Contents lists available at GrowingScience

Journal of Future Sustainability

homepage: www.GrowingScience.com/jfs

Enhancing supply chain resilience: The role of SC-ambidexterity and SC-agility

Muhammad Haris Khan[a*]

[a]*Student at Iqra University Karachi, Department of Business Administration, Pakistan*

C H R O N I C L E

Article history:
Received: April 27, 2023
Received in revised format: May 20, 2023
Accepted: October 15, 2023
Available online: October 15, 2023

Keywords:
Dynamic capabilities
SC-Ambidexterity
SC-Adaptability
SC-alignment
SC-Agility
SC-Resilience

A B S T R A C T

This research aims to explore the significance of supply chain (SC) resilience by integrating SC-Resilience and SC-Ambidexterity concepts. SC-Ambidexterity refers to the simultaneous application of SC-Adaptability and SC-Alignment capabilities within the supply chain. In line with the dynamic capabilities view (DCV) of the firm, this research adopts a quantitative approach to investigate the relationship between variables in the context of manufacturing and production companies in Pakistan, specifically in Karachi. The results of this case study have revealed a strong positive impact of SC-Ambidexterity on SC-Resilience, confirming the significance of adopting concurrent and synchronized supply chain capabilities. Furthermore, the analysis indicated that SC-Agility plays a crucial role as a mediator in the relationship between SC-Ambidexterity and SC-Resilience. The findings suggest that organizations that proactively invest in developing both ambidextrous capabilities and agility are more likely to achieve a higher level of supply chain resilience, enabling them to effectively navigate turbulent business environments.

1. Introduction

In recent years, supply chains have faced an unprecedented level of upheaval and unforeseen events. From natural disasters to man-made crises, political and economic turmoil, the ever-changing landscape has introduced a continuous stream of risks and uncertainties. Startling statistics reveal that a staggering 75% of businesses encounter disruptions in their supply chains annually, highlighting the pervasive nature of these challenges. The repercussions of such disruptions can be far-reaching, impacting not only the operational efficiency of organizations but also their financial performance and customer satisfaction. The need for resilient supply chains that can withstand and swiftly recover from these disruptions has become paramount in today's volatile business environment. Research in this field sheds light on the critical importance of developing strategies and capabilities to enhance supply chain resilience. It involves proactive measures that allow businesses to anticipate, prepare for, and respond effectively to potential disruptions. By fortifying their supply chains with resilience, organizations can mitigate the adverse effects of unforeseen events, maintain a smooth flow of goods and services, and safeguard their overall business continuity. In this dynamic landscape, the ability to adapt, innovate, and swiftly recover from disruptions has emerged as a strategic advantage. Organizations that invest in supply chain resilience can position themselves as robust and agile players in the market, capable of navigating the complexities and uncertainties that lie ahead. As the global business landscape continues to evolve, the imperative to build resilient supply chains becomes increasingly clear. By acknowledging the reality of disruptions and taking proactive measures to enhance resilience, organizations can forge a path towards long-term success and sustainability. (Scholten et al., 2020). Unexpected disruptions lead to poor operational, managerial, and financial performance. (Maryam & Soroosh, 2018; Margolis et al.,2018).

In the context of Brexit, the absence of a trade agreement between Britain and the European Union has the potential to trigger significant supply chain distortions due to the implementation of stricter border controls. This events-based situation prompted manufacturers such as Toyota to express concerns and raise cautionary signals about the potential consequences (Meyer, 2019; Walker, 2020). In light of the recent coronavirus outbreak, numerous international retailers, including IKEA and Starbucks, have made the decision to temporarily close their operational stores in China. In parallel, several international airlines have suspended flights to China, leading to refund being offered by hotels to the customers. These developments

* Corresponding author.
E-mail address: hariskhan228@yahoo.com (M. H. Khan)

ISSN 2816-8151 (Online) - ISSN 2816-8143 (Print)

doi: 10.5267/j.jfs.2024.10.002

have significantly affected global supply chains, as China holds a crucial role in many companies' global supply networks. The repercussions of these disruptive events have reverberated across the entire supply chain, causing disruptions and challenges. As a result, Hyundai, a prominent South Korean automaker, were compelled to stop their manufacturing process because of decline in sourcing part from China. The far-reaching impact of these events has highlighted the vulnerability of supply chains and the importance of proactive measures to manage and mitigate such disruptions (Walker, 2020). These event-driven scenarios have sparked the attention of researchers towards the concept of supply chain SC-Resilience (SC-Resilience). Recognizing the need to effectively manage and mitigate disruptions, the focus has shifted to developing strategies and capabilities that can enhance resilience of supply chain. By fostering SC-Resilience, organizations can better prepare for and respond to unexpected events, minimizing their impact on operational performance and maintaining continuity in the face of disruptions (Tukamuhabwa, 2017; Pettit, 2019).

SC-Resilience is the ability like flexibility and elasticity to recover from any disruption (Hamel & Valikangas, 2004). Supply chain resilience entails the proactive identification and avoidance of identifiable risks, the ability to achieve business goals despite interferences, and the capability to restore and sustain the required level of performance following disruptive events. This encompasses a comprehensive approach to managing and mitigating risks, enhancing the adaptability and flexibility of supply chains, and implementing effective contingency plans to minimize the impact of disturbances. By prioritizing supply chain resilience, organizations can better navigate uncertainties, safeguard their operational performance, and ensure continuity even in the face of unexpected disruptions (Sawyerr & Harrison, 2020). SC-Resilience minimizes instability (Bag et al., 2019; Ali et al., 2017) Crises are not merely temporary events. They underscore the importance of organizational capabilities that enable proactive anticipation of constant change, as well as the ability to make necessary adjustments and alignments that impact the potential and forecasted returns of a business. These capabilities form the foundation for effectively managing uncertainties and disruptions, facilitating the adaptation and resilience necessary for sustained success in an ever-evolving business environment. By cultivating these capabilities, organizations can position themselves to navigate challenges, exploit opportunities, and optimize their business outcomes amidst a dynamic landscape (Hamel & Valikangas, 2004)?

With the continuous growth of the global population and the escalating volatility and unpredictability of climate change, the likelihood of experiencing supply chain disruptions will rise (Guha-Sapir & Ph, 2015). Therefore, understanding and developing SC-Resilience is critical for the future of the organization and industries (Sawyerr & Harrison, 2020). Although there is an increase in literature, exploring various facets of SC-Resilience, there remains a noticeable gap in the literature concerning perspectives from developing countries (Tukamuhabwa et al., 2017) and does not give the full picture (Polyviou et al.,2020). Paradoxically, developing countries bear the brunt of supply chain disruptions, be it natural disasters or man-made conflicts like war. Despite their vulnerability, there exists a dearth of empirical studies compared to non-empirical ones in the field of SC-Resilience, as indicated by meta-analytical evidence (Ali et al., 2017). Researchers also emphasize the importance of integrating the external development of SCM into SC-Resilience (Pettit et al., 2019). Our research endeavors to shed light on these questions by making a valuable contribution to the understanding and advancement of supply chain SC-Resilience.

1.1 Problem Statement

Another significant concern revolves around the exchange of information within the supply chain. The ongoing pandemic has underscored the criticality of information and effective management in developing the necessary skills to mitigate disruptions in the supply chain. The heightened uncertainty stemming from both upstream suppliers and downstream consumers and markets, particularly during the COVID-19 period, has rendered many businesses unable to operate optimally. In light of this, it becomes imperative to collect, process, and analyze the available information to develop strategies and foster resilience within the supply chain (Yang et al., 2021). In essence, the pandemic has brought to the forefront the evident reliance of supply chain operations on the processing power of information (Schippers & Rus, 2020). However, there exists a limited number of journals that have thoroughly explored this aspect. In addressing this gap, the present paper adopts the Information Processing Theory (IPT) as its theoretical lens. By utilizing this framework, we aim to delve deeper into the understanding of information processing with reference to the operations of supply chain. This approach offers a fresh perspective and contributes in the available knowledge by shedding light on the intricate interplay between information processing and supply chain dynamics.

In this study, we embark on an exploration of the underlying factors that contribute to SC-Resilience. Our proposition centers around the concept of supply chain SC-Ambidexterity (O'Reilly et al., 2013; Gibson & Birkinshaw, 2004; Duncan, 1976) leads to SC-Resilience. Ambidexterity theory posits that in today's dynamic and competitive landscape, simply focusing on a singular objective, be it SC-Resilience or efficiency, 1and is insufficient to attain sustainable competitive advantage. Instead, it advocates for the simultaneous pursuit of multiple, seemingly contradictory goals, such as SC-Resilience and efficiency. Organizations aiming to enhance their SC-Resilience cannot afford to neglect efficiency, and vice versa.

Research has demonstrated that organizational ambidexterity is linked to heightened levels of dynamism. This implies that organizations that effectively balance and integrate diverse goals have sufficient resources to analyze constantly evolving business environment. By embracing ambidexterity and concurrently pursuing SC-Resilience and efficiency, organizations can enhance their ability to adapt, innovate, and thrive amidst constant turbulence and uncertainty (Ricciardi et al., 2016)

organizational performance (Boumgarden et al., 2012; Junni et al,, 2013; O'Reilly & Tushman, 2011; Ramachandran et al., 2019). Although substantial research has been conducted on organizational ambidexterity, there is a noticeable dearth of studies examining this concept from a supply chain perspective. However, there are a few notable exceptions that have delved into this area: (Kristal, 2010; Ojha, 2018; Blome et al., 2013a; Rojo, 2016; Partanen et al., 2020)). Moreover, the integration of SC-Ambidexterity and SC-Resilience in research is notably scarce, with few studies exploring the conjunction between these two critical dimensions of supply chain management.

1.2 Purpose of Study

Furthermore, we put forth the proposition that supply chain SC-Agility serves as a mediating factor in the association between SC-Ambidexterity and SC-Resilience (Adobor, 2018). In today's fiercely competitive, intricately complex, and ever-evolving business landscape, marked by dynamic market conditions and cultural nuances, responding to customers' needs and demand has gained the prime importance. SC-Agility emerges as a vital capability that enables organizations to navigate this challenging terrain by facilitating rapid and adaptive responses to market fluctuations and customer needs (Anwer, 2017; Dubey et al., 2018). In order to fulfill the increasing demands of customers SC-Agility has proven to be one of the most important factors (Brusset, 2016). SC-Agility serves as a critical enabler for swift responses to evolving conditions and the dynamic nature of the market. It empowers organizations to adapt quickly, proactively navigate uncertainties, and seize opportunities that arise in the ever-changing business landscape. By embracing SC-Agility, companies can enhance their ability to respond to emerging challenges flexibly and effectively and shifting market dynamics, ensuring their sustained competitiveness and success (Tatham & Christopher, 2018; Christopher & Peck, 2004) risk mitigation and changes in market reaction (Braunscheidel & Suresh, 2009). By adopting SC-Agility, organizations can effectively reduce instability and enhance responsiveness, particularly in dynamic environments. The inherent nature of dynamic organizational settings necessitates the ability to swiftly adapt and respond to changing circumstances, market trends, and customer demands. SC-Agility equips organizations with the agility and flexibility required to navigate through uncertainties, mitigate disruptions, and capitalize on emerging opportunities. It enables a proactive approach to managing volatility and fosters a resilient supply chain that can withstand the challenges posed by dynamic environments (Fayezi et al., 2015; Swafford et al., 2008). For this study, we employ the Dynamic Capabilities View (DCV) as our guiding theoretical framework. The DCV provides a comprehensive lens through which to examine the dynamic capabilities of organizations in managing and responding to a rapidly changing business environment. By leveraging the insights from the DCV, we aim to shed light on the strategic management of supply chain dynamics, resilience, and agility. This theoretical foundation offers a robust and holistic perspective that aligns with the complexity and dynamism inherent in modern supply chain operations (Teece, 2007; Eisenhardt & Martin, 2000; Teece et al., 1997). DCV points out that companies need dynamic capabilities in order to make constant progress and to retain a competitive edge in these evolving market conditions (Teece et al., 1997; O'Reilly & Tushman, 2013) It has been suggested that the Dynamic Capabilities View (DCV) is the most suitable theoretical framework for investigating SC-Ambidexterity. Likewise, numerous studies have also employed the DCV as a theoretical foundation in exploring SC-Agility. This highlights the applicability and relevance of the DCV in understanding the interplay between supply chain capabilities, such as SC-Ambidexterity and SC-Agility, and their impact on organizational performance and resilience. By utilizing the DCV, we can delve deeper into the dynamics and strategic implications of these capabilities with respect to the context of supply chain management (Russell, 2015; Blome et al., 2013; Gligor et al., 2015). Our research points that SC- Resilience is directly influenced by SC- Ambidexterity, with SC-Agility acting as mediator between them. Moreover, in line with the principles of the Dynamic Capabilities View (DCV), we propose that the relationship between SC-Ambidexterity and SC-Resilience is contingent upon environmental uncertainty, thereby playing a moderating role. This study contributes to multiple research streams encompassing DCV, SC-Ambidexterity, and SC-Resilience, enriching our understanding of these diverse fields.

1.3 Significance of study

Previous studies have shown that dynamic and diversified skills are required to achieve SC-Resilience (Gunessee et al., 2018). Our research makes significant contributions to both the dynamic capabilities perspective and the SC-Resilience literature by proposing key supply chain-related factors that contribute to SC-Resilience, specifically through the lens of SC-Ambidexterity. In addition, we contribute to the existing SC-Ambidexterity literature by introducing a novel approach in the form of contextual SC-Ambidexterity. By doing so, we provide a unique solution that addresses the theoretical reasoning put forth by previous studies. These contributions not only advance our understanding of SC-Ambidexterity but also enhance our comprehension of the broader dynamics and resilience within supply chain management (Gibson & Birkinshaw, 2004) Our study delves into the supply chain context, highlighting the contextual nature of coordinating exploitation and exploration activities. We propose that achieving SC-Ambidexterity may necessitate the allocation of time and resources towards Supply Chain Adaptability and Supply Chain alignment goals. By doing so, we contribute to the advancement of SC-Ambidexterity theory, enriching our understanding of how it operates within the supply chain setting.

