Assessing critical indicators of supply chain ambidexterity in the 3PL industry: Insights from Indonesia

Hasemy Rafsanjani[1*], Iwan Vanany[2]
[1,2] Department of Industrial and Systems Engineering, Sepuluh Nopember Institute of Technology, Surabaya, East Java, Indonesia.
* Corresponding author: hasemyr2001@gmail.com

ARTICLE INFO

Article history
Submission: 17th February, 2025
Revised: 5th June, 2025
Accepted: 12th June, 2025

Keywords
Supply Chain Ambidexterity
Supply Chain strategy
3PL
Fuzzy Delphi Method
Best-Worst Method

https://doi.org/10.22219/oe.2025.v17.i2.139

ABSTRACT

Supply chain ambidexterity (SCX) is essential strategy for enhancing the competitiveness and business continuity of third-party logistics (3PL) companies in Indonesia. SCX combines the approaches of Supply Chain (SC) agility and SC integration simultaneously to foster business performance. However, research on the factors influencing SCX remains limited. This study integrated the Fuzzy Delphi Method (FDM) to validate 41 proposed indicators and applied Best-Worst Method (BWM) to assess the relative weight and examine the most and least effective indicators for Indonesia's 3PL industry. The findings revealed 17 effective indicators, with the top 5 being SC sensing, adaptability, process optimization, regulatory compliance, and employee competency development, which were identified as the most significant indicators. These indicators are critical drivers that ensure the successful implementation of SCX strategy. The results offer valuable insights to professionals and policymakers, helping them formulate strategies to strengthen ambidextrous capabilities in the dynamic environment of the 3PL sector, thereby contributing to a more sustainable and competitive logistics landscape in Indonesia.

1. Introduction

The 3PL industry in Indonesia is growing rapidly every year. This industry plays a vital role in supporting the country's economic growth. The expansion is driven by increasing demand, rapid digitalization, and the rise of e-commerce, making it a backbone for domestic and international trade. However, the 3PL industry has to face various pressures due to a dynamic environment, so adaptation efforts are required to face disruption. Disruptions in supply chains can arise from natural disasters, geopolitical instability, and strategic misalignments (Munir et al., 2024). Strategic misalignments can hinder smooth operations and undermine a company's competitive edge. This issue is especially critical for 3PL companies, as it directly affects their logistics operation.

3PL companies must maintain high levels of uncertainty while also responding quickly to changes in volatile environment. This dual requirement creates a paradox: how can firms be both stable and flexible at the same time?. As providers of logistics services, 3PL companies are tasked with the ongoing challenge of enhancing operational efficiency while sustaining their innovation capabilities. This requires companies to continuously exploit existing capabilities and explore new opportunities to sustain growth. Companies must simultaneously be efficient and responsive. These dual strategies result in conflicting tensions and paradoxes (Feizabadi et al., 2024; Sarkis, 2024).

Tensions and paradox are captured in the ambidexterity concept, which originates from organizational theory (Zakrzewska-Bielawska, 2021). Duality and dichotomy between elements are

Please cite this article as: Rafsanjani, H., & Vanany, I. (2025). Assessing Critical Indicators of Supply Chain Ambidexterity in the 3PL Industry: Insights from Indonesia. *Operations Excellence: Journal of Applied Industrial Engineering*, 17(2), 142-156. doi:http://dx.doi.org/10.22441/oe.2025.v17.i2.139

referred to the "Concept of Ambidexterity" (CoA). Ambidexterity in the context of the supply chain is known as "Supply Chain Ambidexterity" (SCX). SCX refers to the firms ability to balance exploitation and exploration, which emphasizes innovation and flexibility. 3PL companies need to implement an approach that is able to maintain a balance between exploration (innovation) and exploitation (efficiency). SCX is a suitable SC strategy for dynamic environments that can easily adapt to disruption. SCX can overcome contradictory problems by creating a balance between short-term needs (operational optimization) and long-term needs (adaptation to change) (Ambulkar et al., 2023). Thus, it is flexible in responding to disruptions and good at managing risks and opportunities. In the context of a 3PL company, SCX allows companies to manage the tension, thereby enhancing their ability to overcome disruptions.

SCX facilitates the combination of supply chain integration and agility within organizations. Furthermore, SCX has been shown to effectively enhance business performance while maintaining supply chain reliability (Gu et al., 2021; Munir et al., 2022). Focusing exclusively on SC integration or SC agility can hinder innovation efforts (Sarkis, 2024). Deploying SCX principles at the corporate level is crucial for enhancing the performance of the company's logistics operation (Sarkis, 2024). However, despite its theoretical appeal, SCX adoption in the logistics sector remains underexplored. The majority of empirical research still centres on manufacturing industries, leaving a gap in understanding how SCX functions in service-based, logistics-intensive settings such as 3PL.

SCX adoption in the industry remains a contentious issue among professionals and scholars. The SCX approach cannot be straightforwardly adopted, as it is relatively recent concept that has been the subject of limited scientific research (Bui et al., 2021; Gala-Velásquez et al., 2024). Consequently, its implementation carries a high level of risk (Sarkis, 2024; Yalcin & Ashraf, 2024). Most scientific studies on SCX focus on additional case studies from the manufacturing sector, including the work of Benzidia et al. (2021), which explored how combining AI and blockchain technology can influence the supply chain’s capacity for ambidexterity. Gastaldi et al. (2022) identified a positive correlation between business success and adoption of SCX practices. Feizabadi et al. (2024) investigated the efficacy of SCX across different scenarios by considering factors like dynamism, complexity, and environmental conditions through computational modelling. Tseng et al. (2022) examined key sustainable SCM indicators within the textile industry, considering the intersection of organizational ambidexterity and disruption. Iftikhar et al. (2024) investigated the role of SCX implementation in establishing supply chain resilience. Previous studies indicate that SCX is a crucial approach for manufacture sector to gain competitive edge, adaptability, and robustness despite rapid market fluctuations and unpredictability. Additional research is required to bridge the existing gaps and offer more thorough advice to professionals.

Furthermore, the applicability of SCX in the 3PL sector, especially in emerging markets like Indonesia, remain largely unexamined. This presents a critical research gap that this study aims to address. This study addresses the gap by evaluating SCX implementation in Indonesia's 3PL industry, which serves as an ideal context because of its complex logistics networks, increasing service demands, and geographical diversity. Consequently, this investigation aims to achieve the following objectives:

1. Validate SCX indicators based on professional judgment.
2. Identify the most effective indicators for successful execution, and.
3. Explore the managerial implications of SCX implementation in the 3PL sector.

This research focuses on the 3PL industry as a key case study because of its pivotal role in overseeing intricate supply chain networks. Additionally, 3PL companies face unique challenges in balancing operational efficiency and innovation, making them an ideal context for exploring supply chain ambidexterity. Furthermore, the increasing demand from both clients and consumers for cost-effective and fast logistics services highlights the relevance of the 3PL industry to SCX research’s objective. This research takes place in Indonesia, a country experiencing rapid growth in the logistics sector, while facing significant geographical challenges. The findings of this case study are also applicable to other developing countries with similar characteristics. Thus, this research contributes to the creation of a more sustainable and competitive logistics landscape in Indonesia.

