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# Key Drivers of Operational Performance of E-commerce Distribution Service Providers in Thailand

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## Abstract

**Purpose:** Due to the rapid growth of e-commerce in Thailand, the operational excellence of distribution service providers has been elevated. Thus, this research investigated the key drivers of operational performance of e-commerce distributors in Thailand. The research contains key variables: the analytics capabilities of an organization, supply chain disruption orientation, innovation capability, and operational performance. **Research design, data, and methodology:** An online survey is administered to top managers and key personnel (N=425) employed for at least one year in Thailand's top five e-commerce distributors. The sampling methods were conducted using purposive sampling, quota sampling, and convenience sampling. Confirmatory Factor Analysis and Structural Equation Model were applied to analyze and confirm the model's goodness-of-fit and hypothesis testing. **Results:** The findings reveal that an organization's analytics capabilities significantly affect supply chain disruption orientation and supply chain resilience. Furthermore, operational performance is affected by supply chain disruption, supplier quality management, and innovation capability. Nevertheless, supply chain resilience and digital supply chain have no significant effect on operational performance. **Conclusions:** The results imply that supply chain digitalization could drive higher operational performance. Distribution businesses are encountering transformation and disruption, which should address the high level of a digital supply chain, innovation, and quality management to maximize their profit margin and delivery service quality.

**Keywords :** Operational Performance, Distribution, Digital Supply Chain, Innovation Capability, Quality Management

**JEL Classification Code** : M10, M31, L61, L62, O30

## 1. Introduction

Thailand is the largest online population and the second largest economy in the ASEAN region, with the rapid growth of e-commerce as part of the alteration process to COVID-19. The distribution and logistics sector has been shifted for the country's trade, investment, and workforce in recent decades. Thailand's logistics industry was the fourth largest industry in the country's service sector, producing economic outputs during the first half of 2021 of approximately US$ 12.2 billion, accounting for 5% of the gross domestic product. Thailand had the largest B2C e-commerce sector in the ten- membered ASEAN region in 2019 with solid growth prospects. Reflecting the surge in e-commerce during the pandemic, for both business-to-consumer (B2C) and business-to-business (B2B)

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transactions, Thailand's revenue from e-commerce increased to approximately $50 billion in 2020, up from $35 billion in 2017. The robust demand for e-commerce in Thailand and across ASEAN has attracted global e-commerce portals to invest in warehouse and logistics facilities in the country (Suangsub et al., 2022).

The growth of the e-commerce market in Thailand is changing the logistics landscape. Because the demands of consumers have increased, they expect fast delivery and more effective which drives online sellers to look for shipping channels without hassle. It is estimated that the e-commerce market in Thailand will be worth more than 33.58 billion US dollars by 2025. E-commerce business in Thailand is growing exponentially, creating many types of shipping businesses that compete fiercely (Suangsub et al., 2022). Distribution services that directly support E-commerce (E-commerce Fulfillment) can be divided into two main groups: parcel delivery service in Bangkok and other provinces (takes 1-5 business days) and service application group by motorcycle within Bangkok and its vicinity (delivery within 1 hour). For E-commerce stores with customers all over the country, the main providers are Thailand Post, Kerry Express, J&T Express, Flash Express, and SCG Express.

In today's business competitiveness, firms need to pay attention to achieve operational performance for sustainable business development. The increased focus on innovation and digitization is the main goal for business transformation and disruption (Syed et al., 2020). For supply chain management in Thailand, many distributors have upgraded the systems, such as enterprise resource planning, cloud-based warehouse management systems, and automation and robotics, to enhance their operational performance and competitiveness. The problem statement is that very limited academic research conducting the operation performance in distribution businesses in Thailand. Therefore, this study aims to investigate the significant roles of the analytics capabilities of an organization, supply chain disruption orientation, supply chain resilience, digital supply chain, supplier quality management, and innovation capability on the operational performance. The findings of this study can contribute as guidelines for chief information officers, chief supply chain officers, and other top executives who have been investigating the improvement of companies' operational performance.

## 2. Literature Review

### 2.1. Analytics Capabilities of an Organization

In recent decades, more and more supply chains have utilized data more intensively and are adopting analytics capabilities for organizations (Shao et al., 2018). According to Liu et al. (2020), the analytics capabilities of firms can facilitate the strategic development of better insights to transform their supply chains. With an organization's analytics capabilities, firms can explore and exploit innovation and technologies to enhance their market competitiveness. (O'Reilly & Tushman, 2013). Analytics capabilities impact supply chain performance and facilitate organizational alignment with big data that can handle different types of data, encouraging companies to opt for analytic applications in their supply chains and enhance capabilities for controlling quality, clustering customers, understanding their requirements, and setting the right price and margin for products (Laguir et al., 2022). Most organizations have adopted data analytics to develop a strategy that greatly impacts firm performance (Grover et al., 2018). Analytics capabilities have managed processes through data analysis to achieve the desired operational performance (Agarwal & Dhar, 2014). The development of analytics capability can ensure smooth operations (Saggi & Jain, 2018). Laguir et al. (2022) indicated that data analytics through intelligent technologies such as mobile devices, the Internet of Things, and Cloud Computing could greatly impact the supply chain disruption orientation and resilience. Golgeci and Ponomarov (2013) pointed out that high supply chain resilience can improve analytics effectiveness. Therefore, the analytics capabilities of organizations facilitate companies to manage their supply chains seamlessly by decreasing delays and sharing insights with partners so that they can response faster to impact the overall operational performance (Tirkolaee et al., 2020). Thus, below hypotheses are proposed:

**H1:** Analytics capabilities of an organization significantly affect supply chain disruption orientation.
**H2:** Analytics capabilities of an organization significantly affect supply chain resilience.

