Optimizing Logistics Capability: Integrating Human Resources, Technology, and Cooperative Efforts

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Abstract

The logistics sector in Indonesia is grappling with significant challenges, marked by high logistics costs and a decreasing Logistics Performance Index (LPI), which dropped from 46th in 2018 to 61st in 2023. This study aims to fill the gap in the existing literature by exploring human resources, technological resources, and collaboration as interconnected factors that collectively influence the capability of logistics firms. The research highlights the critical role of effective human resource management in enhancing logistics capabilities, as skilled and well-trained personnel contribute significantly to operational efficiency. Additionally, the study underscores the importance of leveraging advanced technological resources, such as automation and data analytics, to improve process efficiency and decision-making. While collaboration among logistics firms, suppliers, and customers is identified as a vital component, the findings indicate that it tends to have a comparatively lower impact on logistics capability. Nevertheless, fostering effective collaboration can still lead to improved coordination and information flow within the supply chain. Overall, the insights from this study suggest that logistics service providers in Indonesia should prioritize the development of human capital, invest in modern technologies, and strengthen collaborative partnerships to enhance their capabilities and competitiveness in a rapidly evolving market.

Keywords: Human Resources, Technological Resources, Collaboration, Logistic Capability

Introduction

As the volume of international trade increases and e-commerce grows, logistics companies face increasing pressure to provide efficient, fast, and reliable services. According to the report of McKinsey (2020), the globalization of the supply chain creates new challenges for logistics companies to adapt to evolving demand and improve logistics capabilities.

This article makes a significant contribution to the literature in the field of logistics by integrating three essential elements—human resources, technological resources, and collaboration—into a cohesive analytical framework. Most previous studies have tended to address these factors separately, overlooking the interactions and synergies that can arise among them. By combining the Resource-Based View (RBV) and Dynamic Capabilities approaches, this research highlights how effective collaboration and the appropriate use of technology can bolster a company's internal capabilities.

Moreover, this study identifies unique challenges faced by logistics companies in the Riau Islands, such as limitations in workforce skills and technological infrastructure, providing a new context for the application of this model in specific regions. The findings regarding the varying impact of collaboration on logistics capability also open avenues for exploring more effective collaborative strategies within the logistics industry, an area that has been less examined in prior research. Thus, this article offers fresh insights that are relevant not only for academics but also for practitioners operating in an increasingly competitive and complex logistics environment.

One indicator that shows problems in the logistics industry in Indonesia is the decline in Indonesia's Logistics Performance Index (LPI), ranking from 46th in 2018 to 61st in 2023 (The World Bank, 2023). This

decline indicates obstacles in various aspects, including delays in shipping goods, inefficiencies in the customs system, and low use of technology in supply chain management. In addition, logistics costs in Indonesia are still high, reaching around 24% of the Gross Domestic Product (GDP), much higher than in developed countries with average logistics costs below 10% (Kementerian Perhubungan, 2022).

The intense competition within the global logistics sector necessitates that companies consistently enhance their capabilities by implementing more efficient resource management, technological innovation, and collaborative efforts. Previous studies frequently address human and technological resources independently, without integrating them with collaborative aspects into a unified model. The factors of human resources, technological resources, and collaboration are the main concerns in this study, given the importance of competent human resource management (Evangelista et al., 2023), optimal technology implementation (Kumar & Prashar, 2024), and effective collaboration in improving logistics capabilities (Kirono et al., 2019).

The first factor in influencing logistics capability is human resources. Evangelista et al. (2023) state that good human resources can improve a company's logistics capabilities. Evangelista et al., (2023) and Hasan et al., (2021) found that human resources significantly influence logistic firm performance. Zehir et al., (2016) found that human resources include workforce management and development, such as recruitment, training, performance management, and employee empowerment, to increase organizational productivity and efficiency. Evangelista et al., (2023) argue that good human resources can improve the company's logistics capabilities. One of the factors of concern for logistics companies in the Riau Islands is the limited skilled and qualified workforce. In addition, human resources in the Riau Islands are often poorly trained in operating advanced technology and effective logistics management systems. These limited skills result in low productivity and operational efficiency, compounded by the low level of education and relevant training for local workers, hampering logistics companies' operational efficiency and capability. Such limitations lead to gaps in technological mastery and the handling of complex logistics processes, negatively impacting the overall performance of logistics companies in the Riau Islands.

