KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

COLLEGE OF HUMANITIES AND SOCIAL SCIENCES

SCHOOL OF BUSINESS

DEPARTMENT OF SUPPLY CHAIN AND INFORMATION SYSTEMS

TOPIC:

LINKING SUPPLY CHAIN DISRUPTION TO OPERATIONAL RESILIENCE: THE ROLES OF THREAT INTERPRETATION BIAS AND DISRUPTION ORIENTATION

BY

Felix Kissi Denkyira

(BSc. Natural Resources Management)

A thesis submitted to the Department of Supply Chain and Information Systems, KNUST School of Business, Kwame Nkrumah University of Science and Technology, in Partial Fulfilment of the Requirements for the Award of

MASTER OF PHILOSOPHY

IN LOGISTICS AND SUPPLY CHAIN MANAGEMENT

AUGUST, 2023.

DECLARATION

I, Felix Kissi Denkyira, hereby declare that this submission is my own work towards the award of a Master of Philosophy in Logistics and Supply Chain Management and that to the best of my knowledge, it contains no material previously published by another person, nor material that has been accepted for the award of any other degree of the University, except where due acknowledgement has been made in the text.

Felix Kissi Denkyira	……	……..
	Signature	Date
(Student Ref. No: 20844904)		
Index No. (PG 8287721)		

Certified by:

Prof. Nathaniel Boso	…….	…….
	Signature	Date
(Supervisor)		

Certified by:

Prof. David Asamoah	…….	…….
(Head of Department)	Signature	Date

ABSTRACT

Operations are a peculiar sub-component of a firm that is a key value-creation activity that generates profits for firms and their supply chain partners. However, disruptive events have

made it challenging for firms to maintain stable growth and performance. Anecdotal evidence and past research have identified that operational resilience helps firms thrive despite the disruptions that they may be encountering. However, research on supply chain disruption's relationship with operational resilience is inconclusive as past studies have produced conflicting findings. This study, therefore, draws insights from threat rigidity theory to examine threat interpretation bias as a key intervening force to explain how supply chain disruption contributes to operational resilience. In addition, the study builds on organisational information processing theory to examine how disruption orientation reduces the strength of the relationship between supply chain disruption and operational resilience linkage through threat interpretation bias. These arguments are tested on primary data from 259 firms in Ghana. The study employed covariance-based structural equation modelling in Mplus 7.4 to analysis the data collected in the study. Findings from the study show that the association between supply chain disruption and operational resilience is negative but insignificant, while the supply chain disruption and operational resilience link is negatively mediated by threat interpretation bias. The results further indicates that under conditions of high levels of disruption orientation, the negative relationship between supply chain disruption and operational resilience through threat interpretation bias is weakened. The study suggests that supply chain managers should lessen their propensity to interpret disruptive occurrences as threats, encourage a participative approach by decentralising decision-making on disruptions and engage in increased information search when a disruption strikes.

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LIST OF ABBREVIATIONS

ABV	-	Attention Base View
CEO	-	Chief Executive Officer
GDP	-	Gross Domestic Product
OIP	-	Organisational Information Processing
RBV	-	Resource Base View
RCI	-	Recovery and Continuous Improvement

ACKNOWLEDGEMENT

My utmost gratitude goes to my supervisor, Prof. Nathaniel Boso, for his guidance, assistance, and invaluable insights in refining the thesis. Also, I am very grateful to Dr. Dominic Essuman (Sheffield University), who immensely sacrificed his time to elucidate, guide, correct, and offer insights for the writing of this thesis. Again, I am thankful to Dr. Henry Ataburo for his contribution to the thesis write-up.

To Dr (Mrs.) Patience Bruce, I am sincerely thankful to you for your loving kindness throughout my tertiary education and most especially your pieces of advice during my MPhil. studies. I am equally appreciative of the support from Miss Elsie Konadu Addae (CARISCA Centre Administrator), Dr. Thomas Kwaku Agyemang (Faculty of Renewable Natural Resources), Eurekael Enyonam, and everyone else who contributed to making my study a success. Also, to my parents (Mr. and Mrs. Denkyira) and my siblings, I am profoundly grateful to you all for your prayers, love, encouragement, and unwavering support. Finally, I want to express my gratitude to the agents who helped me collect the data and to everyone who voluntarily responded to the questionnaire.

