# The Relationships between Big Data Analytics Application, Logistics Performance and Firm Performance

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## Abstract

This study investigates the impact of big data analytics (BDA) application on logistics performance and firm performance within the framework of the resource-based view (RBV) and investigates the impact of logistics performance on firm performance. BDA was examined through four key dimensions: descriptive, diagnostic, predictive, and prescriptive analytics. The research employed a census approach, targeting 240 logistics and transportation businesses registered with the Thai Transportation and Logistics Association. A total of 116 completed responses were used in the analysis, achieving a usable response rate of 52.5%. Data were analyzed using multiple regression analysis to test the hypothesized relationships. The results reveal that all four dimensions of BDA significantly enhance logistics performance. However, BDA does not have a statistically significant direct effect on firm performance. Instead, its influence is exerted indirectly through logistics performance, confirming its mediating role. These findings contribute to the theoretical understanding of BDA as an enabler of operational excellence, offering practical insights for managers seeking to leverage data capabilities to enhance logistics functions and overall competitiveness.

**Keywords:** Big data analytics, Logistics performance, Firm performance, Logistics business, Resource-based view

## Introduction

Nowadays, organizations are increasingly confronted with pressures arising from volatile market dynamics, escalating customer expectations, and intensifying international competition. Compounding these challenges is the ongoing disruption in information technology, marked by swift innovations, frequent transitions in digital platforms, and the emergence of transformative technologies such as artificial intelligence and robotic process automation. These technological shifts undermine the stability of

organizational systems and processes, compelling firms to continually adapt to maintain their relevance (Zolfaghari, 2023; Awad and Martín-Rojas, 2024). Traditional decision-making approaches are no longer adequate to sustain competitive advantage in such volatile conditions. As vast volumes of data emerge from diverse sources—ranging from social media platforms and IoT-enabled devices to financial systems and global supply chain networks—organizations are presented with unprecedented strategic opportunities alongside complex operational challenges. The capability to derive actionable insights from this vast and complex data landscape has become a critical determinant of strategic agility and operational excellence (Mouli and Alam, 2024)

Big data analytics (BDA) has become a strategic asset in modern organizations, enabling the transformation of vast amounts of unstructured data into meaningful insights (Fanelli et al., 2023). Through the application of sophisticated analytical methodologies and technological platforms, firms are now better equipped to uncover latent patterns, anticipate market dynamics, refine operational workflows, and tailor customer engagement strategies with greater precision. The integration of BDA into organizational decision-making processes facilitates a shift toward evidence-based management, where strategic choices are informed by empirical data rather than intuition alone. BDA enhances the accuracy of managerial judgments, minimizes ambiguity, and empowers predictive modeling—enabling business leaders to address emerging challenges and seize timely opportunities proactively (Sarker, 2021; Ourzik, 2023; Sukkari, 2024). Additionally, BDA makes substantial contributions to customer-centric innovation. By continuously monitoring user behavior, preferences, and sentiment in real time, organizations can dynamically adjust their offerings, thereby fostering more personalized experiences. This level of responsiveness not only strengthens customer relationships but also reinforces brand loyalty in increasingly competitive markets (Ijomah et al., 2024).

The logistics sector plays a vital role in driving economic growth by serving as the primary mechanism for moving goods across cities, regions, and borders. It plays a critical role across multiple sectors—such as manufacturing, agriculture, retail, and construction—by facilitating the timely and efficient movement of raw materials, components, and finished goods to their intended destinations. This connectivity fosters trade, reduces supply chain disruptions, and enhances market accessibility, which in turn stimulates investment and employment. In the modern logistics landscape, data analytics has become crucial for optimizing operations, reducing costs, and enhancing service quality (Wamba et al., 2017). By analyzing data from GPS tracking, fuel consumption, delivery schedules, driver performance, and traffic patterns, transportation companies can make informed decisions to increase route efficiency, reduce downtime, and forecast demand more accurately (Waller and Fawcett, 2013). Moreover, data-driven insights enable the maintenance of regulatory compliance, the enhancement of safety standards, and the meeting of customer expectations through real-time updates and predictive maintenance (Sakas et al., 2024; Setthachotsombut et al., 2024). Therefore, the integration of data analysis in truck

transportation not only contributes to operational excellence but also strengthens its role as a backbone of economic development.