The remainder of our work is structured as follows. In the subsequent section, we provide a comprehensive overview of the relevant literature and present our research hypotheses. Section 3 outlines the methodology employed in this study, detailing the approach and techniques utilized. In Section 4, we present the measurements and evaluations used to assess the structural model. Finally, in Section 5, we conclude our study by discussing the results and their implications.

2. Literature review

2.1 Supply chain SC-Resilience

In recent years, the occurrence of significant disasters, including acts of terrorism and natural calamities like tsunamis, has had a profound impact on supply chains worldwide. These events have underscored the criticality of SC-Resilience in ensuring the uninterrupted provision of goods and services to customers globally. The imperative for SC-Resilience has been recognized by the realization that not all uncertain conditions can be entirely avoided. By cultivating SC-Resilience, organizations can effectively navigate disruptions and maintain their operational capabilities, enabling them to meet the needs and expectations of their customers. This approach rests on the premise that customers rely on the continued availability and reliability of products and services even when supply chain is facing disruptions (Tukamuhabwa et al., 2017; Sahebjamnia et al., 2018; Bhamra et al., 2011). Resilient organizations excel in managing disruptions by effectively mobilizing their internal resources, skills, and systems (Ambulkar et al., 2015; Ponomarov & Holcomb, 2009)

The currently available literature on SC-Resilience highlights the pervasive nature of environmental uncertainties and disruptions, which extend beyond the confines of individual organizations. These challenges impact the entire supply chain network, emphasizing the need for collaborative efforts between companies and their supply chain or third-party partners. It is imperative for organizations to cultivate the capability to effectively navigate anticipated, unanticipated, and abrupt changes by fostering strong partnerships and collaborative strategies throughout the supply chain. By doing so, companies can enhance their overall resilience and improve their ability to adapt and respond to a wide range of challenges, thereby ensuring the uninterrupted flow of goods and services (Chowdhury & Quaddus, 2017; Ponomarov & Holcomb, 2009; Ali et al., 2017). SC-Resilience, in essence, encompasses the supply chain's capacity to proactively prepare for potential disruptions, swiftly respond to them, and ultimately recover to a state that is at par or even better than the initial conditions prior to the disruption. It involves the development and implementation of robust strategies, processes, and capabilities that enable the supply chain to effectively manage and mitigate the risks associated with disruptions. By embracing SC-Resilience, organizations can enhance their ability to withstand adverse events, minimize the impact of disruptions, and swiftly regain operational stability, thereby ensuring the continuity of their supply chain operations (Chowdhury et al., 2019) Finding the optimal balance between buffer-oriented and process-oriented strategies is essential to optimize SC-Resilience. It requires a thorough understanding of the supply chain dynamics, identification of critical vulnerabilities, and the implementation of appropriate measures to strengthen the supply chain's overall resilience (Zsidisin & Ellram, 2003). Buffer-oriented strategies, such as safety stock holding and engaging multiple suppliers, revolve around the creation of surplus or redundant resources within the supply chain. These strategies aim to provide a cushion against disruptions by ensuring that there are additional inventory levels or alternative sourcing options available (Vanpoucke & Ellis, 2020). Buffer-oriented strategies limit supply chain losses during disruptions, but they do not address the root causes or reduce the likelihood of disruptions, leading to inefficiencies (Vanpoucke & Ellis, 2020; Talluri et al., 2013). Process-oriented strategies focus on developing the ability to identify potential obstacles through assessment, monitoring, and supplier certification (Vanpoucke & Ellis, 2020). These strategies emphasize flexibility, visibility, collaboration, and redundancy as key features to enhance supply chain resilience (Ali et al., 2017; Chowdhury et al., 2019; Brandon-Jones et al., 2014; Zsidisin & Wagner, 2010).

Supply chains that have resilience possess the ability to anticipate and mitigate the adverse impacts of disruptions, resulting in faster recovery and a reduced downtime to resume normal operations. Firms that excel in minimizing the timespan of the supply chain disruption outperform their competitors in terms of resilience (Christopher & Peck, 2004; Scholten et al., 2020) making this a strategic weapon which can be used as a competitive advantage (Scholten et al., 2020). Research has demonstrated that supply chain resilience not only helps organizations overcome disruptions but also directly influences their performance outcomes (Kwak et al., 2018; Birkie et al., 2017; Wieland, & Wallenburg, 2013; Chowdhury et al., 2019; Chunsheng et al., 2020; Altay et al., 2018).

2.2 Supply chain alignment and its dimensions

Supply chain alignment, characterized by the flexible adjustment of configurations and the coordination of goals through collaboration and risk sharing, enables the supply chain to effectively align supply and demand, thereby enhancing its resilience and performance (Dubey et al., 2018). Effective alignment of interests among all companies within the supply chain is crucial for maximizing overall profitability and supply chain power. Whether it involves subcontractors, assemblers, distributors, or retailers, each organization seeks to optimize its own profits. However, if these interests are misaligned with other supply chain partners, it can lead to negative consequences and disrupt supply chain practices. Even within divisions of the same company, conflicting interests can result in errors and disruptions. Therefore, ensuring alignment among supply chain partners is essential to avoid such issues and promote smooth operations (Lee, 2004). Companies can align their partners' interests by redefining terms and establishing fair relationships. This includes sharing risks, costs, and opportunities. Smart companies coordinate their supply chain networks and designs, ensuring equal access to information such as forecasts, sales data, plans, and balances. Clearly defining the roles and responsibilities of each partner helps minimize conflicts and maintain smooth operations within the supply chain (Lee, 2004).

Aligning incentives is crucial for firms to maximize their profits and, in turn, enhance supply chain performance and resilience. When companies have aligned incentives, they are motivated to make decisions and take actions that benefit the

entire supply chain. This alignment encourages collaboration, risk sharing, and coordinated efforts leading to improved performance and resilience is important among supply chain partners. (Wassenhove, 2006) In humanitarian organizations, various factors such as diverse donors, media, governments, and conflicting interests pose challenges to achieving alignment. With numerous humanitarian workers and different agendas involved, coordination becomes crucial in effectively responding to disasters and ensuring resilience. However, aligning these diverse stakeholders, with their own missions, beliefs, and priorities, presents a significant challenge in achieving a unified approach to address humanitarian issues and ensure effective outcomes. (Dubey et al.,2018) (Collaboration and risks sharing identified in 2015), is an important factor of supply chain Alignment and is leveraged consistently.

2.3 Supply Chain Alignment-Collaboration

Collaboration refers to the capability of entities to work together efficiently and harmoniously, with the shared goal of achieving mutual benefits. It involves the coordination and integration of efforts, resources, and expertise among different parties to accomplish common objectives. Collaboration enhances communication, cooperation, and synergy, enabling organizations to leverage each other's strengths, mitigate weaknesses, and create value collectively. Through collaboration, entities can tap into shared knowledge, pool resources, and foster innovation, ultimately leading to improved outcomes and sustainable success (Pettit, 2008). The tremendous level of disruption and complexity in supply chains requires companies to view collaboratively across all business functions within your company. (Pettit, 2008) Collaboration is crucial for identifying and managing risks effectively. It involves the establishment of a collaborative network where departments and institutions evaluate risk related activities by communicating and sharing responsibilities, resources and plans to combat uncertain situations. This form of cooperation requires mutual trust and commitment from all involved parties. It enables the creation of shared goals and a sense of shared identity, allowing for better risk assessment and mitigation. Collaboration also provides an opportunity for outside observers to gain insights into the collaborative efforts and the collective approach to risk management (Christopher, 2011).

One way to enhance supply chain agility is through cooperation and resource sharing with other network entities (Christopher, 2011). Collaborating with other organizations can alleviate the burden of excessive capacity and inventory, resulting in financial benefits such as cost savings, improved service, customer satisfaction, faster throughput times, enhanced information visibility, increased competitiveness, and clear division of responsibilities (Kohli, 2010; Carvalho, 2012) Factors such as fear of failure, competitive pressure, and insecurity, lack of trust, operational complexity, and technical incompatibilities can hinder successful implementation of cooperation in the supply chain. However, in the humanitarian field, logistics cooperation is crucial for accessing shared inventory. An example of this is the United Nations Humanitarian Response Depot (UNHRD) network, which is coordinated by the World Food Program (WFP) in Italy. (Wassenhove, 2006). For such programs to receive sucessful humanitarian response it needs to have effective communication and cooperation with the local governement and strong local capacity. It also refers to allowing foriengn aid, even military resource within the region.

2.4 Supply Chain Alignment-Risk Sharing

Risk sharing in supply chain alignment occurs when contracting parties agree to share the risk and potential profit associated with a transaction, including any potential loss or damage (Al-Badani, 2014). Given the increased risk to which companies are exposed more recently, (Pereira, 2014) Risk assessment and sharing should be aligned with risk mitigation strategies among members of the supply chain network. It is a crucial element of managing risks in the supply chain. By monitoring supply chain risks, organizations can enhance supply chain coordination and reduce the potential negative impacts of disruptions. Risk management, including monitoring and contingency planning, should be a priority in procurement activities, particularly in upstream areas of the company.

H_1: *SC-Alignment (Risk sharing and Collaboration) positively reinforce SC-Ambidexterity to impact on SC-Resilience.*

2.5 Supply Chain Adaptability

Supply chain adaptability plays a significant role in driving operational performance. By developing new strategies such as relocating bases, markets, production facilities, and warehouses, organizations can ensure high-quality levels, guarantee timely delivery, and maintain consistent service even during structural changes in markets and economies. This adaptability allows companies to adjust their operations swiftly in response to evolving market conditions and customer demands, leading to improved overall performance (Lee, 2004; Whitten, 2012). By realizing a flexible structure through the diversification of production and procurement bases, businesses can enhance their performance service and delivery of products. One way manufacturers can do it, is by sourcing baseline demand in low-cost countries and peak demand production to other countries. This approach allows manufacturers to optimize cost efficiencies while meeting fluctuating customer demands. As an example, a manufacturing company may have a procurement team in Pakistan that procures materials at a low cost from China, enabling the production of better-quality products at a competitive price. Additionally, being near key markets reduces lead times and provides greater opportunities for configuring and adapting to customer needs in a timely manner (Christopher, 2011). Toyota demonstrated adaptability in the supply chain during the launch of the Prius in the United States. They successfully enhanced their distribution network integration, which reflected in reduced inventory costs and

improved delivery performance (Lee, 2004). GAP improved delivery performance by adapting its supply chain to meet its specific requirements and the nature of product markets (Lee, 2004) had Production bases may need to be relocated and converted, and suppliers may be required to adapt to regulatory and political changes. Ensuring stable quality, delivery time, and service is crucial. Additionally, innovative capabilities contribute to shorter development lead times and flexible design options, allowing for the timely introduction of innovative products to capture new market opportunities.

H_2: *SC-Adaptability (Structural sensing, flexibility and innovativeness) positively reinforce SC-Ambidexterity to impact on SC-Resilience*

2.6 Supply Chain SC-Ambidexterity

Organizational research has highlighted the existence of trade-offs that organizations frequently face. These trade-offs arise when behaviors that lead to short-term success may not be optimal for long-term success. In other words, decisions and actions that yield immediate benefits may not align with the organization's long-term objectives. This tension between short-term and long-term success necessitates careful consideration and strategic planning to strike a balance and maximize overall organizational performance (Laverty, 1996). The concept of "intertemporal selection" underscores the significance of both long-term and short-term perspectives and orientations. It recognizes that organizations must navigate the challenges of balancing immediate needs with long-term goals. While short-term focus ensures timely responsiveness and quick wins, long-term orientation enables strategic planning and sustainable growth. Effective intertemporal selection involves finding the right equilibrium between these two perspectives, aligning actions and decisions to optimize both short-term outcomes and long-term success (Lumpkin, 2011; Souder & Bromiley, 2012; Miller & Le Breton-Miller, 2015). However, the literature in the field of organizational SC-Ambidexterity shows that seemingly contradictory goals can be reconciled (Wang et al., 2019). This need for ambidexterity arises from the recognition that organizations must balance exploration and exploitation activities. Exploration includes changing and adapting with the marketing conditions along with identifying new opportunities. Exploitation, on the other hand, focuses on optimizing existing resources, processes, and business models. (Hershcovis, 2011).

SC-Ambidexterity in most empirical models is a compromise between exploration and exploitation (Partanen et al., 2020; Blome et al., 2013; Kristal, 2010; Im & Rai, 2008). This is called structural SC-Ambidexterity (O'Reilly et al., 2013). Exploration-related practices are geared towards opening new opportunities and involve activities such as exploration, risk-taking, and innovation. These practices focus on discovering new markets, technologies, and business models, as well as fostering creativity and experimentation within the organization. On the other hand, the practice of exploitation is centered on efficiency, improvements, and implementation. It involves leveraging existing resources, processes, and knowledge to optimize performance, maximize productivity, and drive profitability. Exploitation practices emphasize operational excellence, continuous improvement, and the effective execution of established strategies. Both exploration and exploitation are vital for long-term success. Exploration allows organizations to evolve according to the changing conditions of the market, identify emerging trends, and seize new growth opportunities. Exploitation, on the other hand, ensures that organizations capitalize on their existing strengths, streamline operations, and deliver value to customers. Balancing exploration and exploitation require organizations to foster a culture of innovation, encourage cross-functional collaboration, and allocate resources strategically. It involves managing the inherent tensions and trade-offs between exploration and exploitation to achieve a dynamic equilibrium that enables both short-term results and long-term sustainability (March, 1991). Exploratory practices focus on long-term success, while exploitative practices prioritize short-term results (Wang et al., 2019). Simultaneous adoption of exploratory and exploitative practices is essential for companies to thrive in dynamic markets (March, 1991; March, 2003; Tushman & O'Reilly, 1996).