The second factor that influences capability is technological resources. Kim et al., (2021) explained that technological resources include innovations in process automation, cloud-based management systems, and data tracking and analysis technologies that support strategic decision-making. In logistics, technological resources can improve speed, accuracy, and operational efficiency and facilitate better supply chain management (Grewal et al., 2021). Bag et al., (2020), based on research, explain that the application of appropriate technology can improve logistics capability and efficiency. Although process automation, cloud-based management systems, and data tracking technologies have great potential to improve operational efficiency and accuracy, their application in the region is still minimal. Many logistics firms in Riau Islands face challenges in adopting modern technologies due to inadequate infrastructure, low investment in cutting-edge technologies, and limited knowledge of the local workforce in operating complex systems. These limitations hamper companies' ability to utilize technology for better supply chain management and higher operational efficiency.

The third factor that influences logistics capability is collaboration. Erna et al., (2019) state that collaboration works effectively in a team or between various parties to achieve a common goal. Shin et al., (2019) define collaboration as a process of interaction between individuals or groups with a common goal, where participants work together to complete tasks or achieve better results than can be achieved individually. Zaridis et al., (2021) state that effective collaboration can improve logistics capability through cooperation between companies. Collaboration between logistics companies, suppliers, and customers is often sub-optimal due to communication, trust, and coordination barriers, which hampers the flow of information and the process of making quick and efficient decisions. While effective collaboration between various parties, such as logistics firms, suppliers, and governments, can improve operational capabilities and efficiency, many regional firms face challenges. Lack of coordination between various stakeholders often hampers the flow of goods and the overall logistics process

Literature Review & Hypotheses Development

The development of originality is achieved by combining the Resource-Based View (RBV) and Dynamic Capabilities (Barney, 2000) frameworks to explore how the internal resources of logistics firms, including human and technological resources, engage with external elements like collaboration to enhance logistics capability. The Resource-Based View (RBV) posits that a firm's competitive edge arises from internal resources that are distinctive, rare, and not easily replicated by rivals (Barney, 2000). According to Grant (1991), in the logistics sector, robust human resources and advanced technology serve as crucial assets that enhance logistics capabilities and overall company performance. To surpass various competitors, RBV encourages organizations to cultivate unique and specific core competencies through the adoption of new and diverse innovations. Nonetheless, the resource-based view (RBV) is often seen as static and insufficient in explaining how firms maintain a competitive advantage in a dynamic environment (Priem & Butler, 2001). The organization's dynamic capabilities also play a role in sustaining competitiveness; when a company can effectively "read" its surroundings, learn from multiple sources, and adapt to evolving demands, it can grow and remain dependable (Nurjanah et al., 2023). Firms that embrace innovative and adaptive resource-based approaches tend to outperform those that focus solely on operational efficiency (Teece, 2007; Barney, 2000).

According to Jaworska (2024), Logistics capability refers to a company's ability to effectively manage its logistics operations and improve service delivery through the coordination of appropriate supply chain activities. Bag et al., (2020) argue that logistics capability is an organization's ability to optimize its logistics processes, including the management of supply chain, storage, and transportation flows, in response to market demand. Shraah et al. (2022) argue that Logistics Capability includes a company's ability to manage and integrate logistics processes, including goods distribution and inventory management, to achieve operational efficiency.

Human resources have a significant impact on a company's logistics capability, as employee skills, knowledge, and motivation play an essential role in managing and optimizing logistics processes (Parham & Tamminga, 2018). A good recruitment and selection process ensures that companies attract and retain a workforce that has the necessary skills and experience to handle various aspects of logistics (Gupta et al., 2022). A workforce that understands modern logistics technology, such as cloud-based management systems or tracking technology, can improve accuracy and speed in delivering goods, and it is an essential aspect of logistics capability (Evangelista et al., 2023). A study by Tran & Le (2021) found that the capability of logistics service provider companies is the variable that has the most significant influence on the selection of logistics service provider companies by companies that outsource logistics, and the implication of the study is that competition does not only focus on price but must be expanded to improve capability, for example by increasing human resources. Therefore, the first hypothesis is:

H$_1$: Human resources have a positive effect on logistics capability

Technological resources are crucial in improving logistics capability. Advanced technology can significantly improve operational efficiency and effectiveness (Moldabekova et al., 2021). Technological resources significantly positively affect logistics capability, as seen in the study by Kumar & Prashar (2024). Technological resources play an important role in improving the company's logistics capability by providing tools and systems that enable more efficient and effective supply chain management (Gunasekaran et al., 2017). Advanced technological equipment, such as warehouse management systems and GPS-based shipment tracking devices, allow logistics companies to monitor and manage the flow of goods in real-time (Raja & Sivakumar, 2022). With this technology, companies can optimize shipping routes, reduce storage times, and improve accuracy in inventory management. Integrated technology allows companies to respond

to market demand more quickly and flexibly, which directly contributes to improved logistics capabilities (Raja & Sivakumar, 2022). The second hypothesis proposal is:

H₂: Technological resources have a positive effect on logistics capability

Zhou et al., (2023) explain that collaboration involves combining various parties' skills, resources, and ideas to achieve a common goal, often by utilizing differences and special expertise. According to Lee et al., (2023), collaboration is the active interaction between individuals or organizations working together to achieve mutually beneficial goals through coordination and cooperation. Collaboration plays a strategic role in improving the company's logistics capability by strengthening relationships and coordination between various parties involved in the supply chain (Panahifar et al., 2018). Practical cooperation with suppliers enables logistics companies to obtain quality materials and services at competitive prices and reduces the risk of delays and disruptions in the supply chain (Salam, 2017). Reliable suppliers help ensure the consistent availability of goods and minimize downtime in the logistics process, which impacts operational efficiency and customer satisfaction (Mofokeng & Chinomona, 2019). Therefore, the third hypothesis is:

H₃: Collaboration has a positive effect on logistics capability

Methodology

This study employs a causality research design to elucidate the nature of specific relationships or influences or assessing the significance of the connections between two or more variables (Bougie & Sekaran, 2019). A quantitative method was utilized, representing an objective strategy that necessitates the gathering and analysis of quantitative data, along with the application of statistical testing techniques, in line with the adopted process approach (Hermawan & Yusran, 2017).

This research was carried out in the Riau Islands province of Indonesia. The population targeted in this study consists of logistics service providers who are members of the Indonesian Logistics and Forwarder Association (ALFI) in the Riau Islands. The time frame for this research was cross-sectional. The analysis unit selected for this study includes companies represented by a manager, director, or president director from logistics service provider firms that are part of the Indonesian Logistics and Forwarder Association in Riau Islands.

Primary data was collected through questionnaires utilizing a five-point Likert scale (5-point) for variable measurement. This study employed non-probability sampling, specifically using a purposive sampling technique. This technique was chosen as it aligns with the research objectives that necessitate samples based on certain criteria pertinent to the focus of the study (Said Pace, 2021). Out of 267 distributed questionnaires, 234 passed the screening criteria and were included in the sample. Data was analyzed using SEM-AMOS. Structural equation modeling is a statistical technique that can analyze the pattern of relationships between latent variables and their indicators, latent variables with each other, and measurement error directly (Hair Jr et al., 2021)

Result & Discussion

Direct influence tests were performed on three hypotheses regarding the impact of human resources, technological resources, and collaboration on the capability of logistics firms. These variables determine whether the t-test, which corresponds to the critical ratio (CR) value in Structural Equation Modeling (SEM), yields a significant probability value. A p-value of less than 0.05 indicates that the null hypothesis is rejected in favor of the alternative hypothesis, thereby supporting the research hypothesis; conversely, if the p-value exceeds 0.05, the null hypothesis is accepted, and the alternative hypothesis is rejected, meaning the research hypothesis is not supported. According to the findings presented in Table 1, all three hypotheses exhibit p-values that exceed 0.05, indicating that they are all supported.

Table 1 Hypothesis Test Results

	Hypothesis	Estimates	p-Values	Results
H₁	Human Resources have a positive effect on Logistics Capability	0.299	0.000	Supported
H₂	Technological Resources have a positive effect on Logistics Capability	0.310	0.000	Supported
H₃	Collaboration has a positive effect on Logistics Capability	0.127	0.031	Supported

1. Human Resources Positively Affect Logistic Capability

The hypothesis testing results indicate that Human Resources has a path coefficient of 0.299 with a probability value of 0.000. Since the p-value is below the conventional significance level of 0.05, the null hypothesis (H0) is rejected, and the alternative hypothesis (H_1) is accepted. This result provides statistical evidence that human resources positively affect logistics capability. The higher the competencies and skills of human resources in the logistics industry, the higher the company's logistics ability to manage operations and supply chains efficiently. This result is consistent with earlier research (Tran & Le, 2021) that found a significant positive effect of human resources on the capability of logistics companies, and this study suggests that competition does not only focus on price but must be expanded to improve capability, for example, by increasing human resources. The same result stated that knowledge-based human resources management practices, that are knowledge-based recruitment, training and development, and motivation, significantly affect logistic capability (Evangelista et al., 2023).