Accordingly, this research explores the application of BDA in business strategy with a particular focus on logistics. In the context of logistics firms in Thailand, there remains a significant research gap, particularly the lack of studies that disaggregate BDA into its four dimensions—descriptive, diagnostic, predictive, and prescriptive—to examine their distinct effects on logistics performance and firm performance. The primary objectives of this research are to investigate the impact of BDA on logistics performance and the influence of logistics performance on firm performance. The research underscores the urgency for organizations to adopt data-driven strategies and presents the pathways through which BDA enhances both logistics efficiency and overall business outcomes. Moreover, the findings indicate that BDA delivers its greatest impact when it is first applied to enhance logistics performance, which in turn strengthens the overall performance of the firm. The study supports the resource-based view (RBV) by emphasizing the effective utilization of internal resources and capabilities. It also offers practical guidance for managers to foster cross-department collaboration, ensure logistics teams can effectively leverage data, reduce costs, and respond to customer needs more quickly.

## Research Objectives

1. To investigate the impact of big data analytics applications on logistics performance
2. To investigate the impact of big data analytics applications on firm performance
3. To investigate the impact of logistics performance on firm performance

## Literature Review and Hypothesis Development

### Resource-Based View of the Firm

Within the domain of strategic management, the resource-based view (RBV) of the firm offers a foundational lens through which a firm's sustained competitive edge is understood to arise from its ability to harness internal assets that are valuable, rare, difficult to imitate, and lacking viable substitutes. (Barney, 1991). Under this framework, firms are viewed as unique bundles of resources and capabilities, where strategic success depends on how these assets are developed, managed, and protected. In the context of big data analytics (BDA), RBV offers a strong theoretical foundation for explaining how firms can leverage data and analytics capabilities as strategic assets. BDA, when integrated into organizational processes, becomes a dynamic capability that enables better decision-making, innovation, and responsiveness to market changes (Wamba et al., 2017). The data itself is not a source of advantage unless it is effectively transformed into actionable insights through analytical capabilities, advanced IT infrastructure, and skilled human capital — all of which align with RBV's emphasis on leveraging firm-specific resources.

Several studies have extended the RBV framework to examine IT-enabled capabilities, with BDA emerging as a key capability in modern firms. According to Gupta and George (2016), big data capabilities — including data management, analytical skills, and technology infrastructure — can be classified as intangible strategic resources that support competitive positioning. When these capabilities are embedded within an organization's culture and processes, they become difficult for competitors to replicate, enhancing the firm's long-term performance. Moreover, RBV supports the understanding of complementarities between BDA and other organizational resources, such as leadership support, cross-functional collaboration, and an innovative culture. These elements enhance the effectiveness of BDA initiatives, enabling firms to more closely align their analytics efforts with strategic objectives (Akter et al., 2016). Organizations that can align their BDA capabilities with market opportunities and internal operations can achieve superior performance in areas such as logistics, customer service, and product innovation.

In summary, the RBV offers a comprehensive theoretical framework for understanding the strategic value of Big Data Analytics. It highlights the role of internal capabilities in transforming raw data into a source of sustained competitive advantage. Organizations that successfully develop and apply BDA capabilities, supported by a conducive culture and strategic alignment, are better positioned to enhance performance, particularly in dynamic and information-intensive sectors.

**Big Data Analytics Application**

Big data analytics (BDA) has emerged as a critical enabler in contemporary logistics and supply chain operations, allowing organizations to collect, manage, and interpret large-scale structured and unstructured data originating from sources such as sensors, RFID systems, GPS technologies, and customer-related transactions. In academic and professional discourse, BDA is commonly divided into four distinct categories—descriptive, diagnostic, predictive, and prescriptive analytics (Vassakis et al., 2018)—each playing a pivotal role in enhancing logistics-related decision-making and operational efficiency.

*Descriptive analytics* focuses on the interpretation of past data patterns, aiming to provide insights into historical events and operational trends that have previously occurred. In logistics, this type of analytics is often used for performance monitoring, operational reporting, and real-time visualization of supply chain activities (Waller & Fawcett, 2013). This approach consolidates data from diverse operational platforms—such as transportation and warehouse management systems, RFID technologies, and GPS tracking tools—and presents it through visual formats to enhance situational awareness and decision-making. This enhances real-time visibility into inventory levels, shipment status, and warehouse operations. *Diagnostic analytics* seeks to uncover the root causes of problems by examining data in greater detail. In the logistics context, it enables firms to understand why delays occur, why costs fluctuate, or why customer service levels decline (Chae et al., 2014). This form of analytics is essential for continuous improvement efforts, as it supports better decision-making by revealing relationships between variables, such as warehouse congestion and lead time variability. *Predictive analytics* leverages historical datasets through the application of statistical modeling and machine learning algorithms to estimate probable

