Aligning Risk and Value Creation: A Process Model of Supply Chain Risk Management in Geopolitical Disruptions

Abstract

Purpose: This study aims to develop a process model that captures the co-evolution of supply chain risk management (SCRM) and value creation. The model is designed to support multinational small and medium-sized enterprises (SMEs) in addressing the challenges of geopolitical disruptions, such as the US–China trade war, by providing a framework for simultaneously strengthening SCRM and enhancing value delivery in the global supply chain.

Design/methodology/approach: This study employed an inductive case study methodology to construct a theoretical process model of SCRM, drawing on data from semi-structured interviews with eight multinational SMEs impacted by the US-China trade war since January 2018. Using grounded theory techniques—including open coding, axial coding, and selective coding—the interview data were systematically analyzed to develop a process model that captures the complexities of managing supply chain risks in a volatile geopolitical context.

Findings: This study presents a process model illustrating the co-evolution of SCRM and value creation within firms in response to geopolitical disruptions. The evolutionary process of SCRM progresses through four stages: decoding disruption dynamics, synergizing the information ecosystem, catalyzing adaptive transformation, and architecting resilient adaptation. Correspondingly, the value creation process evolves alongside SCRM, aligning with each stage. It includes value-contextualized recalibration, value-driven communication, value-centric customization, and value-sustained resilience.

Originality: This study offers a novel contribution by developing a process model that captures the co-evolution of SCRM and value creation. It identifies four critical stages in the SCRM life cycle, each intricately aligned with corresponding phases of value creation. This integrated framework provides a strategic pathway for firms to navigate supply chain risks while simultaneously enhancing value delivery, particularly in the context of geopolitical disruptions such as the US-China trade war. By linking SCRM and value creation, the study equips

multinational SMEs with a practical and comprehensive roadmap for building resilience and competitiveness in an increasingly volatile global environment.

Keywords: Process model, geopolitical disruptions, supply chain risk management, value creation.

1. Introduction

Supply chain managers and organizations increasingly face the challenge of anticipating and responding to unforeseen disruptions to maintain operational continuity and sustain competitive advantage (Katsaliaki et al., 2022; Kumar and Sharma, 2021; Messina et al., 2020; Munir et al., 2022). These disruptions, which often occur unexpectedly, interrupt the flow of goods and services, resulting in significant financial losses, operational inefficiencies, and strained stakeholder relationships (Berger et al., 2023; Scheibe and Blackhurst, 2018). Recent geopolitical disruptions, such as the US-China trade war, Brexit, and the COVID-19 pandemic, have exposed critical vulnerabilities in global supply chains. These events underscore the need for strategies that not only mitigate risks but also capitalize on opportunities to adapt and thrive in volatile environments.

The existing literature on SCRM provides valuable insights into how firms address disruptions through strategies like resilience-building, supply chain redesign, and advanced technology adoption (Croson et al., 2013; Blessley and Mudambi, 2022; Dubey et al., 2020). These approaches primarily focus on mitigating risks and restoring operational stability. However, effective supply chain disruption management extends beyond reactive risk mitigation—it necessitates the simultaneous pursuit of value creation during disruptive events (Brun et al., 2006; Hahn and Kuhn, 2012; Trkman et al., 2016). This requires integrating SCRM with value creation processes, continuously developing and refining value propositions (Fierro Hernandez and Haddud, 2018; Holweg and Helo, 2014; Klibi et al., 2010). Such integration enables firms to address immediate disruptions while adapting their value offerings to meet evolving customer expectations and market conditions. By synthesizing these processes, organizations can enhance resilience, advance sustainable supply chain management, and create enduring value in an increasingly volatile global environment.

Despite these advancements, the literature reveals two critical limitations. First, much of the research treats risk management and value creation as separate domains. While studies on risk management focus on strategies to mitigate disruptions (El Baz and Ruel, 2021; Ho et al., 2015; Rahman et al., 2023), research on value creation emphasizes enhancing customer satisfaction

and achieving competitive differentiation (Jääskeläinen and Heikkilä, 2019; Ju et al., 2021; Zhu et al., 2018). However, these studies often fail to systematically integrate the processes of disruption management and value creation. This compartmentalized perspective overlooks their interconnectedness—where effective risk management enhances value creation, and value creation strategies strengthen resilience. For instance, firms that adapt their supply chains during disruptions often uncover opportunities to improve operational efficiency and better meet shifting customer demands, simultaneously mitigating risks and generating value.

Second, a significant portion of the literature adopts static approaches to disruption management, emphasizing predefined strategies and contingency plans. These approaches fail to fully capture the iterative and context-sensitive nature of disruption management, particularly within complex geopolitical environments (Bednarski et al., 2024; Moradlou et al., 2021; Roscoe et al., 2022). Geopolitical disruptions, such as international trade wars, highlight the dynamic nature of supply chain challenges, which require continuous refinement and adaptation of strategies to respond effectively to evolving external conditions (Bednarski et al., 2024). In such contexts, disruption management demands a more iterative approach that prioritizes learning, responsiveness, and adaptive strategies, moving beyond static, one-size-fits-all solutions.

These limitations underscore the need for a more integrated and adaptive approach that reflects the simultaneous and iterative processes of managing supply chain disruptions and fostering value creation. Supporting studies suggest that the complexity of global supply chains and their inherent risks necessitate reevaluating SCRM as a driver of stakeholder value creation (Fierro Hernandez and Haddud, 2018; Hahn and Kuhn, 2012; Trkman et al., 2016). However, limited focus has been given to developing a systematic approach that addresses both SCRM and value creation management concurrently, particularly in the context of geopolitical disruptions.

To address these gaps, this study adopts an organizational information processing theory (OIPT) perspective to propose a process model that integrates SCRM and value creation. OIPT is particularly well-suited for this context as it emphasizes the alignment of an organization's information processing capabilities with the uncertainty and complexity of its external

environment (Galbraith, 1973; Srinivasan and Swink, 2018). This alignment is critical for navigating the multifaceted challenges of supply chain disruptions, especially in volatile geopolitical contexts. By focusing on how organizations process, interpret, and act on information, OIPT provides a theoretical foundation for understanding how firms can simultaneously manage risks and create value under conditions of uncertainty.

The proposed process model builds on OIPT by highlighting the simultaneous and iterative nature of managing disruptions and fostering value creation. It emphasizes the importance of dynamic information flows, feedback loops, and adaptive decision-making frameworks to enable firms to respond effectively to evolving external conditions. Unlike traditional static approaches, which rely on predefined strategies and contingency plans, this model incorporates real-time information processing and context-sensitive adjustments to ensure that organizations can refine their practices continuously and remain competitive (Azadegan et al., 2020; Peticca-Harris et al., 2016). By integrating information processing with risk management and value creation, the model underscores the interdependence of these processes in achieving resilience and sustainable competitive advantage.

This study, therefore, seeks to answer the research question: how can the processes of SCRM and value creation be integrated to address challenges posed by geopolitical disruptions? Using OIPT as a guiding framework, the study explores how firms enhance their information processing capabilities to iteratively align their SCRM strategies with value creation efforts. It contributes to the literature by proposing a dynamic, co-evolutionary model that connects information processing, risk management, and value creation, offering insights into how organizations can thrive in uncertain and complex environments.

Using an inductive approach, the study analyzes qualitative insights from select companies to develop a process model that illustrates the evolution of SCRM and value creation. This study contributes to the literature in several key ways. This study makes three key theoretical contributions to the SCRM literature. First, it introduces an evolutionary process model that explains how firms adapt their risk management practices to navigate prolonged geopolitical disruptions, emphasizing the iterative and adaptive nature of these processes. Second, it

establishes a co-evolutionary process that connects SCRM with value creation, reframing SCRM as a proactive enabler of stakeholder value rather than a siloed operational function. Lastly, it integrates the OIPT perspective into the co-evolutionary process model, offering a novel perspective on how dynamic interactions among supply chain actors simultaneously drive risk management and value creation, advancing understanding of the interconnected and evolving nature of these processes.

The remainder of this paper is structured as follows: First, we provide a review of the theoretical background. This is followed by an explanation of the research methodology and data analysis procedures. Next, we present the study's findings. The paper concludes with a discussion of the theoretical and practical implications, along with suggestions for future research.

2. Theoretical Background

2.1. Organizational Information Processing Theory (OIPT)

OIPT offers a valuable lens for understanding how organizations navigate uncertainty and complexity in their external environments (Galbraith, 1973, 1974; Srinivasan and Swink, 2018; Wong et al., 2020). This theory posits that as uncertainty or equivocality in the environment increases, organizations must enhance their information-processing capabilities to make effective decisions and maintain operational continuity (El Baz and Ruel, 2021; Jia et al., 2020; Joseph and Gaba, 2020). The foundational principle of OIPT is that organizations must align their information processing needs with their information processing capacities, a critical factor in sustaining performance under volatile conditions.

In the context of supply chain disruptions, OIPT underscores the importance of collecting, processing, and interpreting information to manage complexity and uncertainty effectively (Kumar and Sharma, 2021). Disruptions, particularly geopolitical ones, introduce rapidly evolving challenges that require organizations to shift from static, predefined responses to more adaptive and iterative strategies. OIPT emphasizes the role of flexible and dynamic information systems in enabling organizations to respond to such disruptions in real time. These systems facilitate the transformation of raw data into actionable insights, allowing firms to refine their

risk management strategies and ensure operational continuity in turbulent environments (Azadegan et al., 2020).

While OIPT has been widely applied in supply chain management literature (DuHadway et al., 2019; Ho et al., 2015), much of this research adopts a static approach, focusing on predefined information requirements and decision-making frameworks. However, geopolitical disruptions, by nature, are dynamic, multifaceted, and unpredictable. Managing them effectively requires organizations to go beyond static solutions and develop iterative processes that integrate real-time information flows with adaptive decision-making. This study extends OIPT by examining how organizations evolve their information-processing systems and decision-making frameworks over time to address the complexity and volatility of geopolitical disruptions.

This study leverages OIPT to bridge the gap between static and dynamic approaches to disruption management. Specifically, it highlights how organizations iteratively refine their SCRM practices by leveraging enhanced information processing capabilities. By doing so, firms can identify and address emergent risks while proactively creating value for stakeholders. This aligns with the broader argument that risk management processes should not only mitigate disruptions but also uncover opportunities for value creation through continuous learning and adaptation (Azadegan et al., 2020; Joseph and Gaba, 2020).

Integrating OIPT with the concept of dynamic SCRM provides a novel perspective on how firms build resilience in the face of geopolitical disruptions. This study explores the mechanisms through which organizations adapt their information-processing strategies to align with evolving external conditions. It emphasizes the interplay between information systems, decision-making agility, and value creation, offering insights into how firms can navigate uncertainty while maintaining competitive advantage. By shifting the focus to iterative and adaptive processes, this research addresses a critical gap in the literature and advances understanding of the role of information processing in fostering resilient and value-driven supply chains.