DEDICATION

This work is dedicated to the Centre for Applied Research and Innovation in Supply Chain, whose scholarship scheme enabled me to pursue this Master of Philosophy programme.

CHAPTER 1

INTRODUCTION

1.1 Background of the study

Operations are a peculiar sub-component of a firm that is a key value-creation activity that generates profits for firms and their supply chain partners (Essuman et al., 2020). However, today's volatile and uncertain business environment, along with increased incidence of disruptive events, has made it challenging for firms to maintain stability in their operations (Essuman et al., 2023; Li et al., 2022). Recently, the COVID-19 pandemic and Russia's invasion of Ukraine are some watershed disruptive events that have frustrated the operations of firms in several industries. Consequently, these disruptions have triggered production delays, shipping interruptions, increased freight costs, labour shortages, demand peaks, and slowed movement of essential commodities such as auto parts, oil, and grains across major supply chains (Forbes, 2022; KPMG, 2022).

As disruptions continue to loom within firms and across supply chains, researchers and practitioners in strategic and operations management have identified that operational resilience enables businesses to maintain steady growth while facing external shocks (Essuman et al., 2020; Li et al., 2022; The Business Continuity Institute, 2022). Accordingly, 78% of companies surveyed by The Business Continuity Institute (2022) are developing operational resilience programmes. So, operational resilience as the rudimentary and essential component of organisational resilience is the capacity of an organisation's operations to maintain functioning by absorbing disruptions that it may encounter and recover from them (Essuman et al., 2020; Li et al., 2022)

Given the primacy of operational resilience as a key determinant of business stability and survival (Li et al., 2022), scholarly works have examined several antecedents and determinants of operational and supply chain resilience (see Bak et al., 2023; Pettit et al., 2019;

Tukamuhabwa et al., 2015). Predominant theories such as Resource Base View (RBV), Attention Base View (ABV), System Theory, Complex Adaptive System Theory, Dynamic Capability Theory, Organisational Information Processing Theory and Resource Dependence Theory have been used to explicate how firms can build resilience in their operations and supply chains. These theories have shed light on how flexibility, redundancy, forming collaboration, improving agility, and many other factors can enhance the resilience strategies of firms (Tukamuhabwa et al., 2015). A key notion of previous studies is that disruptions present firms with threats and opportunities (Yan et al., 2022), which encourage firms to develop resilience strategies (Brandon-Jones et al., 2014). Yet, prior studies have ignored the role of managerial interpretation of disruptions as either threats or opportunities and their effect on resilience building.

In terms of managerial interpretation of issues, managers characterise environmental changes as either opportunities or threats (Anderson and Nichols, 2007; Chattopadhyay et al., 2001; Haney, 2017; Jackson and Dutton, 1988). As a result, managerial interpretation of disruption as an opportunity or threat will initiate managerial response in a specific direction that may be beneficial or detrimental to the firm. (Chattopadhyay et al., 2017). For example, Yan et al. (2022) affirm that, although disruptions have the efficacy to annihilate business functions, however, they also create opportunities through innovation. Yan et al. (2022) assert that while the COVID-19 pandemic had a severe impact on firms globally, it also created some redundancy, such as idle workers and facilities, which prompted businesses to innovate their operations through new product development (Yan et al., 2022). Similarly, the implementation of environmental sanctions by governments that results in banning of certain materials create supply chain disruption and offers organisations the opportunity to invest in green innovations

(Yan et al., 2022). So, while perceived supply chain disruptions have the potency to threaten the operations of firms, managerial interpretation of such disruptions as opportunities can create disruption absorption and disruption recovery capabilities to enhance resilience building.

Based on the threat rigidity theory (Staw et al., 1981), this study contends that managers, when faced with threatening situations (disruptions), exhibit inflexibility through restricting information processing and control constriction, which engenders maladaptive responses among managers, thereby preventing them from adjusting, participating in, and adapting to resilient strategies (Staw et al., 1981). Hence, the occurrence of a supply chain disruption which has the efficacy to hinder firms' operations and sustainability (Juan and Li, 2023), managers may interpret supply chain disruptions as a threat to their operations resulting in threat interpretation bias- *the extent to which managers frame disruptive events as a threat rather than an opportunity* (Haney, 2017; Sharma, 2000; Staw et al., 1981). Consequently, this study states that managerial threat interpretation bias will reduce operational resilience.