future scenarios and trends. In logistics, it is used for demand forecasting, risk prediction, and inventory optimization (Wamba et al., 2017). For example, predictive models can anticipate weather-related disruptions, identify potential supply chain risks, or forecast delivery times with high accuracy. *Prescriptive analytics* goes beyond prediction by recommending optimal actions or decisions. It involves the use of advanced optimization models, simulation, and AI algorithms to prescribe the best course of action in complex logistics scenarios (Delen & Demirkan, 2013). For instance, prescriptive analytics can optimize vehicle routing, warehouse layout, or inventory replenishment strategies based on real-time data and constraints. This results in cost reduction, improved resource allocation, and enhanced overall operational performance. Based on the foregoing discussion, the research hypotheses have been developed.

*Hypothesis 1: Big data analytics application, a) descriptive analytics, b) diagnostic analytics, c) predictive analytics, and d) prescriptive analytics, positively influence logistics performance.*

*Hypothesis 2: Big data analytics application, a) descriptive analytics, b) diagnostic analytics, c) predictive analytics, and d) prescriptive analytics, positively influence firm performance.*

**The Relationship between Logistics Performance and Firm Performance**

Particularly as global supply chains face increasing complexity and digital transformation, recent studies emphasize that enhanced logistics capabilities can directly improve a firm's operational and financial performance (Wang et al., 2018). Improved logistics performance enables firms to respond faster to market changes, reduce operational costs, and enhance customer satisfaction, all of which contribute to superior firm performance (Sroufe & Gopalakrishna-Remani, 2018). Moreover, logistics management, focusing on transportation and distribution efficiency, has a positive impact on firm performance. Previous research found that effective logistics practices, such as on-time delivery and optimized transportation management, significantly enhance sales growth and overall firm performance (Bagshaw, 2017; Al Zadajali & Ullah, 2024; Wang et al., 2024).

As logistics becomes increasingly strategic, recent literature confirms that firms must continuously innovate and align logistics functions with broader corporate goals to sustain performance and growth in volatile business environments. Therefore, this research aims to investigate the relationship between logistics performance and firm performance. Hence, the hypothesis was postulated.

*Hypothesis 3: Logistics performance positively influences firm performance*

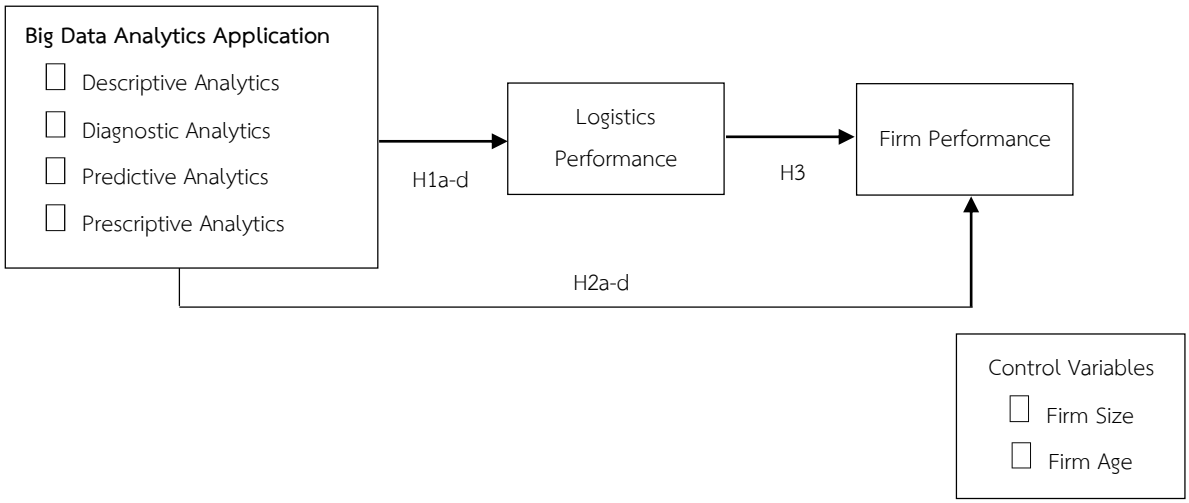


**Figure 1** Research Framework

## Methodology

### Population and Sample

The population and sample in this study consisted of 240 transportation and logistics businesses that are members of the Thai Transportation and Logistics Association. As the total number of businesses was relatively small, this study employed a census approach by including the entire population in the data collection process. Logistics managers were designated as the respondents, as they hold key responsibilities and possess relevant expertise in logistics operations.