2.2. Supply Chain Risk Management

SCRM is a strategic approach aimed at anticipating, managing, and mitigating disruptions within supply chain networks (Holgado and Niess, 2023). It involves identifying potential risks and implementing strategies to minimize vulnerabilities across supply chain entities in both preventive and reactive ways (Manuj and Mentzer, 2008). The literature highlights the critical role of these strategies, especially during crises, in ensuring supply chain resilience and operational continuity (Sodhi et al., 2012). An approach to SCRM requires collaboration, coordination, and integration across the supply chain to effectively identify, assess, and respond to risks (Kilubi and Haasis, 2015; Munir et al., 2020).

Recent studies have emphasized the growing need for agility and strategic depth in SCRM (Cadden et al., 2022; Shekarian et al., 2020). For instance, Juttner (2005) introduced the idea that SCRM requires both proactive and reactive measures, a perspective reinforced by Scholten et al. (2014), who underscored the importance of sophisticated risk management strategies that align information and operational realities. These strategies not only help reduce vulnerabilities but also enhance post-disruption recovery, signaling that anticipation, response, and recovery are vital components of resilient supply chains. Additionally, advanced risk management capabilities, such as real-time data integration and scenario planning, have become crucial for navigating disruptions caused by global crises like the COVID-19 pandemic (Scholten et al., 2020).

While the current literature provides a strong foundation for understanding SCRM, it predominantly adopts a static perspective, focusing on fixed antecedents, frameworks, and stages (Heckmann et al., 2015; Ho et al., 2015; Xu et al., 2020). This static lens overlooks the evolutionary nature of SCRM, particularly how firms dynamically adapt and refine their risk management processes over time in response to external challenges. Understanding this iterative, adaptive progression is critical for organizations striving to build sustainable and resilient supply chains in an era of increasing uncertainty.

This gap in the literature underscores the need for exploratory research to capture the evolving nature of SCRM. Unlike quantitative approaches that often validate predefined models, qualitative research is uniquely suited to uncover the nuanced, iterative processes through

which firms adapt their strategies over time. By adopting a qualitative lens, this study aims to provide deeper insights into the mechanisms driving the evolution of SCRM, highlighting how organizations cultivate resilience and agility in response to disruptions.

2.3. Geopolitical Disruptions and Supply Chain Management

Geopolitical disruptions are among the most complex challenges faced by global supply chains today. Events such as the US-China trade war, Brexit, and the COVID-19 pandemic have exposed vulnerabilities in global supply networks, forcing firms to redesign their supply chains to enhance resilience and adaptability (Huq et al., 2021). Existing research has explored various responses to such disruptions, including sourcing strategies, risk management practices, and energy transition initiatives. For instance, Huq et al. (2021) highlight how aerospace firms adopt nearshoring and insourcing strategies to mitigate geopolitical risks and protect intellectual property, while Roscoe et al. (2020) examine how pharmaceutical firms adapted to Brexit by implementing contingency plans and worst-case scenario strategies.

While these studies offer valuable insights into firm-level responses, they tend to focus on isolated events or short-term adaptations, failing to address the broader, ongoing processes through which organizations adapt to geopolitical disruptions. For example, Ivanov and Dolgui (2020) introduce the concept of "intertwined supply networks," emphasizing the importance of flexibility during disruptions. Kähkönen et al. (2023) further stress the need for dynamic capabilities, particularly the ability to reconfigure resources in response to external shocks. However, these studies often view such adaptations as discrete responses rather than components of a continuous evolutionary process.

The complexity of geopolitical disruptions, such as shifting trade policies, economic sanctions, and regional conflicts, demands a broader understanding of how firms systematically adapt their supply chain strategies over time. Existing studies (e.g., Scholten et al., 2016; Nikjow et al., 2022) highlight the importance of resilience and adaptability but fail to capture the iterative processes through which firms respond to evolving geopolitical landscapes. This oversight creates a significant research void, particularly in understanding how firms integrate short-term

responses with long-term strategies to maintain competitiveness and stability in volatile global markets.

This study addresses this critical gap by adopting an exploratory, qualitative approach to investigate how firms evolve their supply chain strategies to manage geopolitical risks. Qualitative research enables the identification of patterns, processes, and mechanisms that are often invisible in static, quantitative studies. By focusing on the dynamic interplay between disruption and adaptation, this research seeks to uncover how firms build resilience through iterative learning, resource reconfiguration, and strategic realignment.

2.4 Value Creation in Supply Chain Risk Management

Value creation refers to the process of generating benefits for stakeholders by delivering outcomes that enhance competitive advantage, operational performance, and long-term sustainability (Lepak et al., 2007; Narayanan et al., 2009; Tantalo and Priem, 2016). Within the context of SCRM, value creation extends beyond the traditional focus on minimizing costs or improving efficiency (Fierro Hernandez and Haddud, 2018; Trkman et al., 2016). While cost reduction and risk mitigation are critical, they represent only a fraction of what SCRM can achieve. The majority of existing literature on SCRM emphasizes risk avoidance and impact minimization, often neglecting how SCRM can actively enable firms to create and sustain value, particularly during periods of disruption (Pang et al., 2015; Ponomarov and Holcomb, 2009; Trkman et al., 2016). This oversight highlights a need to reframe SCRM as a mechanism that not only protects but also enhances the value creation of firms (Trkman et al., 2016).

To address this gap, scholars argue that SCRM should simultaneously focus on managing unexpected events, mitigating risks, and identifying opportunities to create value for the firm (Fierro Hernandez and Haddud, 2018; Jääskeläinen and Heikkilä, 2019; Trkman et al., 2016). The aim is not merely to eliminate risks and uncertainties but to equip firms with the tools and insights needed to become more risk-informed (Schmitt and Singh, 2012). By adopting a risk-informed approach, firms can go beyond defensive strategies and leverage SCRM as a proactive tool to generate additional value for both shareholders and stakeholders (Chowdhury et al., 2023; Hahn and Kuhn, 2012; Holweg and Helo, 2014). This includes utilizing risk management

processes to identify inefficiencies, uncover new opportunities, and enhance decision-making (Sodhi and Tang, 2021). The inherent nature of SCRM lies in its dual role: mitigating disruptions while simultaneously driving value creation. For instance, risk assessments can help firms optimize supply chain processes, improve supplier relationships, and align their risk management strategies with broader organizational goals (Duong et al., 2023) . This alignment ensures that SCRM contributes not only to operational resilience but also to strategic growth and competitiveness.

Supporting literature further reinforces the idea that SCRM is a vital mechanism for aligning supply chain management with a firm's strategic objectives and stakeholder expectations (Collier and Sarkis, 2021). By fostering resilience and adaptability across the supply chain, SCRM enables firms to maintain operational continuity, even in the face of disruptions. This continuity is critical for sustaining stakeholder value creation. The ultimate objective of SCRM should be sustainable value creation for the firm and its stakeholders (Trkman et al., 2016). Sustainable value creation involves striking a balance between mitigating risks and maximizing opportunities to drive positive outcomes across the supply chain (Klibi et al., 2010). The literature acknowledges that SCRM is not an isolated operational activity but a strategic management function capable of driving value across the entire business ecosystem (Ganesan et al., 2009). For example, by embedding SCRM into strategic planning, firms can better anticipate risks, align resources effectively, and create a competitive advantage (Kwak et al., 2018). Moreover, sustainable value creation ensures that the benefits of SCRM extend to all stakeholders, fostering long-term trust and collaboration within the supply chain network (Trkman et al., 2016). This broader perspective highlights the importance of considering SCRM as both a protective mechanism and a value-generating capability.

However, while much of the literature underscores the importance of value creation in SCRM, there is still limited understanding of the underlying mechanisms that enable firms to achieve this. Many studies highlight SCRM's potential to drive value creation but offer relatively little guidance on how firms can integrate these principles into their practices. For instance, it remains unclear how firms can effectively measure the impact of SCRM on stakeholder outcomes or

identify the specific processes through which value is created. These gaps in understanding hinder firms from fully leveraging SCRM's potential.

Taken together, this study aims to examine a process model that integrates SCRM and value creation. The proposed model highlights the simultaneous and iterative nature of managing risks while creating value, enabling firms to adjust their strategies and operations in response to changing external conditions. To this end, the integration of SCRM and value creation is conceptualized through the theoretical lens of OIPT to address the following research question: How can the processes of SCRM and value creation be integrated to enhance supply chain resilience during geopolitical disruptions?

3. **Research Methods**

To thoroughly comprehend the process model illustrating how SME multinational manufacturing firms develop their global SCRM capabilities in alignment with evolving value creation in China, particularly in the context of the US-China trade war that began in January 2018, we employed an inductive case study research design (Eisenhardt, 1989, 1991; Eisenhardt et al., 2016). This methodological approach is particularly apt for our investigation for several reasons. Firstly, the case study method facilitates an in-depth examination of selected firms within their real-life contexts, capturing the nuances and complexities of their strategic adaptations within a dynamic economic landscape. By selecting a diverse array of cases representing a spectrum of SMEs impacted by the trade war, we gained insights into patterns of resilience and innovation in supply chain management across various industries. The data collection process was multifaceted, involving in-depth interviews with key decision-makers, on-site observations, and analysis of internal documents. This triangulation of data sources ensured a robust and comprehensive data set from which to derive insights. Our analytical process adhered to grounded theory principles, with data being iteratively coded and analyzed (Eisenhardt, 2020). This iterative approach allows themes and patterns to naturally emerge from the data rather than imposing preconceived notions or frameworks. Through this approach, we aimed to construct a grounded model of global SCRM processes that reflects SMEs' experiences and is informative for theoretical development.

Moreover, the case study methodology offers a holistic perspective, essential for understanding the 'what' and 'how' of firms' strategic responses and the 'why'—the underlying strategic intent and contextual pressures driving these responses (Eisenhardt et al., 2016). It provided a framework for a narrative explaining the evolutionary process of SCRM and value creation.

3.1. Research context

The US-China trade war began in January 2018 when the United States, under the administration of president Donald Trump, initiated a series of trade measures that marked the start of increased trade tensions between the two countries. These measures included tariffs on solar panels and washing machines, which were followed by a broader set of tariffs on steel and aluminum imports in March 2018. China responded with its own set of tariffs on US goods, and the situation escalated from there: both sides implemented several rounds of tariffs on each other's products throughout 2018 and 2019. The US-China trade war provides an exemplary context for our research because it presents a unique opportunity to examine the impact of trade tensions on managing global supply chain disruptions. This setting allowed for an in-depth exploration of the ways multinational manufacturing firms adjust their supply chain strategies and operations in response to the complexities introduced by the trade conflict.