### 2.2. Supply Chain Disruption Orientation

Supply chain disruption caters the operational efficiency by affecting the quality, cost, processing, sourcing, and delivery of products and services (Tönnissen & Teuteberg, 2020; Xue et al., 2018). The disruptions may be due to pandemics, cyber-attacks, natural disasters, or the massive defect of product and service (Nguyen & Nof, 2019). Apart from the disruption of Hurricane Katrina in 2005 and the SARS outbreak in 2003, the Covid-19 pandemic has disrupted many supply chains and tremendously impacted firms' survival (Ivanov, 2020). Hobbs (2020) denoted that the Covid-19 pandemic has disrupted both the demand and supply sides. In terms of technology disruption, new technology can perish the old business model, such as the

IOS of Apple, which can disrupt Nokia's Android. Therefore, supply chains must be agile and adaptive to undesired events (Lee, 2004). Laguir et al. (2022) postulated that the supply chain disruption orientation could positively impact organizational performance. Hence, achieving operational performance requires a strategic disruption orientation to stabilize and accelerate companies' growth (Chae et al., 2014). Therefore, a following hypothesis is developed:

**H3:** Supply chain disruption orientation significantly affects operational performance.

## 2.3. Supply Chain Resilience

The data-driven capabilities can influence supply chain resilience and operational performance (Tiwari et al., 2018). Due to the disruptions, organizations must improve operational performance (Ambulkar et al., 2015). Many scholars have found that supply chain resilience is also crucial to achieving operational performance (Min, 2019). Supply chain resilience empowers an organization to evolve to a new and stable state. Resilience helps a firm maintain prominence, agility, receptiveness, and alliance during uncertain times. Supply chain resilience expedites a capability for accomplishing and nourishing the desired firm performance in complex circumstances (Sun et al., 2020). Laguir et al. (2022) explored the linkage between analytics capabilities for an organization to operational performance through supply chain resilience. Supply chain resilience can also be extended by data analytics on service quality and operational capabilities to impact organizational performance (Tiwari et al., 2018). Based on the above assumptions, this study proposes the relationship between supply chain resilience and the operational performance of e-commerce distribution service providers in Thailand:

**H4:** Supply chain resilience significantly affects operational performance.

## 2.4. Digital Supply Chain

The digital supply chain is defined as "leveraging innovative digital technologies to change the traditional way of performing supply chain planning and execution tasks, interacting with all kinds of supply chain participants, and enabling new corporate business models" (Farahani et al., 2017). Digitization in the supply chain can transform the business to more sustainably and cost saving (Singhdong et al., 2021). Some scholars referred digital supply chain as "an intelligent best-fit technological system that can support and synchronize operations to be more agile and efficient" (Büyüközkan & Göçer, 2018). Farahani et al. (2017) added that integrating innovative technologies such as big data, cloud computing, blockchain, IoT, and robotics can transform the traditional supply chain and improve operational efficiency. Saryatmo and Sukhotu (2021) confirmed that the digital supply chain significantly affects operational performance as such performance can be measured by operational effectiveness. Accordingly, a hypothesis is constructed:

**H5:** Digital supply chain significantly affects operational performance.

## 2.5. Supplier Quality Management

Supplier quality management can be strategized and managed as a supplier relationship which is crucial for overall organizational performance (Kaynak, 2003). Supplier quality management grants organizations a high level of commitment to suppliers to ensure the quality of products, services, and processes. Most scholars determine supplier quality management as a part of total quality management (TQM) (Kebede Adem & Virdi, 2021). Nong and Ho (2019) attested that TQM, the materials' quality, can reduce defects and ensure quality. Thus, supplier selection is vital to be considered. Several studies emphasize the significant relationship between supplier quality management and operational performance (Baird et al., 2011; Kaynak, 2003; Kebede Adem & Virdi, 2021; Sadikoglu & Zehir, 2010). Zu and Kaynak (2012) posted that supply chain quality management is the scheme that affects organizational or supply chain performance. Therefore, the proposed hypothesis is presented as follows:

**H6:** Supplier quality management significantly affects operational performance.

## 2.6. Innovation Capability

The innovation can be termed as the "production or adoption, assimilation, and exploitation of a value-added novelty in economic and social spheres; renewal and enlargement of products, services, and markets; development of new methods of production; and establishment of new management systems" (Crossan & Apaydin, 2010). According to Damanpour et al. (2009) innovation is "the development and implementation of new ideas or behaviors in a firm." Technological innovation is the linkage between new technological knowledge and business operation that can maximize capacity and effectiveness (Heij, 2015). Introducing new technologies can be integrated into a product, service, and process innovation (Camisón & Villar-López, 2014; Jaruwanakul, 2021). Kebede Adem and Virdi (2021) pointed out the

positive influence of innovation capability on operational performance. Maldonado-Guzmán et al. (2019) affirmed that a company should maximize its technological and non-technological innovation to find the best way of doing business in the modern era. Subsequently, the following hypothesis is derived based on the above discussions:

**H7:** Innovation capability significantly affects operational performance.

### 2.7. Operational Performance

Operational performance is "a key determinant to the overall supply chain performance, which is usually the amalgamated outcome from multiple factors and enablers in the system" (Lu et al., 2017). Saryatmo and Sukhotu, (2021) stated that supply chain performance is the measurement of financial metrics (i.e., cost, profitability, revenue, and return on investment) and non-financial metrics (i.e., process quality and flexibility). Several scholars have addressed the operational performance of the supply chain (Devaraj et al., 2007; Lu et al., 2017; Saryatmo & Sukhotu, 2021). In addition, operational performance is explained as "quality, cost, productivity and delivery outcomes of an organization" (Kaynak, 2003). Heizer et al. (2008) referred to operational performance as "a firm's capability to reduce operational management costs, meet order cycle time, improve raw material utilization efficiency and meet delivery capacity." Operational performance can also improve companies' production, efficiency, customer satisfaction, and profit (Kebede Adem & Virdi, 2021; Laguir et al., 2022; Nguyen et al., 2022; Saryatmo & Sukhotu, 2021). Operational performance is a key indicator of TQM execution (Salaheldin, 2009). Hallgren and Olhager (2009) refined manufacturing companies' operational performance, which can lead to their competitiveness.