In (Gibson & Birkinshaw, 2004), the researchers examine how the organizational context influences the coordination and adaptability of supply chain processes and systems. The contextual SC-Ambidexterity framework highlights the importance of balancing conflicting demands and achieving coordination across different business units. By adopting this relational view, we aim to shed light on the dynamics of contextual SC-Ambidexterity and its impact on supply chain performance (Hill & Birkinshaw, 2014). According to the relational view, critical resources for supply chain companies' profitability are embedded in inter-firm relationships, processes, and routines (Schilpzand et al., 2016; Im, 2019; Ardito et al., 2019). It is this context that facilitates the construction of the required resource flow using new skills while using existing skills (Hill & Birkinshaw, 2014).

We conceptualize contextual SC-Ambidexterity at the supply chain level as a combination of SC Alignment and SC-Adaptability. According to Lee (2004), SC-Adaptability refers to a company's ability to redesign its supply chain in response to market changes, while SC-alignment focuses on aligning partner incentives for improved performance. SC-Ambidexterity involves balancing both SC-Adaptability and SC-alignment. Managing these elements simultaneously is challenging but yields long-term benefits with Competitive advantage (Liu et al., 2018; Gibson & Birkinshaw, 2004; Cao et al., 2009; He & Wong, 2004).

Our hypothesis suggests that SC-Ambidexterity precedes SC-Resilience. SC-Resilience entails the capacity to prevent disruptions and effectively recover from them. It involves maintaining a balance between proactive measures to mitigate risks and reactive strategies to address disruptions (Vanpoucke & Ellis, 2020). The concept of SC dual wielding, or SC-

Ambidexterity, contributes to SC-Resilience by encompassing key procedures precede it. SC-Adaptability, specifically, plays a crucial role in building resilience by continuously developing redundancy within the supply chain. This involves establishing and nurturing relationships with new suppliers and continually improving logistics infrastructure to ensure alternative options and enhanced flexibility (Lee, 2004). It helps to alleviate disruptions in the supply-side of the supply chain (Vanpoucke & Ellis, 2020). This includes the development of agile and dynamic management systems that are instrumental in implementing effective mitigation strategies. These management systems enable proactive identification of potential risks and disruptions, allowing for timely response and implementation of appropriate mitigation measures. By continuously evolving and adapting these systems, organizations can enhance their ability to effectively manage and mitigate supply chain risks, ultimately contributing to overall SC-Resilience (Gibson & Birkinshaw, 2004). Previous studies have also shown that SC-Adaptability leads to direct impact on SC-Resilience (Pettit et al., 2010; Ali & Golgeci, 2019). Similarly, SC-alignment underlies fair sharing of risk catering for the disruption among supply chain partners (Lee, 2004) and uniformity of labor effort across the supply chain (Gibson & Birkinshaw, 2004). This promotes a collaborative approach among supply chain partners to proactively prevent and mitigate disruptions. By fostering strong relationships and open communication channels, supply chain partners can collectively share information, and develop strategies to minimize the impact of disruptions against identified potential risks. This collaborative effort enhances the overall resilience of the supply chain by leveraging the collective expertise and resources of all involved parties.

H_4: *Supply chain Ambidexterity positively impacts SC-Resilience.*

2.7 The Mediating role of SC-Agility

Agility of a supply chain refers to its ability to adapt its operations in response to changing circumstances. It can be demonstrated either through proactive actions or through a more reactive and passive approach (Gligor & Holcomb, 2012).

A. SC-Agility empowers organizations to modify their routines and swiftly adapt to evolving circumstances. It enables them to embrace flexibility and responsiveness in their operations, allowing for effective adjustments to meet new challenges and seize emerging opportunities (Swafford et al., 2006).

B. Supply chain disruption aids in fine-tuning the response of the organization to the uncertainties present in the environment. It enables organizations to proactively identify and address potential disruptions in the supply chain, allowing for better preparedness and mitigation strategies. By anticipating and managing disruptions, organizations can minimize their impact and maintain operational continuity in the face of uncertainties (Tavani et al., 2013).

In our study, we suggest that SC-Agility serves as a mediator between SC-Ambidexterity and SC-Resilience. We find that both the SC-Adaptability and SC-alignment aspects of SC-Ambidexterity have a positive relationship with SC-Agility. SC-Adaptability encompasses several key features, including the reconfiguration of the supply chain through the identification of new target market, suppliers and by developing evolved infrastructure implementation of flexible management systems that adapt to market changes. These elements contribute to the overall agility of the supply chain, enabling it to regain its strength from disruption and respond effectively (Lee, 2004; Gibson & Birkinshaw, 2004). These activities are crucial for effective functioning of SC-Agility, allowing supply chains to swiftly respond to market changes while minimizing costs and time delays. By continuously looking for markets and new suppliers, developing along with developing infrastructure, and implementing flexible management systems, supply chains can adapt quickly and efficiently to evolving market conditions. This proactive approach enables organizations to seize opportunities, mitigate risks, and maintain a competitive edge in dynamic business environments without incurring substantial costs or time penalties. (Aslam et al., 2018) Empirical evidence demonstrates that SC adaptability fosters SC-Agility, while SC-alignment necessitates cost and benefit sharing as well as a shared commitment to common objectives throughout the supply chain (Lee, 2004; Gibson & Birkinshaw, 2004). SC-Agility relies on enhanced collaboration and trust among supply chain partners to minimize costs and response time in meeting evolving customer demands. Prior research has established a positive correlation between SC-alignment and SC-Agility (Zhou et al., 2018).

Previous studies have confirmed a positive correlation between SC-Agility and SC-Resilience. This identifies the supply chain's ability to rapidly adapt, and combat changes is linked to its overall resilience (Iborra et al., 2020; Lee & Rha, 2016). SC-Agility becomes particularly crucial during turbulent times as it facilitates knowledge sharing and collaboration among partners that are linked with the same supply chain. By fostering effective communication and cooperation, SC-Agility enables the supply chain to navigate challenges and disruptions with greater resilience and adaptability (Scholten et al., 2020).

Agile supply chains are characterized by their ability to promptly recognize environmental threats and potential disruptions. Through proactive monitoring and analysis of market trends, customer demands, and external factors, agile supply chains can quickly identify signals of potential risks and challenges (Hoffmann, 2000). This heightened awareness allows them to take proactive measures, such as adjusting production schedules, reallocating resources, or implementing contingency plans, to mitigate the impact of disruptions and ensure uninterrupted flow of goods and services (Teece, 2007) and respond to them through collaboration. We propose that SC-Ambidexterity plays a crucial role in enhancing SC-Resilience through its active mediation of SC-Agility. SC-Ambidexterity encompasses the ability of supply chains to simultaneously explore new opportunities and exploit existing capabilities. By embracing both exploration and exploitation, supply chains can develop

a collaborative infrastructure for supplier networks, establish redundant resources, and implement effective risk response mechanisms. These activities contribute to the development of SC-Agility, which enables supply chains to adapt quickly and effectively to environmental uncertainties and disruptions. Ultimately, the integration of SC-Ambidexterity and SC-Agility leads to enhanced SC-Resilience, positioning businesses for long-term success and sustainability in a dynamic and challenging marketplace.

H_3: *SC-Agility mediates the relationship between supply SC-Ambidexterity and SC-Resilience.*

H_{3-a}: *SC-Agility (**Dynamic speed**) mediates positively between SC-Ambidexterity and SC-Resilience.*

H_{3-b}: *SC-Agility (**Dynamic flexibility**) mediates positively between SC-Ambidexterity and SC-Resilience.*

H_{3-c}: *SC-Agility (**Dynamic sensing**) mediates positively between SC-Ambidexterity and SC-Resilience.*

3. The results

3.1 Research Approach

This section on Research approach describes how data is collected and validated. Using a deductive research approach, existing theories, DCV (Reyes, 2004). We utilized theoretical test studies to explore the manufacturing industry in Pakistan, which serves as an ideal context for examining supply chain resilience and dynamic capacity. Pakistan has faced numerous natural and man-made disasters in the past two decades. Notably, the country has allocated a significant budget of $10 billion towards disaster relief and recovery in the previous decade (GFDRR, 2019). Pakistan ranks 7th among the world's emitting countries, although she ranks 33rd in (Economy, 2019) and the climate change is one of the factors that has impacted world the most (Ahmed, 2019). As a result of aftereffects of global war on terror, Pakistan endured the tragic repercussions of terrorism, leaving a deep impact on the nation. From 2017 to 2018, estimations reveal that Pakistan incurred colossal losses of approximately US$126.79 billion due to its involvement in the war on terrorism. This staggering figure reflects the profound toll it took on the country's economy and well-being (Mustafa, 2018). The disruptions caused by terrorism and the potential war threat with neighbor India pose significant challenges for those who manage supply chain in Pakistan. For instance, following a recent confrontation with India, the Pakistani government implemented a ban on all imports from India. This decision has adversely affected the pharmaceutical supply chain, the major import of the raw materials for manufacturing life-saving medicine was done from India. Considering these circumstances, for corporates to develop a resilient supply chain has become a core component of corporate strategy in Pakistan.

3.2 Research Design Model

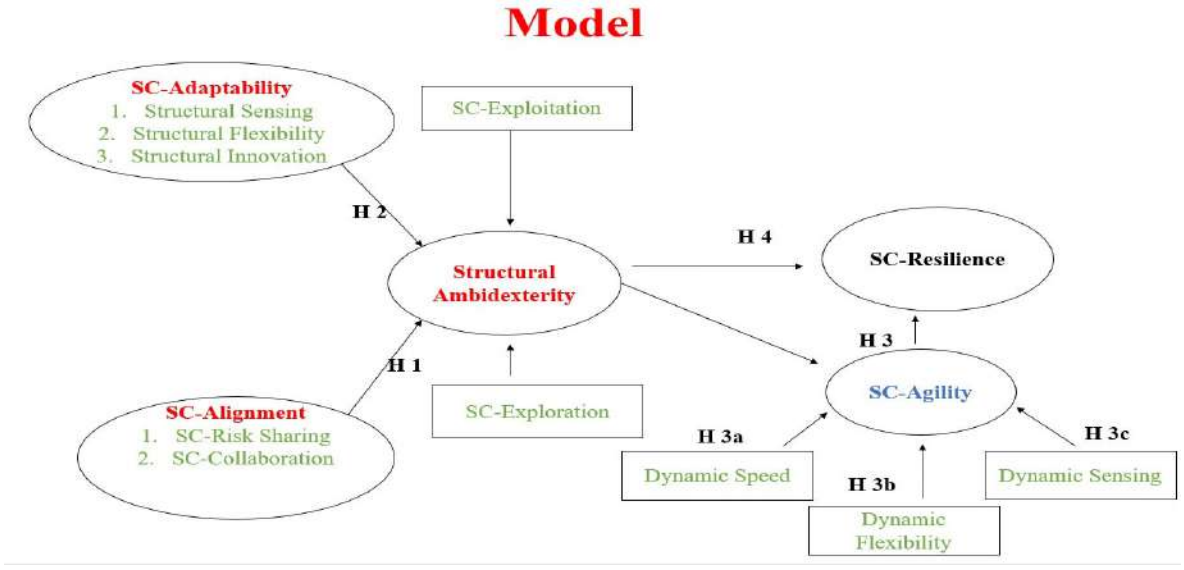

Fig. 1. Research Design Model

3.3 Samples and data collection

In our pursuit of knowledge, we diligently collected data from various industries and engaged professionals closely associated with those sectors in Pakistan. However, it is important to acknowledge that data collection in developing countries presents its own unique set of challenges. These challenges have been extensively documented in prior studies, shedding light on the intricacies involved (Awan, 2009; Russell, 2015; Hoskisson et al., 2000; Malik & Kotabe, 2009). During our data collection process, we encountered various challenges that are commonly documented in previous studies conducted

in developing countries. These challenges included difficulties in identifying suitable sampling sites, encountering sampling errors, and limited understanding of the research topic among participants, a lack of trust in researchers, limited access to senior staff, and a lack of cross-disciplinary knowledge among managers. Moreover, we discovered that their was lack of availability of a combined list of all of the companies established in Pakistan. To overcome this hurdle, we compiled our own list by searching through Pakistan stock listings and yellow pages. Subsequently, we conducted an email inquiry campaign starting in January 2023 and running until May 2023. The questionnaire was distributed to approximately 450 potential respondents, accompanied by a professionally crafted email explaining the survey's significance and key terms. We also send regular weekly reminders to ensure maximum participation. Out of the 450 requests with a response rate of 52% overall 234 responses were received back. This response rate exceeded our expectations, eliminating the need to employ a snowball sampling method. The 234 valid responses were deemed sufficient for our analysis. Thus, we successfully obtained 230 usable responses for further analysis.

In Table 1, we can find the extracted company descriptions, along with the corresponding respondent descriptions, providing a comprehensive overview of the data collected.

3.4 Measures

In our survey, we aimed to capture variables that were not easily accessible through company annual reports. To overcome this challenge, we employed perceptual tools that allowed us to manipulate the structure and extract the desired results effectively. Specifically, we utilized an existing scale that aligned with the configuration of interest in our study, focusing on supply chain resilience. This scale provided a standardized framework to measure and evaluate the relevant factors within the supply chain context (Schminke, 2004). In order to ensure the robustness and credibility of our study, we conducted an extensive literature search to identify relevant scales. These scales were carefully selected based on their established validity and reliability in previous research. In the subsequent section, we will delve deeper into these scales and provide detailed information about their utilization.

The *SC-Ambidexterity*, which is measured using two primary indicators: SC alignment and SC adaptability. These indicators were considered essential in capturing the concept of supply chain ambidexterity. The instructions were provided to the participants to rate their responses against the Likert-type rating scale with a score range of 1 (strongly disagree) to 5 (strongly agree). By using this scale, we aimed to assess the extent to which organizations exhibit ambidexterity capabilities in their supply chain practices.

The *SC-Alignment* and *SC-Adaptability* items were accepted from (Gibson & Birkinshaw, 2004) and (Whitten, 2012).

SC-Agility: We acknowledged the importance of SC-Agility as an intermediary factor between SC-Ambidexterity and SC-Resilience in our study. To measure SC-Agility, we adapted an item from an established scale in the field. This item allowed us to assess the agility of the supply chain in responding and adapting to dynamic and unpredictable situations, bridging the gap between ambidexterity and resilience. Participants were requested to provide their responses on a rating scale, enabling us to gauge the level of agility within the supply chain (Whitten, 2012), measured on a scale of 1 (strongly disagree) to 5 (strongly agree).

