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Effect of Human Resources, Technological Resources and Collaboration Towards Logistic Firm Performance

Indasari Deu[1], Yolanda Masnita[2], Husna Leila Yusran[3], Nasar Buntu Laulita[4]

[1,2,3]Faculty of Economics and Business, Universitas Trisakti
[4]Faculty of Economic and Business, Universitas Internasional Batam

ABSTRACT

The high cost of logistics in Indonesia and Indonesia's declining Logistics Performance Index (LPI) ranking by 2023 showed fundamental problems with the resources of the logistics sector. However, there is a gap in previous studies that only discuss human resources, technological resources, and collaboration separately. This study aims to analyze the human resources, technology, and collaboration in improving logistics firm performance. This quantitative research takes the population of logistics service provider companies incorporated in the Indonesian Logistics and Forwarder Association in the Riau Islands. Data was analyzed using Structural Equation Modeling (SEM). The purposive sampling technique was used, and 234 respondents as the sample used. Results showed that even though collaboration has the lowest effect, but still human resources, technological resources, and collaboration positively affect logistic firm performance.

Keywords: Human Resources, Technological Resources, Collaboration, Logistic Firm Performance

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

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 tight competition in the global logistics industry requires companies to continuously improve performance through more effective resource management and innovation in technology and collaboration. Previous research often discusses human or technological resources separately without combining them with aspects of collaboration in an integrated 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). However, previous research shows inconsistent results regarding the influence of these three factors on logistics firm performance.

The first factor in influencing logistics firm performance is human resources. Evangelista et al. (2023) state that good human resources can improve a company's logistics capabilities, which in turn improves the logistics firm performance. Evangelista et al., (2023) and Hasan et al., (2021) found that human resources significantly influence logistic firm performance. However, research by Yu & Guo (2016) shows different results, human resources have an insignificant effect on logistics 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, improving logistics firm performance. 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 logistics firm performance 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 the application of appropriate technology can improve logistics capability and efficiency, which positively affects logistics firm performance in contrast to research by Kolade et al., (2019) and Naway & Rahmat (2019) which shows the results that technological resources have an insignificant effect on logistics firm performance. 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 firm performance 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, improving logistics firm performance. 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. There are differences in the results of previous studies regarding the effect of collaboration on logistics firm performance, namely research by Shin et al., (2019), which found that collaboration has a significant impact on logistics firm performance. However, research by Riofiandi & Tarigan (2022) has different results that show that collaboration has an insignificant effect on logistics firm performance.

LITERATURE REVIEW & HYPOTHESES DEVELOPMENT

Originality development is carried out by integrating the Resource-Based View (RBV) and Dynamic Capabilities (Barney, 2000) approaches to understand how the internal resources of logistics companies, such as human resources and technological resources, interact with external factors such as collaboration in improving logistics firm performance. Resource-Based View (RBV) is a theory that emphasizes that a firm's competitive advantage comes from internal resources that are unique, rare, and difficult for competitors to replicate (Barney, 2000). Grant (1991) stated that in logistics, strong human resources and technology can be significant resources that contribute to improving logistics capabilities and logistics firm performance. To outperform different competitors, RBV encourages each organization to develop unique and specific core competencies by implementing new and various innovations. However, the resource-based view (RBV) is considered static and inadequate to explain the competitive advantage of firms in a changing environment (Priem & Butler, 2001). Organizational dynamic capabilities also affect sustainable competitiveness; when the organization can improve its ability to "read" the environment, learn from various sources, and adjust to changing needs, it can develop and be reliable (Nurjanah et al., 2023). Companies with innovative and adaptive resource-based strategies tend to be more competitive than those that rely on operational excellence (Teece, 2007; Barney, 2000).