Please cite this article as: Rafsanjani, H., & Vanany, I. (2025). Assessing Critical Indicators of Supply Chain Ambidexterity in the 3PL Industry: Insights from Indonesia. *Operations Excellence: Journal of Applied Industrial Engineering*, 17(2), 142-156. doi:http://dx.doi.org/10.22441/oe.2025.v17.i2.139

2. Methods

This research employed literature review LR to identify preliminary indicators, thereby facilitating a methodical and reproducible framework. Fuzzy Delphi Method (FDM) was applied to verify the proposed indicators based on the linguistic preferences of the interviewees. The Best-Worst Method (BWM) was used to assess the weighting and efficacy of the indicators. The research process is presented in Fig. 1. The analysis steps are as follows:

1. Search term identification: A search was conducted to gather publication details from a database.
2. Indicators generation: SCX indicators are extracted from the chosen databases (Emerald, ScienceDirect, and Scopus), and content analysis is used to group the selected criteria into related categories. The proposed indicators are presented in Table 1.
3. Validation: The professional's assessment of the proposed indicators is derived from a questionnaire. FDM analysis is used to identify and filter out valid and invalid indicators.
4. Effective Indicators Determination: BWM was employed to identify the effective indicators, which subsequently became crucial prerequisites for applying SCX principles. These indicators are essential for 3PL companies to enhance operational execution and realize greater performance outcomes.

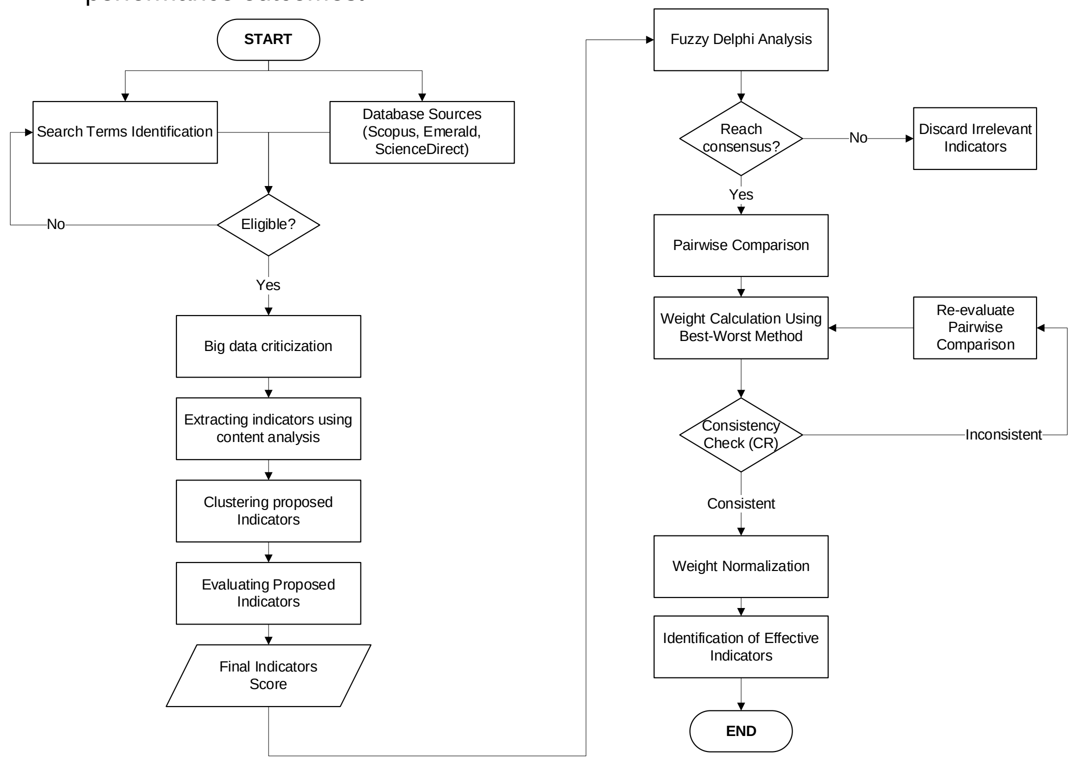

Fig. 1 Methodology.

Table 1 Proposed indicators

Factors	S/N	Preliminary Indicators	Reference
Dynamic capabilities (C1)	C11	SC sensing	(Figueiredo et al., 2024)
	C12	SC seizing	(Figueiredo et al., 2024)
	C13	SC reconfiguring	(Figueiredo et al., 2024)
	C14	learning capability	(Ojha et al., 2018)
	C15	Business continuity	(Aldianto, 2021)
	C16	analytics capability	(Khan et al., 2023)
Risk Management & resilience (C2)	C21	Risk identification capabilities	(Agarwal & Seth, 2021)
	C22	Risk mitigation capabilities	(Aslam et al., 2020)
	C23	Risk assessment	(Aslam et al., 2020)
	C24	Cyber risk	(Herburger et al., 2024)
	C25	Supplier diversification	(Vega et al., 2023)

Please cite this article as: Rafsanjani, H., & Vanany, I. (2025). Assessing Critical Indicators of Supply Chain Ambidexterity in the 3PL Industry: Insights from Indonesia. *Operations Excellence: Journal of Applied Industrial Engineering*, 17(2), 142-156. doi:http://dx.doi.org/10.22441/oe.2025.v17.i2.139

Factors	S/N	Preliminary Indicators	Reference
	C26	Recovery capabilities	(Agarwal & Seth, 2021)
	C27	Adaptability (Risk)	(Kraus et al., 2022)
	C28	Visibility	(Iborra et al., 2020)
	C29	SC Reliability	(Partanen et al., 2020)
	C210	Financial Vulnerability	(Tseng et al., 2022)
Exploitation (C3)	C31	Process optimization	(Leitão et al., 2024)
	C32	Cost control	(Aslam et al., 2024)
	C33	Enhanced quality and reliability	(Srisathan et al., 2023)
	C34	Risk control	(Ambulkar et al., 2023)
	C35	Efficiency	(Wamba et al., 2020)
	C36	Vehicle capacity enhancement	(Stekelorum et al., 2021)
	C37	Utilization of technology	(Alamsjah & Yunus, 2022)
Exploration & Innovation Capabilities (C4)	C41	RnD	(Gala-Velásquez et al., 2024)
	C42	Product/service/business development	(Ashrafi & Zareravasan, 2022)
	C43	Business diversification	(Saleh, 2023)
	C44	Adoption of emerging technologies	(Benzidia et al., 2021)
	C45	Collaborative partnerships	(Matas et al., 2024)
	C46	Employee Competency Development	(Shamout, 2023)
Sustainability (C5)	C51	CSR	(Nakandala et al., 2024)
	C52	Environmental Aspects	(Tseng et al., 2022)
	C53	Adaptive Sustainability Strategies	(Tseng et al., 2022)
	C54	Regulatory Compliance	(Stekelorum et al., 2021)
Organizational capacity (C6)	C61	Organizational structure	(Priyanka et al., 2022)
	C62	Leadership and management of the organization	(Priyanka et al., 2022)
	C63	Organizational culture	(Priyanka et al., 2022)
	C64	Information systems and technology	(Anggadwita, 2021)
	C65	Organizational Practices	(Alamsjah & Yunus, 2022)
	C66	Financial capability	(Aldianto, 2021)
	C67	Organizational resources	(Ahmed et al., 2024)
	C68	Sustainable partnership	(Alsmairat & Al-Shboul, 2023)

