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Causal factors of digital transformation affecting the business operations in courier service

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Abstract

The Thai parcel delivery market is expected to continue growing alongside the growth of e-commerce. However, the market's expansion is impacted by the continuous reduction in shipping rates due to intense price competition, delays in deliveries, lack of infrastructure, high service fees, and data management issues. The objectives of this research study were: 1) to study the causal factors affecting digital transformation and business operations in the courier service, 2) to study the influence of causal factors of digital transformation affecting business operations in the courier service, and 3) to develop a model of the causal factors of digital transformation affecting business operations in the courier service. A researcher collected data from interviews and online questionnaires with courier service operators, from January 2025 to March 2025 by collecting a sample of 540 people. The results of the analysis concluded that digital dexterity affected digital transformation, digital dexterity affected business operations through digital transformation, technology infrastructure affects digital transformation, technology infrastructure affected business operations through digital transformation, a customer-centric approach affected digital transformation, a customer-centric approach affected business operations through digital transformation, and digital transformation affected business operations. Courier services can leverage digital agility and modern infrastructure to enhance efficiency and reduce service time. The development of product innovations allows customers to receive high-quality and up-to-date goods. At the same time, improving operational efficiency helps reduce costs and increase customer satisfaction.

Keywords: Business operations, customer-centric approach, digital dexterity, digital transformation, technology infrastructure.

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1. Introduction

The global express and parcel delivery market has demonstrated significant growth, and Thailand is no exception. In 2022, Thailand's parcel delivery industry showed continued expansion. However, this growth has been challenged by the persistent decline in delivery service fees, primarily due to intense price competition. The market has entered a price war as several new service providers have emerged, aiming to rapidly expand their services and capture or increase their market share.

These challenges highlight the importance of digital agility, robust technological infrastructure, and a customer-centric approach for businesses in the parcel delivery sector. These elements significantly influence digital transformation and business operations. As a result, many researchers have examined how digital transformation can enhance business performance, including works by Hennig-Thurau and Houston [1], Mikalef et al. [2], Nambisan and Baron [3], Chatterjee and Rana [4], Rajala and Westerlund [5] and Westerman and Bonnet [6].

In this study, the researcher collected data from major courier services in Thailand. Interviews were conducted with key industry operators from five major brands: Thailand Post, Kerry Express, Flash Express, DHL Express, and J&T Express. Furthermore, an online questionnaire was distributed to courier services across six regions of Thailand: the North, Central, Northeast, East, West, and South. Data collection took place between January and March 2025. The qualitative sample included five companies, while the quantitative survey gathered responses from 540 businesses, with the sample size determined using structural equation modeling (SEM) techniques.

The expected benefits of this study include helping courier services enhance their strategic development and operational efficiency. Digital agility allows businesses to adapt and respond quickly to customer needs. Moreover, a strong technological foundation facilitates the adoption of new technologies, leading to improved overall performance.

This research, grounded in systems theory, investigates empirical variables that influence digital transformation and business operations. The researcher believes that the findings will be beneficial not only for the parcel delivery industry but also for academic purposes. Academics, researchers, and students can apply the empirical results to future research, integration, and development in the field.

2. Research Objectives

1) To study the causal factors affecting digital transformation and business operations in the courier service.
2) To study the influence of causal factors of digital transformation affecting business operations in the courier service.
3) To develop a model the causal factors of digital transformation affecting business operations in the courier service.

3. Literature Review

The concepts and theories used in the research encompass digital dexterity, technology infrastructure, customer-centric approach, digital transformation, and business operations. These are discussed in the background and significance of the problem, which serve as the variables for defining the conceptual framework. The consideration of the relationships between the variables is as follows:

Hypothesis 1: The Relationship between Digital Dexterity and Digital Transformation.

Bharadwaj et al. [7] found that digital agility is a critical factor enabling organizations to adapt to and effectively respond to digital transformation, which leads to continuous improvements in business operations.

Verhoef et al. [8] emphasized that digital dexterity plays a key role in enabling effective digital transformation across organizations, particularly in the development of business processes and enhancing customer experience.

Liu et al. [9] also discovered that digital dexterity contributes to organizational adaptability in the face of digital change, playing a vital role in fostering more agile and competitive business operations.

Hypothesis 2: The Relationship between Digital Dexterity and Business Operations Through Digital Transformation.

Smith et al. [10] highlighted that organizations with high digital dexterity can quickly and efficiently adapt and improve their internal processes, resulting in more effective business operations.