## 3. Research Methods and Materials

### 3.1. Research Framework and Hypotheses

The conceptual framework of Figure 1 is derived based on the previous four literatures on organizational performance (Kebede Adem & Virdi, 2021; Laguir et al., 2022; Nguyen et al., 2022; Saryatmo & Sukhotu, 2021). The dependent variables (DV) are the analytics capabilities of an organization (ACO), supply chain disruption orientation (SCDO), supply chain resilience (SCR), digital supply chain (DSC), supplier quality management (SQM), and innovation capability (IC). Organizational performance (OP) is an independent variable (IV). Consequently, the following hypotheses are proposed:

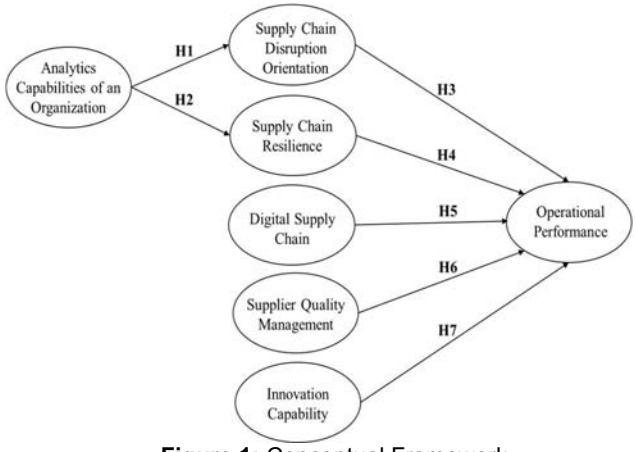



**Figure 1:** Conceptual Framework

**H1:** Analytics capabilities of an organization significantly affect supply chain disruption orientation.
**H2:** Analytics capabilities of an organization significantly affect supply chain resilience.
**H3:** Supply chain disruption orientation significantly affects operational performance.
**H4:** Supply chain resilience significantly affects operational performance.
**H5:** Digital supply chain significantly affects operational performance.
**H6:** Supplier quality management significantly affects operational performance.
**H7:** Innovation capability significantly affects operational performance.

### 3.2. Methodology

The quantitative method and data collection are obtained from the survey distribution. A questionnaire contains three parts which are screening questions (2), the five-point Likert scale questions (36), which ranged from "strongly disagree" (1) to "strongly agree" (5), and demographic information (4), including gender, age, income, and educational level. The survey was distributed to top managers and key personnel (N=425) employed for at least one year in Thailand's top five e-commerce distribution service providers in Thailand. Before the data collection, the Item–Objective Congruence (IOC) index was applied to invite three experts who are Ph.D. and supply chain professionals, resulting in all items being reserved at a score of 0.5. The pilot test of 40 participants was used to verify construct reliability, resulting in all constructs being approved at a score of 0.7 (Nunnally & Bernstein, 1994). Afterward, Confirmatory Factor Analysis (CFA) and Structural Equation Model (SEM) were used to analyze and confirm the model's goodness-of-fit and hypothesis testing.

### 3.3. Population and Sample Size

The target population is top managers and key personnel (N=425) employed for at least one year in Thailand's top five e-commerce distribution service providers in Thailand. A-priori Sample Size Calculator for Structural Equation Models (SEM) by Kline (2011) is employed to determine the sample size. The formula includes seven latent variables and 36 observed variables with a probability level of 0.05 are inputted into the calculation tools, and 425 is recommended as the minimum sample size. After the survey distribution, the researcher qualifies 425 respondents for further analysis.

### 3.4. Sampling Technique

The sampling methods were conducted using purposive sampling, quota sampling, and convenience sampling. First, purposive sampling was applied to select top managers and key personnel employed for at least one year in Thailand's top five e-commerce distribution service providers in Thailand. Second, the researcher adopted a quota sampling technique to the proportionate sample size of each company based on the available data from their annual report, as shown in Table 1. Last, convenience sampling was conducted to distribute offline and online questionnaires from March to August 2022.

**Table 1:** Quota Sampling

| Company | Number of Employee | Sample Size (425) |
|---|---|---|
| Thailand Post | 24,000 | 143 |
| Kerry Express | 22,000 | 132 |
| J&T Express | 10,000 | 60 |
| Flash Express | 10,000 | 60 |
| SCG Express | 5,000 | 30 |

## 4. Results and Discussion

### 4.1. Demographic Factors

The demographic results of 425 respondents are summarized in Table 2. Most respondents were males, 52.94 percent (225), and 47.06 percent (200) were females. The respondents' age mainly ranged between 40 to 49 years old at 44 percent, followed by above 50 years old at 29.41 percent, 30 to 39 years old at 23.06 percent, and less than 30 years old at 3.35 percent. The largest group for monthly income was THB 60,001-90,000 per month, of 39.53 percent. For educational level, most respondents were bachelors' degree, with 62.82 percent.

