

Uncertain Supply Chain Management

homepage: www.GrowingScience.com/uscm**Effect of strategic agility, innovation capability, and technology adoption through supply chain integration on the firm performance moderated by environmental turbulence in Indonesia's textile industry****Julius Solichin^a, Tirta Nugraha Mursitama^a, Rini Setiowati^a and Rano Kartono Rahim^{a*}**^a Management Department, BINUS Business School Doctor of Research in Management, Bina Nusantara University, Jakarta, Indonesia 11480**ABSTRACT***Article history:*

Received August 29, 2024

Received in revised format

October 16, 2024

Accepted February 8 2025

Available online

February 8 2025

*Keywords:**Strategic agility Innovation**Capability technology adoption**Supply chain integration**Environmental turbulence**Firm performance*

Textile industry involves a lengthy process from upstream to downstream, making supply chain integration crucial for enhancing firm performance. This study explores various factors that can boost supply chain integration and company performance in Indonesia's textile sector, including strategic agility, innovation capability, and technology adoption. The research is grounded in resource-based-view and market-based-view theories, suggesting that companies can optimize their resources and collaborate effectively with supply chain partners to enhance industry performance. Additionally, the study considers environmental turbulence as a moderating variable. Utilizing a quantitative approach with judgmental sampling, the research collected data through a structured questionnaire, resulting in 270 valid responses. The data was analyzed using the partial least squares structural equation modeling (PLS-SEM) method with SmartPLS 4.0 software. Findings indicate that strategic agility, innovation capability, and technology adoption significantly influence firm performance through supply chain integration, while environmental turbulence notably moderates the relationship between innovation capability and supply chain integration on firm performance. The study recommends that textile companies prioritize agility, strategic innovation, and technology adoption to enhance their integration with supply chain partners. It underscores the critical role of supply chain integration in improving company performance and the impact of environmental turbulence as a moderating factor.

© 2026 by the authors; licensee Growing Science, Canada.

1. Introduction

Supply chain integration is an important factor in the textile industry, which has a long process from upstream to downstream (Junejo et al., 2024). Supply chain integration creates better collaboration and improves communication and cooperation among various stakeholders in the supply chain, such as suppliers, manufacturers, and distributors (Shahzad et al., 2024). Supply chain integration is a strategic challenge that fluctuates on whether the integration of these parties can achieve goals such as long-term growth in company performance (Maestrini et al., 2018). The textile industry is a key sector in Indonesia, being labor-intensive, meeting clothing needs, generating foreign exchange, and driving economic growth. Indonesia is one of the largest textile-producing countries and the 12th largest textile exporter in the world (Saengchai et al., 2019). In 2022, Indonesia's textile sector generated \$14.41 billion in exports and \$13.02 billion in 2021. This underscores the need for skilled performance to support the industry, which faced GDP declines of -8.88% in 2020 and -4.08% in 2021. This indicates that the industry must improve its performance (Alif, 2022). The textile industry in Indonesia has experienced several environmental turbulences, such as economic restrictions during the covid-19 pandemic, the threat of recession, instability in oil prices after the Russia-Ukraine war, and a decline in export demand due to high inflation in destination countries. Textile raw materials in Indonesia still rely on imports from other countries whose value reaches 10.35 billion USD. High freight rates and delivery delays are major challenges for importing raw materials in Indonesia's textile industry. Lead times have increased from 14-15 days to 3-4 weeks due to port congestion and a shortage of container ships, raising costs and delaying both imports and exports.

* Corresponding author

E-mail address rano.rahim@binus.edu (R.K. Rahim)

ISSN 2291-6830 (Online) - ISSN 2291-6822 (Print)

© 2025 by the authors; licensee Growing Science, Canada.

doi: 10.5267/j.uscm.2025.2.004

Indonesia's total fiber consumption will reach 1,858,102 tons in 2022, consisting of several types, including 40% polyester, 30% rayon, 28% cotton, and 2% others. (Textile Report in Indonesia by United States Department of Agriculture Report, 2022). The other challenge for the textile industry in Indonesia is high imports of ready-made clothing, making it difficult for local products to compete, weakening domestic production, and disrupting the supply chain network (Sarasi et al., 2023). This condition highlights the need for effective supply chain integration in Indonesia's textile industry, which spans from synthetic fiber production to finished apparel. Proper integration can mitigate uncertainties in the supply and demand of raw materials and finished products. Trihastuti et al. (2024) revealed that a sustainable supply chain can be achieved through integration in the textile industry in Indonesia. Suradi et al. (2020) also found that supply chain management had a significant effect on firm performance in the textile industry in Indonesia. Many recent studies emphasize the importance of supply chain integration in improving company performance (Harianto et al., 2024; Ralahallo et al., 2024; Chatha et al., 2024; Sundram et al., 2016; Aeknarajindawat & Chancharoen, 2019). Therefore, companies in the textile industry need to improve supply chain integration (Chatchawanchanchanakij et al., 2023). Companies are required to be more agile in responding to the challenges they face; therefore, they must adopt strategic agility (Dayioglu et al., 2024). Strategic agility is a company's ability to quickly adapt its strategy to changing market conditions and challenges, emphasizing flexibility, speed, innovation, and resilience. It helps organizations remain competitive in dynamic environments (Jasim et al., 2024). Many recent studies emphasize the importance of strategic agility in facing challenges and improving company performance (Marlapa et al., 2024; Liu et al., 2024; Luu, 2024). Indonesia's large textile market demands rapid product distribution to keep up with changing consumer tastes, making supply chain integration (SCI) essential for companies to achieve their goals (Zimmermann et al., 2020). Companies need to enhance efficiency in supply chain management to better connect partners in material transportation and improve information flow among integrated parties. (Sillanpää, 2015).

Textile companies can create high-value products but need to boost innovation, as success relies on their ability to innovate (Shin et al., 2015; AlTaweel & Al-Hawary, 2021). Innovation capability involves fostering an environment equipped with the resources, processes, and mindset required to consistently generate and execute new ideas that promote growth and success (Allammari et al., 2024). Innovation enables companies to tackle internal and external challenges, ensuring business continuity amid environmental changes (Yildiz & Aykanat, 2021; Wadho & Chaudhry, 2018; Setiawan et al., 2022). Many recent studies emphasize the importance of innovation capability to improve company performance in the textile industry (Celik & Uzuncarsili, 2023; Arshad et al., 2023). Consumers consider both the value and added advantages of a product compared to similar options. Innovation is crucial for product development and differentiation, whether for new or existing products. Innovation capabilities can produce high-quality products, improving company performance (Tian et al., 2021). Innovation capability includes external factors from suppliers and consumers, enhancing supply chain integration within a company (Iddris, 2016; Zimmermann et al., 2020; Liao & Li, 2018). Several previous studies have found that innovation capability influences the supply chain (Liao et al., 2021; Qiao et al., 2021; Octavia et al., 2020; Fianko et al., 2022). Innovation and intense global competition drive the industry to be agile; failure to do so can lead to a decline in company performance (Suradi et al., 2020; Haider & Kayani, 2020; Kurniawan et al., 2020; Lyn Chan & Muthuveloo, 2021). Achieving to this demands strategic agility, allowing the company to swiftly adapt and drive change while maintaining flexibility and focus, requiring continuous effort and hard work (Al-Nattar & Alazzawi, 2020; Lyn Chan & Muthuveloo, 2022; Yildiz & Aykanat, 2021; Khaw & Teoh, 2023). The organization implements unique practices at all stages, necessitating agile management to quickly respond to changing consumer needs, government policies, and climate dynamics. Strategic agility enhances company performance and is vital for sustainability (Hijjawi & Al-shawabkeh, 2017). In the textile industry in Indonesia, Suradi et al. (2020) found that strategic agility had a significant effect on firm performance. Previous studies have revealed that strategic agility influences the supply chain (Suradi et al., 2020; Mavengere, 2013; Hussain et al., 2018; Yawson & Yamoah, 2022). Other research also found that strategic agility affects company performance (Khaw & Teoh, 2023; Sikora & Baranowska, 2022; Vrontis et al., 2022; Nurjaman et al., 2021). Technology adoption accelerates a company's effectiveness and efficiency. It is both an opportunity and a challenge in labour-intensive industries such as the textile industry in Indonesia (Nazeer et al., 2021; Cho, 2019). The benefits of adopting technology include: supporting company operational activities to be more efficient and faster, the existence of various applications that make reporting/business activities easier, allowing for faster presentation of information, as well as automating processes that are carried out manually by humans (Lucia-Palacios et al., 2014; Dalle et al., 2020; Dadoukis et al., 2021; Behera et al., 2015).