3.2. Sample selection

We employed a multistep sampling approach to examine how Chinese SMEs manage supply chain risk in response to the US-China trade war. To enhance the generalizability of our findings, we adhered to Eisenhardt's (1989) case selection criteria, ensuring a diverse sample from various industries and product categories. Initially, we selected firms from a list of high-technology SMEs in Suzhou provided by the Jiangsu Provincial Government. In contrast to random sampling, which is suitable for deductive research, theoretical sampling is intentionally nonrandom. Each case is selected for its potential to enrich theory-building by shedding light on the central phenomenon and addressing theoretical gaps, thereby enhancing overall generalizability (Eisenhardt, 1989; Hallen and Eisenhardt, 2012). Thus, we selected SMEs that had maintained global supply chain operations in the United States for at least five years prior to 2018.

Following these criteria, we identified 37 firms from the Suzhou Industrial Park and 26 firms outside the park. We engaged with these firms via governmental and regional committee connections. We successfully established contact with 19 firms from the Suzhou Industrial Park and 9 firms outside it. We conducted informal communications with these firms to verify their experience in supply chain management and their efforts to mitigate disruptions arising from the US-China trade war. Ultimately, we confirmed that these firms had actively managed geopolitical disruptions using their supply chain risk management capabilities, ensuring that the selected firms had implemented processes proven effective in mitigating risks associated with geopolitical challenges.

Through this selection process, we identified eight SMEs, as summarized in Table 1. These firms spanned a diverse range of product categories, encompassing solar panel-related products, automotive technology components, smart white home appliances, smart electronic devices, and telecommunication technology products. Before the formal data collection, we also communicated with the selected firms to understand how they were influenced by the US-China Trade war. The US-China trade war markedly affected these eight high-technology SMEs. SME A, engaged in solar panel-related products, encountered heightened tariffs on photovoltaic cells, resulting in increased production costs and project postponements. SME B, specializing in smart white home appliances, faced acute microchip shortages, leading to production stoppages and diminished market share. SME C, in the smart electronic devices sector, was compelled to elevate prices due to tariffs on circuit boards, which led to reduced consumer demand. SME D, focusing on telecommunication technology, grappled with export restrictions on critical equipment, impeding US market expansion and delaying service deployment. SME E, another smart appliance manufacturer, experienced elevated costs from tariffs on raw materials, undermining competitive pricing strategies. Lastly, SME F, also in the solar panel domain, dealt with supply chain disruptions for inverters, causing costly delivery delays. These disruptions highlight the significant challenges these SMEs faced in managing supply chain risks during the trade war. For the purpose of this study, the eight firms were categorized into three groups based on their sales growth performance: high, moderate, and low. This segmentation enables a more nuanced qualitative case analysis by facilitating the exploration of how firms with

varying levels of sales growth respond to disruptions and implement strategies. By grouping firms in this manner, the approach adds value to the research by uncovering patterns, highlighting differences in practices, and identifying strategies that contribute to resilience and value creation across performance levels.

[Insert Table I about here]

3.3. Data collection

To prepare for data collection, we collaborated with the selected SMEs to identify key informants within their organizations. These individuals offered valuable insights into how the firms' SCRM processes aligned with their value creation management. Our participants included CEOs, COOs, CPOs, product development managers, and key members from the logistics and operations teams. Over two interview phases, we conducted 65 formal semi-structured interviews, ensuring an understanding of the processes involved. The first round of interviews was conducted in July 2021, followed by the second round in May 2022. In the first round of interviews, we sought to examine the specific impacts of the US-China trade war since mid-2018 on firms' supply chain operations and management. Our objective was to explore the processes involved in supply chain management due to these disruptions and to investigate how firms navigated these challenges while managing their value creation. In the second round of interviews, we further examined the processes involved in supply chain management and value creation development in response to the US-China trade war. The length of the interviews varied, ranging from 30 minutes to three hours. A summary of the data sources is provided in Table II.

[Insert Table II about here]

We began the data collection with a structured approach in our initial round of interviews, using a semi-structured format to guide our conversations. We formulated questions designed to build a detailed profile of each participant, including the following inquiries: What is your current role within the company? How long have you been part of the organization? Can you describe your specific responsibilities and the tasks you perform in your position?

The intent behind these questions was to establish a rich understanding of the interviewees' professional backgrounds and involvement in supply chain operations. Having laid this groundwork, we then made the participants' firsthand experiences with developing SCRM capabilities aligned with the evolution of their value creation. We engaged the informants with reflective and probing questions: Can you describe the immediate impact of the US-China trade war on your supply chain operations? How do you define supply chain risk management capability within your organization? What specific risk-management frameworks or models does your company employ to identify and assess supply chain risks? Can you describe the processes and tools you use to monitor geopolitical risks, such as the US-China trade war, and their potential impact on your supply chain? How do you prioritize risks in your supply chain, and how are resources allocated to manage these risks?

During this phase, we carefully documented and synthesized the dialogue from each interview. These were subsequently shared with the interviewees and their organizations to verify their accuracy and maintain transparency while ensuring that individual responses were not disclosed to senior management to protect confidentiality. We actively sought feedback from the participants and amended the summaries where necessary in accordance with their insights. In addition to the formal interviews, we conducted 20 informal discussions to deepen our understanding and address specific issues raised by the participants. Our data collection strategy was comprehensive, incorporating concurrent and retrospective data, as suggested by Eisenhardt and Graebner (2007). We gathered a wide range of data through various means: semistructured interviews, site visits for observation, ongoing email exchanges for further feedback and clarification, and extensive examination of publicly available and private archival documents to complement our primary interview data. All participants explicitly consented to the interviews. The interviews were recorded in detail, transcribed verbatim, and then thoroughly analyzed by our research team. This methodical approach was essential to preserving the integrity and richness of the data for our research findings.

3.4. Data analysis

We initiated our case study analysis by constructing comprehensive case histories for each interviewee, adhering to the methodology described by Eisenhardt (1989). This entailed developing a consistent narrative for each case by integrating insights gathered from multiple interviews. Parallel to this, we used secondary resources to deepen our understanding of each case study's institutional contexts. Employing an inductive, exploratory approach, we analyzed the data with an open-ended perspective. Our primary objective was to decipher the process through which SME multinational firms enhance their global SCRM capabilities in concert with the evolving nature of their value creation. This exploratory stance was pivotal in guiding our analytical journey, given that we endeavored to uncover the underlying mechanisms and strategic endeavors that support the development of these capabilities amid ongoing changes in the firms' market offerings.

We used a systematic approach for data analysis, starting with open coding to categorize participant statements. This process involved several rounds of coding to create initial case-specific codes. To improve understanding and ensure accuracy, we asked participants and industry experts to review the codes. Their feedback helped refine the codes to better reflect the participants' perspectives.

During open coding, narrative statements were categorized into theoretical concepts, as shown in Figures 1-3. Key themes included "market and risk analysis," "supplier reliability challenges," "microchip availability assessment," "consumer demand changes assessment," "market access barriers," "cost structure effects," and "logistics disruption challenges," presented in the first-order column of Figure 1. Researchers repeatedly examined these narratives to ensure a comprehensive understanding. For instance, statements such as "We assess market trends to identify risks from trade disruptions," "Understanding dynamics helps us mitigate trade-related supply issues," "Continuous risk evaluation lets us adapt to tariff changes," "Analyzing competitors helps forecast impacts of trade policies," and "Risk analysis guides decisions in volatile trade conditions" were grouped under "market and risk analysis."

In the subsequent stage of analysis, we transitioned from open coding to axial coding. During

this phase, we refined initial codes into more abstract, second-order themes, allowing for a deeper synthesis of the data. The results are presented in the second-order theme categories in Figures 1-3. For instance, the theme "navigating supply chain tensions" encapsulated various first-order observations. This theme emerged from concepts such as "tariff-induced supply chain disruptions," "supply chain vulnerability assessment," "regulatory impact on supply chains," "photovoltaic supplier challenges," "microchip supply chain constraints," "circuit board supply chain effects," and "supply chain barriers from export restrictions" (See Figure 1). Similarly, the theme "pinpointing core vulnerabilities" is summarized from concepts including "supply chain dependency risks," "cost pressures from tariffs," "market disruption challenges," "operational delays and inefficiencies," "project timeline vulnerabilities," "microchip supply constraints," "consumer demand fluctuations," "equipment sourcing restrictions," "market expansion delays," "raw material cost volatility," "inverter supply interruptions," and "Logistical Network Strains" (See Figure 1).

In the third phase of data analysis, we transitioned from axial coding to aggregate dimension extraction. During this stage, we moved from second-order themes to developing comprehensive aggregate dimensions. Our investigation deepened as we explored broader constructs suggested by these themes. We conducted a meticulous comparative analysis, examining interrelations and potential expansions into new dimensions for deeper insights. For example, we integrated themes such as "enhancing information processing," "navigating supply chain tensions," and "pinpointing core vulnerabilities" into a unified dimension labeled "decoding disruption dynamics" (See Figure 1). Similarly, the second-order themes "driving data supply resilience," "strengthening communication pathways," and "improving system coordination" were abstracted into "synergizing information ecosystem" (See Figure 1).

The data analysis processes are illustrated in Figures 1 and 2.

[Insert Figures 1 and 2 about here]

4. Findings

Figure 3 illustrates a framework detailing the development of SCRM and value creation during geopolitical disruptions. The model includes four sequential stages: decoding disruption dynamics, synergizing the information ecosystem, catalyzing adaptive transformation, and architecting resilient adaptation. Each stage builds on the outcomes of the previous one—beginning with understanding disruptions, then integrating information, driving change, designing resilience, and ultimately fostering a sustainable adaptive ecosystem. Concurrently, we identified key aspects of a firm's value creation development corresponding to each SCRM evolutionary stage, including value-contextualized recalibration, value-driven communication, value-centric customization, and value-sustained resilience.

[Insert Figure 3 about here]

4.1. Stage 1: Decoding disruption dynamics

In the first stage of SCRM, SMEs focused on decoding the risks posed by the US-China Trade War. Each SME faced unique challenges rooted in their specific supply chain structures, requiring tailored strategies to assess and manage disruptions. SME A prioritized evaluating supplier reliability in the US, using historical data and supplier performance reports to identify potential vulnerabilities. SME B concentrated on ensuring a steady supply of microchips, analyzing market trends and industry forecasts to anticipate shortages. SME C examined the impact of tariffs on circuit boards by modeling cost scenarios and monitoring regulatory developments. SME D worked to address export restrictions on telecom equipment through compliance assessments and legal consultations. SME E tracked volatile raw material prices to assess their impact on procurement strategies, while SME F mapped its inverter supply chains to identify potential bottlenecks and assess the overall health of its supply network. These within-case descriptions illustrate how SMEs approached disruption dynamics in ways that reflected their specific operational contexts while setting the stage for identifying shared strategies across cases.

Across the cases, SMEs adopted strategies that revolved around three key processes: enhancing information processing, navigating supply chain tensions, and pinpointing core vulnerabilities. While the specifics of each case differed, these shared processes reveal broader patterns and commonalities in how SMEs adapted to disruption.