**Table 2:** Demographic Profile

| Demographic and general Data (N=425) | | Frequency | Percentage |
|---|---|---|---|
| Gender | Male | 225 | 52.94% |
| | Female | 200 | 47.06% |
| Age | Less than 30 years old | 15 | 3.53% |
| | 30 to 39 years old | 98 | 23.06% |
| | 40 to 49 years old | 187 | 44.00% |
| | Above 50 years old | 125 | 29.41% |
| Income per Month | Below THB 30,000 | 12 | 2.82% |
| | THB 30,001-60,000 | 103 | 24.24% |
| | THB 60,001-90,000 | 168 | 39.53% |
| | THB 90,001-120,000 | 87 | 20.47% |
| | Above THB 120,000 | 55 | 12.94% |
| Educational Level | Below Bachelor's | 5 | 1.18% |
| | Bachelor's | 267 | 62.82% |
| | Master's | 121 | 28.47% |
| | Doctorate | 32 | 7.53% |

### 4.2. Confirmatory Factor Analysis (CFA)

CFA was used to measure the degree of the significant relationship between variables before the analysis measurement model with the structural equation model (SEM). In Table 3, the results show that no constructs were less than the cut-off point of factor loading at 0.50, and the p-value is lower than 0.05. According to Hair et al. (2017), Composite Reliability or CR value is acceptable at 0.7 and above. Nunnally and Bernstein (1994) recommended that Cronbach's Alpha be accepted at 0.70 or higher. Furthermore, the Average variance extracted (AVE) value of each construct at the level above 0.5 is approved (Hair et al., 2017).

**Table 3:** Confirmatory Factor Analysis Result, Composite Reliability (CR) and Average Variance Extracted (AVE)

| Variables | Source of Questionnaire (Measurement Indicator) | No. of Item | Cronbach's Alpha | Factors Loading | CR | AVE |
|---|---|---|---|---|---|---|
| Analytics Capabilities of An Organization (ACO) | Laguir et al. (2022) | 5 | 0.805 | 0.651-0.697 | 0.810 | 0.460 |
| Supply Chain Disruption Orientation (SCDO) | Laguir et al. (2022) | 4 | 0.759 | 0.639-0.715 | 0.761 | 0.444 |
| Supply Chain Resilience (SCR) | Laguir et al. (2022) | 6 | 0.864 | 0.681-0.760 | 0.866 | 0.518 |
| Digital Supply Chain (DSC) | Saryatmo and Sukhotu (2021) | 7 | 0.890 | 0.555-0.861 | 0.891 | 0.544 |
| Supplier Quality Management (SQM) | Kebede Adem and Virdi (2021) | 4 | 0.897 | 0.794-0.899 | 0.902 | 0.698 |
| Innovation Capability (IC) | Nguyen et al. (2022) | 5 | 0.808 | 0.631-0.737 | 0.812 | 0.464 |
| Operational Performance (OP) | Laguir et al. (2022) | 5 | 0.810 | 0.621-0.741 | 0.821 | 0.480 |

Note: CR = Composite Reliability, AVE = Average Variance Extracted

Table 4 exhibited that the square root of AVEs is larger than all inter-construct/factor correlations. Therefore, the discriminant validity is supportive (Fornell & Larcker, 1981). In addition, the factor correlations did not surpass 0.80. Consequently, the problem of multicollinearity is not issued (Studenmund, 1992).

**Table 4:** Discriminant Validity

| | IC | DSC | SQM | SCDO | SCR | OP | ACO |
|---|---|---|---|---|---|---|---|
| **IC** | **0.681** | | | | | | |
| **DSC** | 0.286 | **0.738** | | | | | |
| **SQM** | 0.451 | 0.286 | **0.836** | | | | |
| **SCDO** | 0.408 | 0.229 | 0.563 | **0.666** | | | |
| **SCR** | 0.309 | 0.260 | 0.553 | 0.663 | **0.720** | | |
| **OP** | 0.661 | 0.292 | 0.613 | 0.605 | 0.505 | **0.693** | |
| **ACO** | 0.523 | 0.314 | 0.608 | 0.573 | 0.557 | 0.733 | **0.678** |

Note: The diagonally listed value is the AVE square roots of the variables

As of Table 5, the measurement model fit in CFA is measured by CMIN/DF, GFI, AGFI, NFI, CFI, TLI, RMSEA, and RMR. Statistical values before adjustment showed that it did not result in harmony with empirical data. Therefore, the model adjustment was required. After the adjustment, all values were in acceptable fit criterion and can confirm convergent and discriminant validity.

**Table 5:** Goodness of Fit of Measurement Model

| Index | Acceptable Values | Measurement Model | |
|---|---|---|---|
| | | Statistical Values Before Adjustment | Statistical Values After Adjustment |
| CMIN/DF | < 3.00 (Hair et al., 2006) | 849.426/573 = 1.482 | 690.949/565 = 1.223 |
| GFI | ≥ 0.90 (Hair et al., 2006) | 0.899 | 0.918 |
| AGFI | ≥ 0.90 (Hair et al., 2006) | 0.883 | 0.904 |
| NFI | ≥ 0.90 (Arbuckle, 1995) | 0.892 | 0.912 |
| CFI | ≥ 0.90 (Hair et al., 2006) | 0.962 | 0.983 |
| TLI | ≥ 0.90 (Hair et al., 2006) | 0.958 | 0.981 |
| RMSEA | < 0.05 (Browne & Cudeck, 1993) | 0.034 | 0.023 |
| RMR | < 0.05 (Hair et al., 2006) | 0.016 | 0.015 |
| **Model summary** | | **Not in harmony with empirical data** | **In harmony with empirical data** |

Remark: CMIN/DF = the ratio of the chi-square value to degree of freedom, GFI = goodness-of-fit index, AGFI = adjusted goodness-of-fit index, NFI, normalized fit index, CFI = comparative fit index, TLI = Tucker-Lewis index, RMSEA = root mean square error of approximation, and RMR = root mean square residual

## 4.3. Structural Equation Model (SEM)

SEM was applied to test the fit degree of the structural model, as shown in Table 6. After the adjustment by using SPSS AMOS statistical software, the model showed the acceptable value of CMIN/DF = 1.244, GFI = 0.916, AGFI = 0.902, NFI = 0.910, CFI = 0.981, TLI = 0.979, RMSEA = 0.024, and RMR = 0.016, respectively.