FDM can decrease the time required for data collection and the number of respondents surveyed, providing detailed and accurate results while maintaining research efficiency (Tsai et al., 2020). 19 experts with over five years of expertise in logistics, procurement, warehousing, and supply chain management who hold senior management roles were polled to share their opinions on each criterion's level of effectiveness. Expert a was asked to evaluate the contribution of Indicator b to the system's effectiveness, represented as $J=(x_{ab};y_{ab};z_{ab})$, where $a=1,2,3,...,n$ and $b=1,2,3,...,n$. The weight of indicator b, denoted as j_b, is defined as $j_b=(x_b;y_b;z_b)$, where:

$$x_b = min(x_{ab}),\ y_b = (\prod_1^n y_{ab})^{1/n},\ z_b = max(z_{ab}) \quad (1)$$

Subsequently, expert's opinions were transformed into Triangular Fuzzy Number (TFN), as presented in Table 2.

Table 2 FDM scale for linguistic terms and the corresponding TFN

Scale Number	Linguistic Terms	TFN		
5	Very high	0.75	1	1
4	High	0.5	0.75	1
3	Low	0.25	0.5	0.75
2	Very low	0	0.25	0.5
1	No	0	0	0.25

Then, the defuzzied consensus value D_b is computed as follows:

$$D_b = \int(u_b, l_b) = \delta[u_b + (1-\delta)l_b] \quad (2)$$

Please cite this article as: Rafsanjani, H., & Vanany, I. (2025). Assessing Critical Indicators of Supply Chain Ambidexterity in the 3PL Industry: Insights from Indonesia. *Operations Excellence: Journal of Applied Industrial Engineering*, 17(2), 142-156. doi:http://dx.doi.org/10.22441/oe.2025.v17.i2.139

$$u_b = z_b - \delta(z_b - y_b) \tag{3}$$

$$l_b = x_b - \delta(y_b - yx_b),\ b = 1,2,3,...,m \tag{4}$$

The BWM is utilized to evaluate and rank the most and least significant indicators in the decision-making process. This research evaluates the effectiveness and ineffectiveness of each indicator through expert assessment using a 9-point Likert scale. In the analysis process, the indicator is typically regarded as $\{c_1, c_1, ..., c_n\}$ and either the best or the worst indicator will be determined. The effectiveness and ineffectiveness of each indicator are justified by calculating its weighted value as follows:

$$A_{Bn} = (a_{B1,} a_{B2,} a_{B3,} a_{B4}, ..., a_{Bn,}) \tag{5}$$

$$A_{nW} = (a_{1W}, a_{2W}, a_{3W}, ..., a_{nW}) \tag{6}$$

A_{Bn} and A_{nW} is defined as the best-to-others and the others-to-worst vector. a_{Bn} represents the preference of the most effective indicator B over the n^{th} indicator. a_{nW} represents the preference of least effective indicator W over the n^{th} indicator. Then, calculate Maximum absolute difference (MD) of all n indicator as follows:

$$MD = \left(\left| \alpha_n - \frac{W_B}{W_n} \right|, \left| \beta_n - \frac{W_n}{W_W} \right| \right) \tag{7}$$

$$\alpha_n = \left(\frac{w_B}{w_n} \right),\ \beta_n = \left(\frac{w_n}{w_W} \right) \tag{8}$$

the min-max model is applied to optimize weight allocation by minimizing the maximum deviation (ε)

$$\left\{ \begin{array}{l} for \min \varepsilon \\ \left| \alpha_n - \frac{w_B}{w_n} \right| \le \varepsilon \\ \left| \beta_n - \frac{w_n}{w_W} \right| \le \varepsilon \\ \sum_{n=0} w_n^* = 1 \\ w_n^* \ge 0 \end{array} \right\} \tag{9}$$

$(w_1^*, w_2^*, w_3^*, ..., w_n^*)$ represents the optimal value of ε and the consistency ratio (CR) is calculated as follows:

$$CR = \frac{\varepsilon}{CI} \tag{10}$$

CI identified as the consistency index or the max possible value of ε. if CR value is larger than 1, the indicators is inconsistent. The cut-off value, defined as the average weight of the entire set of indicators, is used to identify those that enhance performance effectiveness. Subsequently, a proportional normalization method was applied as shown in Equation (11), where each score is divided by the total sum of all effective indicator weight to ensure the normalized weights sum up to 1.

$$w_i = \frac{x_i}{\sum_{j=1}^{m} x_j} \tag{11}$$

Only indicators that surpassed the cut-off value were considered in the normalization process to calculate the global weight of the effective indicators. w_i denote the normalized weight of indicator i. x_i represent the initial score assigned to indicator i and m is the total number of effective indicators. The result ensures that all normalized weights lie within the range [0,1] and sum to 1, thereby enabling fair comparison and aggregation.

ISSN-p: 2085-1431
ISSN-e: 2654-5799

3. Results and Discussion

Experts Profile

The profiles of the participating experts are summarized in Table 3. The panel consists of 19 professionals. Most participants are male (68%), and 63% are under the age of 40. In terms of experience, 53% have more than five years, and 47% have over ten years of experience, indicating strong familiarity with the field. Regarding educational background, 84% hold a bachelor's degree and 16% a master's degree, while none of them hold a doctoral degree. Most respondents (68%) work as managers or assistant managers, followed by supervisors or analysts (21%), and executive-level professionals such as directors, commissioners, or vice presidents (11%).

Table 3 Profile of experts participating in this research

Profile		**Number**	**Percentage %**
Gender	Male	13	68%
	Female	6	32%
Age	<40	12	63%
	40-50	5	26%
	>50	2	11%
Years of experience	>= 5	10	53%
	>= 10	9	47%
Educational background	Bachelors degree	16	84%
	Master degree	3	16%
	Doctoral degree	0	-
Job position	SPV/Analyst	4	21%
	Manager/assistant Manager	13	68%
	Executive level [Director/Commisary/VP]	2	11%

Indicator Validation (FDM Result)

The primary research objective is to determine the essential indicators for implementing SCX strategies in 3PL companies. Following an evaluation by 19 experts, 41 potential indicators were identified, of which 38 were deemed crucial for successful application in the 3PL industry. The evaluation outcomes for the potential indicators rely on the threshold construct's value (d), and the lowest consensus percentage that all valid indicators within each factor (C) must attain is 90%, requiring each indicator to have a consensus of more than 75% (Jahanvand et al., 2023).