Enhancing information processing emerged as a critical process for SMEs, particularly given the rapid and unpredictable nature of geopolitical risks. SMEs recognized the importance of gathering accurate and timely information from diverse sources, such as industry reports, news outlets, supplier updates, and government announcements. This information was not merely collected but systematically analyzed to identify patterns and anticipate risks. For example, SME A's CEO described their approach, stating, "*We needed to grab every bit of information we could to stay ahead*." This quote demonstrates how SMEs considered information a critical resource for maintaining competitiveness and reducing uncertainty. Similarly, SME B's COO emphasized the importance of identifying trends early, noting, "*Seeing trends early helped us adjust quickly*." These proof quotes illustrate how SMEs relied on thorough data collection and analysis to enhance their ability to act proactively. SME F also underscored the importance of reliable information, with its operations manager explaining, "*Getting the data right helped us make smarter moves*." Together, these examples show how SMEs developed systematic approaches to information processing, enabling them to anticipate disruptions and respond effectively. For example, the CEO of SME C illustrated:

> *"During the US-China trade war, effectively managing supply chain risks meant improving how we collected, analyzed, and shared information. By ensuring all teams had access to accurate data, we were able to adapt quickly to tariff changes, mitigate disruptions, and identify alternative suppliers to maintain stability and resilience".*

In addition to improving information processing, SMEs had to focus on navigating supply chain tensions caused by the ripple effects of geopolitical disruptions. These tensions often stemmed from dependencies on key suppliers, shifting regulations, and market volatility. To manage these challenges, SMEs prioritized open communication and collaborative relationships with their suppliers and stakeholders. SME D, for instance, relied on transparency with its partners

to address export restrictions. The CEO of SME D explained, "*We talked openly with our partners, and that really helped us solve problems*." This power quote highlights the relational aspect of SCRM, emphasizing how trust and collaboration enabled SMEs to navigate uncertainties effectively. Similarly, SME E worked to identify and strengthen relationships with reliable suppliers who could provide stability during volatile times. The operations manager of SME E noted, "*We realized whom we could trust, and that made it easier to spot problems*." These examples illustrate how SMEs managed supply chain tensions by fostering trust and communication, which enabled them to maintain flexibility and resilience in their operations. The CEO of SME G reflected on this theme in detail, stating:

> *"Geopolitical disruptions forced us to re-evaluate how we worked with our suppliers. During the trade war, we faced issues like tariff hikes and shortages in raw materials…. To adapt, we focused on building stronger partnerships with suppliers who could adjust alongside us. Sharing information—whether it was updated forecasts, regulatory changes, or solutions to delays—became essential….By working together, we were able to anticipate problems and create contingency plans that reduced the impact on our business…. It wasn't just about responding to crises but about creating partnerships that could help us remain competitive and resilient in the face of uncertainty."*

Finally, SMEs engaged in pinpointing core vulnerabilities within their supply chains to prepare for potential disruptions. This process involved systematically identifying critical dependencies, weak points, and potential bottlenecks through detailed supply chain mapping, risk assessments, and scenario planning. For example, SME A conducted a comprehensive mapping exercise to locate weak points in its supply chain. The CEO of SME A described this effort, stating, "*We mapped everything to find where we might get stuck*." This proof quote provides authoritative evidence of the importance of identifying vulnerabilities to build resilience. Similarly, SME B employed stress tests and simulations to predict potential disruptions and develop contingency plans. The operations manager of SME B explained, "*These tests showed us where we needed backup plans*." These approaches enabled SMEs to identify and target critical risks, allowing them to implement preemptive measures such as

diversifying suppliers, exploring alternative logistics routes, and improving supply chain agility. The CEO of SME H shared their experience, reflecting:

> *"When we, um, started looking at our supply chain, it became clear—like, really clear—that we were too dependent on, uh, just a few suppliers for some pretty important components. And… that's not something we could ignore. I mean, we saw how bad it could get during disruptions, like the trade war. So, um, we began by mapping everything—everything. From raw materials to delivery, we wanted to see exactly where we were at risk. And once we had that picture, uh, we knew we had to diversify. We brought on new suppliers, stocked up on key materials, and even… uh, redesigned a few products so they wouldn't need components that were hard to get. We also started doing scenario planning, like… asking, 'What happens if there's a delay here? Or if this cost spikes?' It became part of how we operated. Um, I guess what I'm saying is, addressing those weak points gave us, uh, a sense of control—like we weren't just waiting for something to go wrong. We were ready. And that kind of preparation, it's, uh, it's huge when you're dealing with so much uncertainty."*

Together, these three interconnected processes—enhancing information processing, navigating supply chain tensions, and pinpointing core vulnerabilities—formed the foundation of how SMEs decoded disruption dynamics. By systematically improving their ability to interpret rapidly changing risks, building trust and collaboration within their supply networks, and identifying key weaknesses, SMEs were able to adapt to the challenges posed by the US-China Trade War. These processes did not operate in isolation but worked together to enable SMEs to construct proactive and resilient strategies. The insights from these within-case descriptions and cross-case analysis provide a solid foundation for the conceptual framework, illustrating how SMEs successfully navigated complex disruptions while building long-term resilience.

4.2. Stage 2: Synergizing information ecosystem

In the second stage of SCRM, SMEs focused on synergizing their information ecosystems to manage the disruptions caused by the US-China Trade War. This process involved integrating data systems, strengthening communication, and aligning operational workflows to create a seamless flow of information across supply chains and internal functions. SMEs recognized

that fragmented systems limited their ability to respond effectively to disruptions, as they hindered real-time decision-making, transparency, and coordination. By addressing these challenges, SMEs aimed to build more adaptable and resilient information ecosystems.

SME A, for instance, developed a central data hub to integrate supplier and production information, which allowed the organization to respond quickly to changing tariff regulations. The CEO of SME A explained, "*We needed a single source of truth that would allow us to act fast without second-guessing the data*." This centralization ensured that key operational decisions, such as adjustments to sourcing or pricing, were based on reliable and up-to-date information. SME B improved its digital communication systems, enabling real-time updates on component availability to align production schedules with supply chain conditions. An informant from SME B noted, "When everyone is on the same page, we can avoid costly delays." SME C combined analytics tools with market data to forecast trends and proactively adjust pricing strategies. The CEO of SME C stated, "*Our ability to predict what's coming gave us an edge in staying competitive*." SME D worked with technology providers to create a streamlined data flow for compliance and export management, while SME E emphasized cross-departmental training to improve data sharing and decision-making. SME F focused on enhancing information flow between logistics and procurement to mitigate the impact of supply delays, aligning these functions to reduce inefficiencies.

These specific examples illustrate the diverse strategies SMEs employed to address the challenges of disrupted information ecosystems. While each SME adopted approaches tailored to their unique contexts, three overarching themes emerged: driving data supply resilience, strengthening communication pathways, and improving system coordination.

Driving data supply resilience was a top priority for SMEs, as they recognized the need for robust systems that could collect, analyze, and act on data quickly and accurately. SME A and SME F, for instance, streamlined their supply chain analytics to adjust rapidly to shifting demand patterns and optimize logistics, reducing delays and costs. The manager from SME A emphasized the importance of data systems, stating, "*Our analytics help us adapt quickly and stay ahead*." This proof quote underscores how SMEs relied on data-driven insights to maintain

agility and competitiveness. SME B adopted data-driven sourcing strategies to identify alternative suppliers, ensuring continuity in production despite shortages. Similarly, SME C focused on improving demand forecasting to ensure inventory levels matched market needs, preventing overproduction or shortages. The CEO of SME C explained, "*Accurate forecasting is crucial for us*," emphasizing how predictive insights helped them anticipate and mitigate risks. These examples demonstrate how SMEs built data supply resilience to support rapid decision-making and reduce operational vulnerabilities. The COO of SME E emphasized the importance of leveraging data systems, explaining:

> *"We had to build systems that could, you know, give us real-time insights, not just outdated reports. Once we had that, we could see problems earlier—whether it was a supplier delay or, um, a demand spike—and act faster. It wasn't just about collecting data; it was about using it to stay flexible and keep things running smoothly."*

In addition to building resilient data systems, SMEs worked on strengthening communication pathways to enable transparency, alignment, and collaboration across their supply chains and internal teams. SMEs recognized that fragmented communication channels often led to misalignments between stakeholders, causing delays and inefficiencies. Digital tools played a crucial role in addressing this challenge. For example, SME A deployed real-time dashboards to provide project updates, ensuring that internal teams were aligned and informed about key developments. An informant from SME A noted, "*Real-time updates keep our team informed, so everyone is working toward the same goals*." SME B expanded its supplier network through digital platforms, fostering stronger relationships and enabling faster responses to disruptions. These efforts not only improved operational transparency but also built trust with critical stakeholders, creating more collaborative supply chain networks. The COO of SME B remarked, "*Building better communication channels with suppliers has made all the difference in how we handle disruptions*." These examples highlight how SMEs strengthened communication pathways to improve internal alignment and external collaboration during times of uncertainty. The supply chain manager at SME D shared their perspective, saying:

"One of the biggest challenges for us was, honestly, just getting everyone to talk more openly—whether it was with suppliers or within our own teams. We started scheduling weekly updates with suppliers to share forecasts and challenges, and it was amazing how quickly we started solving problems together. On top of that, we rolled out a messaging tool for internal use, so there's a constant flow of updates. It's not perfect, of course, but compared to before, we're so much more aligned. Decisions happen faster, and everyone knows where things stand. In times of uncertainty, that level of clarity really matters."

Finally, SMEs focused on improving system coordination by aligning production, logistics, and regulatory processes to ensure efficiency and resilience. This involved integrating workflows across departments and supply chain functions to minimize bottlenecks and maintain operational stability. SME D, for example, integrated compliance data into its logistics systems to ensure smooth international operations while avoiding regulatory penalties. An informant from SME D explained, "Integrating compliance has minimized risks and streamlined our processes." Similarly, SME F improved inverter supply coordination by aligning production schedules with supplier deliveries, which reduced downtime and increased overall productivity. The manager from SME F stated, "Aligning schedules with suppliers has greatly boosted productivity." These examples show how SMEs improved system coordination to maintain efficiency and adaptability in the face of disruptions caused by the trade war. The supply chain manager at SME H reflected on their efforts, saying:

"For us, the key was getting everyone on the same page—production, logistics, even our compliance team. Before, these functions were operating in silos, and it caused a lot of delays and confusion. So, we brought in a centralized system to track everything in real time—deliveries, production schedules, even changes in regulations. It wasn't easy at first, but once the system was in place, the difference was night and day. Production delays dropped, and we were able to respond to issues much faster. I'd say better coordination across the board is what helped us stay competitive, even during the worst disruptions."