The threat-rigidity thesis contends that managerial threat interpretation bias is contingent on firm information search and information processing activities (Anderson and Nichols, 2007). Also, past resilience studies that incorporated the organisational information processing theory identified disruption orientation as a vital capability that augments the resilience of firms (Brandon-Jones et al., 2014; Parker and Ameen, 2018; Riley et al., 2019; Yang et al., 2021; Yu et al., 2019). Particularly, Yang et al. (2021) reveal that information requirements on supply chain disruptions can be matched with information processing capacities such as disruption orientation to enhance resilience. Disruption orientation is referred to as "a firm's general awareness and consciousness of, concerns about, seriousness towards, and recognition of the opportunity to learn from supply chain disruptions" (Bode et al., 2011 p. 837). Thus, drawing on the organisational information processing theory, this study asserts that disruption

orientation will lessen the effect of threat interpretation bias on operational resilience-supply chain disruption linkage.

1.2 Problem statement

The ripple effect of supply chain disruptions cascades downstream and sometimes spills over into the global supply chain. The COVID-19 pandemic, for instance, exacerbated the shortage in the already vulnerable semiconductor chip supply chain (Ramani et al., 2022). This disruption grounded the production of many electrical appliance systems to a halt (Ramani et al., 2022). So, for firms to maintain stability, survive and prosper, it is a necessity for them to create resilience capabilities (Bhamra et al., 2011; Burnard and Bhamra, 2019; Li et al., 2022).

Research on operational and supply chain resilience has typically been normative, theoretical, and conceptual (Tukamuhabwa et al., 2015). Along with this, empirical studies on supply chain resilience have grown considerably and is still expanding as disruptive events become more frequent (Pettit et al., 2019). These studies have provided valuable insight into the comprehension of supply chain resilience and its antecedents such as operational vulnerability, financial performance (Chowdhury and Quaddus, 2017; Wong et al., 2019), risk management (El Baz and Ruel, 2021; Lorentz et al., 2021; Riley et al., 2019), and competitive advantage (Pettit et al., 2019).

As noted, research on supply chain resilience is still growing, but there is scarce evidence on operational resilience (Essuman et al., 2022, 2020). It is noteworthy to state that the operations of firms are the processes by which goods and services are produced, and they are a major value-creation activity that generates profits for the firm and its supply chain partners. Again, the study of operational resilience is imperative because if the operations of firms are not robust against disruptions, organisational and supply chain resilience will not last.

Furthermore, many scholarly works have shed light on the various antecedents and determinants of operations and supply chain resilience based on different theoretical lenses. But the theorization of the determinants of operational and supply chain resilience has ignored how the mechanisms that influence organisational responses to disruptions (threatening situations) impact operational and supply chain resilience. Particularly, there exists an empirical gap on how managerial interpretations of disruptions as opportunities or threats affect operations and firm resilience.

Even though firms implement measures to reduce or stop disruptive events, decision-makers typically decide how organisations will react to and recover from disruptions. Accordingly, organisational actions in response to a disruptive event will be dependent on how decisionmakers frame the disruption (Chattopadhyay et al., 2001; Sharma and Nguan, 1999; Thomas et al., 1993). This is because the managerial interpretation of disruptions as threats is likely to cause information restriction, control constriction and resource conservation which consequently leads to managerial rigidity in decision-making (Jackson and Dutton, 1988; Staw et al., 1981).

Also, despite the various studies conducted in strategic management about issue interpretation as either threat or opportunity and organisational actions in response to threatening interpretation, all the findings have failed to generate evidence on how threat interpretation of disruptions affects operational resilience. Again, the existing literature on supply chain disruption and operational resilience linkage is inconclusive as past studies have produced conflicting findings (see El Baz and Ruel, 2021; Parker and Ameen, 2018). For instance, Parker and Amen (2018) found that there is no association between supply chain disruption and supply chain resilience while, El Baz and Ruel (2021) identify that supply chain disruption impacts have a negative correlation with supply chain resilience. To resolve the inconclusiveness of

past resilience studies, this study incorporates threat interpretation bias as a key determinant to investigate its mediation on supply chain disruption and operational resilience linkage.