### Data Collection

A questionnaire served as the data collection instrument, which was distributed to 240 logistics managers who served as key informants due to their central role and expertise in logistics operations. The data collection period spanned from May 1, 2025, to June 30, 2025.

At the conclusion of the survey period, 126 questionnaires were retrieved. In this collection, 10 were excluded due to missing data, resulting in 116 valid responses used in the analysis, corresponding to a response rate of 52.5%, which is deemed acceptable in survey-based research (Aaker et al., 2019). In addition, the sample size was considered adequate for regression analysis, as it met the recommended rule of at least 10–15 cases per independent variable (Hair et al., 2006)

### Validity and Reliability

This study examined the validity of the research instrument, specifically the mailed questionnaire, using factor loadings to assess its validity. According to the recommendation of Nunnally and Bernstein (1994), an acceptable factor loading should be greater than 0.40. The results, as presented in Table 1, with

factor loadings ranging from 0.651 to 0.939, indicate that the research instrument demonstrates acceptable validity.

To evaluate the internal consistency and stability of the measurement instrument, Cronbach's alpha was employed as a reliability indicator. In line with the recommendation of Nunnally and Bernstein (1994), a minimum threshold of 0.60 is considered acceptable for exploratory research. As presented in Table 1, the alpha coefficients for all constructs fall within the range of 0.817 to 0.923, indicating that the instrument demonstrates a satisfactory level of reliability.

**Table 1** Descriptive Statistics and Results of Validity and Reliability Tests

| Variables | Mean | s.d. | Factor Loadings | Cronbach's Alpha Coefficients |
|---|---|---|---|---|
| Descriptive Analysis (DES) | 3.616 | 0.731 | 0.803 – 0.857 | 0.861 |
| Diagnostic Analysis (DIA) | 3.571 | 0.757 | 0.798 – 0.860 | 0.854 |
| Predictive Analysis (PRD) | 3.664 | 0.788 | 0.863 – 0.939 | 0.923 |
| Prescriptive Analysis (PRS) | 3.690 | 0.694 | 0.788 – 0.819 | 0.817 |
| Logistics Performance (LOG) | 3.599 | 0.752 | 0.747 – 0.828 | 0.885 |
| Firm Performance (FPM) | 3.612 | 0.748 | 0.651 – 0.902 | 0.886 |

### Statistical Techniques

To assess the hypothesized relationships, this study utilizes ordinary least-squares (OLS) regression for parameter estimation during hypothesis testing. This analytical technique is appropriate for investigating associations between independent and dependent variables comprising both categorical and interval-scaled data (Hair et al., 2006). Therefore, three statistical equations are shown as follows;

$$LOG = \alpha + \beta_1 DES + \beta_2 DIA + \beta_3 PRD + \beta_4 PRS + \beta_5 SIZ + \beta_6 AGE + \varepsilon \quad (1)$$

$$FPM = \alpha + \beta_7 DES + \beta_8 DIA + \beta_9 PRD + \beta_{10} PRS + \beta_{11} SIZ + \beta_{12} AGE + \varepsilon \quad (2)$$

$$FPM = \alpha + \beta_{13} LOG + \beta_{14} SIZ + \beta_{15} AGE + \varepsilon \quad (3)$$

## Results and Discussion

### Correlation Analysis

This research addresses the multicollinearity problem. Pearson's Correlation was employed to evaluate the correlation coefficients between independent variables, as suggested by Hair et al. (2006), with the stipulation that the correlation coefficients between independent variables should not exceed 0.80. According to the results in Table 2, none of the values exceed this recommended threshold, indicating that there is no issue of multicollinearity among independent variables.