Taken together, the strategies to drive data supply resilience, strengthen communication pathways, and improve system coordination enabled SMEs to synergize their information

ecosystems effectively. Robust data systems allowed SMEs to anticipate risks and respond with agility, while improved communication pathways fostered trust and transparency within supply chain networks. Enhanced system coordination ensured alignment across production, logistics, and compliance processes, reducing operational inefficiencies and enabling proactive adjustments to external disruptions.

These interconnected strategies formed the foundation for SMEs' resilience during the US-China Trade War. By addressing the weaknesses in their information ecosystems, SMEs built systems that were flexible, transparent, and aligned, enabling them to adapt to rapidly changing circumstances and maintain operational continuity. These findings provide a critical basis for the conceptual framework, illustrating how SMEs utilized their information ecosystems as a key mechanism for navigating and mitigating the impacts of geopolitical disruptions.

4.3. Stage 3: Catalyzing adaptive transformation

In the third stage of SCRM, SMEs prioritized catalyzing adaptive transformation to manage the disruptions caused by the US-China Trade War. Recognizing that static approaches would no longer suffice, SMEs reconceptualized their operations, supply chains, and market strategies to build resilience and maintain competitiveness in a volatile environment. By adopting adaptive strategies, SMEs aimed to mitigate risks, reduce costs, and secure long-term stability while responding to immediate challenges.

Each SME implemented specific measures to transform its operations. SME A relocated its photovoltaic cell production to lower-cost regions, reducing the impact of tariffs and maintaining profitability. SME B diversified its supplier network and redesigned its products to address microchip shortages, ensuring production continuity. SME C focused on enhancing product features and improving customer service to maintain demand despite higher tariffs. SME D expanded into new international markets to offset the effects of export restrictions, while SME E streamlined operations and renegotiated supplier terms to reduce raw material costs. SME F enhanced inventory tracking and strengthened supplier relationships to ensure timely deliveries. These examples highlight how SMEs tailored their adaptive transformation strategies to their unique operational contexts and challenges.

Despite the diversity of these approaches, three overarching strategies emerged as central to catalyzing adaptive transformation: reconceptualizing resource allocation, expanding supply network topologies, and optimizing market entry dynamics.

Reconceptualizing resource allocation was one of the first steps SMEs took to adapt to the disruptions caused by the trade war. By reevaluating how resources were distributed across their operations, SMEs improved efficiency and reduced unnecessary costs, ensuring that investments were directed toward areas of greatest strategic importance. For example, SME C streamlined its procurement process by selecting suppliers more strategically, resulting in significant cost savings. A manager from SME C noted, "Streamlining our suppliers has significantly reduced overhead." Similarly, SME F focused on strengthening its supply chain infrastructure to ensure the availability of critical components and mitigate the risk of delays. The manager from SME F emphasized, "Building a resilient logistics network is crucial for stability." These examples illustrate how SMEs reconceptualized their resource allocation strategies to build resilience and optimize operational performance in response to geopolitical disruptions. The CEO of SME A shared their perspective as follows:

> *"We had to, um, really take a hard look at how we were using our resources. A lot of it wasn't going where it should, you know? Like, we were spending too much on things that didn't actually help us adapt to the disruptions we were facing. So, we shifted focus. We cut back on areas that weren't critical and redirected those resources into securing suppliers and improving logistics. That change—it made a big difference. We were leaner, more focused, and a lot more prepared when new challenges came up."*

In addition to rethinking resource allocation, SMEs adopted strategies for expanding supply network topologies to increase flexibility and reduce dependency on single suppliers. By creating more diverse and interconnected supply networks, SMEs were better equipped to handle shortages, delays, and other supply chain risks. SME A, for instance, expanded its photovoltaic supply network by partnering with multiple suppliers to ensure a steady flow of materials. An executive from SME A explained, "Diverse sourcing is essential to our strategy." Similarly, SME B diversified its microchip sources, reducing its reliance on a single supplier

and mitigating the risks of shortages. SME F developed contingency plans and alternative logistics routes to handle unexpected disruptions, allowing it to maintain operational continuity. The manager from SME F stated, "Contingency plans are non-negotiable in today's market." These examples demonstrate how SMEs expanded their supply network topologies to build redundancy and flexibility into their supply chains, enabling them to navigate disruptions more effectively. For example, the COO of SME B described their practice:

> *"We knew we couldn't keep relying on just one or two suppliers for critical components. It was, um, too risky, especially with everything going on during the trade war. So, we started looking for alternatives—new suppliers, you know, in different regions. We also worked on building stronger relationships with the suppliers we already had. That way, if something went wrong with one supplier, we'd have options. It took time, but now our supply chain is more flexible, and honestly, we're in a much better position to handle disruptions."*

Finally, SMEs focused on optimizing market entry dynamics to enhance their competitiveness and capitalize on new opportunities in the face of geopolitical challenges. This involved refining market entry strategies to reduce time-to-market, diversify customer bases, and mitigate risks associated with restricted markets. SME A accelerated product launches and streamlined distribution processes to reduce time-to-market, gaining a competitive edge over rivals. A manager from SME A explained, "*Speed to market gives us a competitive edge*." SME B increased brand recognition through targeted marketing campaigns, ensuring that customer demand remained strong despite supply chain disruptions. SME D expanded into emerging markets to diversify its customer base and reduce reliance on restricted regions. The CEO of SME D remarked, "*Expanding our geographical footprint is key to overcoming disruptions*." These examples highlight how SMEs optimized their market entry dynamics to maintain growth and resilience in a volatile global environment. A product manager from SME C illustrate their practice:

> *"The trade war made it clear we couldn't rely so much on the U.S. market anymore. Tariffs, export restrictions, and, um, all the political uncertainty were just too risky. So, you know, we decided to focus on other regions, especially in Europe and Southeast Asia, where demand was growing. At*

the same time, we worked on shortening our product launch cycles—it was all about being faster and more adaptable. That combination helped us not only reduce our dependency on the U.S. but also stay competitive in new markets despite the challenges."

By focusing on reconceptualizing resource allocation, expanding supply network topologies, and optimizing market entry dynamics, SMEs were able to catalyze adaptive transformation and build resilience against the challenges of the US-China Trade War. Stage 4: Architecting resilient adaptation

In the final stage of SCRM, SMEs focused on architecting resilient adaptation, developing systems capable of responding to both immediate disruptions and long-term uncertainties. Unlike earlier stages that emphasized short-term adjustments, this stage reflects a deliberate effort to embed resilience into the core of supply chains and operations. The strategies SMEs employed revolved around three interrelated themes: designing modular supply chains, strengthening adaptive partnerships, and embedding predictive resilience. By incorporating these strategies, SMEs created adaptable frameworks that ensured continuity while positioning themselves for sustainable growth in an increasingly volatile global market.

Each SME approached resilient adaptation differently, shaped by their unique operational contexts and challenges. For example, SME A addressed the uncertainty of tariff fluctuations by investing in modular components that could quickly adjust to changing tariff regimes. This allowed the company to reconfigure production lines efficiently, minimizing delays and costs. As the CEO explained, "Our components quickly adjust to tariff changes, giving us the flexibility to stay competitive." SME B, on the other hand, responded to microchip shortages by adopting flexible manufacturing systems and integrating alternative technologies. At the same time, it strengthened relationships with key microchip suppliers to ensure a stable supply. The CEO of SME B remarked, "Reliable supply is crucial—without it, everything else falls apart." SME C took a different route by diversifying its supplier base, reducing dependency on any single source, even at the expense of higher costs. An executive from SME C noted, "Expanding our supplier base increased our resilience, even if it meant slightly higher costs."

SME D tackled export restrictions by forming alliances with local partners in new markets, enabling rapid expansion despite regulatory constraints. A senior manager at SME D highlighted the importance of adaptability, stating, "Our adaptable equipment and partnerships helped us enter new markets despite challenges." Meanwhile, SME E sourced alternative raw materials to counter the impact of tariffs, achieving a 20% reduction in costs while maintaining production schedules. The company also leveraged partnerships to stabilize prices and reduce volatility. An informant from SME E explained, "Collaborating on sourcing stabilized prices and reduced uncertainty in our supply chain." Finally, SME F focused on optimizing logistics to minimize delays in the supply of inverters, designing modular systems that reduced downtime during disruptions. An operations manager at SME F emphasized, "Our modular solutions ensure we can pivot quickly when the unexpected happens." These within-case descriptions highlight how SMEs tailored their strategies to address their specific challenges, providing the groundwork for a broader analysis of shared patterns and themes.

Across cases, three key practices emerged as central to resilient adaptation. The first, designing modular supply chains, was a recurring theme across SMEs. Modularity enabled firms to adjust product configurations, reconfigure supplier relationships, and adapt production processes in response to disruptions. SME A's modular components, for example, allowed it to navigate tariff fluctuations without significant operational delays, demonstrating the importance of flexibility in maintaining competitiveness. SME F applied a similar approach by designing modular inverters, which minimized downtime during supply chain disruptions, ensuring continuity in production. As the CEO of SME A remarked, "*Modularity is not just about efficiency—it's about survival in a volatile market*." This power quote underscores the strategic significance of modularity in building resilient supply chains. By decoupling dependencies and enabling rapid adjustments, modular systems allowed SMEs to remain agile in the face of external shocks. A supply chain manager from SME D described their perspective:

> *"The trade war really forced us to rethink how rigid our supply chain was. Um, we realized that if one supplier or product line got hit by tariffs or delays, everything could grind to a halt. You know, there was no room to adjust. So, we started designing modular systems—breaking our products and processes into smaller, interchangeable parts. That way, if something went wrong, we could*

quickly reconfigure without disrupting the whole operation. It's not just about being efficient; it's about being adaptable. Modularity has become the backbone of how we manage risk now."

The second practice, strengthening adaptive partnerships, involved building collaborative networks with suppliers, local partners, and other stakeholders to create flexible solutions and reduce dependencies. SME B, for instance, strengthened its relationships with microchip suppliers to ensure consistent supply during shortages. The CEO of SME B emphasized, "*Reliable supply is crucial*." SME C diversified its supplier base to mitigate risks associated with over-reliance on a single source, increasing resilience to supply chain disruptions. As an executive from SME C explained, "*Expanding our supplier base increased our resilience, even if it meant slightly higher costs*." SME A formed local partnerships to secure a steady supply of raw materials, while SME D collaborated with local stakeholders to accelerate market entry and navigate export restrictions. SME E's partnerships helped stabilize raw material prices, while SME F developed alternative supplier relationships to avoid delays in inverter supply chains. These partnerships were not merely transactional but strategic, enabling SMEs to co-create solutions and share risks. As an informant from SME E noted, "*Collaborating on sourcing has stabilized prices and reduced uncertainty in our operations*." Across cases, adaptive partnerships emerged as a critical enabler of resilience, fostering trust, collaboration, and flexibility. A supply chain manager from SME F reflected that:

"The trade war created so much unpredictability, especially with raw material prices. Um, we couldn't just rely on the same suppliers—we had to start building partnerships that were more, you know, adaptable. For example, we worked closely with local suppliers to stabilize costs and secure steady deliveries. It wasn't just about buying and selling anymore—it became a two-way collaboration. By sharing information and planning together, we reduced uncertainty and kept our operations running smoothly. Honestly, these partnerships are what helped us stay resilient through all the disruptions."