Table 4 Indicators status

Factors (C)	**Proposed Indicator**	**Fuzzy Crisp Value**	**Indicators Consensus (*d*)**	**Status**	**Valid Indicators Consensus (AVG *d*)**
Dynamic capability (C1)	*SC sensing*	0.88	100%	Valid	94%
	SC seizing	0.82	89%	Valid	
	SC reconfiguring	0.86	95%	Valid	
	learning capability	0.86	95%	Valid	
	Business continuity	0.87	95%	Valid	
	analytics capability	0.90	89%	Valid	

Factors (C)	Proposed Indicator	Fuzzy Crisp Value	Indicators Consensus (*d*)	Status	Valid Indicators Consensus (AVG *d*)
Risk Management & resilience (C2)	Risk identification capabilities	0.85	95%	Valid	94%
	Risk mitigation capabilities	0.87	100%	Valid	
	Risk assessment	0.81	89%	Valid	
	Cyber risk	0.88	100%	Valid	
	Supplier diversification	0.78	84%	Valid	
	Recovery capabilities	0.86	95%	Valid	
	Adaptability (Risk)	0.86	100%	Valid	
	Visibility	0.81	95%	Valid	
	SC Reliability	0.82	89%	Valid	
	Financial Vulnerability	0.87	95%	Valid	
Exploitation (C3)	Process optimization	0.84	100%	Valid	97%
	Cost control	0.84	95%	Valid	
	Enhanced quality and reliability	0.88	100%	Valid	
	Risk control	0.73	32%	Invalid	
	Efficiency	0.79	89%	Valid	
	Vehicle capacity enhancement	0.79	37%	Invalid	
	Utilization of technology	0.86	100%	Valid	
Exploration & Innovation (C4)	RnD	0.78	89%	Valid	95%
	Product/business development	0.83	95%	Valid	
	Business diversification	0.75	37%	Invalid	
	Adoption of emerging technologies	0.81	89%	Valid	
	Collaborative partnerships	0.86	100%	Valid	
	Employee Competency Development	0.89	100%	Valid	
Sustainability (C5)	CSR	0.80	95%	Valid	93%
	Environmental Aspects	0.80	84%	Valid	
	Adaptability (Economic/Social/Environmental)	0.84	95%	Valid	
	Regulatory Compliance	0.87	100%	Valid	
Organizational capacity (C6)	Organizational structure	0.85	100%	Valid	97%
	Leadership and management of the organization	0.87	100%	Valid	
	Organizational culture	0.80	89%	Valid	
	Information systems and technology	0.87	100%	Valid	
	Organizational Practices	0.87	100%	Valid	
	Financial capability	0.87	100%	Valid	
	Organizational resources	0.86	100%	Valid	
	Sustainable partnership	0.78	84%	Valid	

The input for the best–worst method is the indicator of each factor that is declared valid. Indicators that meet the validation criteria will be retained, whereas those that do not will be excluded. Three indicators have been declared invalid: risk control, vehicle capacity enhancement, and business diversification. Risk control is invalid because it does not form a fundamental component of the exploitation factor. This factor focuses on enhancing and utilizing existing logistics operations. Risk control prioritizes the ability of a supply chain to maintain its performance under challenging circumstances. Risk control also ensures that the exploitation process proceeds efficiently and continuously. Enhancing vehicle capacity is an exploratory process that typically necessitates substantial investments in infrastructure and labour, as well as significant alterations to existing systems.

The business diversification indicator is deemed unreliable for certain reasons. 3PL companies diverge from the characteristics of companies in other sectors. 3PL companies fail to perceive business diversification as a means to expand their operations due to high operational complexity, significant infrastructure investments, reliance on economies of scale, and stringent regulatory requirements. Logistics management is a complex process due to its multifaceted nature, encompassing transportation, warehousing, and distribution elements that necessitate substantial investment and are not easily replicable in other companies. Diversifying a business can compromise

Please cite this article as: Rafsanjani, H., & Vanany, I. (2025). Assessing Critical Indicators of Supply Chain Ambidexterity in the 3PL Industry: Insights from Indonesia. *Operations Excellence: Journal of Applied Industrial Engineering*, 17(2), 142-156. doi:http://dx.doi.org/10.22441/oe.2025.v17.i2.139

its fundamental operational efficiency and necessitate significant extra investments. Companies that specialize in third-party logistics hold an advantage due to their extensive network and large-scale economies; consequently, concentrating on core businesses is deemed more viable. Companies specializing in logistics are more likely to increase their service offerings within their existing supply chain (vertical integration) by adding capabilities, such as warehousing and freight forwarding, rather than venturing into completely unrelated sectors. Some logistics companies are still expanding their offerings in a limited capacity, including by entering the e-commerce sector, logistics technology, or providing logistics-related financial services, such as factoring invoices.

Effective Indicator (BWM Result)

The BW method's outcomes will give an overview of the top priority indicators or the most effective indicators necessary for putting the SCX strategy into practice. The determination is based on the threshold value (cut-off) derived from the mean outcome of the weight of indicator *i* on factor *j*. Calculations were also conducted to verify the accuracy and reliability of the obtained results. Accepted consistency level is no more than 0.1.

A total of 38 valid indicators are analyzed using BWM, yielding 17 indicators that met effectiveness criterion, while the remaining 21 are classified as ineffective. An indicator is considered effective if its BWM weight is equal to or exceeds the cut-off value. Cut-off value serves as a significant benchmark to filter out indicators with insufficient impact. Cut-off value ensures that only indicators with substantial influence are retained for the normalization process, as presented in Table 5.

Table 5 BWM Results

Factors (C)	Valid Indicators	Weight	Cut-off value	Status
Dynamic capability (C1)	SC sensing	0.3948	0.17	Effective
	SC seizing	0.0718		Ineffective
	SC reconfiguring	0.1309		Ineffective
	learning capability	0.0840		Ineffective
	Business continuity	0.1063		Ineffective
	analytics capability	0.2122		Effective
Risk Management & resilience (C2)	Risk identification capabilities	0.214	0.10	Effective
	Risk mitigation capabilities	0.1189		Effective
	Risk assessment	0.0238		Ineffective
	Cyber risk	0.1189		Effective
	Supplier diversification	0.0297		Ineffective
	Recovery capabilities	0.1189		Effective
	Adaptability (Risk)	0.1189		Effective
	Visibility	0.0264		Ineffective
	SC Reliability	0.0396		Ineffective
	Financial Vulnerability	0.1911		Effective
Exploitation (C3)	Process optimization	0.3771	0.20	Effective
	Cost control	0.1347		Ineffective
	Enhanced quality and reliability	0.0967		Ineffective
	Efficiency	0.1616		Ineffective
	Utilization of technology	0.2299		Effective
Exploration & Innovation (C4)	RnD	0.1286	0.20	Ineffective
	Product/business development	0.1143		Ineffective
	Adoption of emerging technologies	0.3000		Effective
	Collaborative partnerships	0.1143		Ineffective
	Employee Competency Development	0.3429		Effective

Factors (C)	Valid Indicators	Weight	Cut-off value	Status
Sustainability (C5)	CSR	0.1073	0.25	Ineffective
	Environmental Aspects	0.1413		Ineffective
	Adaptability (Economic/Social/Environmental)	0.3936		Effective
	Regulatory Compliance	0.3578		Effective
Organizational capacity (C6)	Organizational structure	0.0441	0.13	Ineffective
	Leadership and management of the organization	0.2497		Effective
	Organizational culture	0.0409		Ineffective
	Information systems and technology	0.0716		Ineffective
	Organizational Practices	0.2130		Effective
	Financial capability	0.2280		Effective
	Organizational resources	0.0573		Ineffective
	Sustainable partnership	0.0955		Ineffective

Table 6 presents the normalized weights of the 17 pivotal indicators identified through the BWM analysis. The most effective indicators are determined based on the highest normalized weights. The 5 most effective indicators are SC sensing, adaptability (economic/social/environmental), process optimization, regulatory compliance, and employee competency development. Conversely, the 5 least influential indicators are risk mitigation capability, cyber risk, recovery capabilities, adaptability (risk), and financial vulnerability, each of which holds the lowest normalized weight.