**Table 2** Results of Correlation Analysis

| Variables | DES | DIA | PRD | PRS | LOG | FPM |
|---|---|---|---|---|---|---|
| $\bar{x}$ | 3.616 | 3.571 | 3.663 | 3.690 | 3.599 | 3.612 |
| s.d. | 0.731 | 0.757 | 0.788 | 0.694 | 0.752 | 0.748 |
| DES | | 0.758*** | 0.364*** | 0.473*** | 0.606*** | 0.384*** |
| DIA | | | 0.341*** | 0.574*** | 0.615*** | 0.375*** |
| PRD | | | | 0.441*** | 0.424*** | 0.309*** |
| PRS | | | | | 0.539*** | 0.264*** |
| LOG | | | | | | 0.245*** |

* $p < .10$, ** $p < .50$, *** $p < .01$

**Table 3** The Results of OLS Regression Analysis for Examining the Relationship between Big Data Analytics Application and Logistics Performance

| Independent Variables | B | Std. Error | Beta | *t* | Sig. |
|---|---|---|---|---|---|
| Constant | -0.040 | 0.148 | | -0.268 | 0.789 |
| Descriptive Analysis | 0.272 | 0.107 | 0.272 | 2.549 | 0.012** |
| Diagnostic Analysis | 0.244 | 0.115 | 0.244 | 2.128 | 0.036** |
| Predictive Analysis | 0.148 | 0.079 | 0.148 | 1.873 | 0.064* |
| Prescriptive Analysis | 0.203 | 0.089 | 0.203 | 2.269 | 0.025** |
| Firm Size | 0.045 | 0.152 | 0.021 | 0.300 | 0.765 |
| Firm Age | 0.015 | 0.141 | 0.007 | 0.104 | 0.918 |

* $p < .10$, ** $p < .50$, *** $p < .01$

**The Influences of Big Data Analytics Application**

The results of this research indicate that big data analytics applications (BDAs) have a positive influence on logistics performance. In this research, BDA was categorized into four dimensions. Specifically, the results presented in Table 3 show that descriptive analytics has a positive influence on logistics performance. Diagnostic analytics positively influence logistics performance. The results also reveal that predictive analytics have a positive influence on logistics performance. Additionally, prescriptive analytics have a positive influence on logistics performance; therefore, hypotheses 1a–1d are supported.

As shown in Table 4, this study found that all four dimensions of BDA have no statistically significant influence on firm performance, suggesting that the application of BDA in its current form may not directly enhance firm performance. Therefore, hypotheses 2a – 2d are not supported.

**Table 4** The Results of OLS Regression Analysis for Examining the Relationship between Big Data Analytics Application and Firm Performance

| Independent Variables | B | Std. Error | Beta | *t* | Sig. |
|---|---|---|---|---|---|
| Constant | -0.208 | 0.184 | | -1.129 | 0.261 |
| Descriptive Analysis | 0.193 | 0.133 | 0.193 | 1.458 | 0.148 |
| Diagnostic Analysis | 0.183 | 0.143 | 0.183 | 1.286 | 0.201 |
| Predictive Analysis | 0.162 | 0.098 | 0.162 | 1.644 | 0.103 |
| Prescriptive Analysis | -0.006 | 0.111 | -0.006 | -0.050 | 0.961 |
| Firm Size | 0.078 | 0.188 | 0.036 | 0.413 | 0.680 |
| Firm Age | 0.256 | 0.175 | 0.126 | 1.468 | 0.145 |

* $p < .10$, ** $p < .50$, *** $p < .01$

The findings of this study are consistent with prior research on the role of big data analytics (BDA) in enhancing logistics performance. Specifically, the positive influence of descriptive analytics on logistics performance supports the findings of Waller and Fawcett (2013), who emphasized the importances of descriptive and predictive analytics in aggregating and visualizing historical data from various sources—such as transportation management systems, warehouse management systems, RFID, and GPS—to enable real-time visibility and operational monitoring within supply chains. Chae et al. (2014) highlighted the role of diagnostic analytics in identifying the root causes of logistics issues, such as delivery delays and cost variability, thereby aiding continuous improvement efforts. In addition, the observed positive impact of predictive analytics aligns with the study by Wamba et al. (2017), which highlights the use of predictive models and machine learning techniques in demand forecasting, risk prediction, and inventory optimization. These predictive capabilities allow logistics firms to make proactive decisions and manage uncertainties more effectively. Similarly, Delen and Demirkan (2013) noted that prescriptive analytics, through optimization models and AI algorithms, supports decision-making in complex scenarios such as vehicle routing, warehouse layout design, and resource allocation, ultimately contributing to improved operational efficiency. Overall, this study reinforces the conceptual framework proposed in earlier research by confirming that specific components of BDA, particularly descriptive and predictive analytics, can significantly enhance logistics performance.