Johnson [11] elaborated on the role of digital dexterity in driving digital transformation, especially in quickly responding to business challenges and leveraging new technologies to enhance organizational competitiveness.

Davenport and Westerman [12] noted that digital dexterity not only influences internal process adjustments but also transforms organizational culture, which contributes to the long-term development and improvement of business operations.

Hypothesis 3: The Relationship between Technology Infrastructure and Digital Transformation.

Lee and Kim [13], focusing on the education sector, emphasized how the integration of virtual reality into educational systems underscores the importance of technology infrastructure in supporting the digital transformation of learning experiences. This integration enhances student engagement and learning outcomes.

Thompson and Harper [14] examined how e-commerce platforms have revolutionized consumer behavior and the retail industry. The foundational technology infrastructure of these platforms facilitates seamless transactions and personalized shopping experiences, marking a significant shift driven by digital transformation.

Smith and Johnson [15] highlighted that renewable energy technologies are indispensable in the digital transformation of the economy, stressing the need for sustainable technology infrastructure to drive economic innovation and sustainability.

Hypothesis 4: The Relationship between Technology Infrastructure and Business Operations Through Digital Transformation.

Franklin and Wallace [16] explored how artificial intelligence (AI) and machine learning technologies enhance business operations and decision-making processes, thereby increasing operational efficiency. Similarly, the transformative potential of blockchain technology was acknowledged.

Patel and Kumar [17] emphasized the critical role of data analytics infrastructure in facilitating business innovation and strategic decision-making, contributing to competitive advantage.

Rodriguez and Martinez [18] analyzed how robust cybersecurity measures prevent cyber threats, ensuring continuity and protection of sensitive data. In this regard, technology infrastructure highlights the necessity of security in sustaining business performance in an era of widespread cyber threats.

Hypothesis 5: The Relationship between Customer-Centric Approach and Digital Transformation.

Shah et al. [19] found that customer-centric organizations are better positioned to adapt strategies and implement digital technologies, which significantly enhances efficiency and responsiveness to customer needs in a timely manner.

Kim and Mauborgne [20] emphasized that organizations with a customer-focused approach can deliver superior experiences by using digital technologies in customer service, strengthening long-term customer relationships.

Kotler and Keller [21] suggested that a customer-centric approach directly influences the development of technologies that enable organizations to quickly and effectively respond to customer needs and behaviors, thus ensuring sustainable digital transformation and competitive advantage.

Hypothesis 6: The Relationship between Customer-Centric Approach and Business Operations Through Digital Transformation.

Verhoef et al. [22] found that a customer-centric approach is a key driver of digital transformation, enhancing customer experience through digital strategies tailored to customer needs.

Hennig-Thurau and Houston [23] emphasized the importance of customer focus in digital processes, which stimulates digital transformation that improves business operations and customer satisfaction.

Liu et al. [9] identified the customer-centric approach as a critical trigger for digital transformation, which significantly contributes to the improvement of organizational business processes.

Hypothesis 7: The Relationship between Digital Transformation and Business Operations.

[24] stated that digital transformation-driven marketing strategies provide new channels for customer engagement and product/service promotion. The use of digital channels and analytics tools enhances marketing efficiency, leading to better customer insights, higher conversion rates, and improved overall business performance.

Wagner and Grant [25] discussed how digital transformation initiatives significantly influence customer experience, a key determinant of business success. The adoption of digital technologies enables personalized customer interactions and improved service delivery, leading to increased satisfaction and loyalty.

Lee and Kim [26] explained that employee productivity is another area where digital transformation has a major impact. By providing access to advanced digital tools and platforms, organizations can enhance workforce efficiency and foster a more innovative and collaborative work environment.

4. Research Framework

This research adopts both qualitative and quantitative approaches. The conceptual framework is based on systems theory, in which the researcher defines the system as comprising four components: (1) Input, (2) Process, (3) Output, and (4) Feedback. These components can be described as follows:

(1) Input refers to the initial factors influencing the system. It includes: Digital Dexterity, consisting of five dimensions: (1) Adoption, (2) Proficiency, (3) Collaboration, (4) Innovation, and (5) Adaptability; Technology Infrastructure, consisting of five dimensions: (1) Security, (2) Mobility, (3) Internet of Things (IoT), (4) Cloud Computing, and (5) Data Analytics; Customer-Centric Approach, consisting of five dimensions: (1) Customer Experience, (2) Engagement, (3) Retention, (4) Resolution, and (5) Business Impact.