SC-Resilience: In this study, the dependent variable, SC-Resilience, was measured using a rating scale ranging from 1 (strongly disagree) to 5 (strongly agree). The items used to assess SC-Resilience were derived from previous research and were carefully chosen to capture the essential dimensions of supply chain resilience. Participants responded by showing their agreement against the statements, enabling us to evaluate the extent to which supply chains demonstrated resilience in the face of disruptions and challenges (Ambulkar et al., 2015).

3.5 Bias in common methods

It is important to acknowledge that in this study, data for study variables were collected from the same set of respondents. This approach may introduce a potential bias known as common method bias or method variance.

Common method bias occurs when respondents' perceptions, attitudes, or biases systematically influence their responses to multiple variables in the study. This can lead to inflated relationships or correlations between variables, thus impacting the validity of the findings. To reduce the effects of common method bias, several steps were taken. First, we employed established scales and items with demonstrated validity and reliability to measure the variables. This helps ensure that the constructs were measured accurately and consistently. Additionally, we used clear and unbiased instructions in the survey to minimize any potential bias. Participants were encouraged to provide honest and independent responses. Furthermore, confidentiality and anonymity were emphasized to promote candid answers. Lastly, statistical techniques such as control variables, hierarchical regression analysis, or structural equation modeling can be employed to account for and minimize the potential impact of common method bias during data analysis (Podsakoff, 2003).

To avoid CMB the guidelines by Conway (2010) and Podsakoff (2003) were followed to address potential method bias, we implemented various strategies in our survey design. Firstly, both the dependent and independent variables were placed in different sections of survey, spread across six pages of a Google form. We also utilized different Likert scales to measure

the variables, such as “not completed at all” to “completely disagree” versus “completely agree”. We ensured the anonymity of respondents' results and offered the option to submit anonymous responses. However, we did request participants to provide their email address and name for data authentication purposes. While this may seem contradictory, it was necessary to verify the data and maintain the integrity of the study.

To further investigate potential common method bias, we employed statistical techniques. Firstly, Harman's one-factor test was conducted, loading all the elements into a factor without applying any rotation. The results revealed that the maximum variance explained by a single factor was 38%, indicating that no single factor dominated the variation. Additionally, we employed Smart PLS 3 and performed tests of collinearity on all of the variables. The test results, as indicated by variance inflation factors (VIFs) below 3.3, suggested that in this study common bias method does not come out as a potential risk. By employing these measures and statistical analyses, we aimed to address and mitigate any potential method bias (Kock, 2015).

3.6 Respondent’s Description

Table 1
Respondent's Descriptive statistics (N = 230)

		Frequency	Percent	Valid Percent	Cumulative Percent
What's your age?	20-25	55	23.6	23.6	26.6
	26-30	82	35.2	35.2	62.7
	31-35	47	20.2	20.2	83.3
	36-40	28	12	12	95.3
	41 and above	11	4.7	4.7	100
Highest Level of Education completed?	Bachelor’s	93	39.9	39.9	40.3
	Diploma	15	6.4	6.4	47.2
	F.Sc.	19	8.2	8.2	55.4
	Master	57	24.5	24.5	80.3
	Matric	1	0.4	0.4	81.1
	Ph.D.	20	8.6	8.6	89.7
	Professional	24	10.3	10.3	100
Designation in Recent Firm?	CEO/General Manager	6	2.6	2.6	
	Assistant Middle Manager	50	21.5	21.5	26.2
	Front End Manager	16	6.9	6.9	37.8
	Govt. Servant	19	8.2	8.2	45.9
	Deputy Manager	20	8.6	8.6	54.9
	Non-Profit org	6	2.6	2.6	57.9
	Senior Manager	12	5.2	5.2	64.8
	Supervisor	52	22.3	22.3	87.6
	SC Manager	24	10.3	10.3	98.3
	Technical Eng.	4	1.7	1.7	100
Year to this organization?	1-5 years	102	43.8	43.8	47.6
	6-10 years	57	24.4	24.4	72
	11-20 years	17	7.3	7.3	79.3
	21-25 years	30	12.9	12.9	92.2
	26 years above	15	6.4	6.4	
Firm’s Annual Sales?	1-10 million	17	7.3	7.3	7.3
	11-50	35	15	15	22.3
	50-100	37	15.9	15.9	38.2
	101-200	29	12.4	12.4	50.6
	Greater than 200	60	25.8	25.8	76.4
	Not Provided	43	18.5	18.5	

4.1 Results and Finding

The data analysis in this study was conducted in two distinct steps to ensure rigorous evaluation of the proposed model. In the first phase, we performed confirmatory factor analysis (CFA) to assess the measurement models. This analysis helped us validate the reliability and validity of the measurement scales used in the study. In the second phase, we utilized structural equation modeling (SEM) with a specific focus on Partial Least Squares Structural Equation Modeling (PLS-SEM). PLS-SEM was chosen due to its flexibility in accommodating different sample characteristics and distributional properties. In our case, PLS-SEM was particularly suitable because the SC ambidextrous construction was considered formative in nature.

By employing PLS-SEM, we were able to evaluate the relationships between the constructs and test the hypothetical model. This allowed us to gain insights into the complex interplay of variables and understand the impact of SC ambidexterity on other constructs within the proposed framework.

Both phases of analysis, CFA and PLS-SEM, were conducted meticulously to ensure robust findings and strengthen the overall validity of the study. (Hair, 2017).

4.2 Assessment of psychometric properties

In order to validate the measurement model, we conducted confirmatory factor analysis (CFA) for all primary measurements in our study. Additionally, we evaluated the internal consistency of the components by examining the Cronbach's alpha coefficient. The results of the analysis indicated that Cronbach's alpha values for all constructs exceeded the threshold of 0.7. This suggests a high level of internal consistency within the components of the study. Moreover, all variables exhibited alpha values ranging between 0.7 to 0.95, further enhancing the reliability of the CFA model.

These findings provide evidence of the structural reliability and precision of the CFA model. The measurement model demonstrated strong internal consistency, allowing us to have confidence in the reliability of the data obtained from the constructs under investigation.

4.3 Model Summary

Table 2
Model Summary on SPSS (N =230)

Model Summary

					Change Statistics					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.905[a]	.818	.806	6.67611	.818	67.106	10	149	.000	2.160

a. Predictors: (Constant), Supply Chain Ambidexterity Exploration Compute, Supply chain Alignment collaboration Compute, Supply chain Adaptability Structural flexibility Compute, Supply Chain Agility Dynamic Speed Compute, Supply chain Adaptability Structural Sensing Compute, Supply chain Alignment Risk Sharing Compute, Supply Chain Ambidexterity Exploitation Compute, Supply Chain Agility Dynamic Sensing Compute, Supply chain Adaptability Structural Innovativeness Compute, Supply Chain Agility Dynamic Flexibility Compute
b. Dependent Variable: Supply Chain Resilience Compute

To assess the convergent validity and discriminant validity of the variables in our study, we employed the Fornell-Lacker criterion. This criterion is a widely recognized approach for evaluating the validity of constructs.

Convergent validity refers to the degree to which different indicators of the same construct are related to one another. In our analysis, we examined the relationships between the indicators within each construct. The Fornell-Lacker criterion allowed us to assess the strength and significance of these relationships, providing evidence of convergent validity.

Discriminant validity, on the other hand, examines the distinctiveness of different constructs. We examined the correlations between the indicators of different constructs and compared them with the square roots of the average variance extracted (AVE) for each construct. If the correlations between constructs were smaller than the square roots of their respective AVEs, it indicated adequate discriminant validity.

By utilizing the Fornell-Lacker criterion, we were able to evaluate both convergent and discriminant validity, ensuring that our measurement model accurately captured the distinctiveness and interrelationships of the variables under investigation. (Fornell, 1981) In order to assess the validity of our measurement model, we examined various statistical indicators, as presented in Table 3. The factor loadings, which ranged from 0.64 to 0.97, demonstrated the strength of the relationships between the indicators and their respective constructs. Notably, even lower-priced items were not removed, indicating the comprehensive coverage of the constructs. The average loading across all coefficients was approximately 0.746, further supporting the reliability and robustness of the measurement model.

Moreover, the average variance extracted (AVE) values, ranging from 0.496 to 0.643, provided evidence of convergent validity. AVE values above 0.5 indicate a substantial amount of variance captured by the construct, reinforcing the convergence of the indicators within each construct. To assess discriminant validity, we compared the square root of the AVE for each construct with the correlations between constructs. The square root of the AVE for each construct was higher than any corresponding correlation, demonstrating effective discrimination between the constructs. These findings collectively support the convergent validity and discriminant efficacy of our measurement model, indicating that the variables adequately capture the intended constructs and are distinct from one another (Fornell, 1981). Table 4 shows the evidence for the validity of the discriminants and also we used Standard mean and standard deviation.

4.4 Structural model Evaluation

The results of the structural model analysis are depicted in Fig. 2. The SC ambidexterity model, which was a secondary formative structure, was examined to understand its impact on the supply chain. In this model, the ambidexterity of the

supply chain was measured through a reflexive combination of SC alignment and SC adaptability path, as illustrated in Figure 2. Significant relationships between variables are represented by solid lines, while dashed lines indicate either significant or insignificant relationships. This distinction helps us differentiate the strength and importance of the relationships.

To further evaluate the significance of the path factors, we performed PLS bootstrapping on a sample size of 450. Bootstrapping is a resampling technique that allows us to assess the stability and reliability of the relationships in the model. By utilizing PLS bootstrapping, we were able to examine the robustness of the relationships and evaluate their statistical significance. This analysis provides us with insights into the importance and impact of the path factors within the SC ambidexterity model.

These analyses and techniques contribute to a comprehensive understanding of the relationships and dynamics within the supply chain, offering valuable insights into the role of SC ambidexterity in enhancing the overall performance and resilience of the supply chain (Hair, 2017). All predictor instruments in our study exhibited VIF (Collinearity statistics) values ranging from 1.3 to 2.744, with an average of approximately 2.064. Importantly, none of these values exceeded the threshold of 3.3. The VIF values serve as an indicator of collinearity between predictor variables in regression models. When VIF values are below the threshold, it suggests that there is no significant issue of multicollinearity among the predictor variables. In our analysis, the VIF values well below the threshold demonstrate that there is no substantial collinearity problem among the predictor instruments. This ensures the reliability and stability of our regression model, allowing us to make accurate inferences from the data. The absence of high VIF values strengthens the validity of our findings and enhances the overall quality of the analysis conducted in this study. (Kock, 2015) The standardized root mean square (SRMR) of our model did not indicate any evidence of multicollinearity issues among the predictor configurations.

4.5 Variables with Cronbach's α, and average variance extracted

Table 3
Variables with Cronback's Alpha and AVE (N =230)

Supply Chain Alignment	**Outer Loading**	**Supply chain Agility**	**Outer Loading**
SCAC1(Collaboration)	0.776	SCADF1(Dynamic Flexibility)	0.720
SCAC2 (α=0.739, AVE=0.559)	0.761	SCADF2 (α=0.893, AVE=0.572)	0.693
SCAC3	0.690	SCADF3	0.770
SCAC4	0.760	SCADF4	0.766
SCARS1(Risk Sharing)	0.675	SCADF5	0.732
SCARS2 (α=0.912, AVE=0.508)	0.751	SCADF6	0.793
SCARS3	0.726	SCADF7	0.816
SCARS4	0.727	SCADF8	0.754
SCARS5	0.726		
SCARS6	0.709	**Supply chain Ambidexterity**	(α=0.898,AVE=0.586)
SCARS7	0.748	SCAME1(Exploitation)	0.803
SCARS8	0.726	SCAME2	0.699
SCARS9	0.664	SCAME3	0.794
SCARS10	0.683	SCAME4	0.680
SCARS11	0.721	SCAMEr1(Exploration)	0.778
SCARS12	0.695	SCAMEr2	0.739
Supply Chain Adaptability		SCAMEr3	0.819
SCASS1(Structural Sensing)	0.842	SCAMEr4	0.802
SCASS2 (α=0.814, AVE=0.643)	0.807		
SCASS3	0.816	**Supply Chain Resilience**	(α=0.946,AVE=0.496)
SCASS4	0.739	SCRES1	0.760
SCASF1(Structural Flexibility)	0.801	SCRES2	0.678
SCASF2 (α=0.815, AVE=0.642)	0.788	SCRES3	0.726
SCASF3	0.823	SCRES4	0.642
SCASF4	0.792	SCRES5	0.744
SCASI1(Structural Innovativeness)	0.778	SCRES6	0.648
SCASI2 (α=0.868, AVE=0.603)	0.761	SCRES7	0.744
SCASI3	0.846	SCRES8	0.710
SCASI4	0.785	SCRES9	0.706
SCASI5	0.755	SCRES10	0.707
SCASI6	0.730	SCRES11	0.690
Supply Chain Agility		SCRES12	0.683
SCADS1(Dynamic Sensing)	0.814	SCRES13	0.731
SCADS2 (α=0.802, AVE=0.628)	0.811	SCRES14	0.653
SCADS3	0.818	SCRES15	0.745
SCADS4	0.722	SCRES16	0.706
SCADSp1(Dynamic Speed)	0.746	SCRES17	0.685
SCADSp2 (α=0.802, AVE=0.628)	0.844	SCRES18	0.672
SCADSp3	0.776	SCRES19	0.729
SCADSp4	0.800	SCRES20	0.715

The fit index, with a value of 0.62 for the saturated model and 0.76 for the estimated model, indicates a good agreement between the hypothetical model and the observed data. The estimated model value is below the cutoff value of 0.8, which further supports the notion of a strong alignment between the proposed model and the collected data. This finding suggests that the model accurately represents the relationships and patterns observed in the real-world data, enhancing the reliability and validity of the study's findings (Henseler, 2016). The cross-validated redundancy index (Q^2) was assessed using the blindfold method in Smart PLS 3. The results indicated that the SC-Resilience (0.34) and SC-Agility (0.294) of the intrinsic structure had values above 0, representing acceptable predictive relevance of the model. These findings demonstrate that the model can accurately predict and explain the variations in SC-Resilience and SC-Agility. The positive Q^2 values further support the validity and reliability of the model in capturing the underlying relationships and dynamics within the supply chain (Hair, 2017).