The textile industry in Indonesia is one of the industrial sectors most ready to implement technology industry 4.0. The ministry of industry has released the Indonesia industry 4.0 Readiness Index (INDI 4.0). This index is to measure industry readiness to implement industry 4.0. This index consists of level 0 (not ready), level 1 (initial readiness), level 2 (medium readiness), level 3 (mature readiness), and level 4 (already implemented). INDI 4.0 assesses industrial readiness based on five pillars, namely management and organization, people and culture, products and services, technology and factory operations. This index is one of the Ministry of Industry's strategic efforts to accelerate the implementation of industry 4.0 in Indonesia. The five priority sectors are already approaching level 2 and level 3. The readiest sectors are the textile industry at level 2.51; food and drink 2.47; chemistry 2.31; electronics 1.84; and automotive 1.72 (Kementerian Perindustrian, 2021). Previous studies have examined firm performance across various industries and countries. In Indonesia's textile industry, firm performance is crucial for business sustainability and achieving company goals (Saengchai et al., 2019; Suradi et al., 2020; Aeknarajindawat & Chancharoen, 2019; Purwanto, 2019). In several countries, firm performance in the textile industry is vital for overall business success (Wadho & Chaudhry, 2018; Shahi et al., 2021; Zia-Ur-Rehman et al., 2019; Nazeer et al., 2021; Iqbal et al.,

2022; Zhong & Lyu, 2022; Cho, 2019). Supply chain integration factors also influence firm performance. Supply chain integration positively affects firm performance (Cho, 2019; Nazeer et al., 2021). The board of directors must oversee supply chain activities to enhance company performance (Shahi et al., 2020; Zhong & Lyu, 2022). Companies must consistently enhance their innovation capabilities (Jalil et al., 2021; Raharja & Rivani, 2022). Innovation capability will strengthen supply chain integration (Iddris et al., 2014) and firm performance (Nazeer et al., 2018; Zia-Ur-Rehman et al., 2019). Companies must implement strategic agility to make activities more agile for effective and efficient results. (Khaw & Teoh, 2023; Sikora & Baranowska, 2022; Vrontis et al., 2022). Strategic agility will strengthen supply chain integration (Hussain et al., 2018; Yawson & Yamoah, 2022). A study in the textile industry shows that strategic agility improves company performance (Suradi et al., 2020). Technology adoption increases process efficiency in the supply chain and company performance. Several previous studies found that technology adoption affected the supply chain (Chowdhury et al., 2022; Han & Rani, 2022; Jabbour et al., 2012; Adel & Younis, 2021; Bai & Song, 2022). And technology adoption affected company performance (Evangelista et al., 2012; Lucia-Palacios et al., 2014; Dalle et al., 2020; Mandal & Dubey., 2020; Dadoukis et al., 2021).

Through supply chain integration it will improve company performance. Several previous studies found that supply chain integration affected the firm performance (Agyei-Owusu et al., 2022; Tian et al., 2021). Finally, this research looks at the influence of these variables amidst environmental turbulence. Previous research revealed there is a moderating relationship of environmental turbulence, between strategic agility and firm performance (Reed, 2020). Between innovation capability and firm performance (Gyedu et al., 2021; Turulja & Bajgoric, 2018; Tsai & Yang, 2014). Between technology adoption and firm performance (Hung & Chou, 2013). Between supply chain integration and firm performance (Chatterjee & Chaudhuri, 2021; Silvestre, 2015). This research will emphasize supply chain integration in industries with long process flows and explore strategic agility, innovation capability, and technology adoption to enhance performance in the textile industry.

2. Review of the literature and research hypotheses

2.1 Relationship between Strategic Agility and Supply Chain Integration

Strategic agility comprises strategic sensitivity, strategic response, and collective capabilities. Strategic sensitivity involves actively gathering and utilizing actionable data. Strategic response entails collaborating with customers and business partners to swiftly adjust resources and processes. Collective capabilities refer to an organization's capacity to leverage the synergy among its resources (Mavengere, 2013). By swiftly adapting to evolving customer preferences, strategic agility enhances communication with suppliers to capitalize on reduced costs, improved quality, and enhanced delivery times. In a competitive landscape marked by rapidly changing customer preferences, companies face challenges that require them to respond promptly. Strategic agility enables organizations to react swiftly and effectively in such competitive environments (Clauss et al., 2021). Through strategic agility, companies can promptly react to market fluctuations and serve as the linchpin in aligning suppliers with customers. In the textile industry, when there are shifts in downstream market sectors, all components of the supply chain must adjust from upstream (Suradi et al., 2020). Strategic agility enables swift responses to these shifts and facilitates enhanced external integration to optimize the supply chain. The theory that strategic agility positively correlates with supply chain integration is affirmed by studies conducted by (Hussain et al., 2018) and (Yawson & Yamoah, 2022). Effective implementation of strategic agility by a company enhances the integration of the supply chain, linking suppliers to customers seamlessly. The hypotheses that will be tested regarding strategic agility and supply chain integration are:

Hypothesis 1. *Strategic Agility has a positive effect on Supply Chain Integration.*

2.2 Relationship between Innovation Capability and Supply Chain Integration

Innovation capability encompasses multiple dimensions, including both product and process innovation. Product innovation involves introducing new offerings that encompass a variety of creative or enhanced products and services (Altaweel & Al-Hawary, 2021). Iddris (2016) examined innovation capabilities, aiming to explore the connection between innovation capability and supply chain agility, emphasizing integration that fosters trust development. As the global landscape increasingly adopts digital business models and technology, the supply chain industry necessitates innovative initiatives for swift integration. Innovation capability refers to a company's capacity to integrate novel elements into processes to enhance value, particularly through supply chain integration (Paul & Zhou, 2017). The ability of a company to innovate its processes significantly affects both suppliers and customers. Companies continually discover how innovative processes can meet customer demands, necessitating supplier involvement in their execution. Therefore, there is an ongoing need for creative processes in integrating supply chains (Qiao et al., 2021). The proposition that there is a positive correlation between innovation capability and supply chain integration is also substantiated by (Iddris et al., 2014; Isfianadewi et al., 2019; Nur, 2019). The expectation is that innovation capabilities will enable and enhance supply chain integration. The hypotheses that will be tested regarding innovation capability and supply chain integration are:

Hypothesis 2. *Innovation Capability has a positive effect on Supply Chain Integration.*

2.3 *Relationship Between Technology Adoption and Supply Chain Integration*

Technology Internet of Things enables increased integration in the manufacturing process between suppliers and customers through the internet. This improved integration can help the flow of information flow faster, resulting in increased efficiency and ultimately enabling companies to respond to customer requests promptly (Tiwari, 2021). Big Data Analytics technology learns what needs are and what obstacles are faced by customers and suppliers so that it can predict things in the future. Resource scarcity and other problems can be predicted and by adopting BDA technology, companies can find the fastest solutions to create an integration that maximizes the potential of suppliers, companies and customers (Chiu & Lin, 2022). The adoption of industry 4.0 technology not only integrates technology with machines, but also creates integration between users from suppliers, companies and customers who are connected in real-time so that the integration process is created faster and more accurately (Jabbour et al., 2012). Chatchawanchanchanakij et al. (2023) found that technology adoption has an impact on sustainable supply chains. The hypothesis of a positive relationship between technology adoption and supply chain integration is also supported by (Chauhan et al., 2021; Chatterjee et al., 2022; Salamah et al., 2023). Technology adoption is hoped to facilitate supply chain integration and ultimately improve company performance. The hypotheses that will be tested regarding technology adoption and supply chain integration are:

Hypothesis 3. *Technology Adoption has a positive effect on Supply Chain Integration.*

2.4 *Relationship Between Strategic agility and Firm Performance*

Strategic agility enables companies to promptly and efficiently anticipate or react to market changes. As a result, it is anticipated to enhance overall corporate performance. Strong strategic agility enables companies to adjust products or services to better meet customer requirements. Rapid response to customer needs is a key indicator of good corporate performance, as it enhances customer satisfaction (Ahmad, 2022). Achieving strategic agility involves ongoing assessment of internal and external environmental factors, swift gathering and utilization of information, and rapid adaptation to market changes. When a business achieves strategic agility, it can enhance overall company performance (Kale et al., 2019). Research conducted in the textile industry demonstrates that strategic agility enhances the performance of companies (Suradi et al., 2020). Similar results were documented by (Kale et al., 2019) and (AlTaweel & Al-Hawary, 2021). The hypotheses that will be tested regarding strategic agility and firm performance are:

