and Trade* , 7(1).
- Ketut, MI, Nyoman, UID, & Wayan, SN (2024). The Importance of Micro, Small, and Medium Enterprises Competitiveness through Digital Transformation. *Journal of Accounting and Strategic Finance* , 7(1), 18–38.
- Munte, ED, Sinaga, S., Tarigan, LL, Surbakti, AY, & Waruwu, OL (2025). The Influence of Knowledge Management and Innovation Capability on Small Business Performance Through Competitive Advantage Mechanism. *JIMKES: Jurnal Ilmiah Manajemen Kesatuan* , 13(2), 1273–1286.

- Nguyen, P. N., & Pham, T. Y. (2025). Assessing the impact of digital transformation on port efficiency and market positioning in Southeast Asia container port system. *The Asian Journal of Shipping and Logistics* , 21(1).
- Porter, M. E. (1985). *Competitive Advantage: Creating and Sustaining Superior Performance* . New York: Free Press.
- Prananta, A. (2025). The Role of Digital Transformation in Enhancing Operational Efficiency and Competitive Advantage in Manufacturing Industries. *Journal of Management & Economics Review (JUMPER)* , 3(1), 333–340.
- Pratama, P., & Martono, BA (2024). Analysis of Sustainable Competitive Advantage Influenced by Organizational Culture and Leadership Behavior through Technological Innovation. *Goodwill Journal of Economics, Management, and Accounting* , 4(2), 279–288.
- Rogers, E.M. (2003). *Diffusion of Innovations* (5th ed.). New York: Free Press.
- Slack, N., Chambers, S., & Johnston, R. (2010). *Operations Management* . Pearson Education.
- Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal* , 18(7), 509-533.
- Westerman, G., Bonnet, D., & McAfee, A. (2014). *Leading Digital: Turning Technology into Business Transformation* . Harvard Business Press.
- Yu, H., Zhang, M., Cui, C., Xu, L., Lin, S., & Xu, J. (2024). Evaluating Competitiveness of Container Shipping Operators in the Sustainability and Digitalization Era. *Sustainability* , 16(10).
- Zeng, X., et al. (2025). *Digitalization Trends in Global Maritime Logistics* . Maritime Policy & Management.
- Zhang, M., et al. (2023). Core Competencies and Digital Transparency in Maritime Firms. *International Journal of Logistics Management* .

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