4.6 Discriminant validity of the Construct

Table 4
Discriminant Validity of Construct and t-test (N =230)

	Cramer-von Mises test statistic	SC Adaptability- Innovativeness	SC Adaptability- Structural Sens-ing	SC Adaptability-Flexibility	SC Agility- Dynamic Sensing	SC Agility-Dynamic Flexibility	SC Agility-Dynamic Speed	SC Alignment-Collaboration	SC Alignment-Risk Sharing	SC Ambidexterity-Exploration & Exploitation
SC Adaptability- Structural Sensing	0.555	0.936								
SC Adaptability-Flexibility	0.805	0.989	0.933							
SC Agility- Dynamic Sensing	0.509	0.944	0.947	0.875						
SC Agility-Dynamic Flexibility	0.685	0.874	0.875	0.857	0.998					
SC Agility-Dynamic Speed	0.688	0.847	0.826	0.770	0.945	0.968				
SC Alignment-Collaboration	0.769	0.906	0.877	0.918	0.871	0.863	0.829			
SC Alignment-Risk Sharing	0.512	0.915	0.887	0.870	0.864	0.768	0.779	0.965		
SC Ambidexterity-Exploration & Exploitation	0.454	0.875	0.880	0.852	0.975	0.944	0.933	0.810	0.789	
SC-Resilience	0.525	0.868	0.888	0.823	0.862	0.869	0.838	0.837	0.778	0.905

4.7 Hypothesis Testing and Validation of Model

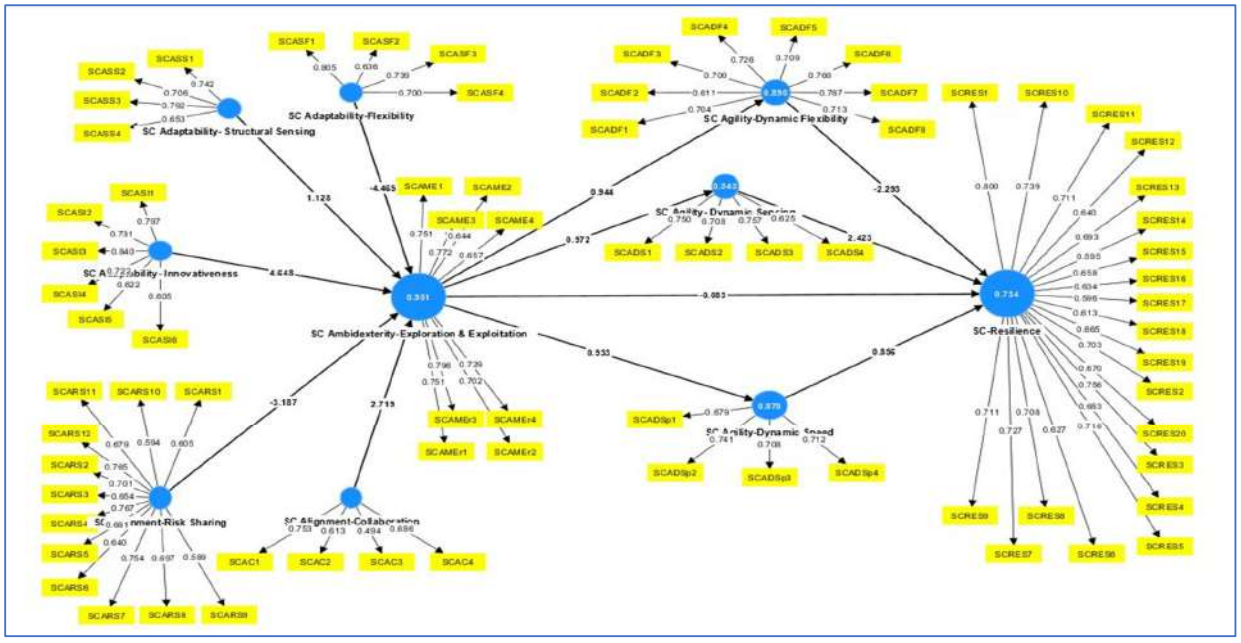

Fig. 2. Hypothesis Testing and Validation of Model

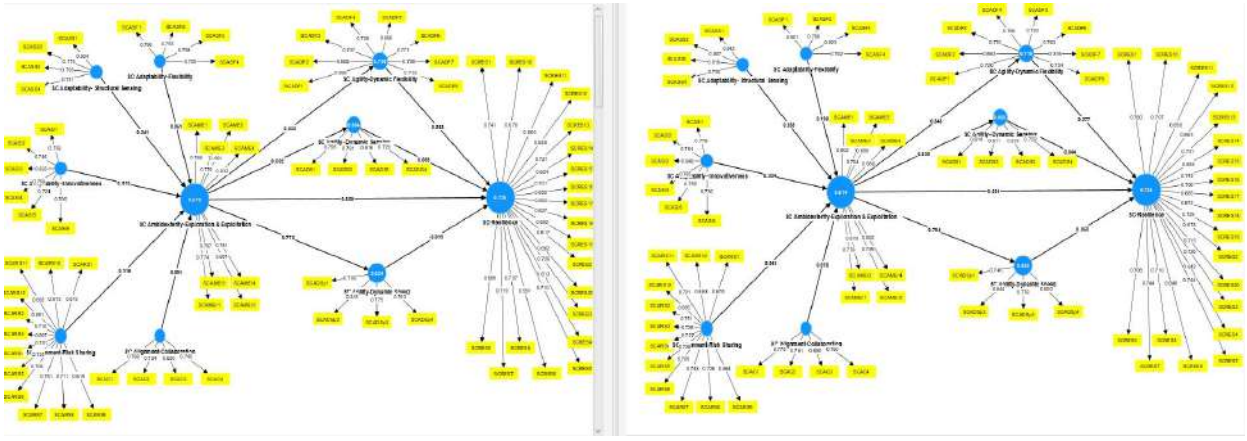

Fig. 3. Model Comparison of POS (Predicted oriented segment) and PLS (Partial Least Square)

Hypothesis 1, which proposed a positive relationship between SC-Alignment and SC-Ambidexterity, did not receive strong support. The f-square values for Risk sharing (0.06) and Collaboration (0.03) indicated a weak effect on SC-Ambidexterity. Consequently, the impact of alignment on SC-Ambidexterity did not significantly reinforce Hypothesis 1.

On the other hand, Hypothesis 2, which explored the relationship between SC-Adaptability and SC-Ambidexterity, received positive support. The f-square values for Innovativeness (0.71), Structural sensing (0.79), and Flexibility (0.15) indicated a moderate to substantial effect of these SC-Adaptability variables on SC-Ambidexterity. This finding suggests that SC-Adaptability has a significant and positive impact on SC-Ambidexterity, strengthening Hypothesis 2.

Overall, the analysis revealed that SC-Adaptability plays a more influential role in shaping SC-Ambidexterity and subsequently impacting SC-Resilience. The results provide coherence and support for Hypothesis 2, while highlighting the limited support for Hypothesis 1.

Table 5
Data of Variables test and predictor Analysis (N = 230)

Variables	Tests	Values	P Value	Sum square	Mean square	F	Test-Statistic	Avg.Predicted Values
Supply Chain Adaptability	Intercept		0.45					
	Regression			138.35	10.64	17.62		
	Durbin-Watson test	1.87						
	Breusch-Pagan Test						58.68	
	SC-adaptability with instruments							3.42
Supply Chain Agility	Intercept		0.17					
	Regression			177.24	11.82	21.35		
	Durbin-Watson test	1.71						
	Breusch-Pagan Test						78.08	
	SC-Agility with instruments							*3.46*
Supply Chain Alignment	Intercept		0.06					
	Regression			166.28	11.09	12.79		
	Durbin-Watson test	1.95						
	Breusch-Pagan Test						22.84	
	SC-Alignment with instruments							3.18
Supply Chain Ambidexterity	Intercept		0.19					
	Regression			156.96	22.42	47.49		
	Durbin-Watson test	2.05						
	Breusch-Pagan Test						15.19	
	SC-Ambidexterity with instruments							3.52
Supply Chain Resilience	Intercept		0.36					
	Regression			158.94	8.83	17.63		
	Durbin-Watson test	1.71						
	Breusch-Pagan Test						68.01	
	SC-Resilience with instruments							3.58

The results of the analysis demonstrate the relationships between the endogenous variables of SC-Agility and SC-Ambidexterity, with a focus on the exploitation and exploration of the supply chain. The f-square values, which indicate the predictor strength of latent variables on SC-Ambidexterity, show substantial mediating effects in the regression model. Specifically, dynamic sensing (2.207), Dynamic flexibility (2.553), and Dynamic speed (1.703) significantly impact SC-Agility, supporting Hypothesis 3. Furthermore, the positive impact of SC-Ambidexterity (f-square = 0.226) on SC-Resilience provides strong support for Hypothesis 4.

The hypothetical results suggest that SC-Ambidexterity has a positive influence on SC-Resilience, as indicated by the inner model collinearity ($\beta = 3.58$, $p < 0.01$), supporting Hypothesis 4. Additionally, the inner model collinearity reveals positive impacts of SC-Ambidexterity (3.46), SC-Adaptability (3.42), and SC-Alignment (3.18) on SC-Resilience. This further supports the relationship between these variables and SC-Resilience. Hypothesis 3, which proposes that SC-Agility mediates the relationship between SC-Ambidexterity and SC-Resilience, is also supported ($\beta = 3.46$, $p < 0.01$).

Regarding the mediating effect hypothesized in Hypothesis 3-a, the impact of Dynamic Speed (Avg $\beta = 0.223$, $p < 0.01$) positively affects agility performance as a mediator. Hypothesis 3-b, which explains the positive effect of Dynamic Flexibility (Avg $\beta = 0.119$, $p < 0.01$), and Hypothesis 3-c, which explains the positive effect of Dynamic Sensing (Avg $\beta = 0.161$, $p < 0.01$), both support the mediating role of SC-Agility in relation to SC-Resilience. The lower intercept value indicates a reduced likelihood of uncertainty. Detailed test results can be found in Table 5, which shows the average impact of each predictor on collinear instruments and their positive effects on the performance of the dependent variable (SC-Resilience) (Tukamuhabwa et al., 2017).

5. Conclusion, Implication, Limitation and Recommendations

5.1 Conclusion

We refer to SC ambidexterity as SC alignment and SC Adaptability (Gibson & Birkinshaw, 2004). The context of this study is to understand and channelize the system and processes that influence behavior within supply chains. By exploring the relationships between various variables, such as SC-Ambidexterity, SC-Adaptability, SC-Agility, and SC-Resilience, the study aims to uncover insights that can help optimize and improve supply chain performance. By examining how these factors interact and impact each other, the research seeks to provide valuable knowledge for guiding decision-making and enhancing overall supply chain management (Ghoshal, 1994). The primary focus of this context is to optimize time and effort for each supply chain partner by balancing the demands for adaptability and alignment. In this contemporary changing business environment, supply chains need to be agile and adaptable to respond effectively to changing market conditions and customer demands. Similarly, alignment among supply chain partners is crucial to ensure smooth coordination and collaboration throughout the entire supply chain network.

By striking the right balance between adaptability and alignment, supply chain partners can optimize their operations, reduce inefficiencies, and enhance overall performance. This context aims to identify strategies, processes, and practices that enable supply chain partners to navigate this delicate balance, fostering a collaborative and synchronized approach while also allowing for flexibility and responsiveness. The goal is to achieve operational excellence, customer satisfaction, and competitive advantage by optimizing the allocation of time and effort across the supply chain network (Raisch, 2008). The analysis highlights the importance of adopting ambidexterity strategies to balance adaptability and alignment and mitigate supply chain disruptions. The findings of the present research make significant contribution in the field of supply chain management by identifying the domains of adaptability and alignment as key factors in achieving ambidexterity. By examining the interdependencies of SC-Adaptability and SC-Alignment, the study expands our understanding of their individual impacts on supply chain resilience. Overall, this research provides valuable insights for organizations aiming to enhance their supply chain management practices and build resilience in the face of challenges (e.g. (Aslam et al., 2018; Dubey et al., 2018). This study's primary contribution lies in introducing a novel method for assessing contextual SC-Ambidexterity within the supply chain. Prior literature on management has highlighted the significance of Supply Chain network strength in navigating the challenges arising from conflicting capabilities and achieving growth and prosperity (Wang et al., 2019). Hence, our study identifies the competing functions of adaptability and alignment within a supply chain, which are instrumental in driving the supply chain's success. By doing so, we contribute to the dynamic functioning of the supply chain literature by providing contextual explanations of ambidexterity from a supply chain perspective. Furthermore, our research extends the existing body of work by incorporating insights from organizational researchers (Gibson & Birkinshaw, 2004; Hill & Birkinshaw, 2014) showed that SC-ambidexterity is a powerful mechanism and model design of architecture for achieving SC-resilience.

5.2 Theoretical implications

In testing Hypothesis 4, we discovered a positive relationship between Ambidexterity and resilience of the supply chain. This finding highlights the significance of SC Ambidexterity in enhancing performance under various conditions like performance (Chandrasekaran, 2012; Blome et al., 2013), flexibility (Patel, 2012) and knowledge sharing (Im et al., 2019) and we extended this work to SC-Resilience as well. The organization that are equipped with diversified capacities such as ambidexterity of the supply chain, remain vigilant and proactive in response to environmental changes and disruptions.