Table 6 Priority indicators

Factors	Indicators	Weight	Weight (Normalization)	CR	Global Rank
Dynamic capability (C1)	SC Sensing	0.3948	0.0945	0	1
	Analytics Capability	0.2122	0.0508		12
Risk Management & resilience (C2)	Risk identification capabilities	0.2140	0.0512	0.0417	10
	Risk mitigation capabilities	0.1189	0.0284		14
	Cyber risk	0.1189	0.0284		14
	Recovery capabilities	0.1189	0.0284		14
	Adaptability (Risk)	0.1189	0.0284		14
	Financial Vulnerability	0.1911	0.0457		13
Exploitation (C3)	Process optimization	0.3771	0.0902	0.05	3
	Utilization of technology	0.2299	0.0550		8
Exploration & Innovation (C4)	Adoption of emerging technologies	0.3000	0.0718	0	6
	Employee Competency Development	0.3429	0.0820		5
Sustainability (C5)	Adaptability (Economic/Social/Environmental)	0.3936	0.0942	0.0417	2
	Regulatory Compliance	0.3578	0.0856		4
Organizational capacity (C6)	Leadership and management of the organization	0.2497	0.0597	0.0714	7
	Organizational Practices	0.2130	0.0510		11
	Financial capability	0.2280	0.0545		9

The key performance metrics for third-party logistics companies include 17 distinct indicators. These indicators hold significant importance due to their substantial influence on companies and supply chains. The 5 indicators with the highest weight of effectiveness are factor dynamic capabilities, exploitation, exploration and innovation, and sustainability. The 5 indicators have the lowest weight and are specifically used to manage risk and enhance resilience. The characteristics of the SCX strategy are evident in its application to 3PL companies. A key indicator of the importance of 3PL companies' business continuity is their emphasis on flexibility when adapting to market shifts, technological advancements, and regulatory requirements. The Exploitation-Exploration factor represents a 3PL company offering a versatile and innovative service portfolio that maximizes its profits. The profile with the lowest weight represents a moderate level of effectiveness.

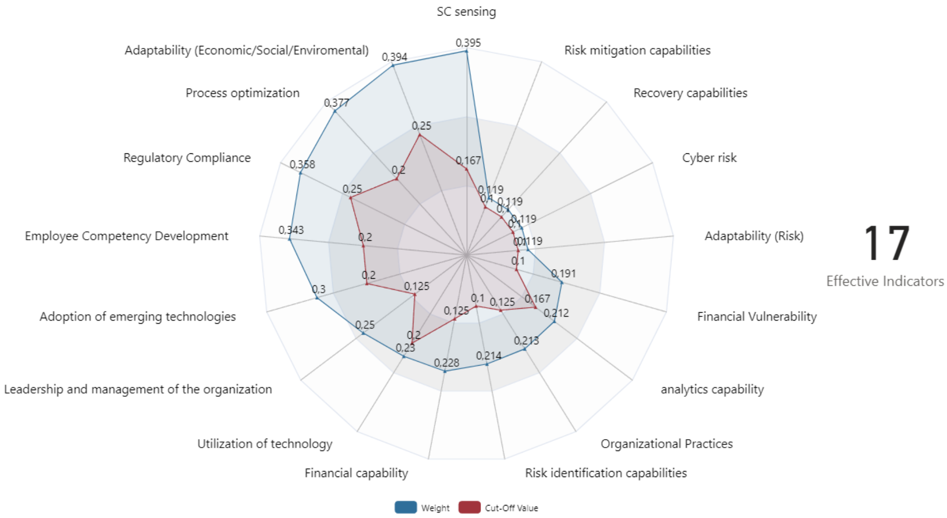

Fig. 2 Cut-off values and weights of effective indicators.

Third-Party Logistics companies have found a balance in their risk tolerance. Risk management is a consideration for them, but it is not their primary indicator of their priorities. Indonesian 3PL companies prioritize innovation and sustainability while taking calculated risks to capitalize on key opportunities. Although they are not entirely risk-averse, their risk management approach involves a proactive, preventative action with a long-term focus on strategic growth.

The top priority indicators, SC sensing capability, represents the key indicator of the SCX. The significance of SC sensing can be attributed to several key factors. Supply chain sensing is closely linked to adaptability, responsiveness to change, and the achievement of competitive supply chain advantages. SC sensing is considered a fundamental requirement for the creation and deployment of other dynamic capabilities, including supply chain seizing and reconfiguring. Companies' SC sensing capabilities extend beyond collecting data, encompassing the processing and utilization of that information to enhance their operational efficiency, adaptability, and market advantage in a rapidly changing and unpredictable business landscape. Sensing SC also plays a key role in integrating external information and activities, which is crucial for developing a comprehensive understanding of potential cyber threats and risks. Cyber threats can originate from any stage of the supply chain; thus, SC sensing is crucial to enable companies to respond promptly and anticipate potential changes.

The second top priority indicator is adaptive capability, which involves adjusting strategies and processes to improve long-term sustainability. The significance of this capability lies in the fact that the global market is characterized by uncertainty and swift changes, specifically, customer preferences. Companies must be able to adapt to environmental changes, including climate change, government regulations and social pressures. Deploying eco-friendly solutions and sustainable innovations enables companies to boost supply chain resilience through adaptability. Adaptive capabilities enable businesses to gain competitive edge by consistently innovating and responding to evolving market requirements and environmental difficulties.

The process optimization indicator is a key indicator to consider. This metric enables firms to reconcile productivity and adaptability, two fundamental aspects of ambidexterity. Existing operations are refined and improved to boost efficiency and reduce expenses. This right encompasses standardizing processes, minimizing waste, and optimizing existing technology to increase productivity using the same or fewer resources. Furthermore, effective process optimization enhances supply chain flexibility. Optimizing processes in the context of supply chain ambidexterity involves more than just enhancing efficiency; it also requires establishing a solid base for innovation, adaptability, and the ability to recover from setbacks.