(2) Process refers to Digital Transformation, which includes five dimensions: (1) Digital Adoption Rate, (2) Innovation Rate, (3) Digital Maturity, (4) Cloud Utilization Rate, and (5) Automation Coverage.

(3) Output refers to Business Operations, which consists of six dimensions: (1) Delivery Time, (2) On-Time Delivery Rate, (3) Customer Satisfaction Score, (4) Delivery Cost Per Package, (5) Delivery Network Efficiency, and (6) Customer Complaints Rate.

(4) Feedback refers to how Business Operations (the output) influence the inputs, specifically Digital Dexterity, Technology Infrastructure, and the Customer-Centric Approach.

All four components are interrelated and interdependent. The absence or failure of any one component will inevitably affect the others. A change in one component will impact the rest of the system, and deficiencies or errors in any area can lead to inefficiencies in the others.

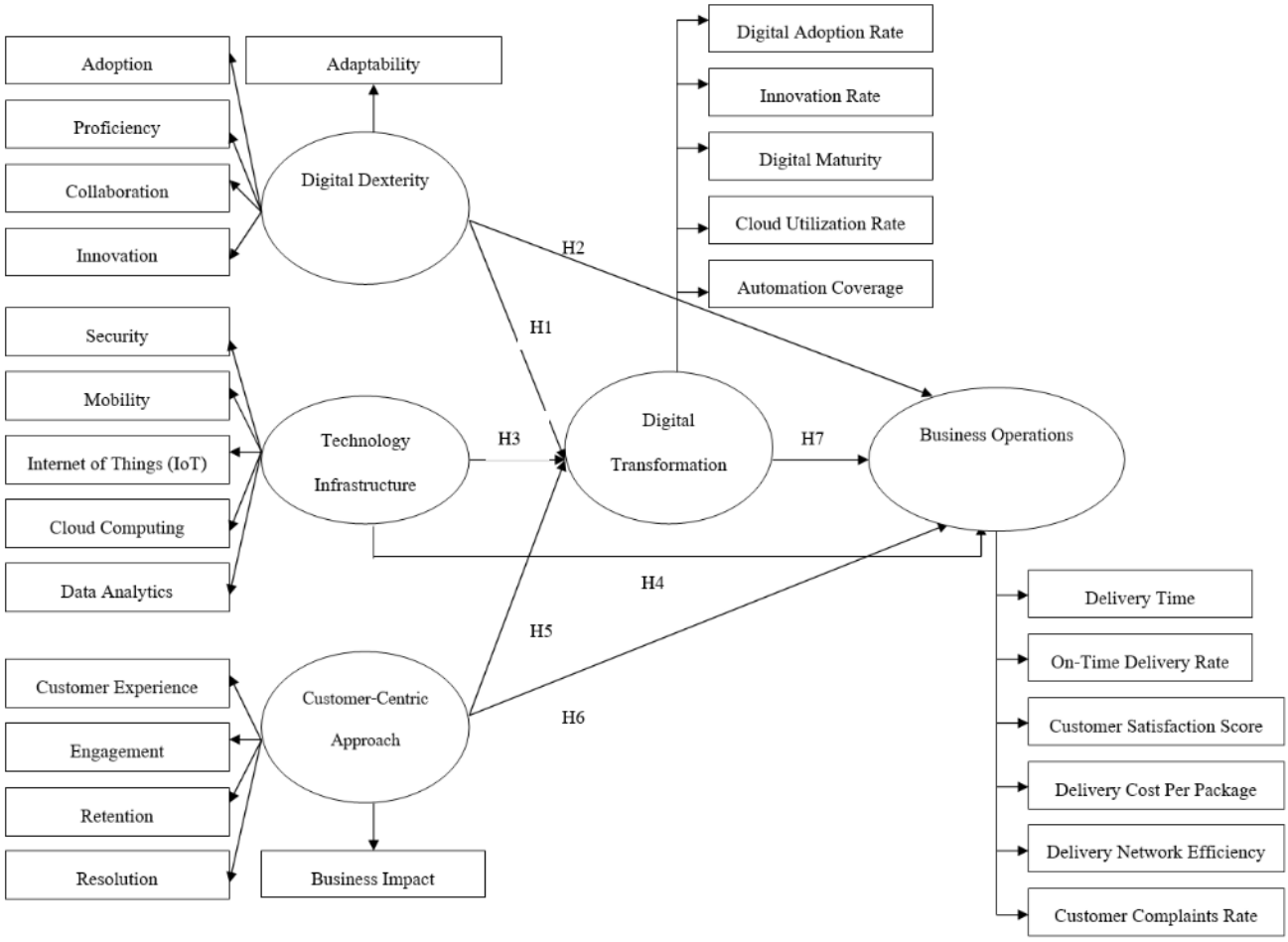

Figure 1.
Research Framework.