Hypothesis 4. *Strategic Agility has a positive effect on Firm Performance.*

2.5 *Relationship Between Innovation Capability and Firm Performance*

Innovation capability empowers companies to continuously explore and generate innovations, as innovation is crucial for enhancing company performance and gaining a competitive edge. By persistently innovating, companies can enhance performance through the development of new ideas, processes, and products, or by refining existing business operations (Ferreira et al., 2018). A critical phase in the innovation process involves converting input into output. It is believed that innovative companies employ various strategies to accomplish their objectives (Wadho & Chaudhry, 2018). A company's capacity to innovate by developing new products may necessitate novel production methods, while introducing these new products often demands fresh marketing strategies or processes. Overall, research indicates that increased utilization of innovation strategies correlates with improved company performance (Wadho & Chaudhry, 2018). Research conducted within the textile industry demonstrates that innovation capabilities enhance company performance (Nazeer et al., 2021; Zia-Ur-Rehman et al., 2019). Similar conclusions were reported by (Zimmermann et al., 2020) and (Ferreira et al., 2018). There is optimism that innovation capability will enhance company performance. The hypotheses that will be tested regarding innovation capability and firm performance are:

Hypothesis 5. *Innovation Capability has a positive effect on Firm Performance.*

2.6 *Relationship Between Technology Adoption and Firm Performance*

Technology Adoption can help make product development decisions, price optimisation and forecasting, satisfying customer demands in a better way and improving company performance (Lin et al., 2019). Technology allows companies to reconfigure production resources for the manufacture of customized products efficiently and with flexibility. Finally, through processing and shaping, technology adoption can help to make production-related decisions that can improve operational efficiency, reduce costs and increase company profits (Díaz-Chao et al., 2021). A study in the textile industry shows that technology adoption improves company performance (Nazeer et al., 2021; Cho, 2019). Studies in other industries also find that technology adoption can improve company performance (Bhagat et al., 2022; Kumar & Bhatia, 2021; Arifin et al., 2016; Lin et al., 2019). The hypotheses that will be tested regarding technology adoption and firm performance are:

Hypothesis 6. *Technology Adoption has a positive effect on Firm Performance.*

2.7 Relationship Between Supply Chain Integration and Firm Performance

Supply chain integration comprises several dimensions, including customer, supplier, and internal integration. It involves sharing demand information to enhance manufacturers' understanding and forecasting of customer needs, engaging in collaborative product design with customers to deliver higher quality products at reduced costs, and increasing flexibility in responding to customer demand (Cui et al., 2023). Supply chain integration represents a sophisticated process of collaboration among the company, suppliers, and buyers. When effectively managed, it can enhance operational efficiency, boost company profits, and ensure satisfaction for all involved parties (Agyei-Owusu et al., 2022). Firm performance encompasses various aspects including profitability, growth, and customer satisfaction. Profitability performance measures the company's ability to generate profits from its operations, while growth performance evaluates its capacity to expand. Customer satisfaction gauges how effectively the company interacts with its customers. Tian et al (2021) discovered that effective supply chain integration enhances company performance, enabling companies to make swift decisions in competitive environments. Similar results were also observed by Suradi et al. (2020) and Iddris et al. (2014). The hypotheses that will be tested regarding supply chain integration and firm performance are:

Hypothesis 7. *Supply Chain Integration has a positive effect on Firm Performance.*

2.8 Relationship Between Environmental Turbulence as a moderator variable

Environmental turbulence is a dynamic, unpredictable, evolving, fluctuating environment characterized by uncertainty and instability. Environmental turbulence challenges existing strategies, requiring adaptation of strategies and strategic planning processes if companies are to survive (Wilden & Gudergan, 2015). Strategic agility may not be as important in stable environments as it is in environmentally volatile environments (Reed, 2020). The relationship between innovation and a company's business performance depends on the external environment. Greater business performance can be achieved by matching innovation to markets by adapting to technological changes and environmental shocks (Gyedu et al., 2021). It is important to realize that environmental shocks will occur in the future. However, by adopting technology, companies can respond quickly and precisely to environmental crises. This will enable the company to maintain its performance and be more flexible when environmental turbulence occurs (Chatterjee & Chaudhuri, 2021). Environmental turbulence forces every party in the supply chain, including suppliers and customers, to adapt to new demands. This can weaken or strengthen the integration created because it is related to company performance. Therefore, environmental turbulence can influence the relationship between supply chain integration and company performance (Silvestre, 2015). The hypotheses that will be tested regarding environmental turbulence as a moderator variable are:

Hypothesis 8. *Strategic agility positively affects firm performance, moderated by environmental turbulence.*

Hypothesis 9. *Innovation capability positively affects firm performance, moderated by environmental turbulence.*

Hypothesis 10. *Technology adoption positively affects firm performance, moderated by environmental turbulence.*

Hypothesis 11. *Supply chain integration positively affects firm performance, moderated by environmental turbulence.*

Based on the explanation of the relationships between variables in this study, we developed a research model, as presented in Fig. 1.

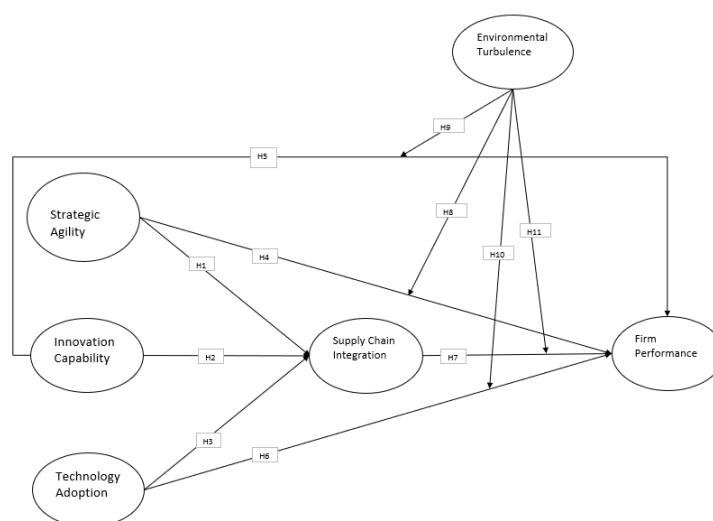


Fig. 1. Research Model

3. Research Methodology

Using a quantitative study approach, the research investigated the effect of strategic agility, innovation capability, technology adoption and supply chain integration on the firm performance moderated by environmental turbulence.

3.1 Sample Data Collection

Data was gathered from textile companies in Indonesia between April and June 2024. Respondents were chosen through judgmental sampling, specifically targeting individuals holding managerial, directorial, or commissioner roles within their companies. This selection criteria aimed to ensure that respondents had insights into enhancing company performance and the capability to mobilize resources effectively. Java Island was selected as the study's location due to its concentration of textile companies, which is the highest among all islands in Indonesia (Kementrian perindustrian, 2023). Data were gathered through online distribution of a questionnaire via email and WhatsApp. According to Hair et al. (2011), the sample size in the study can be estimated by multiplying the number of indicators by 5 to 10. This study included 54 research indicators, and a total of 270 questionnaires were analyzed. The questionnaire comprised two sections. The initial section requested respondents' demographic information, whereas the subsequent section evaluated respondents' agreement with statements that measured variables in the study.

3.2 Scale Development

Measurement items for the key constructs were adapted from existing literature. Strategic agility, a multifaceted concept with three dimensions and nine components, was assessed using three items for each dimension sourced from (Maverange, 2013; Uddin et al., 2023; ALTaweel & Al-Hawary, 2021). Innovation capability is similarly a multifaceted concept with two dimensions and six components. Each dimension was evaluated using three items adapted from (Altawel & Al-Hawary, 2021; Turulja & Bajgoric, 2018). Technology adoption is a multidimensional construct with three dimensions and twelve constructs. Three dimensions was measured by twelve items adopted from (Castelo-Branco et al., 2022; Kaddumi et al., 2023; Mikalef et al., 2019; Evangelista et al., 2012). Supply chain integration is a multidimensional concept, comprising three dimensions and nine components. Each dimension was assessed using three items sourced from (Cui et al., 2023). Environmental turbulence is a multidimensional construct with two dimensions and eight construct, Each dimension was measured by four items adopted from (Huang et al., 2022; Yasmeen et al., 2020; Wilden & Gudergan, 2015; Turulja & Bajgoric, 2018; Bashir et al., 2023). Firm performance is a complex construct that includes three dimensions and ten components. Each dimension was assessed using a selection of three to four items taken from (Mikalef et al., 2019; Selvam et al., 2016). All items were measured using a 5-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree).

3.3 Model Measurement

The data were analyzed using partial least squares structural equation modeling (PLS-SEM) to concurrently assess the proposed relationships in the study. PLS-SEM allows for explicit examination of relationships among multiple dependent and independent variables, making it suitable for analyzing data within a complex research framework. The data was examined using Smartpls 4.0. The outer and inner models are two stages of the instrument examination. The criteria for the outer model examination are Outer Loading>0.7, Average Variance Extracted (AVE)>0.5, Composite Reliability (Pc)>0.7, Cronbach's Alpha>0.6, and Discriminant Validity (Hair et al., 2011).

