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SUPPLY CHAIN COLLABORATION AND RELATIONSHIP MANAGEMENT IN MARITIME LOGISTICS DISRUPTIONS

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Abstract

Maritime disruptions are recognized for their massive impacts on global trade and supply chains, as exemplified by the severe shipping disruptions caused, for instance, by the recent attacks on commercial vessels in the Red Sea (UNCTAD, 2024). This research aims to investigate how collaboration is used to facilitate supply chain resilience during maritime disruptions. Relationships, as an enabler of collaboration, will be examined, specifically focusing on which relationship typologies influence companies to collaborate in response to these disruptions. A case study analysis of 32 companies in Thailand with experience in maritime disruptions is presented. These companies, including carriers, freight forwarders, and export-import companies were selected to represent the collaboration and relationships between buyers and suppliers of maritime transport. The findings show that companies need to develop supply chain resilience through collaborated processes and outcomes, and that this collaboration is built upon four relationship typologies: networking, obligating, transacting, and loyalty.

Keywords: Supply Chain Resilience, Collaboration, Buyer-Supplier Relationship, Maritime Disruption.

1. INTRODUCTION

Maritime disruption is recognized as a major risk to supply chains (SC), having massive impacts on entire SC networks (Lam, 2012). Companies that engage in international trade, from sourcing overseas materials to exporting finished products, have been confronting uncertainty in their operations and performance stemming directly from severe maritime disruptions, including port congestion, container shortages, and fluctuating shipping rates. On a broader scale, these disruptions can ultimately affect global trade and economic development (Nguyen et al., 2021). Extreme events can have tremendous impacts, as recently demonstrated by the Red Sea crisis, which has caused shipping freight rates and insurance costs to soar and shipment periods to extend (Bogetic et al., 2024). The shipment that trades through Suez Canal, and Red Seas, occupy 30 % of the world's container traffic that connects Asia and Europe (Bogetic et al., 2024; J.P. Morgan, 2024). It forecasts that the disruption will reduce the trade between Asia and Europe by up to 20% as the impacts can create ripple effects on other freight routes particularly from Asia to South America (Jacobsen, 2024).

Repeated maritime disruptions, such as those caused by the COVID-19 pandemic (Narasimha et al., 2021), the 'Ever Given' megaship incident in 2021 (Tran et al., 2025), and the Red Sea crisis in 2024 (Bedoya-Maya et al., 2025), have attracted increasing attention from scholars. Current studies on maritime disruptions tend to focus on managerial practices, concentrating on business and organizational operations and disruptions to transport networks. Primary studies focus on examining the root causes of maritime disruptions and their impacts on businesses, such as operational performance (Gurning et al., 2011) and company stakeholders (Wendler-Bosco and Nicholson, 2019).

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For the most part, scholars seek best practices to minimize their impacts. For example, studies propose that companies should implement mitigation activities based on different levels (i.e., port, transport system, supply chain, and regional) (Nguyen et al. 2021), the disruption phase (i.e., readiness, response, and recovery) (Gurning et al., 2011), or the duration of the disruption's impacts (short-term and long-term) (Notteboom et al., 2023).

SC resilience has been noted to help companies return to an original or improved condition when dealing with disruptions (Christopher and Peck, 2004). The previous research demonstrates how SC resilience facilitates companies to minimize the impacts of disruption, but also creates opportunities to solidify their market position after disruptions (Sheffi and Rice Jr, 2005) and maintain their performance (Chowdhury and Quaddus, 2016).

Research shows that businesses that are resilient in their SC can minimize the impacts of various disruptions, such as, extreme weather (Haraguchi and Lall, 2015; Sá et al., 2019), COVID-19 (Gunessee and Subramanian, 2020; Katsaliaki et al., 2022; Wieland et al., 2023), UK Brexit (Hendry et al., 2018), and food security (Amhamed et al., 2023). Scholars have drawn on different theoretical perspectives to understand how to develop SC resilience in their operations and SC networks. A mainstream of discussions concentrates on SC resilience abilities such as agility, flexibility, redundancy, visibility, collaboration, etc. (Hohenstein et al., 2015; Tukamuhabwa et al., 2015 Ali et al., 2017).

Collaboration is highlighted to help develop SC resilience (visibility, velocity and flexibility) (Scholten and Schilder, 2015). The previous studies acknowledge collaboration practices that need to develop in responding to disruption from practice perspective, for example, information exchanges between networks (Ponomarov and Holcomb, 2009; Pettit et al., 2013) and the creation of knowledge (Christopher and Peck, 2004). However, little is known about how collaboration is used in responding to disruptions. Moreover, the study of SC relationships in SC resilience is still in its infancy. While it is known that SC relationships are important for facilitating collaboration (Nidumolu et al., 2007; Duong and Chong, 2020; Lotfi and Larmour, 2022), but it has not yet fully explored the specific buyer-supplier relationship that drive companies to collaborate during a disruption.

In response to these, this research aims to examine the functions of collaboration in responding to SC disruption; particularly, in the case of maritime disruptions as it is significant for companies' survival in long-term. This study addresses this important research gap of Duong and Chong (2020) by exploring the collaboration needed to respond when a disruption occurs.

In this research, maritime disruptions refer to interruptions arising from both day-to-day operations (such as port congestion) and unexpected extreme environments (such as the COVID-19 pandemic and the Red Sea crisis). These disruptions have an impact on business operations and the SC, causing product damage and delays. Moreover, this research encompasses typologies of SC relationship management to enhance our understanding on how companies use their relationship with suppliers or buyers to develop collaboration.

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This research explores two primary research questions:

1) How companies use collaboration in developing SC resilience in response to maritime logistics disruptions?
2) Which relationship typologies do companies use to develop their collaboration in response to such disruptions?"