Melianie et al., (2024) define and emphasize logistic firm performance on the company's ability to transform logistics resources into quality services with high efficiency that considers customer satisfaction and cost control. Bag et al., (2020) argue that logistic firm performance measures the company's effectiveness in terms of speed, quality, flexibility, and innovation in shipping and storing goods. Logistics firm performance is also defined as the accumulation of the final results of the logistics process, which is reflected in the company's speed, efficiency, and ability to respond to customer requests quickly and appropriately (De Lucia et al., 2020).

Human resources have a strategic role in improving logistics firm performance because competent and well-trained human resources directly affect the efficiency and effectiveness of logistics operations. Adequate human resources are critical to the success of logistics firms (Zhang et al., 2019). Selecting competent managers is crucial to successful human resources management in logistics firms (Edinsel & Karahan, 2023). In their research on human resources development, Hanus & Kasperek (2019) found that elements within the organization are the most significant aspects that require immediate attention to create competence in the logistics industry. 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 firm performance (Evangelista et al., 2023). Strategic human resources management, including in the context of logistics, has a significant impact on

improving organizational performance, especially in the aspects of service speed and customer satisfaction (Nafari & Rezaei, 2022; She et al., 2022). Therefore, the first hypothesis is:

H_1: Human resources have a positive effect on logistics firm performance.

Technological resources are crucial in improving logistics firm performance. Advanced technology can significantly improve operational efficiency and effectiveness (Moldabekova et al., 2021). Technological resources significantly positively affect logistics firm performance, as seen in the study by Kumar & Prashar (2024). Bag et al., (2020) highlight the importance of technological capabilities in Logistics 4.0, which contribute significantly to firm performance. Strengthened by the findings of Kolade et al., (2019), which state that technological innovation, although limited by infrastructure, remains vital in supporting the efficiency and effectiveness of logistics company operations, the second hypothesis proposal is:

H_2: Technological resources have a positive effect on logistics firm performance.

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 is essential in improving logistics firm performance by strengthening relationships and coordination between various parties involved 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:

H_3: Collaboration has a positive effect on logistics firm performance.

METHODOLOGY

Causality research design is used in this study, which tries to explain the nature of certain relationships or influences or test the significance level of the relationship between two or more variables (Bougie & Sekaran, 2019). The quantitative method was used, which is an objective approach that requires the collection and evaluation of quantitative data in addition to using statistical testing techniques, in accordance with the process approach used (Hermawan & Yusran, 2017)

This study was conducted in the province of Riau Islands, Indonesia. The population of this research is logistics service providers incorporated in the Indonesian Logistics and Forwarder Association (ALFI) Riau Islands. The time dimension of this research was cross-sectional. The unit of analysis used as a respondent in this study is a company represented by a manager, director, or president director at a logistics service provider company incorporated in the Indonesian Logistics and Forwarder Association in the Riau Islands. The primary data is obtained from questionnaires, and a five-point Likert scale (5-point) is used to measure variables. Non-probability sampling was used in this study, using a purposive sampling technique. This sampling technique was chosen in accordance with the research objectives, which require samples based on specific criteria relevant to the study's focus (Said Pace, 2021). The sample that passed the screening test was 234 out of 267 questionnaires distributed.

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

Direct influence tests were conducted on three hypotheses, namely the influence of human resources, technological resources, and collaboration on logistics firm performance. These variables influence if the t-test, which is identical to the critical ratio (CR) value in SEM, has a significant probability value. If $p<0.05$ means that the null hypothesis is rejected and the alternative hypothesis is accepted, which means that the research hypothesis is supported; otherwise, if $p>0.05$ implies that the null hypothesis is accepted and the alternative hypothesis is rejected, which means that the research hypothesis is not supported. Based on the results shown in Table 4, the three hypotheses have a p-value above 0.05, which means that all hypotheses are supported.