4. Results

4.1 Profile of Respondents

Table 1 presents the main characteristics of the survey participants.

Table 1
Demographic characteristics of the respondents

Characteristics	Frequency	Percentage	Characteristics	Frequency	Percentage	Characteristics	Frequency	Percentage
Gender:			Length of work:			Employees:		
Male	169	62.6	1-5 years	56	20.7	0-100	79	29.3
Female	101	37.4	5-10 years	52	19.2	101-500	95	35.2
			> 10 years	162	60.1	More than 500	96	35.5
Age:			Industrial type:			Location:		
23-35	127	47.0	Fibre	17	6.3	Banten	72	26.7
36-45	78	29.0	Yarn	42	15.5	Jakarta	18	6.7
46-55	46	17.0	Fabric	119	44.1	Jawa Barat	154	57.0
More than 55	19	7.0	Others	92	34.1	Jawa Tengah	10	3.6
						DI Yogyakarta	5	1.9
						Jawa Timur	11	4.1
Education:			Position:					
High school	14	5.2	Commissioner	16	5.9			
Bachelor Degree	208	77.0	Director	42	15.6			
Master Degree	48	17.8	Manager	212	78.5			

The findings indicate a slightly higher percentage of male respondents compared to female respondents. Over 75% of respondents fall within the age range of 23 to 45 years. A majority of respondents, more than 60%, hold bachelor's degrees and work in managerial positions with over 10 years of work experience. The majority of textile companies are located in West Java (57%), employing more than 500 individuals in 35% of cases. Many companies operate within the fabric sector (44%) or other segments of the textile industry (34%).

4.2 Measurement Model

Before proceeding to analyze the structural model, this study assessed the validity and reliability of the measurement items. An indicator is deemed valid if it exhibits a factor loading and Average Variance Extracted (AVE) value exceeding 0.5 (Chin & Todd, 1995). In this study, reliability was assessed using Cronbach's alpha and composite reliability. According to Chin and Todd (1995), a variable is deemed reliable if its Cronbach's alpha or composite reliability reaches at least 0.7. Table II details the results of descriptive statistical analysis as well as the findings from validity and reliability assessments.

Table 2
Reliability and validity test

Variable	Dimension	Construct and items	Factor Loading	Cronbach's Alpha	Composite Reliability	AVE	Remark
Strategic Agility	Strategic sensitivity	SA1	0,949	0,931	0,956	0,878	Valid & Reliable
		SA2	0,925				
		SA3	0,937				
	Strategic Response	SA4	0,939	0,925	0,953	0,870	Valid & Reliable
		SA5	0,916				
		SA6	0,943				
	Collective capabilities	SA7	0,943	0,909	0,943	0,846	Valid & Reliable
		SA8	0,895				
		SA9	0,921				
Innovation Capability	Product innovation	IC1	0,937	0,912	0,945	0,850	Valid & Reliable
		IC2	0,913				
		IC3	0,917				
	Process innovation	IC4	0,926	0,907	0,942	0,844	Valid & Reliable
		IC5	0,916				
		IC6	0,914				
Technology Adoption	Smart Factory	ITA1	0,925	0,908	0,942	0,845	Valid & Reliable
		ITA2	0,907				
		ITA3	0,926				
	Enablers	ITA4	0,885	0,880	0,926	0,807	Valid & Reliable
		ITA5	0,909				
		ITA6	0,902				
	IT Strategy	ITA7	0,838	0,943	0,954	0,778	Valid & Reliable
		ITA8	0,899				
		ITA9	0,896				
		ITA10	0,875				
		ITA11	0,884				
		ITA12	0,898				
Supply Chain Integration	Customer integration	SCI1	0,896	0,878	0,925	0,804	Valid & Reliable
		SCI2	0,904				
		SCI3	0,903				
	Supplier integration	SCI4	0,902	0,898	0,937	0,831	Valid & Reliable
		SCI5	0,912				
		SCI6	0,921				
	Internal integration	SCI7	0,901	0,888	0,930	0,817	Valid & Reliable
		SCI8	0,914				
		SCI1	0,896				
Environmental Turbulence	Technological Turbulence	ET1	0,875	0,926	0,948	0,819	Valid & Reliable
		ET2	0,931				
		ET3	0,910				
		ET4	0,904				
	Market Turbulence	ET5	0,906	0,926	0,948	0,819	Valid & Reliable
		ET6	0,913				
		ET7	0,915				
		ET8	0,887				
Firm Performance	Profitability performance	FP1	0,904	0,929	0,949	0,824	Valid & Reliable
		FP2	0,917				
		FP3	0,913				
		FP4	0,898				
	Growth performance	FP5	0,905	0,899	0,937	0,832	Valid & Reliable
		FP6	0,912				
		FP7	0,920				
	Customer Satisfaction	FP8	0,899	0,878	0,925	0,804	Valid & Reliable
		FP9	0,879				
		FP10	0,913				

Based on the validity assessment, all items exhibited factor loadings ranging from 0.838 to 0.949, with the Average Variance Extracted (AVE) values for all variables falling between 0.778 and 0.878. Composite reliability ranged from 0.925 to 0.956 across all variables. In the reliability analysis, all variables demonstrated composite reliability scores exceeding 0.7, and in the validity examination, all variables had AVE values above 0.5. Consequently, it can be affirmed that all items were both valid and reliable.

4.3 Hypothesis Testing

As presented in Table III, all relationships among strategic agility, innovation capability, technology adoption, supply chain integration, and firm performance were significant. Environmental turbulence moderated innovation capability and supply chain integration to firm performance. Environmental turbulence not moderated strategic agility and technology adoption to form performance. The path diagram is presented in Fig. 2.