To answer the above questions, this study uses qualitative research focusing on maritime disruption. This research used case study research with semi-structured interviews to examine buyer-supplier relationships within three groups of companies: carriers, freight forwarders, and export-import firms. Thus, each group can represent both the buyer and supplier roles. Abductive analysis is employed to allow new theory to emerge from the empirical data, but at the same time the initial theoretical concepts are not ignored.

The contributions of this study are meaningful, extending the current knowledge in the area of SC resilience management. First, this study will identify collaboration from a functional perspective in response to maritime disruptions. Second, this research will identify various relationship typologies which have not been considered by prior SC resilience studies. To achieve this, the key constructs of collaboration and relationship management will emerge from an empirical investigation of case studies. At the same time, this study makes a significant contribution to the maritime disruption literature by integrating theory and practice. This is particularly notable because the topics of collaboration and relationship management have received limited discussion in the prior literature. This study will expand current research on the buyer-supplier relationship in sea freight logistics in Thailand. The sampling will not only include carriers but also freight forwarders and export-import companies. Lastly, practitioners in the area of operations and supply chain management can learn more about how to better implement ‘collaboration’ and manage ‘relationships’ to minimize the impact of future maritime disruptions.

The paper is organized as follows. Section 2 presents the theoretical background and literature review of the study. Section 3 outlines the research design, including case study selection, data collection, and analysis. Section 4 presents the findings of the research, and Section 5 presents the discussion. The final section is the conclusion, which includes theoretical contributions, implications for practice, limitations, and future research.

2. THEORETICAL FOUNDATION AND LITERATURE REVIEW

2.1 Supply chain resilience

Resilience has been presented in a number of fields in both the physical sciences and management theory (Purvis et al., 2016), including psychology, economics, and ecology (Ponomarov and Holcomb, 2009). The notion of SC resilience is that not all risks can be completely eliminated (Juttner and Maklan, 2011). Resilience is about consistently anticipating and adjusting to allow a return to pre-disruption, not about reacting to a single event (Hamel and Valikangas, 2003). When the idea is employed by SC, the content focuses more on a business and the measures it has taken to lessen the chance that an

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unforeseen interruption may affect its SC and networks (Rice and Caniato, 2003). SC resilience involves the SC's ability to cope with disruption and help it either move to a new, more desirable state after being disrupted or return to its original state (Christopher and Peck, 2004; Jüttner and Maklan, 2011).

The literature in SC resilience rests on three primary areas for building its resilience: capabilities, strategies, abilities, and phases. *SC resilience capabilities* involve developing a SC capability to enhance SC resilience and sustainable competitiveness in a changing context. Scholars who take this perspective have integrated strategic management theories from two main perspectives: 1) process capabilities - dynamic capabilities (Hendry et al., 2018; Nikookar and Yanadori, 2022; Silva et al., 2023), 2) managing resources-resource orchestration (Queiroz et al., 2022) and resource reconfiguration (Ambulkar et al., 2015). *SC resilience strategies* involve when to use and implement SC resilience strategies. The existent literature often discusses proactive and reactive strategies, which it can refers proactive strategies with pre-disruptions and reactive strategies with post-disruption (Wieland and Wallenburg, 2012; Tukamuhabwa et al., 2015; Ivanov et al., 2017). *SC resilience* abilities involve building SC resilience from engineering system perspective. Scholars suggest a broad suite of abilities that can build SC resilience, the classic SC abilities are flexibility, redundancy, agility, visibility, robustness, and collaboration (Sheffi and Rice Jr, 2005; Ponomarov and Holcomb, 2009; Jüttner and Maklan, 2011; Pettit et al., 2013), SC re-engineering and risk management culture (Christopher and Peck, 2004). SC resilience phases involve managing SC disruption in phases regarding the nature of disruption (Sheffi and Rice., 2004; Knemeyer et al 2009). Although the SC resilience phases are divergent, the common phases normally discussed are preparedness, response, and recovery.

2.1 Collaboration and relationship in SC resilience

- **SC collaboration and SC resilience**

Collaboration has been defined as the “ability to work effectively with other entities for mutual benefit” (Pettit et al., 2010, p.12). Prior studies indicate that collaboration is one of the main abilities of SC resilience (Christopher and Peck, 2004; Pettit et al., 2010, 2013; Jüttner and Maklan, 2011), its implementation helps reduce the impact of disruptions and enables their operations to continue smoothly (Jüttner and Maklan, 2011), as well as having an influence on performance development (Johnson et al., 2013). Collaboration mainly aims to mitigate risk, involving information exchanges between networks (Ponomarov and Holcomb, 2009; Pettit et al., 2013) and the creation of knowledge (Christopher and Peck, 2004). The collaboration involves decision-making on planning, demand and supply disruptions such as price changes, product and inventory quantity, incentive sharing between parties (Mandal, 2012), and availability of services (Autry and Bobbitt, 2008). Companies can use as part of proactive (in routine operations to mitigate risk) and/or reactive strategies (during disruption) (Hohenstein et al., 2015; Tukamuhabwa et al., 2015). For example, the study of Zhou et al., (2024) address that SC collaboration can create resilience of departments within a company to

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be aware and respond to a disruption, while it needs to combine collaboration with IT to build resilience with suppliers and consumers.

Much of the attention has been devoted to identifying collaboration practices that help enhance SC resilience. Scholten and Schilder (2015) examine in buyer-supplier collaboration in food processing in the Netherlands and show the need for 4 specific collaborations (information-sharing, collaborative communication, mutually created knowledge, and joint relationship efforts) that increase SC resilience (visibility, velocity and flexibility). Umar and Wilson (2021) also conducted their study in the food industry but in Pakistan. Similar to Umar and Wilson (2021); Lotfi and Larmour (2022) also address that the development of collaboration can be done with partners in horizontal and vertical SC. The study investigates which specific collaboration is required at the vertical level (such as buyers and suppliers) and horizontal collaboration (such as wholesalers working together, etc.). These two examine the SC resilience in business operations that are prone to high disruptions. However, research to date has focused little attention on collaboration function. The current literature lacks to explain how companies and their partners use collaboration to develop SC resilience.