**Table 6:** Goodness of Fit of Structural Model

| Index | Acceptable Values | Structural Model | |
|---|---|---|---|
| | | Statistical Values Before Adjustment | Statistical Values After Adjustment |
| CMIN/DF | < 3.00 (Hair et al., 2006) | 946.036/581 = 1.628 | 709.293/570 = 1.244 |
| GFI | ≥ 0.90 (Hair et al., 2006) | 0.887 | 0.916 |
| AGFI | ≥ 0.90 (Hair et al., 2006) | 0.871 | 0.902 |
| NFI | ≥ 0.90 (Arbuckle, 1995) | 0.880 | 0.910 |
| CFI | ≥ 0.90 (Hair et al., 2006) | 0.950 | 0.981 |
| TLI | ≥ 0.90 (Hair et al., 2006) | 0.945 | 0.979 |
| RMSEA | < 0.05 (Browne & Cudeck, 1993) | 0.038 | 0.024 |
| RMR | < 0.05 (Hair et al., 2006) | 0.020 | 0.016 |
| **Model summary** | | **Not in harmony with empirical data** | **In harmony with empirical data** |

Remark: CMIN/DF = the ratio of the chi-square value to degree of freedom, GFI = goodness-of-fit index, AGFI = adjusted goodness-of-fit index, NFI, normalized fit index, CFI = comparative fit index, TLI = Tucker-Lewis index, RMSEA = root mean square error of approximation, and RMR = root mean square residual

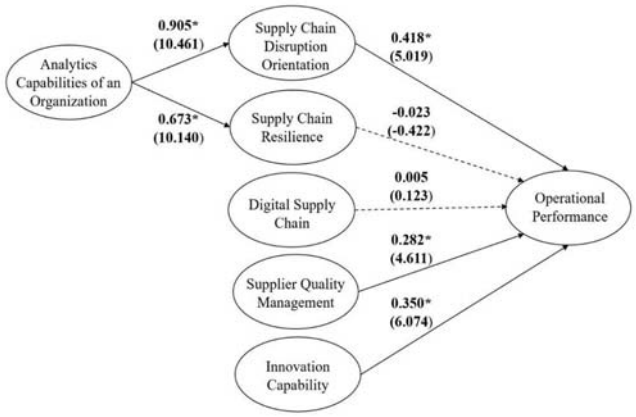
## 4.4. Research Hypothesis Testing Result

The significant relationship of each variable in the research model was examined from its regression weights and $R^2$ variances. The outcomes from Table 7 and Figure 2 presented that five hypotheses were supported with a significance at p = 0.05, except for H4 and H5, which were not supported. The strongest significant relationship is between the analytics capabilities of an organization and supply chain disruption orientation (β = 0.905), followed by analytics capabilities and supply chain resilience (β = 0.673). The highest effect on operational performance shows significance with supply chain disruption orientation (β = 0.418), followed by innovation capability (β = 0.350) and supplier quality management (β = 0.282). Nevertheless, operational performance is not significantly affected by digital supply chain (β = 0.005) and supply chain resilience (β = -0.023).

**Table 7:** Hypothesis Result of the Structural Model

| H | Paths | (β) | S.E. | T-Value | Tests Result |
|---|---|---|---|---|---|
| H1 | SCDO <= ACO | 0.905 | 0.086 | 10.461* | Supported |
| H2 | SCR <= ACO | 0.673 | 0.078 | 10.140* | Supported |
| H3 | OP <= SCDO | 0.418 | 0.087 | 5.019* | Supported |
| H4 | OP <= SCR | -0.023 | 0.047 | -0.422 | Not Supported |
| H5 | OP <= DSC | 0.005 | 0.032 | 0.123 | Not Supported |
| H6 | OP <= SQM | 0.282 | 0.052 | 4.611* | Supported |
| H7 | OP <= IC | 0.350 | 0.068 | 6.074* | Supported |

Note: *p<0.05




Remark: Dashed lines, not significant; solid lines, significant. *p<0.05

**Figure 2:** The Results of Structural Model

The hypothesis results can be interpreted below;

H1 indicates the support of the hypothesis from its significant factor influence of an organization's analytics capabilities and supply chain disruption orientation with the standardized path coefficient value of 0.905. The results are supported by Laguir et al. (2022) that analytics capabilities impact supply chain performance

H2 confirms the significant relationship between the analytics capabilities of an organization and supply chain resilience, resulting in the standardized path coefficient value of 0.673 in this structural pathway. Golgeci and Ponomarov (2013) pointed out that the analytics capabilities of organizations facilitate companies to manage their supply chains seamlessly.

H3 illustrates a significant effect of supply chain disruption orientation towards operational performance as a standardized path coefficient value of 0.418. Based on previous empirical studies, supply chain disruption caters the operational performance in the improvement of quality, cost control, processing, sourcing, and delivery of products and services (Ivanov, 2020; Nguyen & Nof, 2019; Tönnissen & Teuteberg, 2020; Xue et al., 2018).

Conversely, H4 shows the non-support relationship between supply chain resilience and operational performance, with a standardized path coefficient value of -0.023. The result contradicted many scholars that supply chain resilience is a driver of operational performance (Ambulkar et al., 2015; Min, 2019; Tiwari et al., 2018).

Followed by H5, the digital supply chain has no significant effect on operational performance, representing a standardized path coefficient value of 0.005. Thus, the result opposes the previous claims that the digital supply chain significantly affects operational performance (Farahani et al., 2017; Saryatmo & Sukhotu, 2021).