Recent studies over the past decade have revealed that Big Data Analytics (BDA) does not have a statistically significant direct effect on firm performance. Instead, BDA exerts an indirect influence through various mediating variables. This reflects the complex mechanisms by which BDA contributes to organizational effectiveness. Ourzik (2023) found that BDA capabilities influence firm performance through the organization's ability to sense and respond to customer needs—key components of customer agility. Mikalef et al. (2020) demonstrated that BDA capabilities influence firm performance through operational capabilities, underscoring the significance of internal absorptive capacity. In addition, Anwar et al. (2021)

identified that BDA technological capabilities and big data personal capabilities influence firm performance through competitive advantage.

In summary, the results of the hypothesis testing indicated that BDA does not have a direct effect on firm performance. Instead, its influence is exerted indirectly through logistics performance, which serves as a mediating variable. This finding suggests that the benefits of DBA are realized primarily through its ability to enhance logistical capabilities, which in turn contribute to improved overall firm performance.

**The Relationship between Logistics Performance and Firm Performance**

The results presented in Table 5 indicate that logistics performance has a positive influence on firm performance, thereby supporting Hypothesis 3. This finding is consistent with prior research that highlights the critical role of logistics in enhancing overall organizational outcomes.

**Table 5** The Results of OLS Regression Analysis for Examining the Relationship between Logistics Performance and Firm Performance

| Independent Variables | B | Std. Error | Beta | *t* | Sig. |
|---|---|---|---|---|---|
| Constant | -0.193 | 0.191 | | -1.008 | 0.316 |
| Logistics Performance | 0.244 | 0.091 | 0.244 | 2.688 | 0.008*** |
| Firm Size | 0.046 | 0.194 | 0.021 | 0.235 | 0.815 |
| Firm Age | 0.268 | 0.185 | 0.132 | 1.450 | 0.150 |

* $p < .10$, ** $p < .50$, *** $p < .01$

This result is consistent with several prior studies that have highlighted the significant role of logistics capabilities in enhancing organizational outcomes. For instance, Masa'deh et al. (2022) provided empirical evidence that supply chain integration enhances both operational and overall firm performance, with logistics effectiveness being a key component. Similarly, Vlachos (2016) found that reverse logistics capabilities within the Chinese mobile phone industry contribute positively to firm performance, with business strategy acting as a mediating variable. Research by Pisitkasem (2022) on Thai automotive parts manufacturers demonstrated that innovation, flexibility, and service capabilities enhance both logistics and marketing performance, which subsequently improve financial outcomes. These findings collectively affirm that logistics performance is a critical driver of firm success, underscoring the importance of strategic logistics development and integration within the broader supply chain framework.

This study included firm size and firm age as control variables, measured by registered capital and years in operation. Although prior research suggests that differences in these factors may influence how firms benefit from BDA, the analysis did not find significant effects. A likely explanation is the limited variation among sampled firms and the stronger impact of BDA on logistics performance, which overshadowed the role of these structural characteristics.

## Implications and Directions for Future Research

### Theoretical Implications

This research helps explain how BDA affects firm performance. While some may expect that BDA would directly improve results, this study shows that it works more effectively by first improving logistics. By looking at different types of analytics—like descriptive, diagnostic, predictive, and prescriptive—the study gives a clearer view of how BDA supports business operations. This research also extends the literature by reinforcing the resource-based view (RBV), showing that logistics performance functions as a dynamic capability through which BDA creates value. The findings highlight that the true benefit of BDA lies in its ability to enable logistics to run more efficiently, which in turn supports stronger overall performance. In addition, the results confirm and enrich prior work by positioning logistics as a critical mediator that links data-driven insights with sustainable firm performance.

### Managerial Implications

For managerial contribution, managers should not expect immediate improvements in firm performance just by using BDA tools. Instead, the focus should be on how BDA helps improve aspects such as delivery, stock control, and supply chain efficiency. To maximize value, managers must support teamwork across departments and ensure that logistics teams understand how to utilize the data they have effectively. Doing so can lead to better service, faster response to customer needs, and lower costs. This practical application of BDA is what can truly help a company remain strong in a rapidly changing market.