The third practice, embedding predictive resilience, involved leveraging advanced analytics, forecasting tools, and scenario planning to anticipate and proactively address potential disruptions. Predictive tools enabled SMEs to assess risks, forecast demand, and prepare for

regulatory changes, allowing them to act decisively in times of uncertainty. SME A used predictive analytics to analyze tariff impacts and adjust its strategies accordingly. The CEO of SME A explained, "*Predictive analytics help us stay ahead of market changes*." SME B implemented forecasting tools to monitor microchip inventory and avoid bottlenecks, ensuring production continuity. An operations manager at SME B noted, "*We use forecasts to manage inventory efficiently*." Similarly, SME D conducted scenario planning to anticipate export restrictions and prepare for regulatory changes, enabling the firm to adapt quickly to new regulatory environments. A senior manager at SME D stated, "*Scenario planning allows us to adapt quickly to new regulations and avoid costly delays*." SME F applied predictive tools to optimize inventory and logistics to streamline operations and reduce costs. As the operations manager at SME F explained, "*Predictive tools have streamlined our logistics, reducing costs and ensuring we're always prepared*." Across cases, predictive resilience emerged as a key enabler of proactive decision-making, helping SMEs minimize disruptions and maintain continuity. For instance, the supply chain manager from SME B elaborated:

> *"Predictive tools have completely changed how we manage our supply chain. Um, before, we were always reacting to disruptions, whether it was shortages or sudden changes in demand. Now, we can, you know, anticipate problems before they happen. For example, we use forecasting to predict inventory levels and avoid bottlenecks. On top of that, advanced analytics help us optimize our logistics so we're not stuck with unnecessary delays or extra costs. You know, these tools have made us much more proactive. Instead of scrambling to fix things, we can stay one step ahead—even in such an unpredictable market."*

Taken together, these strategies—modular supply chains, adaptive partnerships, and predictive resilience—formed the foundation of resilient systems that allowed SMEs to navigate both immediate and future challenges. Modularity provided the flexibility to adapt to sudden changes, partnerships fostered collaboration and reduced dependencies, and predictive resilience empowered firms to anticipate risks and act proactively. These interconnected strategies reflect how SMEs moved beyond reactive adjustments to develop robust frameworks capable of sustaining long-term resilience. As the CEO of SME A remarked, "Building

resilience is not about reacting to today's problems—it's about preparing for tomorrow's uncertainties."

By grounding these findings in detailed within-case descriptions and cross-case analysis, this stage provides a clear foundation for the conceptual framework. The strategies identified—designing modular supply chains, strengthening adaptive partnerships, and embedding predictive resilience—demonstrate how SMEs architected systems that balanced flexibility, collaboration, and foresight. This framework not only explains how SMEs responded to the disruptions of the US-China Trade War but also offers insights into how firms can position themselves for sustained growth and stability in the face of future uncertainties.

4.4. Value Creation process

4.4.1. Value-contextualized recalibration

During the decoding disruption dynamics stage, SMEs reassessed their strategies to navigate the complex challenges of the US-China trade war. This process involved addressing the immediate impacts of tariffs, supply chain disruptions, and shifting market demands to preserve customer value and maintain competitiveness. Two interconnected strategies emerged from this stage: value-focused market adjustment, which centered on recalibrating market strategies to address immediate disruptions, and value-driven strategic realignment, which involved longer-term shifts in operational priorities to build resilience and adaptability. Together, these strategies reflect how SMEs decoded disruption dynamics by placing value at the core of their decision-making.

Value-focused market adjustment was a critical strategy for managing short-term challenges. SMEs recalibrated their pricing, sourcing, and distribution strategies to ensure their offerings remained competitive in the face of rising costs and disrupted supply chains. For example, SME B undertook a detailed analysis of its cost structure to absorb tariff-related increases without overburdening customers. The CEO of SME B explained, "*We had to dig deep into our costs and find savings to keep our prices competitive*." This quote provides authoritative evidence of how SMEs actively worked to balance cost pressures with customer retention. Similarly, SME

F shifted its focus to local markets, reducing its reliance on international trade to mitigate the risks posed by tariffs and logistical disruptions. As the manager of SME F reflected, "*Focusing on local markets has been a lifesaver for us*." This statement captures the emotional relief and strategic importance of pivoting to domestic markets during a time of uncertainty. Additionally, SME D focused on supplier relationships to stabilize costs and protect quality. The CEO shared the insights:

> *"Rising tariffs and raw material costs were a big problem. We couldn't just pass those increases on to customers—it would've priced us out of the market. Instead, we renegotiated contracts and sourced more materials locally to avoid tariff-related hikes. It wasn't easy, but it was necessary to keep our products competitive and maintain the trust of our customers."*

In addition to market adjustments, SMEs engaged in value-driven strategic realignment to ensure long-term resilience and adaptability. This strategy involved diversifying market exposure, optimizing supply chains, and adopting flexible operational models to reduce vulnerability to future disruptions. For instance, SME C expanded into new international markets, reducing its reliance on regions affected by the trade war while identifying new customer segments. An informant from SME C emphasized, "*Exploring new markets was essential for spreading our risk*." This quote highlights the strategic foresight and calculated risk-taking involved in seeking new opportunities. Meanwhile, SME D focused on optimizing its value chain by adopting lean and flexible supply chain practices. This approach enabled the company to respond quickly to changing customer demands while maintaining cost efficiency. An informant from SME D stated, "*Keeping our supply chain lean and flexible made all the difference*." These examples underscore how strategic realignment allowed SMEs to adapt their operations and prepare for future uncertainties. For example, the product manager from SME A expressed:

> *"The trade war completely disrupted how we operated. You know, with tariffs driving up costs and delays making planning so difficult, we had to rethink our supply chain. You know…We made operations to eliminate inefficiencies and worked closely with suppliers to make sure we could*

adjust quickly to changes. To make our supply chain lean and flexible made all the difference—it allowed us to adapt to disruptions and stay competitive in a volatile market."

Both strategies were deeply interconnected. Value-focused market adjustments addressed immediate disruptions, enabling firms to stabilize their operations and preserve customer relationships. Simultaneously, value-driven strategic realignment ensured that SMEs were not just reacting to challenges but also transforming their businesses to remain competitive in the long term. For example, SME B's cost recalibration efforts complemented SME C's market diversification strategy, as both focused on maintaining value for customers while spreading risks. Similarly, SME F's shift to local markets aligned with SME D's supply chain optimization efforts, demonstrating a shared commitment to agility and adaptability.

The importance of these strategies is reflected in the experiences of SME executives, who described the challenges of navigating the trade war as both a threat and an opportunity for growth. The CEO of SME B remarked, "We realized that resilience is not just about surviving the disruption—it's about finding ways to thrive in it." This power quote captures the broader mindset shift that SMEs experienced as they decoded disruption dynamics and transformed their businesses. By placing value at the center of their strategies, these firms not only weathered the immediate impacts of the trade war but also positioned themselves for sustainable growth in uncertain markets.

4.4.2. Value-driven communication

During the synergizing information ecosystem stage, SMEs adopted value-driven communication to create efficient and collaborative systems of information exchange. This approach prioritized the creation and preservation of value for all stakeholders by ensuring that critical information flowed seamlessly across internal teams, supply chain partners, and other external collaborators. Through value-driven communication, SMEs aligned their strategies with stakeholder expectations, managed trade disruptions effectively, and enhanced their ability to adapt to changing conditions. By integrating communication tools and fostering collaboration, SMEs decoded the complexity of trade war disruptions and translated it into actionable strategies.

To implement value-driven communication, SMEs focused on enhancing their internal communication systems and building collaborative networks that reinforced shared resilience. Internally, value-integrated communication systems allowed SMEs to improve the speed and accuracy of decision-making. For example, SME C implemented real-time data-sharing systems to ensure that changes in tariffs and supply chain conditions could be addressed without delays. As a manager from SME C explained, "*Real-time data sharing was crucial for making quick adjustments*." This proof quote highlights the importance of timely and accurate communication in maintaining operational agility. Similarly, predictive analytics became a critical tool for anticipating potential risks and disruptions. SME E leveraged predictive analytics to identify vulnerabilities and respond proactively. A manager from SME E noted, "*Predictive analytics allowed us to stay ahead of potential disruptions*." These tools ensured that SMEs could not only react to disruptions but also anticipate them, enabling more strategic and informed decision-making. For example, the CEO from SME E indicated:

> *"During the trade war, there were just so many moving parts, like…tariffs, delays, raw material issues. Predictive analytics allowed us to forecast where disruptions might happen and take action before they became problems. Like, we could reroute shipments or adjust production schedules to avoid delays. This wasn't just about avoiding risks—it was about ensuring we continued to deliver value to our customers, no matter how chaotic the situation got."*

Externally, SMEs enhanced their communication ecosystems by fostering value-centric collaborative networks. These networks emphasized partnerships, knowledge sharing, and co-innovation, enabling SMEs to collectively address the challenges posed by the trade war. SME A, for instance, formed strategic partnerships with industry peers to share resources and insights. A manager from SME A remarked, "*Our partnerships have been key in navigating the trade challenges*." This quote demonstrates how collaboration strengthened resilience across the value chain. Similarly, SME D participated in cross-industry forums to share knowledge and foster innovation. Reflecting on these efforts, a manager from SME D explained, "*Sharing knowledge across the value chain helped us stay innovative and adaptable*." These networks not only provided immediate solutions to trade disruptions but also created long-term opportunities for growth and innovation. Reflecting on these efforts, the product manager from SME F shared:

"We realized early on that we needed to collaborate beyond our industry to stay ahead during the trade war. Um…Participating in cross-industry forums allowed us to learn from others facing similar challenges, like dealing with tariffs or finding alternative suppliers. Sharing knowledge about the value development of our products across the value chain helped us stay innovative and adaptable. It wasn't just about solving short-term problems—it also opened up new ideas and opportunities for long-term growth."

Integrating internal systems with external networks allowed SMEs to create a synergized information ecosystem that prioritized value at every level. Real-time data sharing, predictive analytics, and collaborative partnerships worked together to ensure that all stakeholders were aligned, informed, and prepared to respond effectively to disruptions. As one SME executive emphasized, "Strong communication isn't just about sharing information—it's about creating a system where everyone, from suppliers to customers, can act together." This power quote encapsulates the broader vision of value-driven communication as a unifying force that enables agility and resilience during periods of uncertainty.