5. Research Methodology

This research employs a mixed-methods approach. The research area focuses on collecting data from courier services in Thailand, categorized by brand type, including: (1) Thailand Post, (2) Kerry Express, (3) Flash Express, (4) DHL Express, and (5) J&T Express, for the qualitative population group.

The population for the qualitative study consists of courier service, with samples drawn from six regions: (1) Northern, (2) Central, (3) Northeastern, (4) Eastern, (5) Western, and (6) Southern Thailand.

For the quantitative population, a total of 540 respondents were selected using Structural Equation Modelling (SEM) as the statistical technique. Based on the conceptual framework, the research includes five latent variables and twenty-seven observed variables. According to Hair et al. [27], it is recommended that the sample size should be between 15 to 20 times the number of observed variables for robust multivariate analysis. Therefore, an appropriate and sufficient sample size ranges from $15 \times 27 = 405$ to $20 \times 27 = 540$ participants.

The research instruments used in this study are of two types:

1) Questionnaire, consisting of six parts: Part 1: General information about the organization of the respondents; Part 2: Digital Dexterity; Part 3: Technology Infrastructure; Part 4: Customer-Centric Approach; Part 5: Digital Transformation; Part 6: Business Operations.

The researcher submitted the draft questionnaire to five experts for content validation. The Item-Objective Congruence (IOC) index was calculated to be 0.9306, and the reliability of the instrument was measured at 0.9288. These tools were employed to investigate the causal factors of Digital Transformation that impact Business Operations in the parcel delivery service industry.

2) Interview Protocol

The interview questions are as follows:

- Does the Digital Dexterity of employees in your organization correlate with the effectiveness of your current Technology Infrastructure? If such a relationship exists, how has the organization improved its infrastructure to ensure alignment?
- How has Digital Transformation within your organization affected customer service delivery? Has the organization adjusted its strategies to better meet customer demands?
- How does your organization apply a Customer-Centric Approach in developing products and services? And how does this approach impact customer satisfaction?

- Which processes within your organization have been the focus of Digital Transformation efforts? How does the organization measure the success of these transformation initiatives?
- Has your organization achieved success in Business Operations following Digital Transformation? What factors have contributed to either the success or failure of the transformation?
- Does the Digital Dexterity of employees in your organization correlate with the effectiveness of your current Technology Infrastructure? If such a relationship exists, how has the organization improved its infrastructure to ensure alignment?
- How has Digital Transformation within your organization affected customer service delivery? Has the organization adjusted its strategies to better meet customer demands?

The researcher collected data through in-depth interviews conducted between January 2025 and March 2025. The data were analyzed and synthesized, then described using narrative methods and further examined through content analysis. The findings were subsequently used to support the development of a model derived from the quantitative phase of the study.

Table 1.
Research Findings for Objective 1: Perceptions of Key Constructs.

Objective 1	Research Findings
Digital Dexterity	Respondents reported a high level of digital dexterity. When examined across individual components, one component was rated as the highest, while four others were rated as high. It was found that the respondents perceived adaptability as the most important aspect, followed by collaboration, proficiency, innovation, and lastly, adoption.
Technology Infrastructure	Respondents rated the overall technology infrastructure as high. When examined across individual components, one aspect was rated as the highest, while four others were rated as high. The highest-rated component was security, followed by Internet of Things (IoT), cloud computing, mobility, and lastly, empowerment of collaboration.
Customer-Centric Approach	Respondents rated the overall customer-centric approach as high. When broken down into individual components, one was rated as the highest, and four others were rated as high. The highest-rated component was business impact, followed by problem resolution, digital maturity, customer experience, and lastly, engagement.
Digital Transformation	Respondents reported the overall level of digital transformation as the highest. When examining individual components, three were rated as the highest, while two others were rated as high. The highest-rated components were digital maturity, followed by digital adoption rate, innovation rate, automation coverage, and lastly, cloud utilization rate.
Business Operations	Respondents rated the overall business operations as the highest. When examined by individual components, four were rated as the highest, while two others were rated as high. The highest-rated component was delivery network efficiency, followed by the customer complaints rate, on-time delivery rate, delivery time, customer satisfaction score, and lastly, delivery cost per package.