Companies with a highly skilled workforce tend to manage supply chains more efficiently, improve order processing accuracy, and ensure on-time delivery (Kumar & Prashar, 2024; Abdul-Aziz Ahmad & Jais, 2024; Evangelista et al., 2023). A critical factor in improving LPI scores. Based on the results of this study, qualified and trained human resources directly contribute to logistics competence and delivery timeliness, which are key dimensions in the LPI.

The result provides new insight for Resource-Based View (RBV) and Dynamic Capabilities theory, as evidenced by the fact that the quality and competence of the workforce play an essential role in building the company's logistics capabilities. The results of this study also emphasize that logistics companies that want to improve their capabilities must actively invest in employee competency development through training, professional development programs, and the implementation of technology-based HR management systems.

2. Technological Resources Positively Affect Logistic Capability

The hypothesis testing results indicate that Technological Resources has a path coefficient of 0.310 with a probability value of 0.000. Since the p-value is lower than the established significance threshold of 0.05, the null hypothesis (H0) is rejected, and the alternative hypothesis (H_2) is accepted. This indicates that technological resources have a positive effect on logistics capability. This result shows that the higher the application of technology in logistics operations, the better the capabilities of logistics companies. Technologies such as transportation management systems (TMS), the Internet of Things (IoT), and artificial intelligence (AI) play an essential role in improving operational efficiency, speeding up delivery, and improving customer satisfaction.

This result aligns with the findings of Kumar & Prashar (2024) that technological resources significantly positively affect logistics capability. Research that interviewed logistics operations managers shows that logistics firm performance and the company's competitive advantage are influenced by IT usage and IT capability (Nour, 2022). Companies that optimally implement technology-based communication systems can strengthen the coordination between departments and accelerate decision-making in the face of dynamic market changes (Mwangi & Mang'ana, 2024; Bag et al., 2020).

The utilization of technological resources plays a direct role in improving several dimensions of LPI, especially tracking & tracing, timeliness, and logistics competence. The adoption of technologies such as

transportation management systems (TMS), Internet of Things (IoT), and artificial intelligence (AI) allows logistics companies to optimize the delivery process, increase transparency in the tracking of goods, and ensure faster and more accurate delivery (Kumar & Prashar, (2024). Thus, the increased use of technology in the logistics industry can contribute to the overall improvement of Indonesia's LPI score.

This result contributes to expanding the understanding of Resource-Based View (RBV) and Dynamic Capabilities Theory in the context of logistics. This result provides empirical evidence that technological resources not only improve operational efficiency but also strengthen the company's logistics capabilities through aspects such as supply chain integration, real-time tracking, and logistics system automation.

3. Collaboration Positively Affects Logistic Capability

The results in Table 1 indicate that Collaboration has a path coefficient of 0.127 with a probability value of 0.03. Since the p-value is less than the predetermined significance level of 0.05, the null hypothesis (H0) is rejected, and the alternative hypothesis (H$_3$) is accepted. This confirms that Collaboration positively affects logistic capability. The higher the level of collaboration between logistics companies and suppliers, customers, and strategic partners, the better the company's capability. Effective collaboration allows companies to improve supply chain coordination, reduce operational costs, and create added customer value. Although this third hypothesis is supported, the p-value shows a lower effect.

Based on the result in Table 1, the lowest value in collaboration lies in the "trust" dimension, and it is indicated that the level of trust in building cooperative relationships and partnerships in logistics service provider companies is still a challenge. Trust is a key element in building stable and sustainable business relationships, where high trust between business partners allows for more efficient cooperation and reduces uncertainty in logistics operations (Prataviera et al., 2023). If the level of trust is low, the cooperation or partnership relationship is likely to have the potential not to last long, so that it will affect the capability of the logistics service provider company Boonyoo *et al*., 2021; Kirono et al., 2019).