Lastly, previous studies have examined the direct and indirect effects of disruption orientation on operational and supply chain resilience (see Bode et al., 2011; Laguir et al., 2022; Liu and Wei, 2022; Stephens et al., 2022; Wong et al., 2020; Yang et al., 2021). Meanwhile, none of these studies examined the interaction of disruption orientation with threat interpretation bias in achieving operational or supply chain resilience. While threat interpretation bias and disruption orientation may have different effects on resilience building, Section 2.2.5 of this study identifies that they are not mutually exclusive from each other in that they both recognise disruptions as threats, identify the need for stability, and take actions (Brandon-Jones et al., 2014; Staw et al., 1981). Therefore, it is necessary to consider how both threat interpretation bias and disruption orientation help to fully comprehend the nature of firms' responses to disruptions.

1.3 Objective of the study

The overarching goal of this study is to examine the role and boundaries of threat interpretation bias in the supply chain disruption-operational resilience linkage. The study relies on threat rigidity theory and organizational information processing theory to explain how threat interpretation bias influences the supply chain disruption-operational resilience linkage and further examines how under high and low disruption orientations, threat interpretation bias affects operational resilience.

1.3.1 Specific Objective

The study, therefore, aims to examine the extent to which the relationship between supply chain disruption and operational resilience is channelled through threat interpretation bias under varying conditions of disruption orientation. Specifically, the seeks to investigate the:

1. association between supply chain disruption and operational resilience;
2. mediating role of threat interpretation bias on the relationship between supply chain disruption and operational resilience; and
3. moderating role of disruption orientation on the indirect relationship between supply chain disruption and operational resilience through threat interpretation bias.

1.4 Research Questions

In seeking to address the existing gap in the literature on the roles and boundaries of threat interpretation bias in the supply chain disruption-operational resilience link, the study examines the following research questions:

1. what is the relationship between supply chain disruption and operational resilience?
2. what is the mediating role of threat interpretation bias on the relationship between supply chain disruption and operational resilience?
3. what is the moderating role of disruption orientation on the indirect relationship between supply chain disruption and operational resilience through threat interpretation bias?

1.5 Significance of the study

In examining the proposed research questions, the study expands several streams of literature, including but not limited, to issue interpretation thesis, supply chain disruption-operational resilience research, disruption orientation literature, and application of threat rigidity and organisational information processing theories. Three significant contributions to the literature are made from the investigation of threat interpretation bias role and boundaries on supply chain disruption and operational resilience research.

First, the study generates a novel finding on the association between threat interpretation bias and supply chain disruption-operational resilience linkage, which contributes to the theorization of the determinants of operational and supply chain resilience. While prior studies

on threat interpretation bias in relation to threat rigidity theory have focused on the multilevel analysis of individual, group, and organisational responses to environmental change (Staw et al., 1981), as predictors of organisations selection of environmental strategies (Sharma, 2000), as antecedent of innovation adoption in the face climate change (Haney, 2017), and the effect of information gathering on threat and opportunity interpretations (Anderson and Nichols, 2007), none of the studies examined threat interpretation bias and its role and boundaries on supply chain disruption- operational resilience linkage. Therefore, the evidence from this study sets the tone for a wider discourse on managerial issue interpretation as a key determinant of operational and supply chain resilience to disruptive events.

Secondly, greater disruption orientation of firms improves firm resilience (Brandon-Jones et al., 2014a; Parker and Ameen, 2018; Wong et al., 2019). Evidence shows that disruptionoriented firms can respond to and recover from disruptions that they encounter more than firms that are not (Ambulkar et al., 2015; Riley et al., 2019). This study illustrates how disruption orientation interacts with threat interpretation bias to achieve operational resilience during supply chain disruptions. The empirical evidence in this study extends the contribution of disruption orientation as an antecedent of supply chain resilience.

In addition, this study jointly incorporates threat rigidity theory and organisational information processing theory to examine how they complementarily offer theoretical underpinnings to the roles and boundaries of threat interpretation bias on supply chain disruption- operational resilience linkage. Threat rigidity theory and information processing theory are two different theories that examine organisational decision-making regarding environment adversities and uncertainties (Brandon-Jones et al., 2014; Sund, 2015). So, this study integrates the two theories to capture how firms respond to supply chain disruptions. Since the incorporation of the two theories is novel, the study examines how they both complement each other. Also, whereas the information processing perspective is well known to enhance resilience, there is

scant knowledge as to whether threat rigidity affects resilience. Therefore, the outcome of this study extends knowledge on the theorization of threat rigidity theory as a standpoint of operational resilience.

Finally, the findings of the provides useful information for managers and decision makers with regards to the how interpretation of disruptive events as threats affect operational resilience. This study therefore makes salient implication for managers that threat interpretation of supply chain disruption reduces operational resilience however greater disruption orientation enable managers to explore and exploit opportunities that disruptive events present them to improve operational resilience.