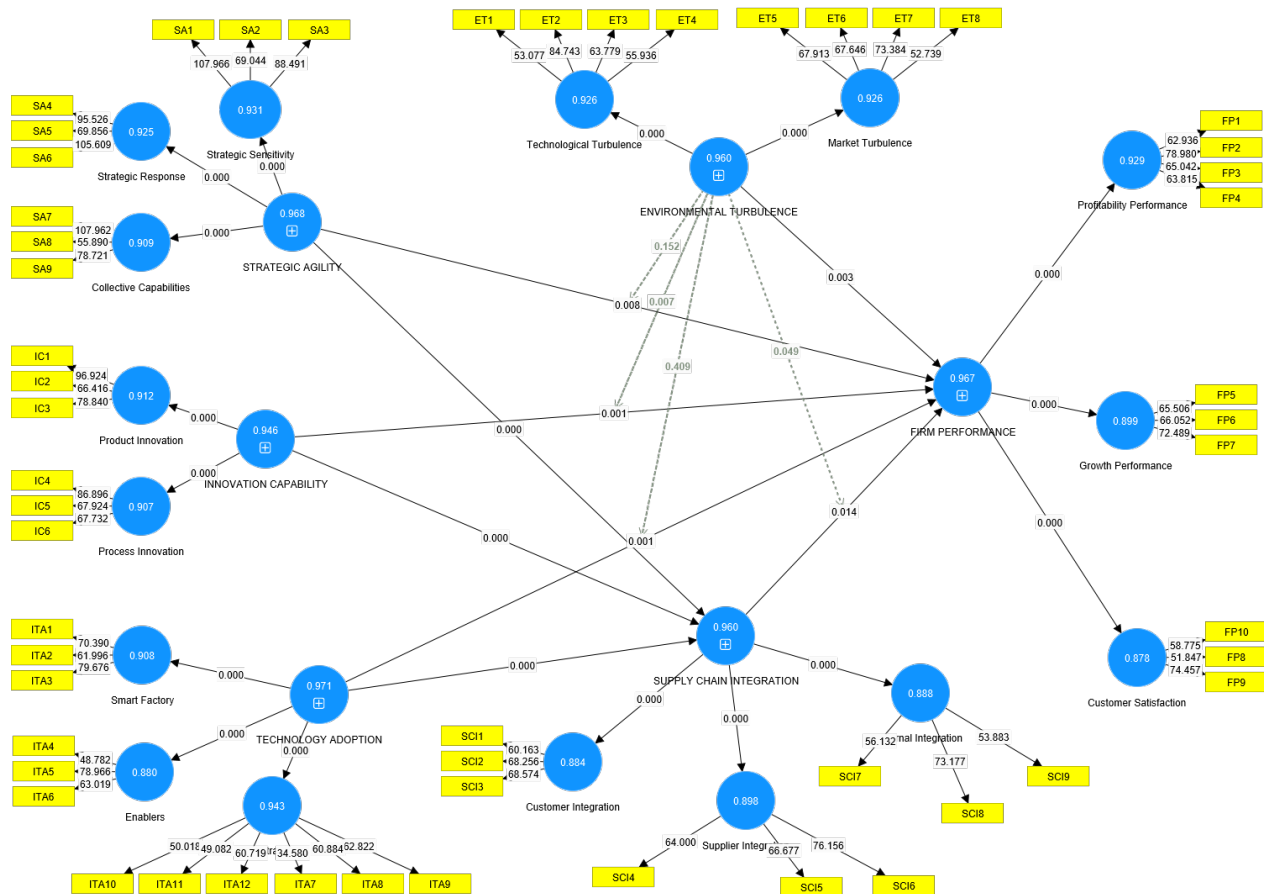


Fig. 2. Path Coefficient Analysis

Table 3
Summary of statistical hypothesis test

Hypothesis	Path coefficient	t-statistics	p-values	Remark
Strategic Agility → Supply Chain Integration	0.341	3.943	0.000	Supported
Innovation Capability → Supply Chain Integration	0.309	5.077	0.000	Supported
Technology Adoption → Supply Chain Integration	-0.331	3.978	0.000	Supported
Strategic Agility → Firm Performance	0.179	2.419	0.008	Supported
Innovation Capability → Firm Performance	0.180	3.155	0.001	Supported
Technology Adoption → Firm Performance	-0.225	3.283	0.001	Supported
Supply Chain Integration → Firm Performance	0.139	2.915	0.014	Supported
Environmental Turbulence moderated SA → FP	-0.059	1.031	0.152	Rejected
Environmental Turbulence moderated IC → FP	-0.129	2.471	0.007	Supported
Environmental Turbulence moderated TA → FP	0.015	0.231	0.409	Rejected
Environmental Turbulence moderated SCI → FP	0.151	1.964	0.049	Supported

Strategic agility showed a notable positive impact on supply chain integration ($\beta = 0.341$, $p < 0.05$), while innovation capability also exhibited a significant positive influence on supply chain integration ($\beta = 0.309$, $p < 0.05$). Conversely, technology adoption significantly negatively affected supply chain integration ($\beta = -0.331$, $p < 0.05$). Together, these three variables explained 88.8% of the variability in supply chain integration (adjusted $R^2 = 0.888$). Both strategic agility ($\beta = 0.179$, $p < 0.05$) and innovation capability ($\beta = 0.180$, $p < 0.05$) significantly positively influenced firm performance, as did supply

chain integration ($\beta = 0.139$, $p < 0.05$). In contrast, technology adoption significantly negatively impacted firm performance ($\beta = -0.225$, $p < 0.05$). These four variables collectively explained 90.5% of the variability in firm performance (adjusted $R^2 = 0.905$). Environmental turbulence significantly moderated the effects of innovation capability and supply chain integration on firm performance ($p < 0.05$). However, environmental turbulence did not significantly moderate the effects of strategic agility and technology adoption on firm performance ($p > 0.05$).

3 Discussion

This study aimed to evaluate 11 hypotheses outlined in section 2. Out of these, 9 hypotheses were supported while 2 were rejected. The positive and significant impact of strategic agility on supply chain integration aligns with findings from previous research by Hussain et al. (2018) and Yawson & Yamoah (2022). Information serves as a crucial driver of supply chain integration. Strategic agility facilitates quicker acquisition and utilization of necessary information. By anticipating future market and customer needs, strategic agility enables prompt integration with companies and suppliers. In the textile industry, rapid information flow and responsive actions from upstream to downstream contribute significantly to maintaining supply chain integration. The textile industry in Indonesia demonstrates a high level of agility in forecasting and responding to future information, as indicated by the strategic agility variable's high mean value (mean = 4.17 out of 5). Companies that excel in obtaining and leveraging information promptly can swiftly integrate it with customers and suppliers.

The impact of innovation capability on supply chain integration is positive and statistically significant, consistent with prior research such as that by (Iddris et al., 2014; Isfianadewi et al., 2019; Nur, 2019). Integration entails collaboration between entities. Innovation capability, characterized by its facets in the innovation process, enables companies to continuously seek more effective and efficient methods in the integration process. The incorporation of innovation into integrated operations enhances the pace of all related activities. In Indonesia's textile industry, there is a demonstrated ability to innovate within processes, reflected in the high mean value of the innovation capability variable (mean = 4.10 out of 5). Technology adoption significantly influences supply chain integration, consistent with earlier research by (Chauhan et al., 2021; Chatterjee et al., 2022; Salamah et al., 2023). And has significant influence on firm performance which supports previous studies by (Bhagat et al., 2022; Kumar & Bhatia, 2021; Arifin et al., 2016; Lin et al., 2019).

In a previous study technology adoption has a positive significant effect on supply chain integration and firm performance, new finding in this research technology adoption has a negative influence on supply chain integration and firm performance. This can happen because textile companies in Indonesia have not fully adopted existing technology, which can be seen from the low mean value of the technology adoption variable (mean = 1.90 of 5). Innovation capability, technology adoption, and strategic agility collectively account for 88.8% of the influence on supply chain integration. The textile industry in Indonesia has effectively implemented strategic agility and innovation capability, leading to substantial impacts and fostering robust integration within the textile supply chain in Indonesia, as evidenced by the high mean value of the supply chain integration variable (mean = 4.14 out of 5).

Strategic agility positively impacts firm performance, as supported by research findings from (Suradi et al., 2020; Kale et al., 2019; AlTaweel & Al-Hawary, 2021). Similarly, innovation capability enhances firm performance, consistent with studies by (Nazeer et al., 2021; Zia-Ur-Rehman et al., 2019; Zimmermann et al., 2020; Ferreira et al., 2018). Furthermore, supply chain integration positively influences firm performance, as indicated by research from (Tian et al., 2021; Suradi et al., 2020) and (Iddris et al., 2014). Effective company performance encompasses growth performance, profitability performance, and customer satisfaction. Supply chain integration reduces lead times for goods, shipping costs, and storage expenses, benefiting companies and enhancing customer satisfaction by aligning supply chains with customer needs.

The textile industry in Indonesia has effectively implemented the integration process. Companies can innovate within this process and swiftly gather market and customer insights. During periods of environmental turbulence, companies are prompted to enhance their innovation capabilities and integrate their supply chains more effectively. Innovation serves as a critical response to environmental challenges, requiring enhanced integration among all supply chain members (suppliers, companies, customers). Strategic agility and innovation capability contribute significantly to stronger supply chain integration, thereby impacting overall company performance. These factors, along with technology adoption, collectively account for 90.5% of company performance, ensuring the effective operation of textile companies in Indonesia. This is reflected in the high mean value of company performance (mean = 4.12 out of 5).

5. Conclusion

The main objectives of this study are to investigate the correlations among strategic agility, innovation capability, technology adoption, supply chain integration, environmental turbulence, and firm performance. From the hypothesis testing results, 9 out of 11 hypotheses were supported while 2 were rejected. Notably, the impacts of strategic agility, innovation capability, and technology adoption on firm performance are mediated through supply chain integration. Innovation capability plays a crucial role in integrating processes within the supply chain, enabling rapid acquisition of information essential for integration, facilitated by strategic agility's focus on anticipating future market and customer needs. Technology adoption significantly influences both supply chain integration and firm performance, emphasizing the necessity for comprehensive technological

adoption to prevent adverse relationships. Ultimately, supply chain integration reduces operational costs, enhances company profitability, and enhances customer satisfaction by aligning with current and future customer needs. Companies must maintain strategic agility to swiftly adapt to market and customer changes. During environmental turbulence, companies should bolster their innovation capability and enhance supply chain integration processes, leading to improved overall company performance.

This research provides implications for enhancing the performance of Indonesia's textile industry. It demonstrates that strategic agility and innovation play positive roles in connecting supply chain integration and firm performance. Companies should enhance strategic agility by carefully assessing present and future opportunities and challenges, which can inform responsive strategies. Additionally, prioritizing innovation capability is crucial for integrating innovation into the supply chain integration process effectively. Efficient supply chain operations significantly enhance firm performance, particularly in Indonesia's textile industry, which involves extensive upstream and downstream processes. This improvement ultimately leads to enhanced company performance. When adopting technology, companies must ensure thorough implementation to avoid any negative impact on company performance. Moreover, during environmental disruptions, textile companies should focus on enhancing innovation and integration across all supply chain segments.

This study validated the model linking strategic agility, innovation capability, technology adoption, supply chain integration, environmental turbulence, and firm performance through a survey conducted among textile companies in Indonesia. Previous studies have rarely explored technology adoption within the textile industry, especially in Indonesia. This research introduces novel insights, revealing a potential negative and significant relationship between technology adoption, supply chain integration, and company performance. Several limitations should be acknowledged when interpreting the findings of this study. Firstly, the data collection utilized a non-probability sampling technique and was confined to respondents from the Java Island region. This may constrain the generalizability of the results in explaining the performance of textile companies on a broader scale. Future studies could employ probability sampling and include companies from different islands or cities to enhance the robustness of the findings. Secondly, future research could extend this framework to diverse business sectors and research settings, such as automotive and agriculture industries, to further validate and refine the theoretical underpinnings.