Please cite this article as: Rafsanjani, H., & Vanany, I. (2025). Assessing Critical Indicators of Supply Chain Ambidexterity in the 3PL Industry: Insights from Indonesia. *Operations Excellence: Journal of Applied Industrial Engineering*, 17(2), 142-156. doi:http://dx.doi.org/10.22441/oe.2025.v17.i2.139

Regulatory compliance indicators are crucial components of the supply chain, as they have a direct impact on a company's reputation and overall performance. Adhering to regulations signifies that the company is conducting business in an ethically and responsible manner. Furthermore, third-party logistics providers are also engaged in international trade, requiring companies to adhere to a range of regulations in both their countries of origin and final destinations. Ensuring compliance facilitates seamless logistics operations. Regulatory compliance is not only a legal requirement but also a crucial strategic investment that supports the long-term sustainability, reputation, and performance of the supply chain. Firms that focus on adhering to regulatory requirements generally exhibit a lower risk profile, are more inclined to innovation, and achieve greater success.

The interplay between supply chain sensing, adaptability, process optimization, and regulatory compliance strengthens supply chain ambidexterity. Supply chain sensing enables companies to identify opportunities for process improvements and innovation. Adaptability supports changes in supply chain design and the integration of new technologies. Process optimization enhances operational efficiency while creating space for innovation. Regulatory compliance ensures ethical business practices and reduces risks. Together, these elements help organizations balance exploration and exploitation while improving their ability to adapt to and recover from disruptions. Ambidexterity involves not only balancing exploration and exploitation but also integrating them to maximize their impact. Organizations that effectively achieve ambidexterity can create synergies between these approaches, leading to enhanced innovation and overall performance.

There are also priority indicators that are slightly less important. In the context of ambidexterity, indicators that belong to risk management and resilience factor are typically given a lower weight than other indicators. Maintaining supply chain stability relies heavily on effective risk management, and a lack of emphasis can be justified. A company’s proactive capability to adapt to disruptions and changes is more closely associated with other indicators such as SC sensing, adaptability, and process optimization. Ambidexterity involves exploring new opportunities while simultaneously utilizing one's existing resources and capabilities. Risk management is often seen as a fundamental component that underpins supply chain operations rather than a primary goal in supply chain strategies that require flexibility in both directions.

Risk management factors play a crucial role in supporting other indicators and ensuring operational stability; however, they do not directly drive exploration and innovation. Research indicates that data-driven supply chain management tends to prioritize measurable and optimizable indicators through data analysis. In contrast, risk-related indicators are often harder to quantify and may require qualitative assessments. Therefore, organizations emphasize indicators that enhance adaptability and agility because they directly contribute to supply chain ambidexterity.

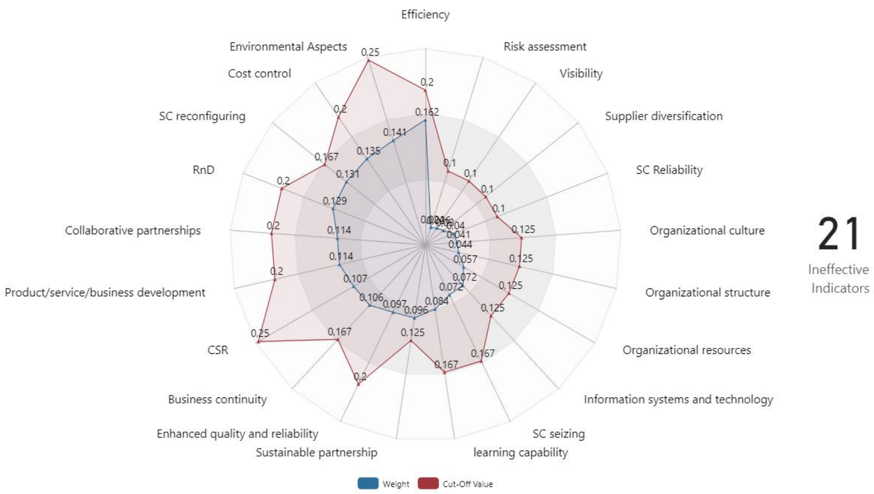

Fig. 3 Cut-off values and weights of ineffective indicators.

Fig. 3 presents a set of valid indicators that contribute only marginally to the Supply Chain ambidexterity (SCX). These indicators fail to exceed the established cut-off values within their respective factors, indicating limited direct impact. Specifically, 21 indicators exhibit a mediated effect rather than a direct influence on the SCX. The mediating role of SC sensing is evident, as both SC

Please cite this article as: Rafsanjani, H., & Vanany, I. (2025). Assessing Critical Indicators of Supply Chain Ambidexterity in the 3PL Industry: Insights from Indonesia. *Operations Excellence: Journal of Applied Industrial Engineering*, 17(2), 142-156. doi:http://dx.doi.org/10.22441/oe.2025.v17.i2.139

seizing and SC reconfiguring influence SCX through SC sensing rather than exerting a direct effect. Organizations must first enhance their SC sensing capabilities to effectively leverage the seizing and reconfiguring mechanisms to achieve SCX.

The limited contribution of these indicators can be attributed to their lower priority in decision-making within the MCDM framework. Despite their theoretical relevance, their overall weight in determining SCX framework remains insufficient for direct impact. Several possible explanations exist for this outcome: (1) these indicators may represent secondary or supporting factors rather than primary drivers of SCX; (2) their influence may be conditional, meaning they become more relevant only under specific circumstances; or (3) their effects are overshadowed by more dominant criteria within the decision-making hierarchy. Consequently, while these indicators are valid within the conceptual framework, they do not emerge as critical determinants of SCX strategy in the MCDM evaluation.

Managerial Implications

In today's volatile logistics landscape, 3PL providers must rethink their strategic playbook to stay ahead. Achieving SCX—the ability to balance operational efficiency (exploitation) with innovation and agility (exploration)—is no longer optional; it is a necessity. As disruptions become more frequent and customer expectations evolve, 3PLs must build resilience while driving continuous transformation.

Winning in the 3PL space requires real-time SC sensing—the ability to anticipate shifts in demand, regulatory changes, and emerging risks. This means leveraging advanced analytics, AI-driven forecasting, and IoT-enabled visibility to move from reactive to proactive decision-making. Companies that excel in SC sensing create a foundation for rapid adaptation, enabling them to seize opportunities and reconfigure operations swiftly. However, sensing alone is not enough; successful 3PLs also master the art of balancing efficiency and innovation. Efficiency is table stakes, but innovation drives the next frontier. 3PLs must deploy automation, AI, and digital twins to streamline processes while simultaneously experimenting with new business models, such as platform-based logistics ecosystems. Investing in modular, scalable technology stacks ensures that organizations can flexibly navigate shifts in the global supply chain.

SCX is not just about strategy, it's about people. 3PL leaders must foster a culture of experimentation while maintaining execution discipline. Traditional hierarchical decision-making must give way to empowered, cross-functional teams that drive both efficiency gains and breakthrough innovations. Moreover, avoiding paternalistic leadership and shifting towards data-driven, feedback-centric management will be crucial in unlocking high-performance teams. At the same time, risk is no longer just something to be mitigated, it's something to be managed strategically. Leading 3PLs embed Supply Chain Risk Management (SCRM) practices into organizations, using predictive risk analytics to anticipate disruptions before happening. Those that master risk resilience don't just survive uncertainty—they turn it into a competitive differentiator.