This paper adopts Nidumolu et al.'s (2007) two categorizations of organizational collaboration as follows:

1. Coordinated processes: Stakeholders identify and share new operational processes.
2. Coordinated outcomes: Stakeholders work together to define desired outcomes.

The study on organizational collaboration by Nidumolu et al. (2007) categorizes the concept of collaboration into subcategories by focusing on its functions. This study developed a collaboration framework based on a case study of sustainability initiatives that aims to enhance group productivity in project development. The conceptual model proposed by Nidumolu et al. (2007), along with other studies on collaboration, has laid the foundation for further research in this field.

- **SC Relationship management**

Scholars have also studied the various factors that help enhance collaboration during SC disruptions, including relationships (Nidumolu et al., 2007; Lotfi and Larmour, 2022). Relationships are described as facilitating collaboration among stakeholders through relationship-building activities like communication, motivation, and training (Duong and Chong, 2020). To date, research in this area is only beginning to develop an understanding of how relationships enable collaboration.

In contrast, research on relationships in SC management in stable situations has been well-established for a few decades (Ellram and Hendrick, 1995; Benton and Maloni, 2005). Some scholars examine factors that influence the building of SC relationships. For example, Ferrer et al. (2010) indicate that certain factors positively influence SC relationships, such as sharing, power, and interdependency. Mena et al. (2013) examined multi-tier SC relationships related to global sourcing within UK food companies. Their study found that power balance, structure, interdependence, and relationship stability are

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significant factors. Some studies indicate that relationships can be classified into different typologies (Wu and Choi, 2005). Therefore, different types of relationships have a significant influence on buyer management. For example, Wu and Choi (2005) developed five typologies of supplier–supplier relationships from eight case studies: conflicting, contracting, dog-fighting, networking, and transacting. The study advanced the knowledge that suppliers might be obligated to join projects for both positive and negative aspects. Guided by this SC management literature, this study will examine the typologies of relationships that are important for building collaboration in response to disruptions.

2.1.2 Managing maritime logistics disruption

Maritime logistics disruption is recognized to be one major risk in SC disruptions (Lam, 2012). The previous literature has examined point out that maritime logistic operations are vulnerable from day-to-day operations, such as port congestion, equipment malfunction, and cleanliness inspection, as well as unexpected catastrophes, such as natural disasters, tsunamis, political events, etc. (Gurning et al., 2011). These incidents can have tremendous impacts not only on operations performance (such as, port operations, cargo traffic volume, financial impacts, etc.) (Gurning et al., 2011; Narasimha et al., 2021), but also create high damage on companies' stakeholders, including vessels, ports, inland shippers, and manufacturers (Wendler-Bosco and Nicholson, 2019). The impacts can be beyond freight SC on global trade and economic development (Nguyen et al., 2021). The study of Narasimha et al (2021) highlight COVID-19 as the cause of maritime transport and its SC disruption, as well as presenting the decrease in performance of main seaports in India after the disruptions.

The domain of the studies in maritime disruptions contributes to mitigation approaches. Scholars seek a suitable approach to minimize their impacts from broad perspectives (Lam, 2012; Errett et al., 2018). The list of practices studied in the extant literature includes rerouting of vessels, using modal alternatives, SC redesign, containerization etc. (Wendler-Bosco and Nicholson, 2019; Notteboom et al., 2023). Thus, these practices can also be implemented at different levels of transport networks, for instance, managing disruptions from the port level, transport system level, SC level, and regional level (Nguyen et al., 2021). Other, more specific practices occur in case of managing port disruptions, such as the employee recruitment and retention, financial and information flows, and threshold of port users, which the results show that these practices can enhance a port's operational resilience and create new opportunities, which in turn, shows enhance its port's performance in terms of financial health and market reputation (Loh and Thai, 2015).

Another common approach in managing maritime disruption involves designing practices that are suitable for each disruption phase (Gurning et al., 2011; Narasimha et al., 2021). This is similar to SC resilience phases. Gurning et al., (2011) suggest implementing supply flexibility and backup plans in pre-disruptions (readiness phase) for risk control and preparation; implementing inventory polling, monitoring, and changing working practices when disruptive events occur (response phase); and coordinating with SC partners, initiating instigation of an immediate maintenance program for equipment

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breakdown, utilizing back-up facilities, and allocate emergency budget in post-disruptions for recovery. The research also suggests how companies should implement activities after an event occurs when there is a lack of resources. The study addresses the need for collaboration from multi-sector and implements those activities based on the emergency (Errett et al, 2018).

Previous studies have examined various contexts of maritime disruptions to deepen our understanding. In particular, the scope of these studies is often concentrated on organizational and transport system levels (Nguyen et al., 2021). For example, Lam (2012) investigated mitigation techniques and how port disruptions spread throughout operational networks in Singapore.

Wendler-Bosco and Nicholson (2019) conducted a literature review on the impact of port disruptions on the maritime supply chain and the growing academic focus on port resilience. Recently, a study by Notteboom et al. (2023) illustrated the impacts of the Red Sea crisis on vessel operations and shipping networks, suggesting temporary adaptations or structural adjustments to overcome the situation. Some studies have broadened their scope to cover other businesses or organizations affected by maritime disruptions.

For instance, Errett et al. (2018) conducted interviews in British Columbia, Canada, to identify the effects of marine transportation disruptions on the availability of medical supplies and personnel required for providing acute hospital care in remote areas after a disaster. This study proposed approaches to help enhance system resilience in health care. Nguyen et al. (2021) conducted a literature review revealing the five countries with the most contributions are developed nations: the USA, Singapore, England, Australia, and Norway.

From the above literature review, current studies on maritime disruptions are concentrated on maritime business, organizational operations, and transport networks, focusing on the interruptions in material flow.

Furthermore, the literature on maritime disruptions has not moved beyond a practical lens. The studies offer sets of activities to mitigate the severity of maritime disruptions and lack advanced theoretical insight.