References

- Adel, H. M., & Younis, R. A. A. (2021). Interplay among blockchain technology adoption strategy, e-supply chain management diffusion, entrepreneurial orientation and human resources information system in banking. *International Journal of Emerging Markets*.
- Aeknarajindawat, N., & Chancharoen, S. (2019). Product Modularity, Mass Customization Supply Chain Quality Integration and the Competitive Performance of Textile and Appraisal Sector of Indonesia: The Role of Open Book Accounting. *International Journal of Supply Chain Management*, 8, 467-478.
- Agyei-Owusu, B., Asamoah, D., Nuertey, D., & Acquah, I. N. (2022). Examining the relationship between dimensions of supply chain integration, operational performance and firm performance: evidence from Ghana. *Management Research Review*.
- Ahmad, H. (2022). Factors affecting supply chain integration and customer satisfaction. *Uncertain Supply Chain Management*, 10(3), 1037-1040.
- Alif, K. (2022). Kinerja Industri Tekstil Kembali Terkontraksi pada 2021. Dataindonesia.id. <https://dataindonesia.id/industri-perdagangan/detail/kinerja-industri-tekstil-kembali-terkontraksi-pada-2021>.
- Allammari, Y., Jaride, C., Azdod, M., & Taqi, A. (2024). The role of customer orientation in enhancing the innovation capability and performance of Moroccan SMEs: A structural equation approach. *Multidisciplinary Science Journal*, 6(11), 2024250-2024250.
- Al-Nattar, B. A., & Alazzawi, A. (2020). Data Analytics of Strategic Agility and Competitiveness in Operation Performance: A case of Banking Sector in Saudi Arabia. In 2020 International Conference on Decision Aid Sciences and Application (DASA) (pp. 293-298). IEEE.
- AlTaweel, I. R., & Al-Hawary, S. I. (2021). The mediating role of innovation capability on the relationship between strategic agility and organizational performance. *Sustainability*, 13(14), 7564.
- Arifin, Z., Fontana, A., & Wijanto, S. H. (2016). The determinant factors of technology adoption for improving firm's performance: An empirical research of Indonesia's electricity company. *Gadjah Mada International Journal of Business*, 18(3), 237-261.
- Arshad, M. Z., Arshad, D., Lamsali, H., Alshuaibi, A. S. I., Alshuaibi, M. S. I., Albashar, G., ... & Chuah, L. F. (2023). Strategic resources alignment for sustainability: The impact of innovation capability and intellectual capital on SME's performance. Moderating role of external environment. *Journal of Cleaner Production*, 417, 137884.
- Bai, Y., & Song, W. (2022). Environmental collaboration and blockchain technology adoption in green medical supply chain management during the COVID-19 pandemic. *Frontiers in Environmental Science*, 1964.
- Bashir, M., Alfalih, A., & Pradhan, S. (2023). Managerial ties, business model innovation & SME performance: Moderating role of environmental turbulence. *Journal of Innovation & Knowledge*, 8(1), 100329.
- Behera, A., Nayak, N., & Das, H. (2015). Performance measurement due to IT adoption. *Business Process Management Journal*.

- Bhagat, P. R., Naz, F., & Magda, R. (2022). Role of Industry 4.0 Technologies in Enhancing Sustainable Firm Performance and Green Practices. *Acta Polytechnica Hungarica*, 19(8).
- Castelo-Branco, I., Oliveira, T., Simões-Coelho, P., Portugal, J., & Filipe, I. (2022). Measuring the fourth industrial revolution through the Industry 4.0 lens: The relevance of resources, capabilities and the value chain. *Computers in Industry*, 138, 103639.
- Celik, D., & Uzuncarşili, U. (2023). Is the Effect of Organizational Ambidexterity and Technological Innovation Capability on Firm Performance Mediated by Competitive Advantage? An Empirical Research on Turkish Manufacturing and Service Industries. *SAGE Open*, 13(4), 21582440231206367
- Chatha, K. A., Jajja, M. S. S., Gillani, F., & Farooq, S. (2024). Examining the effects of technology–organization–environment framework on operational performance through supply chain integration of the firm. *Benchmarking: An International Journal*, 31(5), 1797-1825.
- Chatchawanchanchanakij, P., Jermittiparsert, K., Chankoson, T., & Waiyawuththanapoom, P. (2023). The role of industry 4.0 in sustainable supply chain: Evidence from the textile industry. *Uncertain scm*, 11(1), 1-10.
- Chatterjee, S., & Chaudhuri, R. (2021). Supply chain sustainability during turbulent environment: Examining the role of firm capabilities and government regulation. *Operations Management Research*, 1-15.
- Chatterjee, S., Chaudhuri, R., Kamble, S., Gupta, S., & Sivarajah, U. (2022). Adoption of Artificial Intelligence and Cutting-Edge Technologies for Production System Sustainability: A Moderator-Mediation Analysis. *Information Systems Frontiers*, 1-16.
- Chauhan, C., Singh, A., & Luthra, S. (2021). Barriers to industry 4.0 adoption and its performance implications: An empirical investigation of emerging economy. *Journal of Cleaner Production*, 285, 124809.
- Chin, W.W. and Todd, P.A. (1995), "On the use, usefulness, and ease of use of structural equation modeling in mis research: A note of caution", *MIS Quarterly: Management Information Systems*, Vol. 19 No. 2, pp. 237–246.
- Chiu, M. L., & Lin, C. N. (2022). Developing supply chain open innovation capability: The mediating role of the knowledge creation process, governance mechanism and technology as a driver. *Journal of Innovation & Knowledge*, 7(4), 100264.
- Cho, B. (2019). The Effect of Technology Driven Mergers and Acquisitions on Firm Performance in the US Textile Industry. North Carolina State University.
- Chowdhury, S., Rodriguez-Espindola, O., Dey, P., & Budhwar, P. (2022). Blockchain technology adoption for managing risks in operations and supply chain management: evidence from the UK. *Annals of operations research*, 1-36.
- Clauss, T., Kraus, S., Kallinger, F. L., Bican, P. M., Brem, A., & Kailer, N. (2021). Organizational ambidexterity and competitive advantage: The role of strategic agility in the exploration-exploitation paradox. *Journal of Innovation & Knowledge*, 6(4), 203-213.
- Cui, L., Wu, H., Wu, L., Kumar, A., & Tan, K. H. (2023). Investigating the relationship between digital technologies, supply chain integration and firm resilience in the context of COVID-19. *Annals of Operations Research*, 327(2), 825-853.
- Dadoukis, A., Fiaschetti, M., & Fusi, G. (2021). IT adoption and bank performance during the Covid-19 pandemic. *Economics Letters*, 204, 109904.
- Dalle, J., Siyoto, S., Astika, N. D., Negara, D. J., Chandra, T., & Anam, K. (2020). Moderating role of IT adoption and mechanism of dynamic capabilities on Indonesian pharmaceutical firms performance.
- Dayioglu, M., Küskü, F., & Cetindamar, D. (2024). The Impact of Business Environmental Factors on Performance Through Strategic Agility and Business Model Innovation: An Analysis Based on Dynamic Capabilities Theory. *IEEE Transactions on Engineering Management*
- Díaz-Chao, Á., Ficapal-Cusí, P., & Torrent-Sellens, J. (2021). Environmental assets, industry 4.0 technologies and firm performance in Spain: A dynamic capabilities path to reward sustainability. *Journal of Cleaner Production*, 281, 125264.
- Evangelista, P., Mogre, R., Perego, A., Raspagliesi, A., & Sweeney, E. (2012). A survey based analysis of IT adoption and 3PLs' performance. *Supply Chain Management: An International Journal*.
- Ferreira, J., Coelho, A., & Moutinho, L. (2018). Dynamic capabilities, creativity and innovation capability and their impact on competitive advantage and firm performance: The moderating role of entrepreneurial orientation. *Technovation*. doi:10.1016/j.technovation.2018.11.
- Fianko, A. O., Essuman, D., Boso, N., & Muntaka, A. S. (2022). Customer integration and customer value: contingency roles of innovation capabilities and supply chain network complexity. *Supply Chain Management: An International Journal*.
- Gyedu, S., Tang, H., Ntarmah, A. H., & Manu, E. K. (2021). The moderating effect of environmental turbulence on the relationship between innovation capability and business performance. *International Journal of Innovation Science*.
- Haider, S. A., & Kayani, U. N. (2020). The impact of customer knowledge management capability on project performance-mediating role of strategic agility. *Journal of Knowledge Management*.
- Hair, J.F., Ringle, C.M. and Sarstedt, M. (2011), "PLS-SEM: Indeed a silver bullet", *Journal of Marketing Theory and Practice*, Vol. 19 No. 2, pp. 139–152.
- Han, X., & Rani, P. (2022). Evaluate the barriers of blockchain technology adoption in sustainable supply chain management in the manufacturing sector using a novel Pythagorean fuzzy-CRITIC-CoCoSo approach. *Operations Management Research*, 1-18.
- Harianto, K.J., Tarigan, Z. J. H., Siagian, H., Basana, S. R., & Jie, F. (2024). The effect of digital ERP implementation, supply chain integration and supply chain flexibility on business. *International Journal of Data and Network Science*, (8) pp. 2399–241.