Balancing short-term cost discipline with long-term strategic investments is also critical. Rather than focusing solely on cost-cutting, 3PLs must assess the ROI of digital transformation, automation, and new service models. High-performing firms adopt dynamic capital allocation frameworks, ensuring that financial resources are channelled into initiatives that sustain both operational excellence and market expansion. 3PLs must embed SCX into their DNA in order to thrive, continuously refining their ability to sense, seize, and transform. Those practices is important to balance efficiency, innovation, and turning uncertainty into opportunity or disruption into a sustainable competitive advantage.

4. Conclusion

Indonesia's third-party logistics (3PL) sector functions within a rapidly evolving landscape, making the implementation of Supply Chain Ambidexterity (SCX) a fundamental business imperative. Our research revealed 38 critical factors necessary for the successful implementation of SCX, with 17 of these key indicators having considerable strategic importance. Although still theoretically valid, the remaining 21 indicators have a restricted impact on SCX success due to various factors: (1) they primarily serve as secondary elements, (2) their relevance is extremely context-dependent, and (3) their impact is frequently overshadowed by more influential decision-making criteria.

The core of SCX is SC sensing, which anticipates demand shifts, regulatory changes, and emerging risks. This requires 3PLs to transition from reactive operations to proactive decision-making by leveraging advanced analytics, AI-powered forecasting, and IoT-enabled supply chain visibility. However, SC sensing alone is insufficient; it must be integrated with process optimization to ensure both efficiency and adaptability. In this context, efficiency is non-negotiable, but innovation differentiates market leaders from laggards. To remain competitive, 3PLs must embed automation, AI, and digital twins into their operations while simultaneously exploring new business models, such as platform-based logistics ecosystems. In addition, regulatory compliance is a cornerstone of operational resilience, safeguarding both performance and corporate reputation. Companies that seamlessly integrate SC sensing, operational efficiency, and compliance-driven governance will be best positioned to navigate market uncertainties, capitalize on emerging opportunities, and build long-term competitive advantage in Indonesia's rapidly evolving 3PL sector.

Long-term studies could provide insights into how firms develop and sustain ambidextrous supply chain capabilities over time, particularly in response to disruptions or market changes. In addition, there is a need for rigorous quantitative modelling to evaluate SCX effectiveness prior to implementation. Simulation modelling or machine learning could be utilized to predict ambidexterity levels and assess their potential implications for supply chain performance.

Acknowledgments

I would like to express my deepest gratitude to Prof. Iwan Vanany, my supervisor, for his invaluable guidance, constructive feedback, and unwavering support throughout this research. I also would like to acknowledge the contributions of all respondents and my supervisor whose works have provided a foundation for this study. Without their valuable insights and contributions, this research would not have been possible.

References

Agarwal, N., & Seth, N. (2021). Analysis of supply chain resilience barriers in Indian automotive company using total interpretive structural modelling. *Journal of Advances in Management Research*, *18*(5), 758-781. https://doi.org/10.1108/JAMR-08-2020-0190

Ahmed, F., Hu, W., Arslan, A., & Huang, H. (2024). Ambidexterity of HR practices in fortune 500 companies and employee innovation performance: mediating role of inclusive leadership. *Journal of Organizational Change Management*, *37*(2), 237-254. https://doi.org/https://doi.org/10.1108/JOCM-05-2022-0139

Alamsjah, F., & Yunus, E. N. (2022). Achieving Supply Chain 4.0 and the Importance of Agility, Ambidexterity, and Organizational Culture: A Case of Indonesia. *Journal of Open Innovation: Technology, Market, and Complexity*, *8*(2), 83. https://doi.org/https://doi.org/10.3390/joitmc8020083

Aldianto, L. (2021). *Toward a business resilience framework for startups*. https://api.elsevier.com/content/abstract/scopus_id/85103096704

Alsmairat, M. A. K., & Al-Shboul, M. d. A. (2023). Enabling supply chain efficacy through supply chain absorptive capacity and ambidexterity: empirical study from Middle East region - a moderated-mediation model. *Journal of Manufacturing Technology Management*, *34*(6), 917-936. https://doi.org/10.1108/JMTM-10-2022-0373

Ambulkar, S., Ralston, P. M., Polyviou, M., & Sanders, N. (2023). Frequent supply chain disruptions and firm performance: the moderating role of exploitation, exploration and supply chain ambidexterity. *International Journal of Physical Distribution & Logistics Management*, *53*(10), 1261-1285. https://doi.org/10.1108/IJPDLM-01-2023-0051

Anggadwita, G. (2021). The Implementation of Technology Capabilities, Agile Leadership and Innovation Ambidexterity to Improve SMEs' Sustainability in Bandung.

Ashrafi, A., & Zareravasan, A. (2022). An ambidextrous approach on the business analytics-competitive advantage relationship: Exploring the moderating role of business analytics strategy. *Technological Forecasting and Social Change*, *179*, 121665. https://doi.org/https://doi.org/10.1016/j.techfore.2022.121665

Aslam, B., Abbas, S., Ahmad, Y., Shah, S. T. H., & Raza, M. (2024). Interplay of emerging industrial technologies, ambidexterity, and sustainability: The case of the textile sector. *Sustainable Production and Consumption*, *49*, 372-386. https://doi.org/https://doi.org/10.1016/j.spc.2024.07.006

Aslam, H., Khan, A. Q., Rashid, K., & Rehman, S.-u. (2020). Achieving supply chain resilience: the role of supply chain ambidexterity and supply chain agility. *Journal of Manufacturing Technology Management*, *31*(6), 1185-1204. https://doi.org/10.1108/JMTM-07-2019-0263

Benzidia, S., Makaoui, N., & Subramanian, N. (2021). Impact of ambidexterity of blockchain technology and social factors on new product development: A supply chain and Industry 4.0 perspective. *Technological Forecasting and Social Change*, *169*, 120819. https://doi.org/https://doi.org/10.1016/j.techfore.2021.120819

Feizabadi, J., Gligor, D. M., Alibakhshi Motlagh, S., & Srivastava, R. (2024). When and under what conditions ambidextrous supply chains prove effective? Insights from simulation and empirical studies. *Transportation Research Part E: Logistics and Transportation Review*, *183*, 103461. https://doi.org/https://doi.org/10.1016/j.tre.2024.103461

Figueiredo, M., Ferreira, J. J., & Vrontis, D. (2024). Perspectives on dynamic capabilities and ambidexterity in born-global companies: Theoretical framing, review and research agenda. *Journal of International Management*, *30*(1), 101099. https://doi.org/https://doi.org/10.1016/j.intman.2023.101099

Gala-Velásquez, B. D. l., Ruiz-Ortega, M. J., García-Villaverde, P. M., & Hurtado-Palomino, A. (2024). Can ambidexterity lead to pioneering orientation in adverse situations? A new approach about when and how. *Technological Forecasting and Social Change*, *198*, 122993. https://doi.org/https://doi.org/10.1016/j.techfore.2023.122993