Table 2.
Research Findings for Objective 2: Path Coefficients and Significance Levels.

Objective 2	Research Findings
Digital Dexterity (DGDT)	Direct positive influence on Digital Transformation (DGTF) with a path coefficient of 0.44, which is statistically significant at the 0.01 level.
Digital Dexterity (DGDT)	Direct positive influence on Business Operations (BSOR) with a path coefficient of 0.12, which is statistically significant at the 0.05 level.
Technology Infrastructure (TNIS)	Direct positive influence on Digital Transformation (DGTF) with a path coefficient of 0.14, which is statistically significant at the 0.05 level.
Technology Infrastructure (TNIS)	Direct positive influence on Business Operations (BSOR) with a path coefficient of 0.33, which is statistically significant at the 0.01 level.
Customer-Centric Approach (CCTA)	Direct positive influence on Digital Transformation (DGTF) with a path coefficient of 0.27, which is statistically significant at the 0.01 level.
Customer-Centric Approach (CCTA)	Direct positive influence on Business Operations (BSOR) with a path coefficient of 0.42, which is statistically significant at the 0.01 level.
Digital Transformation (DGTF)	Direct positive influence on Business Operations (BSOR) with a path coefficient of 0.16, which is statistically significant at the 0.01 level.
Indirect Influence on Business Operations (BSOR)	Digital Dexterity (DGDT), Technology Infrastructure (TNIS), and Customer-Centric Approach (CCTA) all have indirect positive influences on Business Operations (BSOR) through Digital Transformation (DGTF), with path coefficients of 0.17, 0.12, and 0.14, respectively. These values are statistically significant at the 0.01 and 0.05 levels.

6. Research Results

Objective 3: The research findings reveal that the model developed from the confirmatory analysis has been named the Digital Transformation for Business Operations Model (DTBO Model). This model explains how digital transformation influences business operations.