Taken together, the two perspectives of SC collaboration and relationships are likely to play significant roles in maritime disruptions. However, the literature has highlighted two major issues that require further exploration: how collaboration is used to enhance SC resilience in maritime disruptions, and which types of relationships within SC networks are important for enhancing their collaboration.

Figure I summarize an initial conceptual framework of SC collaboration that leads to SC resilience in maritime disruptions; thus, SC collaboration is enhanced by relationships. This research aims to extend the study of SC collaboration and SC relationships by building on the existing theories of organizational collaboration of Nidumolu et al. (2007) and SC relationships of Wu and Choi (2005). This research also uses an abductive qualitative approach.

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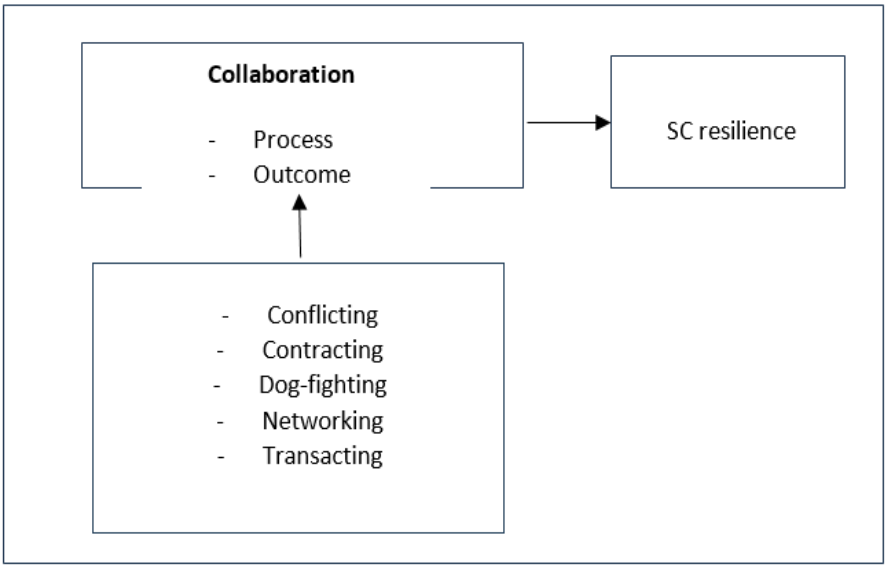

Figure 1: Initial framework for SC collaboration and relationship in response to maritime disruptions

3. RESEARCH DESIGN

According to the research questions, which aim to explore and generate understanding, this research employs a qualitative approach to understand SC partners' collaboration and relationships in responding to maritime disruptions. This study adopts a purposive sampling technique pertinent to the research questions (Saunders et al., 2012). Case study research was employed as it is appropriate for examining problems with phenomena closely linked to their real-life contexts (Yin, 2014). Therefore, data were obtained from carriers, freight forwarders, and export-import companies. These three groups of companies were selected as they represented buyers and suppliers in maritime logistics and were directly affected by the disruption. The interviews were conducted with a total of 32 companies in Thailand: 1) 11 carriers (informants included staff members in operations, customer service, or sales departments); 2) 10 freight forwarder companies (informants included staff from sales and/or operations departments); and 3) 11 export-import companies (informants included staff who worked in export-import, logistics, and SC departments). The informants were staff members, managers, and managing directors in those departments that had responsibility for responding to maritime logistics disruptions. The informants also met the criteria of having sufficient knowledge and direct experience with maritime disruptions that had impacted their companies. Data collection continued until data saturation was reached, at which point no new findings emerged from the data. The data were collected between January and May 2025. Semi-structured interviews were carried out as they allowed for the addition or omission of questions, a method well-suited for revealing relationships (Saunders et al., 2012). Questions framed by the literature served as a guideline, while the format provided the flexibility to add questions for a more in-depth investigation. An interview protocol was developed that

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outlined the objectives of the interview, the informants' backgrounds, and interview questions regarding collaboration and relationships in responding to maritime disruptions. The interview questions were designed specifically for the three groups of interviewees (carriers, freight forwarders, and export-import companies) and were open-ended to allow interviewees to describe the situation broadly. For example: "How did you collaborate with carriers/shipping agents/or customers?" and "Do relationships influence the cooperation between you and your partners (freight forwarders, carriers, customers)? If so, how?" Since the research context focuses on investigating a range of significant maritime disruptions, interviewees were asked how they responded to major disruptions that had major impacts on their businesses. The questions covered various incidents, including those from extreme environments (such as the COVID-19 pandemic and the Red Sea crisis), and those from operational disruptions (such as port congestion), that had impacted maritime logistics, causing product damage and delays. The interviews were audio-recorded (with prior consent) and lasted between 45 minutes and 2 hours. They were transcribed verbatim to preserve the full details and meaning. The data were transcribed by third parties, and the researcher then cross-checked the records to ensure the accuracy of the transcripts and maintain the quality of the data analysis.

This study adopted the company as its unit of analysis. The analysis focused on buyer-supplier relationships, specifically the interactions between carriers, freight forwarders, and (or) export-import companies, as well as between export companies and import companies. Thus, carriers represent suppliers who provide a carrying service of physical goods to freight forwarders and export-import companies. Freight forwarders, as middlemen, represent suppliers who provide services to export-import companies, as well as buyers who use services from carriers. Lastly, export-import companies represent buyers who purchase services from freight forwarders and (or) carriers. In this research, the words "buyer" and "customer" were used interchangeably. **Figure II** shows the process of international maritime delivery from an exporter to an importer; thus, a maritime disruption can occur at any particular time during delivery.