Gastaldi, L., Lessanibahri, S., Tedaldi, G., & Miragliotta, G. (2022). Companies' adoption of Smart Technologies to achieve structural ambidexterity: an analysis with SEM. *Technological Forecasting and Social Change*, *174*, 121187. https://doi.org/https://doi.org/10.1016/j.techfore.2021.121187

Herburger, M., Wieland, A., & Hochstrasser, C. (2024). Building supply chain resilience to cyber risks: a dynamic capabilities perspective. *Supply Chain Management: An International Journal*, *29*(7), 28-50. https://doi.org/10.1108/SCM-01-2023-0016

Iborra, M., Safón, V., & Dolz, C. (2020). What explains the resilience of SMEs? Ambidexterity capability and strategic consistency. *Long Range Planning*, *53*(6), 101947. https://doi.org/https://doi.org/10.1016/j.lrp.2019.101947

Iftikhar, A., Ali, I., & Stevenson, M. (2024). The silver lining of supply chain complexity: building supply chain resilience and robustness through exploitation and exploration. *Supply Chain Management: An International Journal*, *29*(2), 244-259. https://doi.org/10.1108/SCM-01-2023-0022

Jahanvand, B., Bagher Mortazavi, S., Asilian Mahabadi, H., & Ahmadi, O. (2023). Determining essential criteria for selection of risk assessment techniques in occupational health and safety: A hybrid framework of fuzzy Delphi method. *Safety Science*, *167*, 106253. https://doi.org/https://doi.org/10.1016/j.ssci.2023.106253

Khan, S. A. R., Piprani, A. Z., & Yu, Z. (2023). Supply chain analytics and post-pandemic performance: mediating role of triple-A supply chain strategies. *International Journal of Emerging Markets*, *18*(6), 1330-1354. https://doi.org/10.1108/IJOEM-11-2021-1744

Kraus, P., Stokes, P., Tarba, S. Y., Rodgers, P., Dekel-Dachs, O., Britzelmaier, B., & Moore, N. (2022). The ambidextrous interaction of RBV-KBV and regional social capital and their impact on SME management. *Journal of Business Research*, *142*, 762-774. https://doi.org/https://doi.org/10.1016/j.jbusres.2021.12.047

Leitão, J., de Brito, S., & Pereira, D. (2024). Organizational ambidexterity, open innovation and innovation outputs: How do followers and low-flyer EU countries innovate? *International Journal of Innovation Studies*, *8*(2), 186-235. https://doi.org/https://doi.org/10.1016/j.ijis.2024.01.001

Matas, J., Perez, N., Ruiz, L., & Riquelme-Medina, M. (2024). Firm disruption orientation and supply chain resilience: understanding mechanisms to mitigate disruption impact. *Journal of Business & Industrial Marketing*, *39*(13), 82-95. https://doi.org/10.1108/JBIM-10-2023-0562

Nakandala, D., Elias, A., & Hurriyet, H. (2024). The role of lean, agility and learning ambidexterity in Industry 4.0 implementations. *Technological Forecasting and Social Change*, *206*, 123533. https://doi.org/https://doi.org/10.1016/j.techfore.2024.123533

Ojha, D., Acharya, C., & Cooper, D. (2018). Transformational leadership and supply chain ambidexterity: Mediating role of supply chain organizational learning and moderating role of uncertainty. *International Journal of Production Economics*, *197*, 215-231. https://doi.org/https://doi.org/10.1016/j.ijpe.2018.01.001

Partanen, J., Kohtamäki, M., Patel, P. C., & Parida, V. (2020). Supply chain ambidexterity and manufacturing SME performance: The moderating roles of network capability and strategic information flow. *International Journal of Production Economics*, *221*, 107470. https://doi.org/https://doi.org/10.1016/j.ijpe.2019.08.005

Priyanka, Jain, M., & Dhir, S. (2022). Antecedents of organization ambidexterity: A comparative study of public and private sector organizations. *Technology in Society*, *70*, 102046. https://doi.org/https://doi.org/10.1016/j.techsoc.2022.102046

Saleh, R. H. (2023). What makes innovation ambidexterity manageable: a systematic review, multi-level model and future challenges. *Review of Managerial Science*, *17*(8), 3013-3056. https://doi.org/10.1007/s11846-023-00659-4

Sarkis, J. (2024). *The Palgrave Handbook of Supply Chain Management*. Springer.

Shamout, M. D. (2023). Analyzing the moderating role of coopetition network size on the impact of analytics capabilities, ambidexterity, and coopetition on firm performance. *Journal of Co-operative Organization and Management*, *11*(1), 100203. https://doi.org/https://doi.org/10.1016/j.jcom.2023.100203

Srisathan, W. A., Ketkaew, C., & Naruetharadhol, P. (2023). Assessing the effectiveness of open innovation implementation strategies in the promotion of ambidextrous innovation in Thai small and medium-sized enterprises. *Journal of Innovation & Knowledge*, *8*(4), 100418. https://doi.org/https://doi.org/10.1016/j.jik.2023.100418

Stekelorum, R., Laguir, I., Lai, K.-h., Gupta, S., & Kumar, A. (2021). Responsible governance mechanisms and the role of suppliers' ambidexterity and big data predictive analytics capabilities in circular economy practices improvements. *Transportation Research Part E: Logistics and Transportation Review*, *155*, 102510. https://doi.org/https://doi.org/10.1016/j.tre.2021.102510

Tsai, F. M., Bui, T.-D., Tseng, M.-L., Lim, M. K., & Hu, J. (2020). Municipal solid waste management in a circular economy: A data-driven bibliometric analysis. *Journal of Cleaner Production*, *275*, 124132. https://doi.org/https://doi.org/10.1016/j.jclepro.2020.124132

Tseng, M.-L., Bui, T.-D., Lim, M. K., Fujii, M., & Mishra, U. (2022). Assessing data-driven sustainable supply chain management indicators for the textile industry under industrial disruption and ambidexterity. *International Journal of Production Economics*, *245*, 108401. https://doi.org/https://doi.org/10.1016/j.ijpe.2021.108401

Vega, D., Arvidsson, A., & Saïah, F. (2023). Resilient supply management systems in times of crisis. *International Journal of Operations & Production Management*, *43*(1), 70-98. https://doi.org/10.1108/IJOPM-03-2022-0192

Wamba, S. F., Dubey, R., Gunasekaran, A., & Akter, S. (2020). The performance effects of big data analytics and supply chain ambidexterity: The moderating effect of environmental dynamism. *International Journal of Production Economics*, *222*, 107498. https://doi.org/https://doi.org/10.1016/j.ijpe.2019.09.019

Yalcin, M. G., & Ashraf, M. H. (2024). Viewing Supply Chain Ambidexterity (SCX) Through Paradox Theory and an Innovation Framework. In *The Palgrave Handbook of Supply Chain Management* (pp. 271-292). Springer. https://doi.org/https://doi.org/10.1007/978-3-030-89822-9_104-1

Zakrzewska-Bielawska, A. (2021). *Ambidextrous strategy: Antecedents, strategic choices, and performance*. Routledge.