4.4.3. Value-centric customization

During the catalyzing adaptive transformation stage, SMEs responding to the disruptions of the US-China trade war prioritized value-centric customization to adapt their products, services, and processes to meet evolving customer needs and market demands. This strategy ensured that SMEs could deliver unique value while remaining flexible and competitive in an uncertain environment. Two interconnected strategies emerged during this stage: value-tailored solutions development, which focused on customizing offerings to align with customer preferences, and value-agile response mechanisms, which enabled SMEs to adapt swiftly to external disruptions and operational challenges.

To achieve value-tailored solutions development, SMEs tailored their products and services based on direct customer feedback, leveraging agile processes and iterative improvement to remain relevant in volatile markets. For instance, SME A redesigned its product offerings to reflect customer input, ensuring that its solutions aligned with shifting preferences and expectations. A manager from SME A explained, "*We had to rethink our product designs based on direct feedback to stay relevant*." This proof quote highlights how SMEs prioritized

customer-centricity by embedding feedback directly into their innovation processes. SME C, on the other hand, adopted modular development strategies and continuous feedback loops to make real-time adjustments to its offerings. An informant from SME C noted, "*Adapting quickly to customer input was key*." These examples underscore how value-tailored solutions development allowed SMEs to co-create value with their customers, ensuring that their offerings remained competitive and aligned with market needs. Additionaly, the CEO from SME D explained:

> *"You know…The trade war taught us that we couldn't just react to disruptions—we had to anticipate them. Using data analytics, we could predict where delays or cost increases might happen and adjust our plans accordingly. This wasn't just about avoiding risks—it was about ensuring we could consistently deliver value to our customers, even when the supply chain was under pressure."*

In parallel, SMEs implemented value-agile response mechanisms to respond rapidly to disruptions and maintain operational continuity. These mechanisms emphasized organizational flexibility, supply chain resilience, and real-time decision-making. For example, SME E established cross-functional teams that were trained to pivot quickly in response to unexpected challenges. As an informant from SME E remarked, "*Our teams had to be ready to pivot at a moment's notice*." This quote underscores the importance of agility in navigating sudden changes. Meanwhile, SME D incorporated uncertainty training into its operations, equipping employees with the skills and mindset needed to handle unforeseen disruptions. A manager from SME D explained, "*Being prepared for the unexpected became part of our strategy*." These strategies ensured that SMEs could adjust their operations swiftly, redeploy resources efficiently, and sustain value delivery despite external challenges. For instance, The CEO from SME D highlighted:

> *"The trade war created a level of unpredictability we had never seen before. Um…Our teams had to be ready to pivot at a moment's notice—whether it was finding a new supplier, renegotiating contracts, or reworking timelines. Flexibility wasn't just a nice-to-have—it became essential to our survival and our ability to deliver value to customers."*

The integration of value-tailored solutions development and value-agile response mechanisms created a process framework for SMEs to navigate disruptions while maintaining customer

satisfaction and operational resilience. Customizing offerings allowed SMEs to stay aligned with customer expectations, while agile response mechanisms enabled them to adapt quickly to changes in the external environment. Together, these strategies exemplify the dual focus on customer-centricity and adaptability that defined the catalyzing adaptive transformation stage. As one SME executive summarized, "Customization isn't just about products—it's about transforming how we operate to create value, no matter how unpredictable the circumstances." This power quote captures the broader mindset shift that SMEs adopted to thrive in the face of disruption.

4.4.4. Value-sustained resilience

During the architecting resilient adaptation stage, SMEs prioritized value-sustained resilience to navigate the challenges posed by the US-China trade war. This approach was essential for maintaining their value creation amidst disruptions caused by tariffs and supply chain uncertainties. SMEs recognized that resilience was a cornerstone for long-term stability and competitiveness, enabling them to protect their market position and consistently deliver products and services despite external shocks. By proactively embedding resilience into their strategies, SMEs were able to anticipate and mitigate the trade war's impacts, safeguarding their operations and preserving customer relationships.

To achieve value-sustained resilience, SMEs implemented value-protective systems to ensure continuous delivery of value even in the face of disruptions. These systems focused on enhancing risk management practices and establishing robust contingency measures to address potential vulnerabilities. For example, SME B quickly diversified its supplier base to avoid bottlenecks caused by trade restrictions. A manager from SME B explained, "We had to quickly diversify our suppliers to avoid potential bottlenecks." This proactive approach allowed SMEs to maintain supply chain continuity and avoid interruptions to production and delivery. In addition, SMEs developed detailed contingency plans that enabled them to respond swiftly to unforeseen challenges. By integrating these practices, SMEs ensured that their operations remained resilient and capable of meeting customer needs under challenging conditions. For instance, the product manager from SME F said:

"Having detailed contingency plans in place gave us a roadmap for handling unexpected situations.

Whether it was a delay in raw materials or a sudden tariff increase, we could act quickly and keep things running smoothly. It gave our customers confidence that we could deliver, even when external conditions were tough."

In parallel, SMEs emphasized value-consistent operations to strengthen processes and maintain stability during disruptions. This involved streamlining operations to enhance efficiency and flexibility, enabling rapid adaptation to the evolving trade environment. SME F invested in technology upgrades as part of this effort, enhancing operational agility and responsiveness. As an informant from SME F noted, "Investing in technology upgrades helped us stay agile and responsive." These technological improvements not only supported efficiency but also ensured that SMEs could quickly adjust to new market conditions. Maintaining consistent operations was a critical factor in preserving customer trust and loyalty. The CEO of SME A highlighted this, stating, "Our ability to deliver consistently was key to retaining customer confidence." By ensuring that their value offerings remained reliable and effective, SMEs reinforced their competitive position and strengthened their relationships with customers. For instance, the CEO from SME G stated:

"Investing in technology upgrades helped us stay agile and responsive, but more importantly, it ensured that our operations continued as planned even when the trade war caused unexpected challenges. You know…Consistency in our operations was able to give our customers confidence that we could deliver no matter what happened."

The integration of value-protective systems and value-consistent operations enabled SMEs to embed resilience throughout their business models. Diversified supply chains and robust contingency plans ensured that risks were mitigated, while operational streamlining and technology investments allowed SMEs to maintain stability and adaptability. Together, these strategies reflect an approach to resilience, focusing not only on protecting value but also on consistently delivering it during periods of disruption. As one SME executive summarized, "Resilience isn't just about surviving disruptions—it's about ensuring that our value remains reliable, no matter what happens." This power quote encapsulates the mindset shift that SMEs embraced as they architected resilience into their operations to navigate the complexities of the trade war.

5. Discussion

5.1. Theoretical contributions

This study makes several theoretical contributions to the SCRM literature. First, it introduces an evolutionary process model that significantly enriches our understanding of how firms manage supply chain risks in response to geopolitical disruptions. While prior research has primarily focused on discrete aspects of SCRM—such as buffering strategies to address internal factors or bridging strategies to mitigate external factors (Holgado and Niess, 2023; Ho et al., 2015; Katsaliaki et al., 2022; Ponis and Ntalla, 2016)—it has largely overlooked the processes through which firms adapt their risk management practices to navigate prolonged geopolitical uncertainties. This study addresses this gap by theorizing the evolutionary adaptation of managing supply chain risk, offering a process-based perspective that explains how firms respond to and manage the challenges posed by geopolitical disruptions. Unlike the previous research, which often adopts a static perspective, this study emphasizes the ongoing nature of managing supply chain risks under geopolitical disruptions. The proposed process framework demonstrates how firms iteratively adjust their strategies and resources to address uncertainties and maintain supply chain operations in volatile geopolitical environments. By advancing an evolutionary perspective, this study provides significant theoretical insights into the processes firms undertake to manage supply chain risks in complex and uncertain geopolitical contexts.

Second, this study makes a substantial contribution by establishing a co-evolutionary process that connects managing supply chain risk with value creation. Previous research often treats risk management in supply chains as an isolated activity, overlooking its fundamental connection to value creation for stakeholders (Fierro Hernandez and Haddud, 2018; Jääskeläinen and Heikkilä, 2019; Trkman et al., 2016). Supporting studies have identified insufficient investigation into the interaction between SCRM and value creation while also suggesting that SCRM can serve as a source of value generation (Trkman et al., 2016). By demonstrating how firms can synchronize risk mitigation with value creation efforts, this study reframes SCRM as more than just a defensive mechanism—it positions it as a proactive enabler of stakeholder value. This perspective challenges the traditional view of SCRM as a siloed

operational function focused solely on mitigating risks, instead highlighting its dual role in addressing risks and driving value creation. By connecting SCRM with value creation in parallel during geopolitical disruptions, the study introduces a co-evolutionary approach that allows firms to align their risk management efforts with strategies for value creation, even in highly uncertain and volatile environments. This contribution extends the theoretical discourse by encouraging scholars to explore how firms can leverage risk mitigation mechanisms not only to manage threats but also as a means of generating value for stakeholders.

Third, this study makes a significant theoretical contribution by integrating OIPT into the co-evolutionary process model of SCRM and value creation. By leveraging OIPT, this study provides a novel perspective to explore how enhanced information processing capabilities enable supply chain actors to simultaneously manage risks and co-create value in dynamic and uncertain environments (Tiwari et al., 2024; Manurung et al., 2023). This approach moves beyond traditional frameworks that view risk management and value creation as separate or sequential processes. Instead, it reframes them as interdependent and co-evolving processes that adapt in real time to external conditions. The integration of OIPT emphasizes the critical role of information flows, collaboration, and adaptive decision-making among supply chain actors in achieving outcomes that balance risk mitigation with value generation. It highlights how organizations process and share information to build resilience while co-creating value through relational exchanges and coordinated actions.

5.2. Practical implications

This study provides insights that SME managers can reflect on to enhance their SCRM and value-creation approaches in the context of geopolitical disruptions. First, SME managers can consider the process model as a helpful guide for navigating disruptions. The four stages of SCRM—decoding disruption dynamics, synergizing the information ecosystem, catalyzing adaptive transformation, and architecting resilient adaptation—offer a structured way to think about managing risks in uncertain environments. By following this process, managers may find opportunities to gradually adapt their operations and strengthen supply chain resilience over time.

Second, aligning risk management efforts with value creation can support both operational stability and stakeholder relationships. The value creation stages—value-contextualized recalibration, value-driven communication, value-centric customization, and value-sustained resilience—highlight how value can be embedded into SCRM practices. For example, focusing on clear communication or tailoring solutions to meet specific customer needs could help SMEs maintain trust and satisfaction even during disruptions.

Third, collaboration with supply chain partners can play a key role in navigating uncertainties. The OIPT perspective highlights the importance of working closely with partners, sharing information, and co-creating solutions. For SMEs, building strong relationships within their networks could help manage resource constraints and foster shared resilience. This collaborative approach may also open up opportunities for mutual value creation in challenging environments.