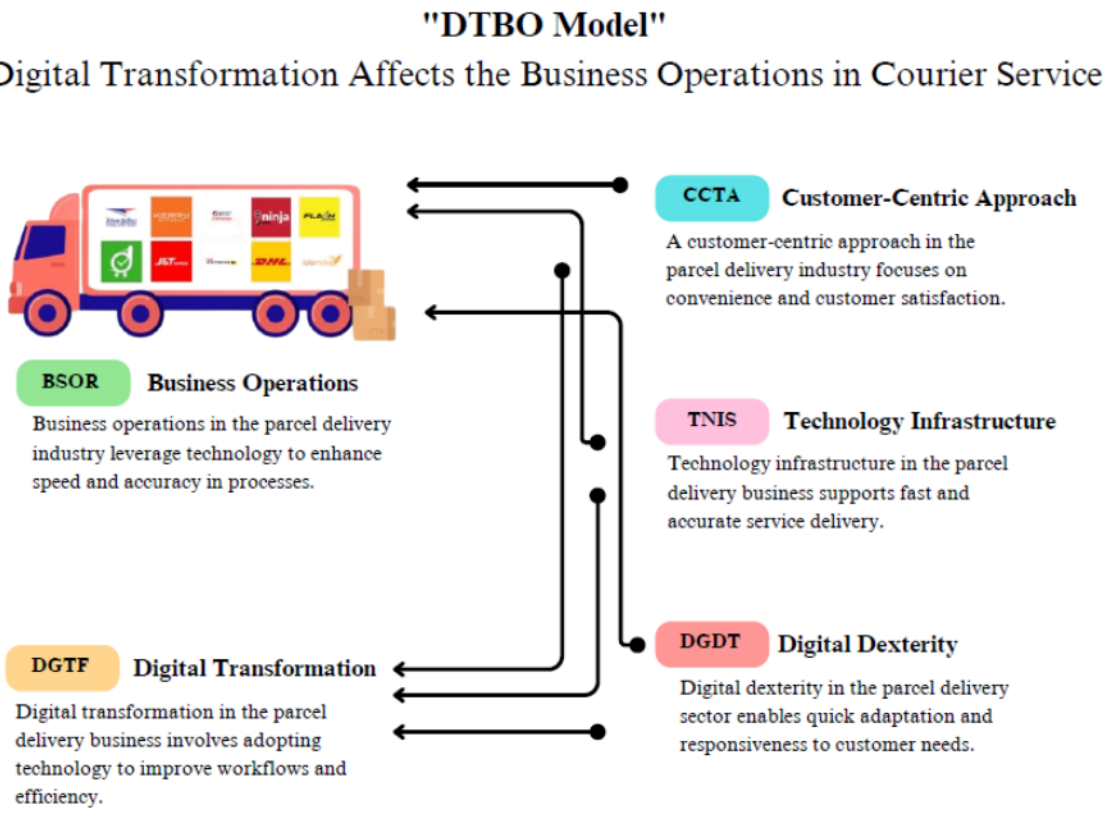

Figure 2.
Digital Transformation for Business Operations Model.

7. Conclusion

The overall summary of the article is that courier services must increasingly compete in various areas, particularly in expanding service offerings that are diverse and competitive with their counterparts. This shift is driven by digital dexterity, technology infrastructure, and a customer-centric approach, all of which are part of the digital transformation of businesses in response to the growth of e-commerce. Challenges and key issues in courier services include delivery delays, infrastructure shortages, high competition, high service costs, and data management problems. The researcher collected data through interviews and online surveys from courier services. The analysis concluded that digital dexterity influences digital transformation, which in turn impacts business operations. Additionally, technology infrastructure and a customer-centric approach also influence digital transformation, subsequently affecting business operations. Courier services can leverage digital dexterity and modern technology infrastructure to improve efficiency and reduce service delivery times. The development of innovative products helps provide customers with high-quality and up-to-date products, while improving operational efficiency reduces costs and increases customer satisfaction.

8. Discussion

The results from the research objectives 1 and 2 are as follows:

- Digital dexterity is a crucial factor in driving digital transformation within organizations, which ultimately leads to improvements in business operations. This result demonstrates that organizations with high digital dexterity can quickly adapt and respond to digital changes, resulting in improved internal processes, such as cost reduction, increased efficiency, and enhanced competitiveness in the market. This finding is consistent with the study by Smith et al. [10].
- Technology infrastructure significantly impacts digital transformation within organizations. The statistical significance at the 0.01 level indicates that the likelihood of these results occurring by chance is only 1%, meaning that technology infrastructure plays a vital role in enabling businesses to develop and adapt efficiently in the digital era. This is in line with the study by Rodriguez and Martinez [18].
- Customer-centric approach is a key factor in driving digital transformation that affects business operations. The results found statistical significance at the 0.01 level, indicating that the chances of these results occurring by chance are only 1%. This suggests that a customer-centric approach is a reliable and essential factor in stimulating digital

transformation, which helps to develop and improve business operations in the long term. This aligns with the study by Wagner and Grant [25].

- The adoption of digital technology in business operations has a significant impact and can lead to clear changes in business performance and outcomes. The statistical significance at the 0.01 level indicates that the likelihood of these results occurring by chance is only 1%, a very low value, demonstrating that digital transformation has a strong and credible impact on business operations. This finding is consistent with the study by Lee and Kim [26].

From the research objective 3, the results from in-depth interviews led to a causal relationship model of digital transformation that impacts business operations.

9. Research Contribution

The findings of this research provide academic insights into the causal factors that affect digital transformation and business operations in the parcel delivery service industry. The results help to understand the relationships that influence various variables related to digital transformation and business operations. This knowledge can be developed and extended academically for further study and applied in other academic fields in the future.

10. Recommendation

In future research, it is recommended to use the causal relationship model of digital transformation and its impact on business operations to validate the model's alignment with empirical data. Additionally, future studies should explore other key factors that contribute to digital transformation and its impact on business operations, as there are several factors not yet examined in this study. For example, Digital Leadership, which refers to the ability of organizational leaders to drive the adoption of digital technologies to develop strategies, processes, and culture aligned with modern contexts; Organizational Culture for Change, which encompasses the attitudes, values, and behaviors of employees that facilitate adaptation to technological changes; Competitive Pressure, which refers to the competitive forces in the market pushing organizations to adapt and leverage digital technologies in their operations; Data Management & Analytics Capability, which pertains to an organization's ability to collect, manage, and analyze data effectively for decision-making; and the Regulatory Environment, which includes external regulations, laws, or government policies that may impact the adoption of digital technologies in business operations.

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