They possess the ability to reconfigure their resources based on the available options, enabling them to effectively navigate through challenging situations (Ambulkar et al., 2015). So the present study builds upon the existing literature work on relationships between structures and algorithm of Ambidexterity and resilience (e.g. (Iborra et al., 2020; Lee & Rha, 2016)) with the role of contextual ambidexterity in the development of SC-resilience, our study contributes to the existing literature on ambidexterity and resilience in supply chains. We found empirical evidence supporting Hypothesis 3, which was about mediating role of SC-Agility between SC-Ambidexterity and SC-Resilience. This finding highlights the significance of SC-Agility in enabling organizations to effectively navigate and survive supply chain disruptions. Our research complements previous work in this field by providing insights into the specific mechanisms by providing explanation about SC-Ambidexterity contributions to organizational resilience. (Tuan, 2016) by stating performance-based outcomes through the relationship between SC-ambidexterity and SC-agility. Our study is an evolution extension of the work by (Altay et al., 2018) in our study investigating the association between SC-Agility and SC-Resilience in disaster recovery performance, our study did not specifically looked for the relationship between the two components. However, findings indicate that SC-Agility serves as medium through which resilience in the supply chain is achieved. This suggests that the agility of a supply chain plays a crucial role in enhancing its overall resilience.

Surprisingly, when we examined the potential moderating effect of uncertainty on the relationship between SC-Ambidexterity and SC-Resilience, we did not find a significant effect. This finding is intriguing, as previous research by leading scholars in the field of dynamic capabilities has suggested that environmental are necessary for facilitating the beneficial impacts of diverse capacities. While our study did not uncover a significant moderating effect of uncertainty, it opens up avenues for further investigation into the complex interplay between environmental factors, dynamic capabilities, and supply chain resilience (Awan, 2009). Future research may delve deeper into understanding the contextual factors that influence the relationship between SC-Ambidexterity and SC-Resilience, providing a more comprehensive understanding of how organizations can effectively respond to and recover from disruptions ((Teece, 2014; Drnevich & Kriauciunas, 2011; Wilhelm et al., 2015). Our findings suggest that dynamic skills can indeed be effective in uncertain environments. However, contrary to expectations, we did not observe a significant impact of uncertainty on the relationship between SC-Ambidexterity and SC-Resilience. This implies that the positive association between the dual wielding of ambidexterity and resilience remains consistent across different levels of uncertainty (Kreye, 2017).

It is noteworthy that many in developing countries like Pakistan organizations that are associated with manufacturing tend to prioritize cost minimization over resilience strategies. This approach may stem from a focus on financial gains that are short term instead of focusing on long-term sustainability and resilience against potential environmental disruptions. As a result, these organizations may be more vulnerable to chronic or environmental destruction, as they have not fully embraced resilience as a strategic imperative (Malik & Kotabe, 2009).

These findings underscore the importance of raising awareness among manufacturing organizations about the value of resilience in mitigating the risks posed by environmental threats. Encouraging a shift in mindset towards a more proactive and resilient approach can help organizations better prepare for and respond to disruptions, ultimately enhancing their long-term sustainability and success (Tukamuhabwa et al., 2017). The success of companies lies in their ability to identify threats and implement appropriate countermeasures throughout their integrated supply chains. By doing so, they can effectively minimize the negative impacts of uncertainty. Our study provides support for the concept of the triple A (Agility, Adaptability, Alignment) in supply chain management.

The triple A-Supply chain model, as proposed by Lee, emphasizes the importance of these three dimensions in achieving superior supply chain performance and enhancing supply chain resilience. Our findings align with this model, indicating a positive relationship between triple A-Supply chains and supply chain performance specifically related to resilience. By cultivating agility, adaptability, and alignment within their supply chains, companies can enhance their ability to respond swiftly to disruptions, adapt to changing market conditions, and align their operations with strategic goals. This holistic approach to supply chain management enables organizations to maintain resilience and establish competitive edge in the changing environments.

Therefore, it is crucial for companies to embrace the triple A-Supply chain model and integrate it into their supply chain strategies to effectively navigate challenges and ensure long-term success. (Lee, 2004). Since then, many studies have confirmed triple-A analysis and evaluated different Models (Whitten, 2012; Attia, 2015; Marin-Garcia, 2018; Dubey et al., 2018)). This study highlights the impact of the triple-A supply chain on resilience, which is a novel contribution. Unlike previous studies, this research considers the interdependency and coherence among the triple-A practices. It reveals the specific order in which these practices should be implemented to achieve desired performance outcomes.

The findings demonstrate that the implementation of triple-A supply chain practices must be enabled to effectively influence performance. This implies that companies should prioritize and carefully sequence these practices to maximize their impact on resilience and overall supply chain performance. By recognizing the importance of the triple-A supply chain framework and strategically implementing its practices, organizations can enhance their resilience capabilities and improve their performance in the face of disruptions and uncertainties. (Russell, 2015). Our study reveals the sequential activation of SC-Adaptability, SC-Alignment, and SC-Agility as crucial steps to achieve SC-Resilience. This empirical test of dynamic skill

performance underscores their significance in enhancing supply chain resilience. Importantly, our findings challenge the notion that dynamic skills are only relevant in fast-paced environments, as they also hold relevance in developing countries.

While previous research has primarily focused on the role of dynamic skills in developed countries, our study highlights their importance in the context of developing countries. We demonstrate that dynamic capabilities, such as SC Ambidexterity, are essential for companies operating in developing countries to effectively navigate the constant chaos and vulnerabilities posed by natural disruptions.

In these challenging environments, investing in dynamic capabilities becomes imperative for survival and mitigating vulnerabilities. It goes beyond just innovation and encompasses factors like global awareness and susceptibility to interference. Therefore, companies operating in developing countries should prioritize the development of dynamic capabilities to enhance their resilience and ensure their sustainability in the face of constant disruption (Hoskisson et al., 2000).

5.3 Management implication

Consistent with prior research, our study provides evidence that the benefits of ambidexterity re not only limited to the organization itself but they far reaching outside the boundaries of firm. While existing literature has primarily focused on the internal impacts of SC-Ambidexterity within a firm, our findings indicate that the positive impacts of dual wielding are not limited to the firm itself. By embracing SC-Ambidexterity, firms can effectively navigate the challenges and intricacy of the broader environment of the supply chain. It allows them to evolve with the change in market trends, align their operations with strategic goals, and build resilience against disruptions.

This emphasizes the significance of considering the wider supply chain context when examining the benefits of SC-Ambidexterity. By recognizing the external implications and interdependencies, firms can harness the power of dual wielding to enhance their performance and competitiveness within the supply chain ecosystem. Overall, our findings highlight the need for a holistic approach to SC-Ambidexterity, considering both internal and external factors, to fully leverage its benefits and achieve sustainable success in the dynamic and interconnected world of supply chain management. (Blome et al., 2013; Tuan, 2016). Past studies have also shown this that the importance of Cooperative Action by Supply Chain Partners When Disruption Occurs (Sawyerr & Harrison, 2020; Pettit et al., 2019), achieve SC-resilience.

In summary, the direction of the supply chain is crucial for the success of both SC-Ambidexterity and SC-Resilience. It is important for companies operating in the supply chain industry to prioritize these skills and work collectively to address the challenges posed by disturbances. Managers are increasingly aware of the significance of SC-Resilience and the need to proactively manage supply chain disruptions to ensure survival in a turbulent business environment (Scholten et al., 2020). However, the role of SC-Ambidexterity in achieving SC-Resilience is not fully understood. This study highlights the significance of SC-Ambidexterity in the context of SC-Resilience. Situational ambidexterity in the supply chain necessitates a management system that can effectively navigate disruptions while aligning goals, missions, visions, activities, and partner resources. By creating synergy between SC-Alignment and SC-Adaptability, organizations can work towards their targets while adapting to the current circumstances (Im, 2014; Gibson & Birkinshaw, 2004). Our results indicated that SC-Ambidexterity is a skill that does more than just affect performance issue related to optimization of results (Wamba et al., 2019) Our study suggests that the development and implementation of skills such as SC-Ambidexterity, SC-Agility, and SC-Resilience are essential for organizational success in the supply chain. We emphasize the importance of a strategic order in developing and organizing these skills to enhance SC-Ambidexterity and SC-Agility, ultimately leading to improved SC-Resilience. These findings have practical implications for organizations in both developing and developed states, as they can improve management practices and economic performance by effectively responding to disturbances and fostering resilience in the supply chain. Resilience is not a given for all organizations, but it can be nurtured and executed through the strategic use of dynamic features such as SC-Ambidexterity. Our study provides valuable guide for the development of such networks of supply chain that are resilient enough. By implementing SC-Ambidexterity in their daily activities, supply chain managers can effectively respond to disruptions and enhance resilience.

This research offers insights for administrators to adapt, integrate, innovate, and rebuild their businesses with a focus on Ambidexterity as a valuable resource, skill, and core competency for navigating disruptive environments and gaining a competitive advantage. For resource-constrained manufacturing organizations in developing countries, this study presents an opportunity to efficiently manage modern businesses and improve existing resources through an ambidextrous approach tailored to their specific context (Gibson & Birkinshaw, 2004).

5.4 Limitations and future research directions

This section acknowledges the limitations of the study. The cross-sectional nature and relatively small sample size may restrict the generalizability of the findings. To include variety of industry efforts were made but it was not possible for the researcher to rule out non-response bias. The study focused on developing countries, specifically in the manufacturing and organizational context of Pakistan. Therefore, caution should be exercised when applying the results to service supply chains or beyond the specific context of this study. Future research could explore the applicability of the research model in service contexts and replicate the study to validate the findings.

Another limitation is the use of a single-informant study design relying on self-reported cognitive data. While precautions were taken during data collection and statistical methods were used to address common method bias, the possibility of common method bias still exists. Future studies could consider gathering data from multiple informants to provide more robust evidence. Additionally, the study measured environmental uncertainty as a representation of market dynamics. Future research could further investigate other drivers such as skills, competition, technology, and innovation, which are also important in the context of dynamics.

In conclusion, while this study provides valuable insights, researchers should be mindful of these limitations and address them in future studies to enhance the understanding of the subject matter.

5.5 Recommendation

1. Cultivate an Ambidextrous Culture: Organizations should foster a culture that encourages both exploration and exploitation within the supply chain. This involves creating an environment where employees are encouraged to innovate, take calculated risks, and explore new opportunities while also maintaining operational efficiency and effectiveness.

2. Develop Agility Skills: Enhancing supply chain agility is crucial for achieving resilience. Companies should focus on developing agile skills such as flexibility, adaptability, and responsiveness. This includes improving coordination, communication, and streamlining processes to enable quick and effective responses to disruptions.

3. Invest in Training and Development: Building supply chain agility requires skilled and knowledgeable employees. Organizations should make efforts to initiate such developing and training programs that will equip their work force with required skills and competencies to handle unexpected challenges and implement agile practices.

4. Foster Collaboration and Information Sharing: The sharing of information and cooperation among supply chain partners are vital for enhancing agility and resilience. Businesses should promote collaboration, establish strong partnerships, and share relevant information to anticipate disruptions, develop contingency plans, and respond effectively to unexpected events.

5. Improve Supply Chain Visibility: Enhancing supply chain visibility is essential for agility and resilience. Companies should invest in technologies and systems that provide real-time visibility into supply chain activities. This enables proactive monitoring, early detection of potential disruptions, and faster decision-making to mitigate risks and maintain smooth operations.

6. Implement Risk Management Strategies: Effective risk management is critical for supply chain resilience. Organizations should identify and assess potential risks and vulnerabilities in their supply chain and develop strategies to mitigate them. This may involve diversifying suppliers, establishing redundant channels, and implementing proactive risk monitoring and response systems.

7. Continuously Monitor and Adapt: The dynamic nature of the supply chain requires continuous monitoring and adaptation. Management should regularly assess supply chain performance, monitor key indicators, and seek feedback from customers, suppliers, and other stakeholders. This enables organizations to identify areas for improvement, anticipate changes, and make necessary adjustments to maintain resilience.

By implementing these recommendations, organizations can enhance their supply chain management practices, build resilience, and effectively navigate disruptions and uncertainties in today's business environment.

Acknowledgements.

The author acknowledges the efforts of all the individuals who took time to take part in this research study. It is because of their efforts I was able to complete this study.

References

Adobor, H. a. (2018). Supply chain resilience: a dynamic and multidimensional approach. *International Journal of Logistics Management, 29*(4), 1451-1471.

Ahmed, A. (2019). Islamabad Seeks Compensation for Low Carbon Footprint. Islamabad, pakistan.

Al-Badani, Y. (2014). The concept of Risk Sharing in Islamic Financial Institutions:. *ALHIJAZ International Referred Journal for Islamic and Arabic Studies, 9*, 375-407.

Ali, A., Mahfouz, A., & Arisha, A. (2017). Analyzing supply chain resilience: integrating the constructs in a concept mapping framework via a systematic literature review. *Supply Chain Management: International Journal,, 22*(1), 16-39.

Ali, I., & Golgeci, I. (2019). Where is supply chain resilience research heading? A systematic and co-occurrence analysis. *International Journal of Physical Distribution and Logistics Management, 49*(8), 793-815.

Altay, N., Gunasekaran, A., Dubey, R., & Childe, S.J. (2018). Agility and resilience as antecedents of supply chain performance under moderating effects of organizational culture within the humanitarian setting: a dynamic capability view. *Production Planning and Control, 29*(14), 1158-1174.

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

Anwer, A.-S.M.d. (2017). Infrastructure framework and manufacturing supply chain agility: the role of delivery dependability and time to market. *Supply Chain Management: International Journal, 22*(2), 172-185.

Ardito, L., Messeni Petruzzelli, A., Dezi, L., & Castellano, S. (2019). The influence of inbound open nnovation on ambidexterity performance: does it pay to source knowledge from supply chain Stakeholders? *Journal of Business Research*.

Aslam, H., Blome, C., Roscoe, S., & Azhar, T.M. (2018). "Dynamic supply chain capabilities: how market sensing, supply chain agility and adaptability affect supply chain ambidexterity. *International Journal of Operations and Production Management, 38*(12), 2266-2285.

Attia, A. (2015). Testing the effect of marketing strategy alignment and triple-a supply chain on performance in Egyp. *EuroMed Journal of Business, 10*(2), 163-180.

Awan, U. (2009). Total quality management in developing countries. *International Journal of Pharmaceutical and Healthcare Marketing, 3*(4), 363-380.