Similar to the result, Prataviera et al., (2023) explained that by building logistic capabilities and relational mechanisms, logistics service providers can help manufacturers collaborate with retailers by increasing mutual trust and communication and can act as trust builders or conductors of trust, and these can bring its own benefits to logistics service providers. Research states that collaboration has a positive influence on logistics capability, where collaboration is used to collaborate at the inter-company and inter-personal levels (Kirono et al., 2019). Kapoor & Banerjee (2021) argue that logistics service providers should invest more in interpersonal relationships to facilitate collaboration with customers and improve capabilities to coordinate and manage customer supply chain activities.

The result contributes to the expansion of the understanding of Resource-Based View (RBV) and Dynamic Capabilities theory by proving that effective collaboration through network quality, trust, and strategic partnerships have a significant role in strengthening logistics capabilities of logistics companies.

Regarding the Logistics Performance Index (LPI), collaboration within the supply chain plays a vital role in enhancing several essential dimensions, notably International shipments, Logistics competence, and timeliness. In international shipments, effective collaboration with global supply chain partners allows logistics firms to expedite both export and import procedures while minimizing obstacles in cross-border transportation (Zaridis et al., 2021). Additionally, concerning logistics competence, partnerships with a variety of stakeholders, such as technology providers, transportation companies, and governmental bodies, enhance an organization's ability to navigate complex operations (Riofiandi & Tarigan, 2022). Furthermore, strong collaboration can lead to improved on-time delivery by fostering better coordination among different participants in the supply chain, which in turn boosts customer satisfaction and enhances the competitiveness of Indonesia's logistics sector (Boonyoo et al., 2021).

Conclusions And Recommendations

Based on the background of the problem, literature review, and the results of data analysis, this study generally shows that human resources, technological resources, and collaboration positively affect logistics firm performance. This research helps develop constructs and measurement scales for internal and external firm resources of logistics service provider firms. Unlike most previous studies, which only focus on company resources (Kumar & Prashar, 2024; Evangelista et al., 2023; Hasan et al., 2021), or which only focus on collaboration strategies (Riofiandi & Tarigan, 2022; Boonyoo et al., 2021; Kirono et ., 2019), this study focuses on human resources, technological resources, and collaboration that logistics service provider companies should use in achieving competitive advantage.

In addition to strengthening the RBV and Dynamic Capabilities theories, the results of this study provide essential input that in the context of the logistics industry in an archipelago such as the Riau Islands, resource-based competitive advantage (RBV) depends not only on the existence of unique and scarce resources but also on the company's ability to optimize external collaboration more intensively to accelerate the development of internal capabilities. This research also extends the understanding of the Dynamic Capabilities theory by showing that dynamic capabilities in the logistics industry not only serve to respond to market changes adaptively. Still, it should address specific geographical and infrastructural challenges, such as limited inter-island connectivity, to improve logistics performance sustainably.

Based on the results of this study, recommendations can be given to logistics service providers. First, logistics companies in Riau Islands, Indonesia, should focus on developing workforce skills through training and certification relevant to the logistics industry. Second, digital technologies such as cloud-based supply chain management systems and logistics process automation should be invested in order to improve efficiency and reduce operational costs. Third, build closer cooperation with suppliers, customers, and other relevant parties to improve the speed and accuracy of logistics services.

Suggestions For Future Research

Based on the findings of this study, future research should consider expanding the research model by incorporating additional variables that could further enrich the understanding of logistics capability. One notable variable to consider is information sharing within the supply chain, which has become increasingly vital in today's data-driven environment.

Information sharing can significantly impact collaboration among stakeholders, enhance decision-making processes, and ultimately influence logistics capability. By examining how information sharing interacts with human and technological resources, researchers can provide a more nuanced understanding of its role in optimizing logistics operations.

Additionally, variables such as supply chain resilience, sustainability practices, and customer relationship management could also be integrated into future studies. Investigating how these factors relate to logistics firms' capability could provide insights into developing more robust and adaptive strategies in the face of global challenges, such as market fluctuations and environmental concerns.

Lastly, conducting longitudinal studies could also be beneficial to assess the long-term effects of these variables on logistical capability, allowing for a deeper exploration of causation and temporal dynamics in logistics management.

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