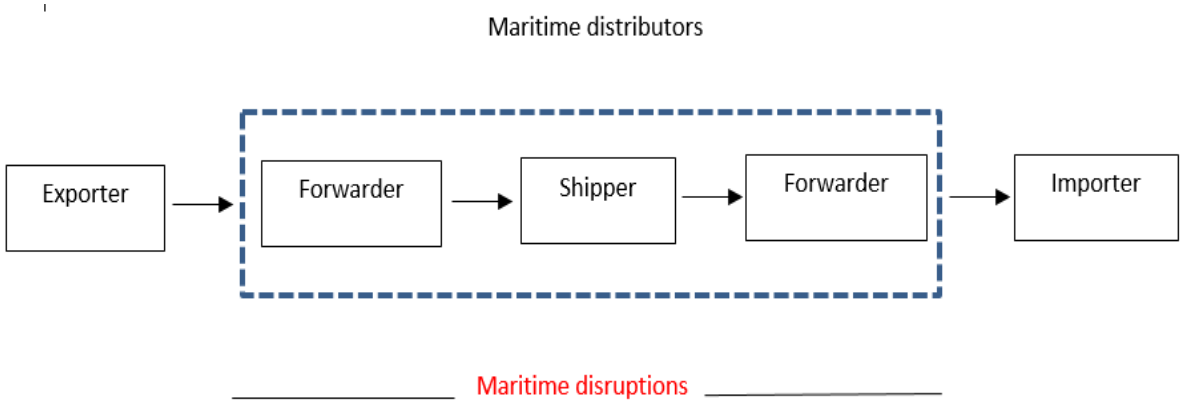

Figure 2: A framework of international maritime delivery process when there is a disruption.

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The data analysis was conducted using abductive analysis (Locke et al., 2008), which allowed for new theory to emerge from empirical data without ignoring existing theory (Dubois and Gadde, 2002). The data were coded according to the existing theoretical framework to explore company collaboration and relationships. However, new themes also arose from the empirical data. The definitions of these emerging concepts were refined based on the empirical data. For example, some of the coding utilized terminology from the existing literature on the supplier-supplier relationship, such as networking and transacting (Wu and Choi, 2005), while the analysis also allowed two new themes to emerge: obligating and loyalty.

The coding process followed Miles et al. (2014) and Saldaña (2015). First-cycle codes were inductively generated from the empirical data. Then, second-cycle coding was developed by looking for similarities and differences among the first-cycle codes to identify patterns. The interview transcripts from each case company were analyzed individually, followed by a cross-case analysis. Themes across the case studies were summarized to identify these patterns. Finally, the conceptual framework was revised.

4. FINDINGS

We summarize the findings across the company cases: carriers, freight forwarders, and export-import companies. The basic concepts of collaboration and relationship defined in the previous studies were used to guide and structure these findings.

4.1 Collaborated process and outcome

In analyzing the data, this study revealed specifically how collaboration is used to develop SC resilience. The findings identified two key dimensions of collaboration for developing SC resilience during maritime disruption.

Collaborated process involves buyers and suppliers in maritime logistics (carriers, freight forwarders, and/or export-import companies) working together on operating process. This form of collaboration includes information sharing, agreement coordination, and joint planning, is a fundamental collaboration that leads to collaborated outcomes. In other words, the companies involved share resources and work together to find solutions and solve problems.

Information sharing involves sharing, explaining, and updating critical information and valuable knowledge. This information may be relevant to vessel routes, additional expenses, disruption status, delivery rules, delivery dates, product concerns, causes of delay, import licenses, space availability, new delivery ports, and updated container prices. When a maritime disruption occurred, the export-import companies faced significant uncertainty and required timely, relevant information for their decision making. For instance, they needed up-to-date details on the disruption's status and delivery dates, available vessel space, and current container prices. To acquire this information, companies turned to their logistics providers, where each partner plays a distinct role. Carriers, for example, coordinate with port authorities to gather information on regulations and port conditions to share with their clients. Freight forwarders, acting as intermediaries,

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source this information from carriers to keep their own customers informed. Finally, exporters consolidate this data from their maritime logistics suppliers to update their end-customers and adjust their internal strategies, such as modifying production schedules, managing inventory, or redesigning operations. For this process to be effective, the shared information must be accurate, current, and in-depth. Moreover, SC partners can learn from each other in response to a disruption. For example, some export-import companies were inexperienced with maritime disruptions, and they did not know how to handle such situations. They needed support from their more experienced partners. Consequently, freight forwarders, who possessed greater expertise, had to share their knowledge with these buyers to help them navigate the crisis.

Agreement coordination involves ensuring that all partners adhere to the practices, procedures, policies, and safety protocols stipulated in their contract, including taking necessary precautions to avoid potential disruptions or accidents. The data demonstrate that new agreements regarding the emerging situation needed to be understood and accepted by the buyers. As such, a bulk vessel carrier asked the product owner and charterer not to pass through the risky area or war zone.

Joint planning occurs when buyer-supplier partners proactively work together on future activities to achieve shared objectives, such as planning container quantity and future corrections. The research findings showed higher levels of collaboration between export-import companies and freight forwarders than with carriers directly. For example, during the COVID-19 pandemic and the Red Sea crisis, which caused significant container shortages, exporters had to forecast their shipments several months in advance. This allowed their freight forwarders to negotiate container volumes with carriers. Simultaneously, export companies and their customers needed to coordinate on orders and production capacity. Joint planning also occurred in response to port congestion and container delays. In these situations, exporters and importers worked with their freight forwarders to find direct shipping routes that avoided transshipment and to avoid using carriers known for frequent delays. Additionally, suppliers (i.e., carriers and freight forwarders) needed to communicate with buyers and help them adjust their delivery plans in response to available vessel space that was more limited than usual.

Collaborated outcome refers to buyer and supplier companies working together for desired outcomes. The data highlight two types of outcome-focused collaboration that the companies used to enhance SC resilience, consisting of providing advice and solutions, and joint problem-oriented. This form of collaboration supports companies in responding to maritime disruptions, such as holding more inventory, using alternative modes of transport, or restructuring production schedules.