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### Limitations and Directions for Future Research

This study was conducted using data collected from logistics companies registered with the Logistics and Transport Association. Due to the limited number of registered firms, the sample size was relatively small, which may have reduced the statistical power of the findings. Future research could

consider expanding the sample to include a larger and more diverse group of companies to improve generalizability. In addition, this study focused specifically on the impact of BDA on logistics performance and overall firm performance. Future studies may explore the effects of BDA on other aspects of operational performance using the same constructs, or they may consider developing and testing new constructs to capture different dimensions of BDA application. Moreover, Future studies may examine how factors like organizational culture or competitive pressure moderate the impact of BDA on performance outcomes.

## Conclusion

This study examined the role of BDA in enhancing logistics performance and overall firm performance by categorizing BDA into four main types: descriptive, diagnostic, predictive, and prescriptive. The research found that each type helps strengthen logistics functions in different ways. These improvements include better tracking, more accurate forecasting, and faster response to problems. However, the findings also show that BDA, by itself, does not directly improve overall firm performance. Instead, its impact works through improved logistics, which in turn supports business success. This highlights the importance of looking beyond direct effects and understanding how different parts of a business are connected. The study provides new insights into existing theories by demonstrating how data tools must collaborate with other areas, such as operations and personnel, to create genuine value. For businesses, this means focusing on how to utilize analytics in everyday work, particularly in logistics, to remain competitive in a changing environment.

## References

Aaker, D. A., Kumar, V., Leone, R. P. & Day, G. S. (2019). *Marketing Research*. (13th ed.). New York: John Wiley and Sons.

Akter, S., Wamba, S.□F., Gunasekaran, A., Dubey, R., & Childe, S.□J. (2016). How to improve firm performance using big data analytics capability and business strategy alignment? *International Journal of Production Economics, 182*, 113–131. https://doi.org/10.1016/j.ijpe.2016.08.018

Al Zadajali, A., & Ullah, A. (2024). The effectiveness of logistics services on firms' performances – A literature review. *American Journal of Economics and Business Innovation, 3*(1), 125–132. https://doi.org/10.54536/ajebi.v3i1.1744

Anwar, M., Khan, S. Z. A., Shah, S. Z., & Khan, M. (2020). Big data capabilities and a firm's performance: A mediating role of competitive advantage. *Journal of Information & Knowledge Management, 17*(4), Article 1850045. https://doi.org/10.1142/S0219649220500452

Awad, J. A. R. & Martín-Rojas, R. (2024). Digital transformation influence on organisational resilience. *Journal of Innovation and Entrepreneurship*, Article 405. https://doi.org/10.1186/s13731-024-00405-4

Bagshaw, K. B. (2017). Logistics management from firms' performance perspective: Evidence from Nigeria. *International Journal of Supply Chain and Logistics, 1*(3), 10–20. https://doi.org/10.47941/ijscl.180

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management, 17*(1), 99–120. https://doi.org/10.1177/014920639101700108

Chae, B., Olson, D. L., & Sheu, C. (2014). The impact of supply chain analytics on operational performance: A resource-based view. *International Journal of Production Research, 52*(16), 4695–4710. https://doi.org/10.1080/00207543.2013.861616

Delen, D., & Demirkan, H. (2013). Data, information, and analytics as services. *Decision Support Systems, 55*(1), 359–363. https://doi.org/10.1016/j.dss.2012.05.044

Fanelli, S., Pratici, L., Salvatore, F. P., Donelli, C. C., & Zangrandi, A. (2023). Big data analysis for decision-making processes: Challenges and opportunities for the management of health-care organizations. *Management Research Review, 46*(4), 369–389. https://doi.org/10.1108/MRR-09-2021-0648

Gupta, M., & George, J.□F. (2016). Toward the development of a big data analytics capability. *Information & Management, 53*(8), 1049–1064. https://doi.org/10.1016/j.im.2016.07.004

Hair, J. F., Black, W. C., & Anderson, R. E. ( .(2006*Multivariate Data Analysis*. (6th ed.). New Jersey: Pearson Education International.