5.3. Limitations and future research directions

This study, while insightful, has certain limitations that open avenues for future research. A key limitation lies in the generalizability of the findings. Although this research makes a significant contribution by proposing an evolutionary process model within the context of SMEs impacted by the US-China trade war, future studies should explore the applicability of these findings across different contexts. This includes extending the analysis to larger corporations, varying geopolitical disruptions, and diverse national settings to determine whether the proposed model holds relevance beyond the specific circumstances.

Furthermore, while this study employs an inductive approach to develop the evolutionary process model, future research could incorporate quantitative methods to validate and expand these findings. Quantitative studies might focus on entrepreneurial startups, newly public companies, or firms operating in both technology-focused and traditional industries. Such investigations would offer deeper insights into how contextual factors influence the model's effectiveness and its application in managing supply chain risks across a broader range of organizational types and sectors.

6. Conclusion

This study develops a process model that captures the co-evolution of SCRM and value creation, offering a practical and theoretical framework for multinational SMEs navigating geopolitical disruptions, such as the US–China trade war. By examining the experiences of eight multinational SMEs and employing grounded theory techniques, the study identifies four iterative stages of SCRM—decoding disruption dynamics, synergizing the information ecosystem, catalyzing adaptive transformation, and architecting resilient adaptation—and their corresponding value creation stages. These findings highlight the interconnected nature of risk management and value creation, providing SMEs with a structured approach to strengthen resilience and enhance value delivery in volatile global supply chains. This research contributes to the understanding of how SMEs can adaptively manage risks while maintaining competitiveness in challenging geopolitical contexts.

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Figure 1: Data structure of global supply chain management process model (Source: Author's own compilation)

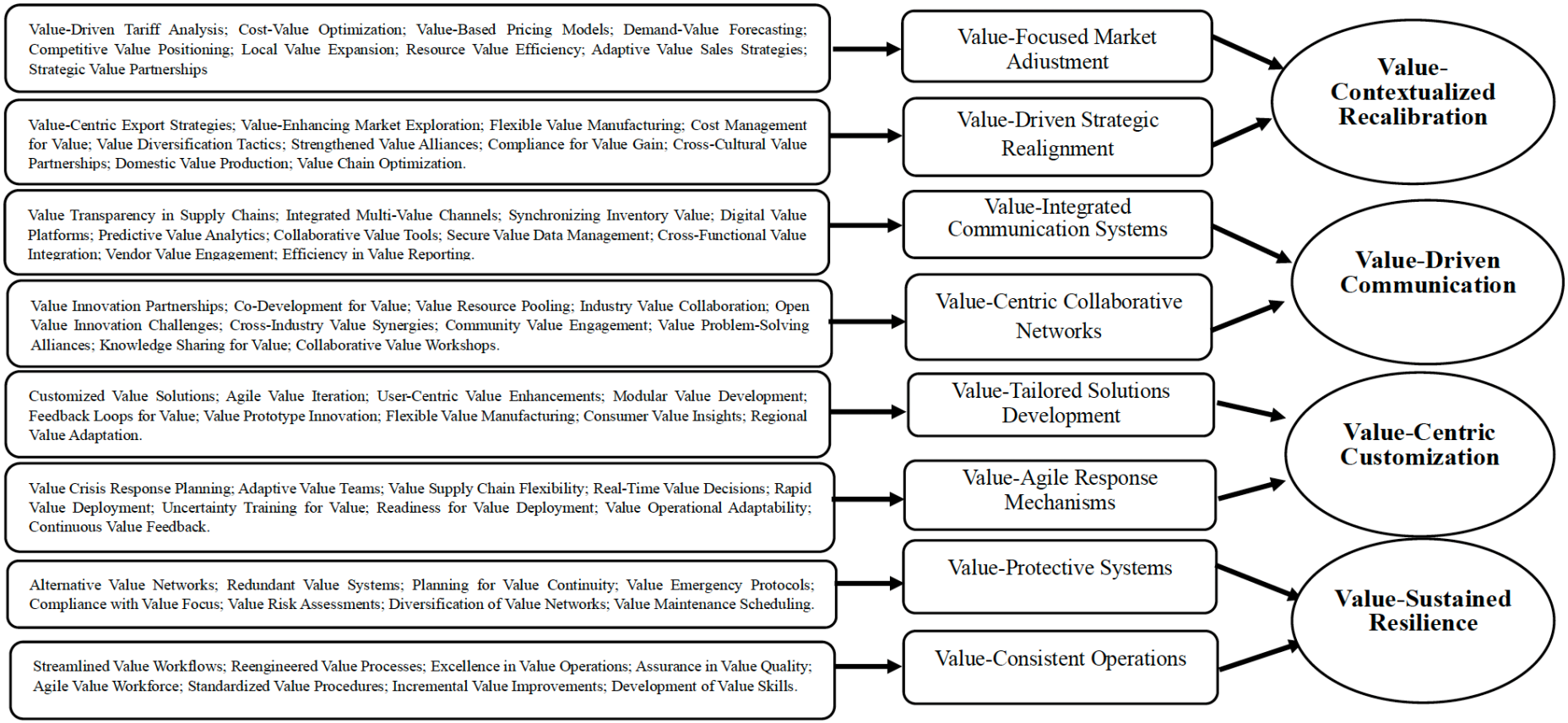

Figure 2: Data structure of value creation along with global supply chain management process model (Source: Author's own compilation)

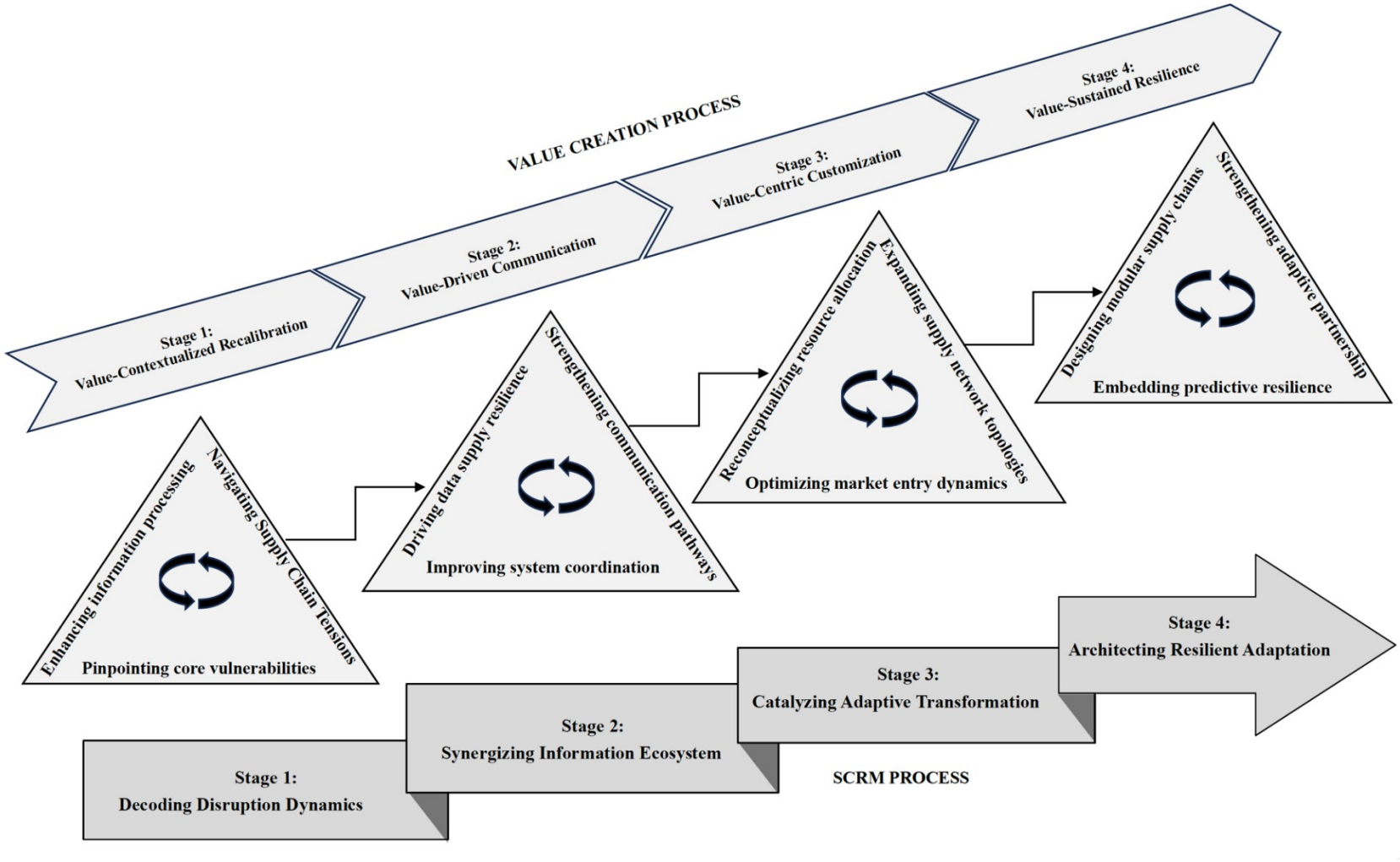

Figure 3: Integrating risk and value: a process model for evolving SCRM and value creation in US-China Trade War (Source: Author's own compilation)

Table I: Sample characteristics

Group	Firm	Founding Year	Firm Location	US Market Expansion History	Product Sector	Supply Chain Networks in the US	Importance of Sales in the US	Number of Other Overseas Markets
High	SME A	2008	Suzhou Industrial Park	8 years	Solar panel-related products	Yes	Very important	5
	SME B	2009	Suzhou Industrial Park	7 years	Smart white home appliances	Yes	Important	4
	SME C	2012	Outside Suzhou Industrial Park	6 years	Smart electronic devices	Yes	Important	2
Moderate	SME D	2007	Suzhou Industrial Park	9 years	Telecommunication technology	Yes	Moderately important	4
	SME E	2005	Outside Suzhou Industrial Park	10 years	Smart white home appliances	Yes	Very important	2
	SME F	2014	Suzhou Industrial Park	5 years	Solar panel-related products	Yes	Important	1
Low	SME G	2013	Suzhou Industrial Park	6 years	Smart electronic devices	Yes	Important	4
	SME H	2006	Outside Suzhou Industrial Park	8 years	Automotive technology	Yes	Very important	3

(Source: Author's own compilation)

Table II: Summary of Data Sources

Group	Firm	Semistructured Interview					Informal Consultation		
		CEO	COO	Supply Chain Manager		CPO/Product Manager	Informal Interview	Summary Documents Checked	
High	SME A	2	1		3	2	5	2	
	SME B	2	2		2	2	4	2	
	SME C	2	2		3	2	2	2	
Moderate	SME D	2	2		3	2	4	2	
	SME E	2	1		2	2	3	2	
	SME F	2	1		3	2	3	2	
Low	SME G	2	2		2	2	4	2	
	SME H	2	2		2	2	3	2	
Total		16	13		20	16	28	16	
Sum		65					44		

(Source: Author's own compilation)