- Hijjawi, G. S., & Al-Shawabkeh, K. M. (2017). Impact of strategic agility on business continuity management (BCM): The moderating role of entrepreneurial alertness: An applied study in Jordanian insurance companies. *International Journal of Business and Management*, 12(10), 155-155.
- Huang, Y., Liu, X., Kim, J., & Na, S. (2022). Effects of idiosyncratic deals, psychological contract, job satisfaction and environmental turbulence on unethical pro-organizational behavior. *Sustainability*, 14(23), 15995.
- Hung, K. P., & Chou, C. (2013). The impact of open innovation on firm performance: The moderating effects of internal R&D and environmental turbulence. *Technovation*, 33(10-11), 368-380.
- Hussain, Z. N., Abood, Z. A. R., & Talib, A. H. (2018). Strategic Agility and its Impact on Organizational Supply Chain Success: Applied Research in a Sample of the Faculties of the University of Babylon. *Int. J. Sup. Chain. Mgt Vol*, 7(6), 578.
- Iddris, F., Baffour Awuah, G., & Abraha Gebrekidan, D. (2014). The role of innovation capability in achieving supply chain agility. *International Journal of Management and Computing Sciences*, 4(2), 104-112.
- Iddris, F. (2016). Innovation capability: A systematic review and research agenda. *Interdisciplinary Journal of Information, Knowledge, and Management*, 11, 235-260.
- Iddris, F. (2016). Measurement of innovation capability in supply chain: an exploratory study. *International Journal of Innovation Science*.
- Isfianadewi, D., Arrachman, F. S., & Alwani, D. R. (2019). Improving company performance through innovation capability and supply chain integration. *Proceeding UII-ICABE*, 335-345.
- Iqbal, T., Shahzad, M. A., Alonso-Nuez, M. J., & Rosell-Martínez, J. (2022). Importance of environmental policy on firm performance for the textile industry: A contextual study of Pakistan. *Frontiers in Psychology*, 13.
- Jabbour, A. B. L. D. S., Filho, A. G. A., Viana, A. B. N., & Jabbour, C. J. C. (2012). Supply Chain Management practices in the electro-electronics sector in Brazil: evolutionary approach, information technology adoption and management actions. *International Journal of Manufacturing Research*, 7(2), 123-147.
- Jalil, M. F., Ali, A., & Kamarulzaman, R. (2021). Does innovation capability improve SME performance in Malaysia? The mediating effect of technology adoption. *The International Journal of Entrepreneurship and Innovation*, 146575032111048967.
- Jasim, T. A., Khairy, H. A., Fayyad, S., & Al-Romeedy, B. S. (2024). Digital leadership and creative performance in tourism and hotel enterprises: leveraging strategic agility and organizational learning culture. *Geo Journal of Tourism and Geosites*, 54, 872-884.
- Junejo, I., Hossain, M. B., Abid, S., Janjua, Q. R., Ejaz, S., & Vasa, L. (2024). Supply chain integration and supply chain performance: evidence from the textile industry. *Industria Textila*, 75(4), 396-404.
- Kaddumi, T. A., Baker, H., Nassar, M. D., & A-Kilani, Q. (2023). Does Financial Technology Adoption Influence Bank's Financial Performance: The Case of Jordan. *Journal of Risk and Financial Management*, 16(9), 413.
- Kale, E., Aknar, A., & Başar, Ö. (2019). Absorptive capacity and firm performance: The mediating role of strategic agility. *International Journal of Hospitality Management*, 78, 276-283.
- Kementerian Perindustrian. (2021). Laporan industri tekstil edisi III kementerian perindustrian Indonesia tahun 2021. <https://kemenperin.go.id/download/27418/Laporan-Informasi-Industri-2021>
- Kementerian Perindustrian. (2023). List direktori perusahaan. <https://kemenperin.go.id/direktori-perusahaan>
- Khaw, T. Y., & Teoh, A. P. (2023). The influence of big data analytics technological capabilities and strategic agility on performance of private higher education institutions. *Journal of Applied Research in Higher Education*, (ahead-of-print).
- Kumar, S., & Bhatia, M. S. (2021). Environmental dynamism, industry 4.0 and performance: Mediating role of organizational and technological factors. *Industrial Marketing Management*, 95, 54-64.
- Kurniawan, R., Budiastuti, D., Hamsal, M., & Kosasih, W. (2020). The impact of balanced agile project management on firm performance: the mediating role of market orientation and strategic agility. *Review of International Business and Strategy*.
- Liao, S. H., Hu, D. C., & Shih, Y. S. (2021). Supply chain collaboration and innovation capability: the moderated mediating role of quality management. *Total Quality Management & Business Excellence*, 32(3-4), 298-316.
- Liao, Y., & Li, Y. (2018). Complementarity effect of supply chain competencies on innovation capability. *Business Process Management Journal*.
- Lin, B., Wu, W., & Song, M. (2019). Industry 4.0: Driving factors and impacts on firm's performance: An empirical study on China's manufacturing industry. *Annals of Operations Research*, 1-21.
- Liu, Y., Wu, M., Lai, K. H., Zhang, J. Z., & Wang, J. (2024). Strategic responses to market uncertainty: performance value of strategic agility and online-to-offline platform adoption. *Enterprise Information Systems*, 18(1), 2292983.
- Lucia-Palacios, L., Bordonaba-Juste, V., Polo-Redondo, Y., & Grünhagen, M. (2014). Technological opportunism effects on IT adoption, intra-firm diffusion and performance: Evidence from the US and Spain. *Journal of business research*, 67(6), 1178-1188.
- Luu, T. D. (2024). Leveraging digital transformation and agile slack to integrate team-level I-deals with strategic agility for enhancing international performance. *Thunderbird International Business Review*, 66(1), 101-122.
- Lyn Chan, J. I., & Muthuveloo, R. (2021). Antecedents and influence of strategic agility on organizational performance of private higher education institutions in Malaysia. *Studies in Higher Education*, 46(8), 1726-1739.
- Mandal, S., & Dubey, R. K. (2020). Role of tourism IT adoption and risk management orientation on tourism agility and resilience: Impact on sustainable tourism supply chain performance. *International Journal of Tourism Research*, 22(6), 800-813.