Bag, S., Gupta, S., & Foropon, C. (2019). Examining the role of dynamic remanufacturing capability on supply chain resilience in circular economy. *Management Decision, 57*(4), 863-885.

Bhamra, R., Dani, S., & Burnard, K. (2011). Resilience: the concept, a literature review and future directions". *International Journal of Production Research,, 49*(18), 5375-5393.

Birkie, S.E., Trucco, P., & Fernandez Campos, P. (2017). Effectiveness of resilience capabilities in mitigating disruptions: leveraging on supply chain structural complexity. *Supply Chain Management: International Journal, 22*(6), 506-521.

Blome, C., Schoenherr, T., & Kaesser, M. (2013a). Ambidextrous governance in supply chains: the impact on innovation and cost performance. *Journal of Supply Chain Management, 49*(4), 59-80.

Blome, C., Schoenherr, T., & Rexhausen, D. (2013b). Antecedents and enablers of supply chain agility and its effect on performance: a dynamic capabilities perspective. *International Journal of Production Research,, 51*(4), 1295-1318.

Boumgarden, P., Nickerson, J., & Zenger, T.R. (2012). Sailing into the wind: exploring the relationships among ambidexterity, vacillation, and organizational performance. *Strategic Management Journal, 33*(6), 587-610.

Brandon-Jones, E., Squire, B., Autry, C., & Petersen, K.J. (2014). A contingent resource-based perspective of supply chain resilience and robustness. *Journal of Supply Chain Management, 50*(3), 55-73.

Braunscheidel, M.J., & Suresh, N.C. (2009). The organizational antecedents of a firm's supply chain agility for risk mitigation and response. *Journal of Operations Management, 27*(2), 119-140.

Brusset, X. (2016). Does supply chain visibility enhance agility? *International Journal of Production Economics, 171*(46-59).

Cao, Q., Gedajlovic, E., & Zhang, H. (2009). Unpacking organizational ambidexterity: dimensions contingencies, and synergistic effects. *Organization Science, 20*(4), 781-796.

Carvalho, H. &. (2012). Agile and resilient approach to supply chain managemnt:. *Influnce on performance and competitiveness. , 4*, 49-62.

Chandrasekaran, A. L. (2012). Antecedents to ambidexterity competency in high technology organizations. *Journal of Operations Management, 30*(1-2), 134-151.

Chowdhury, M.M.H., & Quaddus, M. (2017). Supply chain resilience: conceptualization and scale development using dynamic capability theory. *International Journal of Production Economics, 188*, 185-204.

Chowdhury, M.M.H., Quaddus, M., & Agarwal, R. (2019). Supply chain resilience for performance:role of relational practices and network complexities. *Supply Chain Management: International Journal, 24*(5), 659-676.

Christopher, M. (2011). Supply Chain 2.0': Managing supply chains in the era of Turbulence. *International Journal of Physical Distribution & Logistics Management,, 41*(1), 63-82.

Christopher, M., & Peck, H. (2004). Building the resilient supply chain. *International Journal of Logistics Management, 15*(2), 1-14.

Chunsheng, L., Wong, C.W., Yang, C.-C., Shang, K.-C., & Lirn, T.-c. (2020). Value of Supply chain resilience: roles of culture, flexibility, and integration. *International Journal of Physical Distribution and Logistics Management, 50*(1), 80-100.

Conway, J. a. (2010). What reviewers should expect from authors regarding common method bias in organizational research. *Journal of Business and Psychology, 25*(3), 325-334.

Drnevich, P.L., & Kriauciunas, A.P. (2011). Clarifying the conditions and limits of the contributions of ordinary and dynamic capabilities to relative firm performance. *Strategic Management Journal, 32*(3), 254-279.

Dubey, R., Altay, N., Gunasekaran, A., Blome, C., Papadopoulos, T., & Childe, S.J. (2018). Supply chain agility, adaptability and alignment: empirical evidence from the Indian auto components industry. (Dubey, R., Altay, N., Gunasekaran, A., & Blome, C., Eds.) *International Journal of Operations and Production Management, 38*(1), 129-148.

Duncan, R.B. (1976). The ambidextrous organization: designing dual structures for innovation. *The Management of Organization, 1*, 167-188.

Economy, T. G. (2019). *The Global Economy* . Retrieved from Carbon dioxide (co2) emissions - country rankings: theglobaleconomy.com.

Eisenhardt, K., & Martin, J. (2000). Dynamic capabilities: what are they? *Strategic Management Journal, 21*(10-11), 1105-1121.

Fayezi, S., Ambika, Z., & Andrew, O.L. (2015). How Australian manufacturing firms perceive and understand the concepts of agility and flexibility in the supply chain. *International Journal of Operations and Production Management, 35*(2), 246-281.

Fornell, C. a. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*(1), 39-50.

Gadde, L.-E., & Finn, W. (2018). Purchasing management and the role of uncertainty. *IMP Journal, 12*(1), 127-147.

GFDRR. (2019). *Pakistan', global facility for disaster reduction and recovery*. Retrieved from GFDRR: www.gfdrr.org/en/pakistan.

Ghoshal, S. a. (1994). Linking organizational context and managerial action: the dimensions of quality of management. *Strategic Management Journal, 15*(S2), 91-112.

Gibson, C.B., & Birkinshaw, J. (2004). The antecedents, consequences, and mediating role of organizational ambidexterity. *Academy of Management Journal, 47*(2), 209-226.

Gligor, D., Esmark, C., & Holcomb, M. (2015). Performance outcomes of supply chain agility: when should you be agile? *Journal of Operations Management, 33*(1), 71-82.

Gligor, D.M., & Holcomb, M.C. (2012). Antecedents and consequences of supply chain agility:establishing the link to firm performance. *Journal of Business Logistics, 33*(4), 295-308.

Guha-Sapir, D. (2015). Annual disaster statistical review 2014: the numbers and trends. (U. c. Louvain, Ed.) *Annual disaster statistical review*, p. all.

Gunessee, S., Subramanian, N., & Ning, K. (2018). Natural disasters, PC supply chain and corporate performance. *International Journal of Operations and Production Management, 38*(9), 1796-1814.

Hair, J. H. (2017). A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM), Sage, Los Angeles, CA.

Hamel, G., & Valikangas, L. (2004). *The quest for resilience* (Vol. Vol. 2003). Harvard Business Review: He, Z.-L. and Wong, P.-K.

He, Z.-L., & Wong, P.-K. (2004). Exploration vs. exploitation: an empirical test of the ambidexterity hypothesis. *Organization Science, 15*(4), 481-494.

Henseler, H. a. (2016). Using PLS path modeling in new technology research: updated guidelines. *Industrial Management and Data Systems, 116*(1), 2-20.

Hershcovis, M.S. (2011). Incivility, social undermining, bullying... oh my!': a call to reconcile constructs within workplace aggression research. *Journal of Organizational Behavior, 32*(3), 499-519.

Hill, S.A., & Birkinshaw, J. (2014). Ambidexterity and survival in corporate venture units. *Journal of Management, 40*(7), 1899-1931.

Hoffmann, P. S. (2000). Uncertainty, supply risk management and their impact on performance. *Journal of Purchasing and Supply Management, 19*(3), 199-211.

Hoskisson, R.E., Eden, L., Lau, C.M., & Wright, M. (2000). Strategy in emerging economies. *Academy of Management Journal, 43*(3), 249-267.

Iborra, M, Safon, V., & Dolz, C. (2020). *What explains resilience of SMEs? Ambidexterity capability and strategic consistency.* Japan: Long Range Planning.

Im, G. a. (2014). IT-enabled coordination for ambidextrous interorganizational relationships. *Information Systems Research, 25*(1), 72-92.

Im, G., & Rai, A. (2008). Knowledge sharing ambidexterity in long-term interorganizational relationship. *Management Science, 54*(7), 1281-1296.

Im, G., Rai, A., & Lambert, L.S. (2019). Governance and resource sharing ambidexterity for generating relationship benefits in supply chain collaborations. *Decision Sciences, 50*(4), 656-693.

Junni, P., Sarala, R.M., Taras, V., & Tarba, S.Y. (2013). Organizational ambidexterity and performance: a meta-analysis. *Academy of Management Perspectives, 27*(4), 299-312.

Juttner, U. a. (2011). Supply chain resilience in the global financial crisis: an empirical study. *Supply Chain Management: International Journal,, Vol. 16*(4), 246-259.

Kock, N. (2015). Common method bias in PLS-SEM: a full collinearity assessment approach. *International Journal of E-Collaboration, 11*(4), 1-10.

Kohli. (2010). Assessing effectiveness of supply chain collaboration: An empirical study. *Supply chain forum. An international journal, 11*(2), 1-16.

Kreye, M.E. (2017). Can you put too much on your plate? Uncertainty exposure in servitized triads. *International Journal of Operations and Production Management, 37*(12), 1722-1740.

Kristal, M. H. (2010). The effect of an ambidextrous supply chain strategy on combinative competitive capabilities and business performance. *Journal of Operations Management, 28*(5), 415-429.

Kwak, D.-W., Seo, Y.-J. and Mason, R. (2018). Investigating the relationship between supply chain innovation, risk management capabilities and competitive advantage in global supply chains. *International Journal of Operations and Production Management, 38*(1), 2-21.

Laverty, K. (1996). Economic 'short-termism': the debate, the unresolved issues, and the implications for management practice and research. *Economic 'short-termism, 21*(3), pp. 825-860.

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

Lee, S.M., & Rha, J.S. (2016). Ambidextrous supply chain as a dynamic capability: building a resilient supply chain. *Management Decision, 54*(1), 2-23.

Liu, Y., Liao, Y., & Li, Y. (2018). Capability configuration, ambidexterity and performance: evidence from service outsourcing sector. *International Journal of Production Economics, 200*, 343-352.

Lumpkin, G.T., & Brigham, K.H. (2011). Long–term orientation and intertemporal choice in family firms. *Entrepreneurship: Theory and Practice, 35*(6), 1149-1169.

Malik, O.R., & Kotabe, M. (2009). Dynamic capabilities, government policies, and performance in firms from emerging economies: evidence from India and Pakistan. *Journal of Management Studies, 46*(3), 421-450.

March, J.G. (1991). Exploration and exploitation in organizational learning. *Organization Science, 2*(1), 71-87.

March, J.G. (2003). Understanding organisational adaptation. *Society and Economy, 25*(1), 1-10.

Margolis, J.T., Sullivan, K.M., Mason, S.J., & Magagnotti, M. (2018). A multi-objective optimization model for designing resilient supply chain networks. *International Journal of Production Economics,,, Vol. 204*, pp. 174-185.

Marin-Garcia, J. A.-L. (2018). A Triple-A supply chain measurement model: validation and analysis. *International Journal of Physical Distribution and Logistics Management, 48*(10), 976-994.

Maryam, L., & Soroosh, S. (2018). Disentangling resilience, agility and leanness: conceptual development and empirical analysis. *Journal of Manufacturing Technology Management,, Vol. 29* (No. 1), pp. 168-197.

Meyer, D. (2019). *Toyota Is Latest Automaker to Raise Alarm Over a No-Deal Brexit, Fortune*. Retrieved from Fortune Media IP Limited: https://fortune.com/2019/03/05/toyota-no-deal-brexit-warning/

Miller, D., & Le Breton-Miller, I. (2015). Managing for the Long Run: Lessons in Competitive Advantage from Great Family Businesses,. *Harvard Business Press, United States of America*.

Mustafa, K. (2018). Pakistan Sustains $126.79b Loss in War on Terror. *The News, Jang Group*. Islamabad, Pakistan.

O'Reilly, C.A., & Tushman, M.L. (2011). Organizational ambidexterity in action: how managers explore and exploit. *California Management Review. 53*(4), 5-22. California: California Management Review.

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

Ojha, D. A. (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.

Partanen, J., Kohtamaki, 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*, 107-470.

Patel, P. T. (2012). Enhancing effects of manufacturing flexibility through operational absorptive capacity and operational ambidexterity. *Journal of Operations Management, 30*(3), 201-220.

Pereira, C. (2014). Achieving supply chain resilience: The role of procurement. Supply chain mangement. *An International Journal, 19*(5), 626-642.

Pettit, T. (2008). Supply chain resilience: Development of a conceptual framework,. *assessment tool and an implementation process:. PhD Thesis. Graduate school of the Ohio state university*.

Pettit, T. C. (2013). Ensuring supply chain resilience: development and implementation of an assessment tool. *Journal of Business Logistics, 34*(1), 46-76.

Pettit, T.J., Croxton, K.L., & Fiksel, J. (2019). The evolution of resilience in supply chain management: a retrospective on ensuring supply chain resilience. *Journal of Business Logistics,, 40*(1), 56-65.

Pettit, T.J., Fiksel, J., & Croxton, K.L. (2010). Ensuring supply chain resilience: development of a conceptual framework. *Journal of Business Logistics, 31*(1), 1-21.

Podsakoff, P. M.-Y. (2003). Common method biases in behavioral research: a critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*(5), 879.

Polyviou, M., Croxton, K.L., & Knemeyer, A.M. (2020). Resilience of medium-sized firms to supply chain disruptions: the role of internal social capital. *International Journal of Operations and Production Management, 40*(1), 68-91.

Ponomarov, S. and Holcomb, M. (2009). Understanding the concept of supply chain resilience. *International Journal of Logistics Management, 20*(1), 124-143.

Raisch, S. a. (2008). Organizational ambidexterity: antecedents, outcomes, and moderators. *Journal of Management, 34*(3), 375-409.

Ramachandran, I., Lengnick-Hall, C.A., & Badrinarayanan, V. (2019). Enabling and leveraging ambidexterity: influence of strategic orientations and knowledge stock. *Journal of Knowledge Management, 23*(6), 1136-1156.

Reyes, M.Z. (2004). Social Research: A Deductive Approach. In *Social Research: A Deductive Approach.* Manila: phililpines.

Ricciardi, F., Zardini, A., & Rossignoli, C. (2016). Organizational dynamism and adaptive business model innovation: the triple paradox configuration. *Journal of Business Research, 69*(11), 5487-5493.