Solution coordination involves sharing and discussing potential solutions and making joint decisions for problem-solving. This includes addressing issues like additional demand, expenses, invalid import licenses, vessel routes, and delivery ports in risky areas. For example, during an invalid import license issue, a freight forwarder might discuss solutions with their customers, such as rerouting the shipment to a different country. In

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another case, if an importer urgently needed products from a large order, the freight forwarder could recommend breaking the order into smaller, partial shipments.

Cooperative action involves SC partners sharing responsibilities and working together to solve problems. The findings demonstrate that maritime suppliers and buyers share challenges and solve them together, showing a shift from individual responsibility to mutual support. For example, during a container shortage, when exporters were unable to book space, their import partners intervened by pressuring their local agents to help release containers at the delivery port. In another instance, the customer assisted the carrier with preparing the necessary documents for an insurance claim. These findings demonstrate that partners are willing to take on joint responsibility to solve problems. The data also show that several freight forwarders absorbed additional expenses, such as those from container shortages, overweight containers, and detention fees, instead of passing the costs to their customers.

4.2 SC Relationships

Table I summarizes key concepts from empirical data. The data show the varieties of relationships implemented at the case companies. The data illustrate 11 characteristics of buyer-supplier relationship (alliance, expertise, intimacy, contracting, policy, foreseeing, giving and taking, hands-in, maximizing, trusting and nationalism), and then they are further grouped into four typologies of relationship (networking, obligating, transacting, and loyalty). The definitions of typologies and descriptions for the sub-categories developed from the findings and existing literature are offered with evidence from the cases.

Table 1: Summary of Buyer-Supplier Relationship Typologies in the Maritime Industry

Typologies	Characteristics	Companies
Networking	Alliance	B5, B7, B10, B11, C6, F2, F5, F7, F8, F10
	Expertise	B3, B5, B9, C1, C3, C7, F3, F7
	Intimacy	B2, B4, B6, B11, C1, C4, C9, F1, F2, F3, F6
Obligating	Contracting	C2, C7, C11, F5, F6
	Policy	B11, C3, C10
Transacting	Foreseeing	C3, F2, F5
	Giving & taking	B1, B2, B8, C2, F4, F5, F6, F7, F10
	Hands-in	F1, F4, F8
	Maximizing	B5, B6, B8, C8, F3, F4, F6
Loyalty	Trusting	C1, C4, B2, F2, F7
	Nationalism	B3, C2, C5

Note: B- Export-import companies, C-Carriers, F-Freight forwarder

Networking describes a relationship where the companies in the buyers and suppliers cooperated to solve the maritime logistics problems by relying on their close relationships and their work characteristics. The data showed that this case occurred within existing relationships with buyers and suppliers. The suppliers and buyers had long-term

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relationships, working together in their day-to-day operations, and this collaboration continued during the disruptions. In this typology, the case companies decide to collaborate with one another because of three key characteristics of networking, including alliance, expertise, and intimacy. An *alliance* formed in their day-to-day operations when buyers and suppliers worked together, shared interests, and had mutual benefits. Some of them had pooled resources such as knowledge, skills, bargaining power, and money to work together. The findings showed that this type of relationship was one of the top priorities for companies providing mutual assistance during a disruption. For example, a carrier might have prioritized the containers of customers with whom they had such an alliance. An *expertise* relationship forms because of a partner's specialized knowledge. Buyers had a long-term business history with their suppliers, relying on them for their specialization in logistics. These suppliers were seen as having a good level of knowledge in managing disruptions, allowing them to explain problems and suggest effective solutions. This long-standing familiarity also assist buyers and suppliers to communicate easily during disruptions.

Intimacy leads to collaboration when a company and its partners have strong interpersonal relationships at the staff level, rather than just at the organizational level. Over a long business relationship, the staff at both the buyer and supplier companies can develop a sense of closeness and a personal connection, feeling like close friends. The findings also indicate that some buyers liked the personal characteristics of the salesperson. They understood each other's working styles and could communicate with ease. Several buyer companies showed that having a close relationship with sales representatives, particularly those from carriers, provided them with additional suggestions and in-depth information. They also acted on behalf of the customers to negotiate with their headquarters to resolve problems.

Obligating characterizes the buyer-supplier relationship where a relationship that arises from a legal duty or commitment by which companies are bound. In this typology, the case companies decide to collaborate with one another because of two key characteristics of obligating, including and contracting and policy. *Contracting* led to collaboration when a company helped another company solve disruption-related problems because of a formal and legally binding agreement. A sales contract that buyers had signed with their suppliers, either before or during a disruption, could force the suppliers to follow the agreement. For instance, buyers might have asked their suppliers (carriers and freight forwarders) to provide containers in the amount and at the prices specified in the contract, even though there was a container shortage and prices were higher. Similarly, charterers had to listen to the vessel owners who operated the route of the vessels to avoid risky zones, such as the Red Sea. *Policy* led to collaboration when a company considered that it aligned with its strategic goals. Some companies set their rules and criteria to facilitate such collaboration. For instance, a carrier helped customers because it aligned with its business ethics and performance. Another example was a carrier that would provide services on a "first-come, first-served" basis. Finally, freight forwarders would choose to assist their customers in a serious issue—for example, if the customers could not import certain items, their production would have been halted.

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Transacting describes a relationship where buyer and supplier companies work together to solve problems from maritime disruptions because of the resulting benefits.In this typology, the case companies decide to collaborate with one another due to the key characteristics of foreseeing, giving & taking, hands-in, and maximizing. Both foreseeing and maximizing relationships can be built either before or during a disruption, allowing for collaboration with both regular and spot-event customers. In contrast, giving & taking and hands-in relationships require buyers and suppliers to have a close relationship. *Foreseeing* led to collaboration when a company worked with another because they hoped that it would lead to future benefits and opportunities, such as new shipments or assisting with document amendment services. Suppliers helped solve the buyers' problems because they hoped to continue their business or to maintain their relationship in the future.