1.6 Research Methodology

Based on the positivist deductive approach, this study used a survey design to collect empirical data from 259 manufacturing and service firms operating in the two major cities known as Kumasi and Accra in Ghana. The study utilised a multi-sampling technique to collect data by using quota and stratified sampling to determine the representative sample of the study and purposive sampling to collect the data from key informants. Structured questionnaires were delivered face-to-face, drop-and-collect to senior managers (CEO/ managing director/ general manager/ operations manager) in identified firms. Existing measures from prior studies were adapted to tap the study's constructs and were pretested to guarantee reliability and validity. Additionally, prior to testing the hypotheses of the study, covariance-based confirmatory factor analysis was used to assess the study's measurement indicators. The hypotheses of the study were tested using structural equation modelling in Mplus 7.4.

1.7 Scope of the study

This study focuses on the intersection between supply chain and operational resilience literature, and issue interpretation research in strategic management. The study examined the

mediating role of threat interpretation bias and the moderating role of disruption orientation on the supply chain disruption-operational resilience link through the theoretical lens of threat rigidity theory and organisational information processing theory.

The study collected data from manufacturing and service firms based in Accra and Kumasi in the Greater Accra and Ashanti regions, respectively.

1.8 Limitations of the study

Despite the study's illuminating findings, it is crucial to recognise the two major limitations of the study. First, the study uses threat rigidity theory as a lens to conceptualise and operationalise threat interpretation bias as a determinant of operational resilience. This limits the study to only examine managerial interpretation of disruptive events as threats and neglects the potential role of opportunity interpretation of disruptions and its effect on operational resilience. Also, the methodological limitation of this study is that it uses a cross-sectional survey to make causal inferences. Although past resilience studies (see, e.g., Ambulkar et al., 2015; Essuman et al., 2022, 2020; Wong et al., 2020) used a cross-sectional design, it limits the ability to draw causal inferences from the findings.

1.9 Organisation of the Study

This study is organised into five chapters. Chapter one presents the background, problem statement, objective of the study, significance of the study, gives an overview of the research methodology, and organisation of the study. Chapter two reviews the conceptual literature on resilience, threat interpretation bias, supply chain disruptions, and disruption orientation. Also, the conceptual review discusses the similarities and differences between threat interpretation bias and disruption orientation. Additionally, an empirical review of the main constructs of operational resilience, threat interpretation bias, and disruption orientation is undertaken, and the path for the present study is discussed. Furthermore, the conceptual model is generated, and

hypothesis development is discussed. Chapter three outlines the methodology of the study by discussing the study's philosophical perspective, research approach and design, empirical setting and population, sample and sampling approach, unit of analysis, data collection and analysis, and ethical consideration. Chapter four centres on the presentation of results on descriptive statistics, reliability and validity, correlation analysis and covariance based structural equation modelling, and hypothesis evaluation. Also, a discussion of the results is made. Lastly, chapter five summarises the findings of the study, concludes the study, and makes recommendations for managers and future research while recognising the limitations of the study.

Chapter 2

LITERATURE REVIEW

2.1 Introduction

This chapter discusses the conceptual review, theoretical review, and empirical review of the main concepts of the study. Furthermore, a conceptual framework is developed, followed by a discussion of the underlying theoretical arguments for generating the hypothesis.

2.2 Conceptual Review

This section discusses the conceptual domains of the study's main concepts (operational resilience, supply chain disruption, threat interpretation bias, and disruption orientation). In addition, this section explains on how each concept is operationalised in the study.

2.2.1 Resilience

The study of resilience is one of the most prevalent topical issues in contemporary research. Numerous fields of study have conducted various research studies on resilience (Pettit et al., 2019). The origin of resilience research can be traced to the Canadian ecologist Crawford Stanley Holling (1973), who introduced resilience in ecological systems. Subsequently, in many fields of study, resilience has become a rudimentary approach to mitigate risks of disturbances and threats that face ecological systems, business environments, organisations, supply chains, and the operations of firms (Pettit et al., 2019; Ponomarov and Holcomb, 2009). From an ecological perspective, resilience is the ability of an ecological system (the interaction between living and non-living organisms) to withstand disturbance and continue to perform its functions and controls (Gunderson, 2000).