Table 4 Hypothesis Test Results

	Hypothesis	Estimates	p-Values	Results
H_1	Human Resources have a positive effect on Logistic Firm Performance	0.127	0.004	Supported
H_2	Technological Resources have a positive effect on Logistic Firm Performance.	0.134	0.012	Supported
H_3	Collaboration has a positive effect on Logistics Firm Performance.	0.107	0.041	Supported

DISCUSSION

1. Human Resources Positively Affect Logistic Firm Performance

Based on the test results in this study, it is known that there is a positive influence between human resources and logistic firm performance. It can be seen from the probability value 0.004 or less than 0.05 (0.004<0.05), and the Estimate value is 0.127, indicating a significant effect. This finding suggests that the higher the quality of human resources, the better the company's performance in terms of efficiency, operational effectiveness, and competitiveness. This result is consistent with earlier research (Nafari & Rezaei, 2022) that found a significant positive effect of human resources strategy on organizational performance, and this study suggests that when companies want to improve Firm Performance (especially from a non-financial perspective), then companies should consider developing human resources strategies. The same result stated that human resources positively affect firm performance (She et al., 2022). Each of the three knowledge-based human resources management practices, namely knowledge-based recruitment, training and development, and motivation, significantly affects the company's organizational performance (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 is adequate human resource competence. 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.

2. Technological Resources Positively Affect Logistic Firm Performance

The results in Table 4 show that technological resources positively affect logistics firm performance. It

can be seen from the probability value of 0.012 or less than 0.05 (0.012<0.05), and the Estimate value is 0.134, which indicates a significant effect. This result indicates that the second hypothesis in this study is supported. That is, the higher the application of technology in logistics operations, the better the performance 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), who concluded that technological resources significantly positively affect logistics firm performance. 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). The positive effect of logistic information technology on firm performance implies that when it is adopted and used effectively by companies, it can help improve firm performance (Agyabeng-Mensah et al., 2019). 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.

3. Collaboration Positively Affects Logistic Firm Performance

Based on the results in Table 4, it is known that collaboration has a positive effect on logistics firm performance. It can be seen from the probability value is 0.041 or less than 0.05 (0.041<0.05), and the Estimate value is 0.107, which indicates that there is a significant effect. This result indicates that the third hypothesis in this study is supported. The higher the level of collaboration between logistics companies and suppliers, customers, and strategic partners, the better the company's performance. 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 small effect. Based on the test, 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. If the level of trust is low, the cooperation or partnership relationship likely has the potential not to last long so it will affect the performance of the logistics service provider company.

Similar to the result, Kim et al., (2023) suggested that supply chain-risk management-collaboration has a positive effect on logistics performance, further explaining that to maintain a competitive advantage in the supply chain, companies need to foster collaborative relationships and the formation of these relationships depends on the formation of mutual trust. Shin et al. (2019) researched partnership-based collaboration variables and firm performance and found that high partnership commitment can improve innovation and operational performance. The result also aligns with research by Zhou et al. (2023), who stated that customer collaboration positively affects logistics firm performance, both financial and service performance.

Concerning the Logistics Performance Index (LPI), collaboration in the supply chain directly contributes

to the improvement of several key dimensions, especially International shipments, Logistics competence, and timeliness. In international shipments, close collaboration with global supply chain partners enables logistics companies to speed up export and import processes and reduce barriers in cross-border shipments (Zaridis et al., 2021). Meanwhile, concerning logistics competence, partnerships with various parties, such as technology providers, transportation suppliers, and governments, help improve the company's capabilities in managing complex operations (Riofiandi & Tarigan, 2022). Effective collaboration can also improve on-time delivery by ensuring better coordination between various actors in the supply chain, thereby increasing customer satisfaction and strengthening the competitiveness of Indonesia's logistics industry (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; Yu & Guo, 2016), 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.

Recommendations are also given for future research by developing a research model by adding a variable such as information-sharing, as done by Kirono et al., (2019). Judging from the test results, the coefficient estimate of the effect of collaboration on logistics firm performance in this study has the lowest value, so the addition of the information-sharing variable is expected to synergize with the collaboration variable, as shown in the research of Kirono et al., (2019) which researched these two variables which proved to be able to improve the logistics capabilities of logistics service provider companies, which in turn can improve the performance of logistics companies.

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