Furthermore, *Giving & taking* led to collaboration when a company worked together with another with an equal exchange of benefits between them. In this relationship, both companies normally took turns helping each other. For example, in normal situations customers might have provided a volume of containers or some information to the carriers or freight forwarders, and during a disruption the suppliers might have provided container space for the customers. Another example was in the case of the COVID-19 and Red Sea crises when there was a high demand for containers. Carriers asked their contract customers to pay a higher price than what was in the contract, and in return, they would provide the containers for them. *Hands-in* led to collaboration when a staff member of a supply company helped to solve a maritime disruption within the scope of their authority. This relationship characteristic was found with freight forwarders. The companies described that if they were close to the sales staff of carriers, the staff would be willing to help. However, the offers were limited and depended on what was requested. *Maximizing relationship* led to collaboration when a company worked with another by focusing on its own benefits and securing the best possible offer. This characteristic of relationship was normally found among buyers (e.g., export-import companies and freight forwarders) when the market demand for containers shifted. Buyers compared the benefits (e.g., prices, services) of their suppliers and then chose the best offers. These findings implied that the buyers were willing to change suppliers that provided the highest offer.

Loyalty describes a relationship where buyer and supplier companies work together to respond to problems because of their sense of unity and shared identity. A company may collaborate with another based on a long-term relationship built on two key factors: trust and nationalism. *Trusting* led to collaboration when a company believed that their partners were reliable, honest, and had a good reputation. The data showed that this type of relationship took time to develop. Buyers that trusted their suppliers (carriers and freight forwarders) made quick decisions to follow their advice when a disruption occurred. *Nationalism* led to collaboration when they shared a common nationality. The customers or carriers might have chosen to collaborate, such as by allocating space when demand was at its peak. The findings also demonstrated that this relationship occurred from the top management's policy, such as from one headquarter to another.

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Furthermore, the **Table I** demonstrated which characteristics of buyer-supplier relationships the case companies implemented for developing collaboration. If a company code appeared in a specific row, it implied that they implemented collaboration based on the particular characteristics of that relationship. That particular relationship characteristic was important and was considered for a company to create collaboration with their suppliers or buyers in response to maritime disruptions. The data also revealed that each company used a different relationship for collaborating with their suppliers or customers. For example, F10 appeared in alliance-networking and giving & taking-transacting, which meant that the company collaborated with their suppliers or customers because they considered an alliance and giving & taking relationship.

5. DISCUSSION AND CONCLUSION

5.1 Theoretical implications

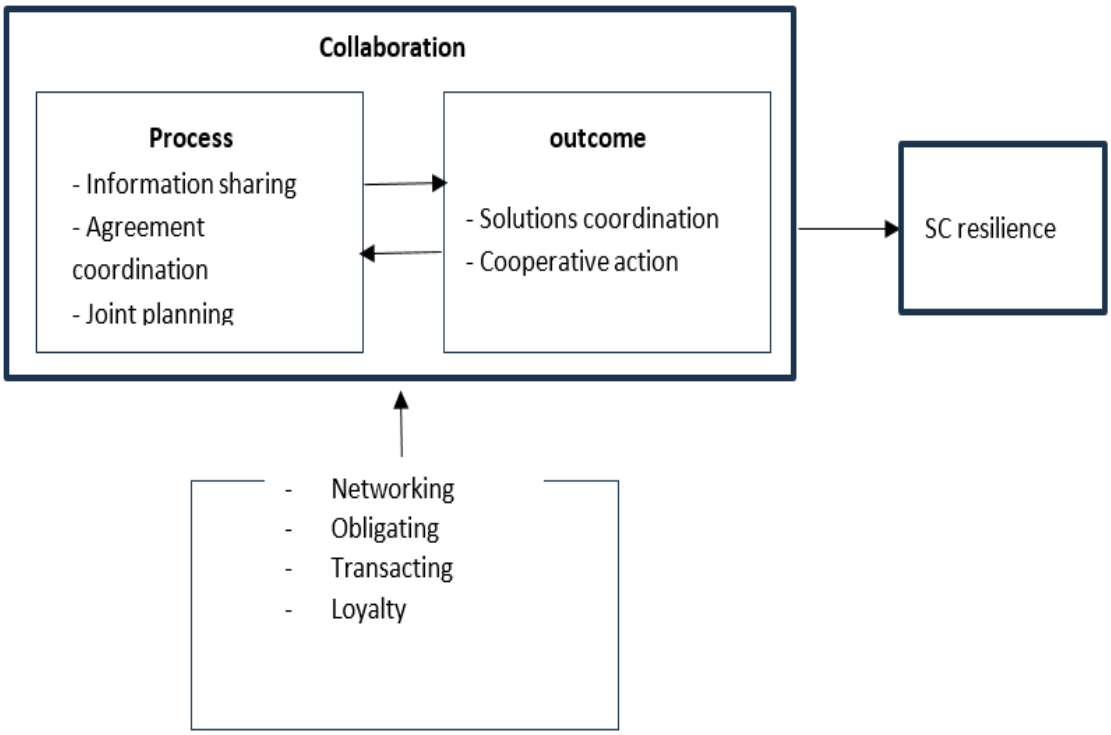

Figure 3: revised framework for SC collaboration and relationship in response to maritime disruptions

Based on the empirical data from our case study and abductive analysis, we revisit the framework. **Figure III** enhances our understanding of how SC collaboration is used, and it depicts the conditions for relationships in developing collaboration, which ultimately influence SC resilience in response to maritime disruptions. This study is in response to calls for a better understanding of the collaboration needed to respond to disruptions with empirical study (Duong and Chong, 2020). This study extends the current knowledge of

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SC collaboration into the context of a qualitative case study on maritime disruptions. The current study of collaboration in the food industry (Scholten and Schilder, 2015; Umar and Wilson, 2021) suggests that collaboration is likely to be specific and applicable only to a specific context. Companies can also prepare for natural disasters (Scholten et al., 2014) and COVID-19 (Zhou et al., 2024), which are low-probability occurrences. The study of maritime disruption is different.