H6 proves the significant effect of supplier quality management on the operational performance of e-commerce distribution service providers. The analysis shows the standardized path coefficient value of 0.282. The finding aligns with prior literature that supplier quality management significantly affects operational performance (Baird et al., 2011; Kaynak, 2003; Kebede Adem & Virdi, 2021; Sadikoglu & Zehir, 2010).

The analysis outcome confirms H7 that innovation capability significantly affects operational performance with the standardized path coefficient value of 0.350. As supported by the study that innovation capability is an influential factor in operational performance. (Camisón & Villar-López, 2014; Heij, 2015; Kebede Adem & Virdi, 2021).

## 5. Conclusions and Recommendation

### 5.1. Conclusion

The research objectives are achieved by investigating key drivers of the operational performance of e-commerce distribution service providers in Thailand. 425 top managers and key personnel employed for at least one year in Thailand's top five e-commerce distributors have been surveyed. The data analysis was proven by CFA and SEM. The results show that an organization's analytics capabilities significantly affect supply chain disruption orientation and resilience. Furthermore, operational performance is affected by supply chain disruption, supplier quality management, and innovation capability. Nevertheless, supply chain resilience and digital supply chain have no significant effect on operational performance.

The findings can be discussed. Firstly, an organization's analytics capabilities directly impact supply chain disruption orientation and indirectly impact organizational performance. It empirically supports the view that analytics capabilities can strengthen operational performance. Most organizations exploit big data to ensure the high accuracy and capabilities to manage the storage and delivery for e-commerce businesses (B2B) and to their end consumers (B2C). Saggi and Jain (2018) added that developing analytics capability could improve operational performance in smooth operations and higher customer satisfaction.

Secondly, the analytics capabilities of an organization can endorse supply chain resilience. Golgeci and Ponomarov (2013) stated that the analytics capabilities of organizations facilitate companies to respond faster and to serve customers better. Tirkolaee et al. (2020) extended that supply chain resilience is driven by how a firm exploits the data to forecast consumers' trends and profitability. However, the finding revealed the non-supported

relationship between supply chain resilience and operational performance. It could be assumed that supply chain resilience is long-term. In contrast, operational performance can be by quarter and annual, which can be varied according to the economic and market situation.

Thirdly, a significant effect of the digital supply chain on operational performance was not found. Referring to Singhdong et al. (2021), digitization helps a company transform the business more sustainably and efficiently. However, an intelligent best-fit technological system can be a huge cost and investment which cannot determine operational performance (Büyüközkan & Göçer, 2018). In addition, the technologies that can be used are varied, such as big data, cloud computing, blockchain, IoT, and robotics which may not be significant to the supply chain's operational performance (Farahani et al., 2017).

Next, Kaynak (2003) researched the linkage between supplier quality management can improve organizational performance. In the consensus with other researchers, this study highlighted the significant role of supplier quality management in ensuring the quality of products, services, and processes, determining it as a part of total quality management. Therefore, supplier quality management is a key driver of organizational performance (Baird et al., 2011; Kaynak, 2003; Kebede Adem & Virdi, 2021; Nong & Ho, 2019; Sadikoglu & Zehir, 2010).

Lastly, innovation capability is today's big research topic. The development of fast and advanced technologies has forced most firms to transform for their survival. Traditional business has been challenged when the smartphone and pandemic disrupted face-to-face interaction. Even though online shopping was invented in 1979, it has taken a few decades to be boomed and can be critical to people's daily lives. The product, service, and process innovation have gained wide attention more than the 4Ps marketing mix as a critical determinant to stay over competitors and achieve the highest operational performance (Camisón & Villar-López, 2014; Kebede Adem & Virdi, 2021; Maldonado-Guzmán et al., 2019).

## 5.2. Recommendation

The findings of this study can contribute as guidelines for chief information officers, chief supply chain officers, and other top executives who have been investigating the improvement of companies' operational performance. The business model of e-commerce delivery service relies on its operational excellence to maximize its resources and efficiency and can retain the highest profit margin. The researcher emphasizes key operational performance drivers in modern businesses, including an organization's analytics capabilities, supply chain disruption orientation, supply chain resilience, digital supply chain, supplier quality management, and innovation capability.

For the managerial application, top managers and related personnel need to carefully consider the role the capability of their supply chains to recognize the degree of key drivers impacting operational performance. This study suggests leveraging analytics capabilities to encourage companies to acquire resilience and disruption orientation to improve operational performance. In addition, analytics capabilities have to be under the proper mitigation of technologies and workforce to ensure the proper budget and effectiveness. Even though the pandemic disruption can be a "friend" of e-commerce, where more users have increased during the outbreak, the cost and investment of the new technology and highly skilled professionals can be a "foe." Furthermore, the ability of their supply chains to recover from disruptive events is to be ensured to accomplish the desired operational performance.

It has been found that supplier quality management is the main principle of TQM that significantly and directly affects operational performance. The continuity to improve quality is crucial for sourcing suppliers who can ensure service quality, provide accurate performance feedback, conduct audits regularly, and document precise information. Hence, managing quality-related issues with suppliers can help firms to enhance their performance concerning distribution services. Additionally, innovation capability is required to be enhanced as it influences the operational performance of distribution companies in this study. The management team should set up and promote innovative ideas across the companies.

Some empirical evidence indicates that the digital supply chain and supply chain resilience are operational performance drivers. The result of this study has conversed. However, managers should acquire a greater understanding of the digital supply chain and supply chain resilience by conducting investments that necessitate in-depth research and other parameters that may need to be reconfigured and redefined. Thus, business practitioners should be knowledgeable about the diversity of emerging technology that might be worth investing in and how to strengthen its resilience in the modern business world.