Ritchie, B., & Brindley, C. (2007). Supply chain risk management and performance: a guiding framework for future development. *International Journal of Operations and Production Management, 27*(3), 303-322.

Rojo, A. J.-M.-A. (2016). The impact of ambidexterity on supply chain flexibility fit. *Supply Chain Management: International Journal,, 21*(4), 433-452.

Ruiz-Benítez, R., López, C., & Real, J. C. (2018). The lean and resilient management of the supply chain and its impact on performance. *International Journal of Production Economics*, *203*, 190-202.

Russell, C.J. (2015). *Is it time to voluntarily turn over theories of voluntary turnover?* (Vol. 6). Germany: Industrial and Organizational Psychology.

Sá, M. M. D., Miguel, P. L. D. S., Brito, R. P. D., & Pereira, S. C. F. (2020). Supply chain resilience: the whole is not the sum of the parts. *International Journal of Operations & Production Management*, *40*(1), 92-115.

Sahebjamnia, N., Torabi, A., & Mansouri, A. . (2018). Building organizational resilience in the face of multiple disruptions. *International Journal of Production Economics, 197*, 63-83.

Sawyerr, E., & Harrison, C. (2020). Developing resilient supply chains: lessons from high reliability organisations. *Supply Chain Management: International Journal, Vol. 25*(No. 1), pp. 77-100.

Schilpzand, P., De Pater, I.E., & Erez, A. (2016). Workplace incivility: a review of the literature and agenda for future research. *Journal of Organizational Behavior, 37*, S57-S88.

Schippers, M., & Rus, D. (2020). *Optimizing Decision-Making Processes in Times of COVID-19: Using Reflexivity to Counteract Information Processing Failures*. (ERS-2020-003-LIS) Retrieved from Optimizing Decision-Making Processes in Times of COVID-19: http://doi.org/10.2139/ssrn.3599939/

Schminke, M. (2004). From the editors raising the bamboo curtain. *Academy of Management Journal, 47*(3), 310-314.

Scholten, K., Stevenson, M., & van Donk, D.P. (2020). "Dealing with the unpredictable: supply chain resilience",. *International Journal of Operations and Production Management, Vol. 40* (No. 1), 1-10.

Souder, D., & Bromiley, P. (2012). Explaining temporal orientation: evidence from the durability of firms' capital investments. *Strategic Management Journal, 33*(5), 550-569.

Swafford, P.M., Ghosh, S., & Murthy, N. (2008). Achieving supply chain agility through IT integration and flexibility. *International Journal of Production Economics, 116*(2), 288-297.

Swafford, P.M., Ghosh, S., & Murthy, N. (2006). The antecedents of supply chain agility of a firm:scale development and model testing. *Journal of Operations Management, 24*(2), 170-188.

Talluri, S., Kull, T.J., Yildiz, H., & Yoon, J. (2013). Assessing the efficiency of risk mitigation strategies in supply chains. *Journal of Business Logistics,, 34*(4), 253-269.

Tatham, P., & Christopher, M. (Eds.). (2018). *Humanitarian logistics: Meeting the challenge of preparing for and responding to disasters*. Kogan Page Publishers.

Tavani, S.N., Sharifi, H., & Ismail, H.S. (2013). A study of contingency relationships between supplier involvement, absorptive capacity and agile product innovation. *International Journal of Operations and Production Management, 34*(1), 65-92.

Teece, D.J. (2014). The foundations of enterprise performance: dynamic and ordinary capabilities in an (economic) theory of firms. *Academy of Management Perspectives , 28*(4), 328-352.

Teece, D.J. (2007). Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal, 28*(13), 1319-1350.

Teece, D.J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal, 18*(7), 509-533.

Tuan, L. (2016). Organisational ambidexterity and supply chain agility: the mediating role of external knowledge sharing and moderating role of competitive intelligence. *Journal of Logistics Research and Applications, 19*(6), 583-603.

Tukamuhabwa, B., Stevenson, M., & Busby, J. (2017). Supply chain resilience in a developing country context: a case study on the interconnectedness of threats, strategies and outcomes. *Supply Chain Management: International Journal, 22*(6), 486-505.

Tukamuhabwa, S. M. (2015). "Supply chain resilience: definition, review and theoretical foundations for further study". *International Journal of Production Research,, Vol. 53*(No. 18), pp. 5592-5623.

Tushman, M.L., & O'Reilly, C.A. III. (1996). Ambidextrous organizations: managing evolutionary and revolutionary change. *California Management Review, 38*(4), 8-29.

Vanpoucke, E., & Ellis, S.C. (2020). Building supply-side resilience–a behavioural view. *International Journal of Operations and Production Management, 40*(1), 11-33.

Walker, A. (2020). *Coronavirus: the economic cost is rising in china and beyond*. Retrieved from BBC News,: https://www.bbc.com/

Wamba, S.F., Dubey, R., Gunasekaran, A., & Akter, S. (2019). The performance effects of big data analytics and supply chain ambidexterity: the moderating effect of environmental dynamism. *International Journal of Production Economics*, 107498.

Wang, S.L., Luo, Y., Maksimov, V., Sun, J., & Celly, N,. (2019). Achieving temporal ambidexterity in new ventures. *Journal of Management Studies, 56*(4), 788-822.

Wassenhove. (2006). Humanitarian aid logistics: Supply chain mangement in high gear. *Journal of the Operational Research Society., 57*(5), 475-489.

Whitten, G. K. (2012). Triple-A supply chain performance. *International journal of Operations and Production Management, 32*(1), 28-48.

Wieland, A., & Wallenburg, C.M. (2013). The influence of relational competencies on supply chain resilience: a relational view. *International Journal of Physical Distribution and Logistics Management, 43*(4), 300-320.

Wilhelm, H., Schlomer, M., & Maurer, I. (2015). How dynamic capabilities affect the effectiveness and efficiency of operating routines under high and low levels of environmental dynamism. *British Journal of Management, 26*(2), 327-345.

Yang, J., H. Xie, G. Yu, & M. Liu. (2021). Antecedents and Consequences of Supply Chain Risk Management Capabilities: An Investigation in the Post-Coronavirus Crisis. *International Journal of Production Research, 59*(5), 1573-1585.

Zhou, J., Bi, G., Liu, H., Fang, Y., & Hua, Z. (2018). Understanding employee competence, operational IS alignment, and organizational agility–An ambidexterity perspective. *Information and Management, 55*(6), 695-708.

Zsidisin, G.A., & Ellram, L.M. (2003). An agency theory investigation of supply risk m anagement. *Journal of Supply Chain Management, 39*(2), 15-27.

Zsidisin, G.A., & Wagner, S.M. (2010). Do perceptions become reality? The moderating role of supply chain resliency on disruption occurrence. *Journal of Business Logistics, 31*(2), 1-20.

Appendix: A

	Supply Chain Resilience	
1	Resilient capabilities in the aspect of logistics and supply chain management should enable cost effective minimisation of vulnerabilities.	Asbjørnslett (2009)
2	There is a need to minimize the expected cost of mitigation when building SCRES.	Bakshi & Klein-dorfer (2009)
3	A resilient supply chain should be able to cope with disruptions with minimal losses.	Barac et al. (2011)
4	The attributes which are capable of enhancing the firm's supply resilience are those that increase its ability to quickly and efficiently recover from disruptive phenomena	Blackhurst et al. (2011)
5	Too high investments in creating SCRES may overshadow its marginal benefits.	Brandon-Jones et al. (2014)
6	Lean (cost minimisation and waste elimination) and resilience can co-exist in supply chain management.	Cabral et al. (2012)
7	Time and cost are key performance indicators of resilient supply chains.	Carvalho et al. (2011b)
8	Supply chain resilience strategies should provide efficient and effective response	Carvalho et al.(2012d); Car-valho et al.(2012c)
9	Network resilience should be measured considering the cost, time and resources incurred in the recovery process.	Chen & Miller-Hooks (2012)
10	SCRES can be created efficiently and cost effectively through the agile six sigma approach.	Christopher & Rutherford (2004)
11	Investment in SCRES-building measures should be balanced against the need to maintain a cost-efficient supply chain	Dahlman (2008)
12	SCRES strategies, such as maintaining enough slack, should not adversely affect the normal operational efficiency.	Datta (2007)
13	Through flexible system optimization, a resilient supply network can be realised both effectively and efficientl	Fang et al. (2012)
14	Resilience aims to recover the desired values of the states of a system not only within an acceptable time but also at an acceptable cost.	Haimes (2006); Haimes et al. (2008)
15	Disruptions should be mitigated at minimum cost in order to achieve an optimum state of SCRES	Ivanov et al. (2014)
16	A supply chain should be designed in such a way that it is resilient as well as optimal in its operations.	Mandal (2012)
17	Optimisation models aim to allocate limited resources among mitigation strategies in order to achieve SCRES cost effectively	. Ratick et al. (2008); Sawik (2013)
18	Strategies for enhancing SCRES, such as increasing safety inventory and improving the efficiency of reserve capacity should be within the cost margins	shuai et al. (2011)

19	An increase in relationship resources results in increased network resilience, but such resources should not be increased beyond a certain limit, where it is not cost effective	Smith & Vidal (2010)
20	The resilience of a system involves its ability to use the lowest possible amount of resources during recovery processes. The system that incurs the lower resilience costs will be considered the more resilient one	Vugrin et al. (2011)
	Supply Chain Adaptability Measurement Model	Dominik Eckstein(2017)
	Structural Sensing	
1	Ability to sense long-term, fundamental changes in terms of:	
2	Changes in technology (e.g., fundamental technological advances)	
3	Changes in competition (e.g., fundamental changes in the competitive landscape	
4	Changes in supply (e.g., new emerging supply markets)	
5	Changes in demand (e.g., fundamental changes in consumer preferences)	
	Structural Flexibility	Dominik Eckstein(2017)
1	Ability to flexibly respond by adjusting the configuration of the supply chain to long-term, fundamental changes in terms of:	
2	Technology (e.g., fundamental technological advances)	
3	Competition (e.g., fundamental changes in the competitive landscape)	
4	Supply (e.g., new emerging supply markets)	
5	Demand (e.g., fundamental changes in consumer preferences)	
	Structural Innovativeness	Dominik Eckstein(2017)
1	Ability to engage in innovation in response to long-term, fundamental changes	
2	We introduce a greater number of new products and services to markets in comparison with our competitors	
3	The period from product development to final customer delivery is considerable shorter in comparison with our competitors.	
4	Our supply chain demonstrates a higher degree of product innovativeness in comparison with our competitors	
5	Our supply chain changes production methods at a greater speed in comparison with our competitors.	
6	Our supply chain is constantly improving its manufacturing processes	
	Supply Chain Agility Measurement Model	Michael Henke(2017)
	Dynamic Sensing	
	Ability to sense short-term, temporary changes in terms of:	
1	Changes in technology (e.g., revisions of existing technologies)	
2	Changes in competition (e.g., fluctuations in competitors' product pricing)	
3	Changes in demand (e.g., demand fluctuations)	
4	Changes in supply (e.g., changes in suppliers' offers)	
	Dynamic Flexibility	Michael Henke(2017)
1	Ability to flexibly respond to short-term, temporary changes with the existing supply chain in terms of:	
2	Reducing manufacturing throughput times	
3	Adjusting production process	
4	Adjusting inventory turnover	
5	Adjusting worldwide delivery capacities	
6	Reducing delivery times	
7	Enhancing delivery reliability	
8	Reducing replacement times of purchase	
9	Adjusting ordered of goods and services in the short term	

	Dynamic Speed	Michael Henke(2017)
1	Ability to speedily respond to short-term, temporary changes with the existing supply chain in terms of:	
2	Manufacturing throughput times	
3	Customer delivery times	
4	Replacement times of purchases	
5	Manufacturing set-up times	
	Supply chain ambidexterity (Kristal et al., 2010)	(Kristal et al., 2010)
	Supply Chain Exploitation Practices Listed below are supply chain management practices that may affect firms' ability to compete in an industry	(HULT, 1998)
	. Please indicate your level of agreement with these statements about your business unit's supply chain practices over the past 12 months.	
	Supply Chain Exploitation	
1	In order to stay competitive, our supply chain managers focus on reducing operational redundancies in our existing processes	
2	Leveraging of our current supply chain technologies is important to our firm's strategy	
3	In order to stay competitive, our supply chain managers focus on improving our existing technologies	
4	Our managers focus on developing stronger competencies in our existing supply chain processes	
	Supply Chain Exploration Practices Listed below are supply chain management practices that may affect firms' ability to compete in an industry	
	Please indicate your level of agreement with these statements about your business unit's supply chain practices over the past 12 months.	
	Supply Chain Exploration	
1	We proactively pursue new supply chain solutions	
2	We continually experiment to find new solutions that will improve our supply chain	
3	To improve our supply chain, we continually explore for new opportunities	
4	We are constantly seeking novel approaches in order to solve supply chain problems	
	Supply Chain Alignement	Arthur Ahimbi-sibwe (2016)
	Supply Chain Risk Sharing	
1	Our organization invests directly in our suppliers or customers operations as well as other actions to share risks	
2	We exchange information frequently with our collaborative partners related to demand forecasts	
3	We exchange information frequently with our collaborative partners related to lead time	
4	We exchange information frequently with our collaborative partners related to price levels and pricing information	
5	We exchange information frequently with our collaborative partners related to product / service quality	
6	We regularly solve problems jointly with our key suppliers	
7	We help our key suppliers to improve their product quality in the long run	
8	We hold meetings with suppliers on a regular basis to solve quality problems	
9	We invest in our key supplier's facility to improve product quality	
10	We provide training for suppliers on quality requirements	
11	We set up tasks and procedures for supplier's production with our key suppliers	
12	We require our key suppliers to return the documents or statistical	
	Supply Chain Collaboration	Arthur Ahimbi-sibwe (2016)
1	process control (SPC) data so we can keep track of the production quality	
2	We effectively employ collaborative demand forecasting techniques using shared data	

3	Our data flows transparently between supply chain members with full access by all firms to facilitate collaborative decision making	
4	Our customers are willing to delay orders when our production capacity is hampered	
5	We have proactive product lifecycle management programs that strive to reduce both costs and risks