Ijomah, T. I., Idemudia, C., Eyo-Udo, N. L., & Anjorin, K. F. (2024). The role of big data analytics in customer relationship management: Strategies for improving customer engagement and retention. *World Journal of Advanced Science and Technology, 6*(1), 13-24. https://doi.org/10.53346/wjast.2024.6.1.0038

Masa'deh, R., Muheisen, I., Obeidat, B., & Bany□Mohammad, A. (2022). The impact of supply chain integration on operational performance: An empirical study. *Sustainability, 14*(24), 16634. https://doi.org/10.3390/su142416634

Mikalef, P., Krogstie, J., Pappas, I.□O., & Giannakos, M. (2020). Investigating the effects of big data analytics capabilities on firm performance: The mediating role of dynamic and operational capabilities. *Information & Management, 57*(2), 103169. https://doi.org/10.1016/j.im.2019.05.004

Mouli, M. A., & Alam, M. (2024). Role of data analytics in organizational decision making. *International Research Journal of Economics and Management Studies, 3*(12), 89–94. https://irjems.org/Volume-3-Issue-12/IRJEMS-V3I12P127.pdf

Nunnally, J. C. & Bernstein, I. H. (1994). *Psychometric Theory* (3rd ed.). New York: McGraw-Hill.

Ourzik, V. Y. (2023). Big data and performance: The mediating effect of customer agility. In *Proceedings of the 24th European Conference on Knowledge Management* (Vol. 24, No. 2). https://doi.org/10.34190/eckm.24.2.1483

Pisitkasem, P. (2022). A structural equation modeling of logistics capability on firm performance of the autopart manufacturing industry in Thailand. *Kasetsart Journal of Social Sciences, 43*(1), 11–18. https://doi.org/10.34044/j.kjss.2022.43.1.02

Sakas, D. P., Giannakopoulos, N. T., Terzi, M. C., & Kanellos, N. (2023). Engineering supply chain transportation indexes through big data analytics and learning. *Applied Sciences, 13*(17), Article 9983. https://doi.org/10.3390/app13179983

Sarker, I. H. (2021). Data science and analytics: An overview from data-driven smart computing, decision-making and applications perspective. *SN Computer Science, 2*(5), 377. https://doi.org/10.1007/s42979-021-00765-8

Setthachotsombut, N., Sommanawat, K., & Sua-iam, G. (2024). Logistics business management of provider in Thailand with smart logistics. *Journal of Open Innovation: Technology, Market, and Complexity, 10*(4), Article 100422. https://doi.org/10.1016/j.joitmc.2024.100422

Sroufe, R.□P., & Gopalakrishna-Remani, V. (2018). Management, social sustainability, reputation, and financial performance relationships: An empirical examination of U.S. firms. *Organization & Environment, 32*(3), 331–362. https://doi.org/10.1177/1086026618756611

Sukkari, L. (2024). The impact of big data analytics on customers' online buying. *International Journal of Management and Marketing Intelligence, 1*(2), 10–19. https://doi.org/10.64251/ijmmi.6

Vassakis, K., Petrakis, E., & Kopanakis, I. (2018). Big data analytics: Applications, prospects and challenges. In G. Skourletopoulos et al. (Eds.), *Mobile big data* (Lecture Notes on Data Engineering and Communications Technologies, Vol. 10, pp. 3–20). Springer. https://doi.org/10.1007/978-3-319-67925-9_1

Vlachos, I.P. (2016). Reverse logistics capabilities and firm performance: The mediating role of business strategy. *International Journal of Logistics Research and Applications, 19*(5), 424–442. https://doi.org/10.1080/13675567.2015.1115471A

Waller, M.A., & Fawcett, S.E. (2013). Data science, predictive analytics, and big data: A revolution that will transform supply chain design and management. *Journal of Business Logistics, 34*(2), 77–84. https://doi.org/10.1111/jbl.12010

Wamba, S. F., Gunasekaran, A., Akter, S., Ren, S. J.-F., Dubey, R., & Childe, S.□J. (2017). Big data analytics and firm performance: Effects of dynamic capabilities. *Journal of Business Research, 70*, 356–365. https://doi.org/10.1016/j.jbusres.2016.08.009

Wang, M., Jie, F., & Abareshi, A. (2018). Logistics capability, supply chain uncertainty and risk, and logistics performance: An empirical analysis of Australian courier industry. *Operations and Supply Chain Management: An International Journal, 11*(1), 45–54. https://doi.org/10.31387/oscm0300200

Wang, W., Wu, Q., Su, J., & Li, B. (2024). The impact of international logistics performance on import and export trade: An empirical case of the “Belt and Road” initiative countries. *Humanities and Social Sciences Communications, 11*(1), Article 1028. https://doi.org/10.1057/s41599-024-03541-0

Zolfaghari, M. S. (2023). The impact of digital disruption on organizational sociology. *Journal of Digital Transformation and Artificial Intelligence, 3*(1), 1–15. https://journaldtai.com/index.php/jdtai/article/view/44