## 5.3. Limitation and Further Study

This research emphasizes top managers and key personnel employed for at least one year in Thailand's top five e-commerce distributors. Hence, a study on different countries may produce different results. For instance, a developed country with the most advanced innovative technology and highly skilled labor would require a response from different perspectives. The comprehensive study can be further explored in the different market and

economic situations. Furthermore, the result of this study might apply to the field of the supply chain in the context of companies where they can improve analytics, disruption orientation, resilience, digitization, quality management, and innovation. This study excludes small companies with different budgets and a small number of employees. Lastly, the research methodology is quantitative. The numeric and statistical data may not yet provide a detailed explanation and interpretation of employees in the role of each driver that could affect the operational performance. As a result, future studies could dive deep into the rational information through qualitative analysis such as interviews or focus groups.

## References


Agarwal, R., & Dhar, V. (2014). Big data, data science, and analytics: The opportunity and challenge for IS research. *Information Systems Research, 25*(3), 443–448.

Ambulkar, S., Blackhurst, J., & Grawe, S. (2015). Firm's resilience to supply chain disruptions: Scale development and empirical examination. *Journal of Operations Management, 33*(1), 111–122.

Arbuckle, J. J. (1995). *AMOS user's guide.* Small Waters.

Baird, K., Hu, K. J., & Reeve, R. (2011). The relationships between organizational culture, total quality management practices and operational performance. *International Journal of Operations and Production Management, 31*(7), 789-814.

Browne, M. W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K. A. Bollen & J. S. Long (Eds.), *Testing structural equation models* (pp. 136-162). Sage.

Büyüközkan, G., & Göçer, F. (2018). Digital supply chain: Literature review and a proposed framework for future research. *Computers in Industry, 97,* 157–177.

Camisón, C., & Villar-López, A. (2014). Organizational innovation as an enabler of technological innovation capabilities and firm performance. *Journal of Business Research, 67*(1), 2891–2902. https://doi.org/10.1016/j.jbusres.2012.06.004

Chae, B. K., Yang, C., Olson, D., & Sheu, C. (2014). The impact of advanced analytics and data accuracy on operational performance: A contingent resource-based theory (RBT) perspective. *Decision Support Systems, 59,* 119–126.

Crossan, M. M., & Apaydin, M. (2010). A multi-dimensional framework of organizational innovation: A systematic review of the literature. *Journal of Management Studies, 47*(6), 1154–1191. https://doi.org/10.1111/j.1467-6486.2009.00880.x

Damanpour, F., Walker, R. M., & Avellaneda, C. N. (2009). Combinative effects of innovation types and organizational performance: A longitudinal study of service organizations. *Journal of Management Studies, 46*(4), 650–675. https://doi.org/10.1111/j.1467-6486.2008.00814.x

Devaraj, S., Krajewski, L., & Wei, J. C. (2007). Impact of eBusiness technologies on operational performance: The role of production information integration in the supply chain. *Journal of Operations Management, 25*(6), 1199–1216.

Farahani, P., Meier, C., & Wilke, J. (2017). Digital supply chain management agenda for the automotive supplier industry. In G. Oswald & M. Kleinemeier (Eds.), *Shaping the Digital Enterprise* (pp.157-172). Springer International Publishing.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*(1), 39–50. https://doi.org/10.2307/3151312

Golgeci, I., & Ponomarov, S. Y. (2013). Does firm innovativeness enable effective responses to supply chain disruptions? An empirical study. *Supply Chain Management: An International Journal, 18*(6), 604–617.

Grover, V., Chiang, R. H., Liang, T. P., & Zhang, D. (2018). Creating strategic business value from big data analytics: A research framework. *Journal of Management Information Systems, 35*(2), 388–423.

Hair, J., Black, W., Babin, B., Anderson, R., & Tatham, R. (2006). *Multivariate Data Analysis* (6th ed.). Pearson Prentice Hall.

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2017). A *Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)* (2nd ed.). SAGE.

Hallgren, M., & Olhager, J. (2009). Lean and agile manufacturing: external and internal drivers and performance outcomes. *International Journal of Operations & Production Management, 29*(10), 976-999.

Heij, C. V. (2015). *Innovating beyond technology: Studies on how management innovation, co-creation and business model innovation contribute to firms.* Erasmus Research Institute of Management.

Heizer, J. H., Render, B., & Weiss, H. J. (2008). *Principles of Operations Management* (7th ed.). Pearson Prentice Hall.

Hobbs, J. E. (2020). Food supply chains during the COVID-19 pandemic. *Canadian Journal of Agricultural Economics, 68*(1), 171-176.

Ivanov, D. (2020). Predicting the impacts of epidemic outbreaks on global supply chains: a simulation-based analysis on the coronavirus outbreak (COVID-19/SARS/Cov-2) case. *Logistics and Transportation Review, 136*(1), 1-14.

Jaruwanakul, T. (2021). Key Influencers of Innovative Work Behavior in Leading Thai Property Developers. *AU-GSB E-JOURNAL*, *14*(1), 61-70. https://doi.org/10.14456/augsbejr.2021.7

Kaynak, H. (2003). The relationship between total quality management practices and their effects on firm performance. *Journal of Operations Management, 21*(4), 405-435.

Kebede Adem, M., & Virdi, S. S. (2021). The effect of TQM practices on operational performance: an empirical analysis of ISO 9001: 2008 certified manufacturing organizations in Ethiopia. *The TQM Journal, 33*(2), 407-440. https://doi.org/10.1108/TQM-03-2019-0076

Kline, R. B. (2011). *Principles and Practice of Structural Equation Modeling* (3rd ed.). Guilford Press,

Laguir, I., Modgil, S., Bose, I., Gupta, S., & Stekelorum, R. (2022). Performance effects of analytics capability, disruption orientation, and resilience in the supply chain under environmental uncertainty. *Annals of Operations Research.* Advance Online Publication. https://doi.org/ 10.1007/s10479-021-04484-4

Lee, H. L. (2004). The triple-A supply chain. *Harvard Business Review, 82*(10), 102–113.