Specifically, most companies that operate in a global SC need to deal with both small, short-term disruptions from day-to-day operations (such as port congestion, equipment malfunction, and cleanliness inspections) and serious, long-duration disruptions from unexpected catastrophes (such as natural disasters, tsunamis, or political events) (Gurning et al., 2011). The current study highlights the importance of relationships as an enhancer of SC collaboration (Nidumolu et al., 2007; Lotfi and Larmour, 2022), but it does not advance our understanding of how buyers and suppliers use their relationships to develop SC collaboration. Drawing on the supplier-supplier relationship in SC management (Wu and Choi, 2005), this study helps build typologies of relationships between buyers and suppliers that occurred during maritime disruptions.

The study also explains why companies create such collaboration and which relationship types motivate it. The empirical data help identify four typologies of buyer-supplier relationships in developing collaboration during a maritime disruption: networking, obligating, transacting, and loyalty. In this research, two relationship typologies from the five identified by Wu and Choi (2005) were found to be similar to those in their study: networking and transacting. Networking differs from previous studies in that suppliers and buyers voluntarily build collaboration, while in the study on supplier-supplier relationships, collaboration is directed by a single leading supplier.

Transacting differs from the one in a supplier-supplier relationship as it specifies different types of benefits for which buyers or suppliers engage. Obligating and Loyalty are two emerging typologies of relationships that businesses should not ignore. Obligating is a relationship that emerges from signing contracts and agreements and following company policies, while loyalty is a relationship created by buyers and suppliers who share a sense of unity and identity with each other. Therefore, these typologies allow us to understand the role of relationships for an organization in developing collaboration, which is significant in helping to enhance SC resilience and further minimize the impacts of a disruption. Lastly, this study extends the context of maritime disruptions to include buyer-supplier relationships within sea freight logistics operating in Thailand. The data were collected from case companies—including carriers, freight forwarders, and export-import companies—providing new insights regarding buyer-supplier relationships.

In contrast, current research on maritime disruptions has primarily clustered in developed nations, such as the USA, Singapore, England, Australia, and Norway (Nguyen et al., 2021). These studies also primarily focus on logistics business and their partners such as port operators and transport networks (Lam, 2012; Wendler-Bosco and Nicholson, 2019), which may specifically represent companies that conduct their core business in maritime logistics.

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6. CONCLUSIONS

6.1 Theoretical contributions

In response to calls for a better understanding of collaboration from empirical data (Duong and Chong, 2020), this study investigates the role of collaboration in maritime disruptions. The case analysis enhances our understanding of the role of collaboration, how it is used to enhance SC resilience, and the relationships that help facilitate that collaboration in response to maritime disruptions.

This study makes a significant contribution to the literature on SC collaboration and supply chain resilience by integrating several literature streams to develop a framework for collaboration that enhances SC resilience. Drawing on the concepts of organizational collaboration from Nidumolu et al. (2014), this study enhances the understanding of SC collaboration from a functional perspective, focusing on how it is used. Collaborated processes are fundamental forms of collaboration created to facilitate problem-solving, while collaborated outcomes help companies derive solutions to maritime problems.

Employing typologies of the supplier-supplier relationship in SC management (Wu and Choi, 2005) helps to identify relationships between buyers and suppliers that occurred during maritime disruptions and helps to explain why companies create such relationships. The case study research also revealed that this collaboration is built upon four relationship typologies: networking, obligating, transacting, and loyalty. The data showed that each company used different relationships, which can be built before and during disruptions, when collaborating with their suppliers or customers.

This study also contributes to the maritime disruption literature by advancing theoretical insights through its incorporation of SC collaboration and relationships. The empirical data highlights the significance of collaboration and relationships in minimizing the impacts of maritime disruptions. Furthermore, this study extends current research on the buyer-supplier relationships in sea freight logistics in Thailand, including carriers, freight forwarders, and export-import companies.

6.2 Practical implications

The collaboration identified in this study has important implications for practice. The study examines the role of collaboration in guiding companies in response to maritime disruptions. The two typologies of collaboration emphasizes that the companies need to engage in both collaborated process and outcomes to enhance their SC resilience. For example, maritime logistics suppliers (carriers or freight forwarders) and buyers (export-import companies) can work together by sharing information and providing updates on disruptive situations. At the same time, the buyers can coordinate with their suppliers to share responsibilities or discuss solutions with them.

The study examines buyer-supplier relationships to help guide companies, in their roles as either buyers or suppliers, to be more aware of their partners and how they can assist one another during maritime disruptions. The four typologies of SC relationships identified in this study explain how companies leverage their relationships to foster collaboration

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during maritime disruptions. Different companies can leverage different relationships to build collaboration with their SC partners, depending on what is available when the disruption occurs. At the same time, companies can also utilize several relationships during a single disruptive event. Furthermore, the findings also reveal how companies can develop such relationships with their partners. Networking and loyalty relationships must be cultivated in advance of disruption during day-to-day operations, and these relationships will continue throughout the disruption. In contrast, obligating and transacting relationships can be developed while disruption is ongoing. Furthermore, some relationship characteristics provide in-depth information on whether companies should develop relationships at the company level (such as alliance, expertise, nationalism) or at the individual staff level (such as intimacy, hand-in). This finding implies a company's strategy in developing relationships with its buyer-supplier companies to help it respond during maritime disruptions.

6.3 Limitations and Future research

Like most studies, this research is not without limitations. This research is based on qualitative interview data collection, which the findings cannot be generalized the whole population. Further investigations, such as conducting quantitative surveys, might improve the generalizability of the results. Scholars can extend the concepts and investigate in-depth details of collaboration in various settings. For example, they can examine collaboration in case of Trump’s policy on Taxation. The findings guide research opportunities. As this study focuses on collaboration in response during maritime logistic disruption, it could be further conducted into recovery from disruptions.

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