- Marlapa, E., Karyatun, S., Yuliantini, T., Pradopo, L. L.R., & Endri, E. (2024). Determinants of sustainable performance: The mediating role of strategic agility and the moderating role of leadership. *Uncertain Supply Chain Management*, 12(4), 2253-2262.
- Mavengere, N. B. (2013). Information technology role in supply chain's strategic agility. *International Journal of Agile Systems and Management*, 6(1), 7-24.
- Mavengere, N. B. (2013). The role of information systems in promoting strategic agility in supply chains. *Journal of Information Technology Case and Application Research*, 15(4), 13-33.
- Maestrini, V., Luzzini, D., Caniato, F., Maccarrone, P., & Ronchi, S. (2018). Measuring supply chain performance: a lifecycle framework and a case study. *International Journal of Operations & Production Management*.
- Mikalef, P., Boura, M., Lekakos, G., & Krogstie, J. (2019). Big data analytics and firm performance: Findings from a mixed-method approach. *Journal of Business Research*, 98, 261-276.
- Nazeer, N., Rasiah, R., & Furuoka, F. (2021). Technology transfer, technological capability, absorptive capacity and firm performance: An investigation of the textile and clothing firms in Pakistan. *Malaysian Journal of Economic Studies*, 58(1), 99-124.
- Nur, S. A. (2019). Innovation capability, absorptive capacity and supply chain integration in smes performance: case study of creative industry in yogyakarta, Indonesia. *Proceedings on Engineering Sciences*, 1(2), 203-218.
- Nurjaman, R., Rahayu, A., & Wibowo, L. A. (2021, February). The Relationship between Strategic Agility and Resource Base View of the Firm Performance in Manufacturing Industry: The Research Framework. In *Journal of Physics: Conference Series* (Vol. 1764, No. 1, p. 012148). IOP Publishing.
- Octavia, A., Sriyudha, Y., & Ali, H. (2020). Innovation capability and supply chain management: empirical study of inodonesian tradisional herbal medicine product. *International of Journal Supply Chain Management*, 9(1), 601-608.
- Qiao, S., Wang, Q., Guo, Z., & Guo, J. (2021). Collaborative innovation activities and BIM application on innovation capability in construction supply chain: mediating role of explicit and tacit knowledge sharing. *Journal of Construction Engineering and Management*, 147(12), 04021168.
- Paul, J., & Zhou, Y. (2017). How to build sustainable innovation capability in supply chain management. *International Journal of Business and Globalisation*, 19(4), 456-476.
- Purwanto, S. (2019). The effect of competitive advantage and commodity strategic supply chain on Indonesia textile industry. *Uncertain Supply Chain Management*, 7(2), 133-144.
- Raharja, S. U. J., & Rivani, R. (2022). Effects of information and communication technology adoption and innovation capability on export performance: study of Purwakarta ceramic industry in Indonesia. *International Journal of Trade and Global Markets*, 15(1), 104-113.
- Ralahallo, F., Wijaya, F., Latuconsina, Z., Firman, F., & Titioika, B. (2024). The role of supply chain integration, management commitment and supply chain challenges on supply chain performance and MSMEs performance. *Uncertain Supply Chain Management*, 12(3), 1833-1840.
- Reed, J. H. (2020). Strategic agility and the effects of firm age and environmental turbulence. *Journal of Strategy and Management*, ahead-of-print(ahead-of-print). doi:10.1108/jsma-07-2020-0178
- Saengchai, S., Duangkaew, S., & Jermisittiparsert, K. (2019). Consequences of the Recruitment and Selection Process on Employee Turnover & Absenteeism: Profitability in the Textile Sector of Indonesia. *International Journal of Innovation, Creativity and Change*, 10(1), 40-57.
- Salamah, E., Alzubi, A., & Yinal, A. (2023). Unveiling the Impact of Digitalization on Supply Chain Performance in the Post-COVID-19 Era: The Mediating Role of Supply Chain Integration and Efficiency. *Sustainability*, 16(1), 304.
- Sarasi, V., Primiana, I., Harsanto, B., & Satyakti, Y. (2023). Sustainable supply chain of Indonesia's textile & apparel industry: opportunities and challenges. *Research Journal of Textile and Apparel*, (ahead-of-print).
- Selvam, M., Gayathri, J., Vasanth, V., Lingaraja, K., & Marxiaoli, S. (2016). Determinants of firm performance: A subjective model. *Int'l J. Soc. Sci. Stud.*, 4, 90.
- Setiawan, R., Princes, E., Tunardi, Y., Chandra, A., Noerlina, N., Mursitama, T. N., & Limto, D. (2022). Assessing the Impacts of IT Usage, IT Adoption, and Innovation Capabilities in Increasing the Hybrid Learning Process Performance. *International Journal of Learning, Teaching and Educational Research*, 21(4), 337-354.
- Shahi, S. K., Shiva, A., & Dia, M. (2021). Integrated sustainable supply chain management and firm performance in the Indian textile industry. *Qualitative Research in Organizations and Management: An International Journal*, 16(3/4), 614-635.
- Shahzad, S. K., Masudin, I., Zulfikarijah, F., Nasyiah, T., & Restuputri, D. P. (2024). The effect of supply chain integration, management commitment, and sustainable supply chain practices on non-profit organizations performance using SEM-FsQCA: Evidence from Afghanistan. *Sustainable Futures*, 8, 100282.
- Shin, H., Lee, J. N., Kim, D., & Rhim, H. (2015). Strategic agility of Korean small and medium enterprises and its influence on operational and firm performance. *International Journal of Production Economics*, 168, 181-196.
- Sikora, T., & Baranowska-Prokop, E. (2022). Strategic Agility and Economic Environment's Friendliness-Hostility in Explaining Performance of Polish SMEs in the Phase of COVID-19 Pandemic. In *International Conference on Applied Economics* (pp. 477-496). Springer, Cham.
- Sillanpää, I. (2015). Empirical study of measuring supply chain performance. *Benchmarking: An International Journal*.
- Silvestre, B. S. (2015). Sustainable supply chain management in emerging economies: Environmental turbulence, institutional voids and sustainability trajectories. *International Journal of Production Economics*, 167, 156-169. doi:10.1016/j.ijpe.2015.05.025

- Sundram, V. P. K., Chandran, V. G. R., & Bhatti, M. A. (2016). Supply chain practices and performance: the indirect effects of supply chain integration. *Benchmarking: An International Journal*.
- Suradi, S., Mahrinasari MS, M., & Hasnawati, S. (2020). The mediating effect of strategic agility in the relationship of supply chain management activities and firm performance of the textile industry of Indonesia. *International Journal of Supply Chain Management*, 9(3), 649-656.
- Tian, H., Otchere, S. K., Coffie, C. P., Mensah, I. A., & Baku, R. K. (2021). Supply chain integration, interfirm value co-creation and firm performance nexus in Ghanaian SMEs: mediating roles of stakeholder pressure and innovation capability. *Sustainability*, 13(4), 2351.
- Tiwari, S. (2021). Supply chain integration and Industry 4.0: a systematic literature review. *Benchmarking: An International Journal*, 28(3), 990-1030.
- Trihastuti, D., Dewi, D. R. S., Santosa, H., & Yuliawati, E. (2024). Developing a Framework on Designing a Sustainable Supply Chain by Integrating Input-Output Analysis and DEMATEL Method: A Case Study on Textile Industry in Indonesia. *Journal Européen des Systèmes Automatisés*, 57(2).
- Tsai, K. H., & Yang, S. Y. (2014). The contingent value of firm innovativeness for business performance under environmental turbulence. *International Entrepreneurship and Management Journal*, 10(2), 343-366.
- Turulja, L., & Bajgoric, N. (2018). Innovation, firms' performance and environmental turbulence: is there a moderator or mediator?. *European Journal of Innovation Management*.
- Uddin, A., Cetindamar, D., Hawryszkiewicz, I., & Sohaib, O. (2023). The Role of Dynamic Cloud Capability in Improving SME's Strategic Agility and Resource Flexibility: An Empirical Study. *Sustainability*, 15(11), 8467.
- United states department of agriculture. (2022). Textile report no ID2022-0011. https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Cotton%20and%20Products%20Update_Jakarta_Indonesia_ID2022-0041.
- Vrontis, D., Belas, J., Thrassou, A., Santoro, G., & Christofi, M. (2022). Strategic agility, openness and performance: a mixed method comparative analysis of firms operating in developed and emerging markets. *Review of Managerial Science*, 1-34.
- Wadho, W., & Chaudhry, A. (2018). Innovation and firm performance in developing countries: The case of Pakistani textile and apparel manufacturers. *Research Policy*, 47(7), 1283-1294.
- Wilden, R., & Gudergan, S. P. (2015). The impact of dynamic capabilities on operational marketing and technological capabilities: investigating the role of environmental turbulence. *Journal of the Academy of Marketing Science*, 43, 181-199.
- Yasmeen, H., Wang, Y., Zameer, H., & Ahmad, Z. (2020). Environmental Turbulence as a Moderator on the Impact of Transformational Leadership and IT Business Strategy Alignment on EIS Adaptation. *International Journal of Information Systems in the Service Sector (IJISSS)*, 12(3), 74-92.
- Yawson, D. E., & Yamoah, F. A. (2022). Review of strategic agility: a holistic framework for fresh produce supply chain disruptions. *Sustainability*, 14(22), 14977.
- Yildiz, T., & Aykanat, Z. (2021). The mediating role of organizational innovation on the impact of strategic agility on firm performance. *World Journal of Entrepreneurship, Management and Sustainable Development*.
- Zhong, D., & Lyu, T. (2022). Implementation of supply chain management practices and its effect on textile firm's performance at China: A mediation analysis. *Managerial and Decision Economics*, 43(6), 2515-2528.
- Zia-Ur-Rehman, M., Baig, S. A., Abrar, M., Hashim, M., Amjad, F., Baig, I. A., & Usman, M. (2019). The impact of intellectual capital, organizational capabilities and innovation on firm performance of textile sector: a moderating effect of GSP plus. *Industria Textila*, 70(6), 572-578.
- Zimmermann, R., Ferreira, L. M. D., & Moreira, A. C. (2020). How supply chain strategies moderate the relationship between innovation capabilities and business performance. *Journal of Purchasing and Supply Management*, 26(5), 100658



© 2026 by the authors; licensee Growing Science, Canada. This is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC-BY) license (<http://creativecommons.org/licenses/by/4.0/>).