Liu, Y., Lee, Y., & Chen, A. N. (2020). How IT wisdom affects firm performance: An empirical investigation of 15-year US panel data. *Decision Support Systems, 133,* 22-35. https://doi.org/10.1016/j.dss.2020.113300

Lu, D., Ding, Y., Asian, S., & Paul, S. K. (2017). From supply chain integration to operational performance: The moderating effect of market uncertainty. *Global Journal of Flexible Systems Management, 19*(1), 3–20.

Maldonado-Guzmán, G., Garza-Reyes, J. A., Pinzón-Castro, S. Y., & Kumar, V. (2019). Innovation capabilities and performance: Are they truly linked in SMEs? *International Journal of Innovation Science, 11*(1), 48–62. https://doi.org/10.1108/IJIS12-2017-0139

Min, H. (2019). Blockchain technology for enhancing supply chain resilience. *Business Horizons, 62*(1), 35–45.

https://doi.org/10.13106/JAFEB.2019.VOL6.NO2.213

Nguyen, T. T., Le-Anh, T., & Nguyen, T. X. H. (2022). Factors Influencing Innovation Capability and Operational Performance: A Case Study of Power Generation Fields in Vietnam. *The Journal of Asian Finance, Economics and Business, 9*(5), 541–552. https://doi.org/10.13106/JAFEB.2022.VOL9.NO5.0541

Nguyen, W. P., & Nof, S. Y. (2019). Collaborative response to disruption propagation (CRDP) in cyber-physical systems and complex networks. *Decision Support Systems, 117,* 1–13.

Nong, N.-M. T., & Ho, P. T. (2019). Criteria for Supplier Selection in Textile and Apparel Industry : A Case Study in Vietnam. *The Journal of Asian Finance, Economics and Business*, *6*(2), 213–221. https://doi.org/10.13106/JAFEB.2019.VOL6.NO2.213

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

O'Reilly, C. A., III., & Tushman, M. L. (2013). Organizational ambidexterity: Past, present, and future. *Academy of Management Perspectives, 27*(4), 324–338.

Sadikoglu, E., & Zehir, C. (2010). Investigating the effects of innovation and employee performance on the relationship between total quality management practices and firm performance: an empirical study of Turkish firms. *International Journal Production Economics, 12*(7), 13-26.

Saggi, M. K., & Jain, S. (2018). A survey towards an integration of big data analytics to big insights for value-creation. *Information Processing and Management, 54*(5), 758–790.

Salaheldin, S. I. (2009). Critical success factors for TQM implementation and their impact on Performance of SMEs. *International Journal of Productivity and Performance Management, 58*(3), 215-237.

Saryatmo, M. A., & Sukhotu, V. (2021). The Influence of the Digital Supply Chain on Operational Performance: A Study of the Food and Beverage Industry in Indonesia. *Sustainability, 13,* 1-18. https://doi.org/10.3390/su13095109

Shao, B. B., Shi, Z. M., Choi, T. Y., & Chae, S. (2018). A data-analytics approach to identifying hidden critical suppliers in supply networks: Development of nexus supplier index. *Decision Support Systems, 114,* 37–48.

Singhdong, P., Suthiwartnarueput, K., & Pornchaiwiseskul, P. (2021). Factors Influencing Digital Transformation of Logistics Service Providers: A Case Study in Thailand. *The Journal of Asian Finance, Economics and Business*, *8*(5), 241–251. https://doi.org/10.13106/JAFEB.2021.VOL8.NO5.0241

Studenmund, A. H. (1992). *Using Econometrics: A Practical Guide.* Harper Collins.

Suangsub, P., Chemsripong, S., & Srisermpoke, K. (2022). High Performance Organization: A Case Study of the Logistics Industry in Thailand. *Journal of Community Development Research (Humanities and Social Sciences), 15*(1), 98-112.

Sun, L., Wang, Y., Hua, G., Cheng, T. C. E., & Dong, J. (2020). Virgin or recycled? Optimal pricing of 3D printing platform and material suppliers in a closed-loop competitive circular supply chain. *Resources, Conservation and Recycling, 162,* 10-35. https://doi.org/10.1016/j.resconrec.2020.105035

Syed, T. A., Blome, C., & Papadopoulos, T. (2020). Resolving paradoxes in IT success through IT ambidexterity: The moderating role of uncertain environments. *Information & Management, 57*(6), 13-45. https://doi.org/10.1016/j.im.2020.103345

Tirkolaee, E. B., Hadian, S., Weber, G. W., & Mahdavi, I. (2020). A robust green traffic-based routing problem for perishable products distribution. *Computational Intelligence, 36*(1), 80-101.

Tiwari, S., Wee, H. M., & Daryanto, Y. (2018). Big data analytics in supply chain management between 2010 and 2016: Insights to industries. *Computers and Industrial Engineering, 115,* 319–330.

Tönnissen, S., & Teuteberg, F. (2020). Analysing the impact of blockchain-technology for operations and supply chain management: An explanatory model drawn from multiple case studies. *International Journal of Information Management, 52*, 101-109. https://doi.org/10.1016/j.ijinfomgt.2019.05.009

Xue, K., Li, Y., Zhen, X., & Wang, W. (2018). Managing the supply disruption risk: Option contract or order commitment contract? *Annals of Operations Research, 291*, 985–1026.

Zu, X., & Kaynak, H. (2012). An agency theory perspective on supply chain quality management. *International Journal of Operations & Production Management, 32*(4), 423-446. https://doi.org/10.1108/01443571211223086