Narrowing the contextual review of resilience to business and management research, the subject of resilience has been investigated in the background of organisations, supply chains,

firms, employees, and operational activities (Linnenluecke, 2017). Linnenluecke (2017) states that resilience studies in business have developed into five areas: (1) organisational action towards external threats; (2) employee perseverance; (3) organisational consistency; (4) flexibility to adopt new business models; and (5) designed frameworks to mitigate supply chain vulnerabilities and disruptions.

In organisations, resilience is seen from the viewpoint of individual and organisational reactions to instability and discontinuity (Bhamra et al., 2011). It implies the capacity to resist turbulence and the ability to adapt to risky business environments (Bhamra et al., 2011; Burnard and Bhamra, 2019). Linnenluecke (2017) identifies that resilience in organisations is studied in the context of organisational action in response to external threats and organisational reliability. In organisational resilience, two contrasting views are opined by Staw et al. (1981) and Meyer (1982). Staw et al. (1981) assert that when organisations are faced with adversities emanating from negative events, they exhibit "threat rigidity" by avoiding the risk entirely. Meyer (1982), in advancing the work of Staw et al. (1981), stated a contradictory finding that with the occurrence of external threats such as strike actions, administrative organisations are likely to undertake adaptability through absorption or retention. Therefore, the actions taken to resolve the strike actions are what result in the bounce back to normalcy (Linnenluecke, 2017). The findings by Staw et al. (1981) and Meyer (1982) ignited research into organisational response to external threats, which inspired organisational strategic positioning and adaptability (Linnenluecke, 2017).

According to Linnenluecke (2017), the fifth stream of business resilience research emerged because of the increased vulnerability of the supply chain to disruptive events. Supply chain resilience studies began in the early 2000s due to the following activities: globalisation of distribution and procurement, intensification of climate change, outsourcing, just-in-time (JIT),

Six Sigma, leaning out and many others, exposing supply chains to disruptions (Pettit et al., 2019). Ponomarov and Holcomb (2009) define supply chain resilience as a multidimensional and multifaceted construct that emanates from a multidisciplinary standpoint. Accordingly, supply chain resilience encompasses the ability of the supply chain to proactively anticipate unforeseen circumstances, effectively handle disruptions, and bounce back from them. It involves maintaining uninterrupted operations while ensuring the desired level of interconnectedness, control over the structure, and functional integrity of the supply chain. (Ponomarov and Holcomb, 2009). Also, Tukamuhabwa et al. (2015), after a critical review of the literature proposed that supply chain resilience can be evaluated on four criteria. These are (1) preparation for a disruptive event; (2) response to an event; (3) recovery from the event; and (4) growth or competitive advantage after the event.

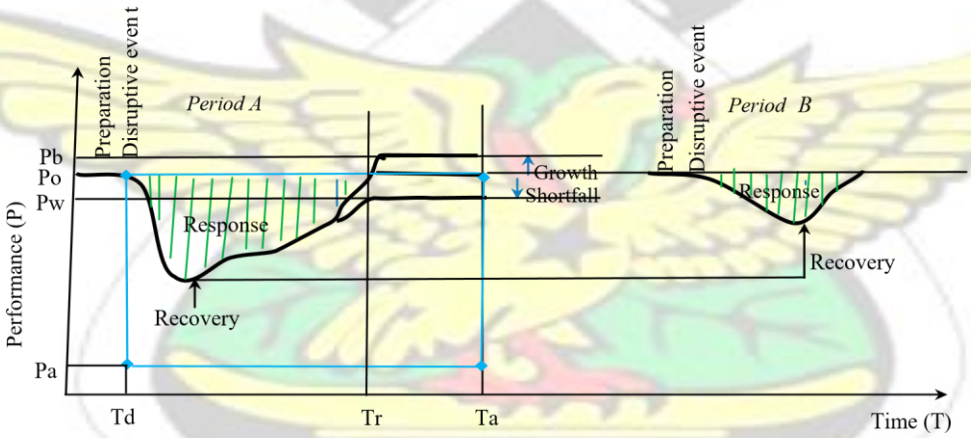

Figure 2.1: A diagram showing the operationalisation of supply chain resilience

Source: Tukamuhabwa et al. (2015)

Pb = best performance after recovery; Po = ordinary or normal performance before disruption; Pw = worst outcome anticipated after recovery. Pa is the accepted performance floor beyond which operations are assumed to close out. Td = time in which disruption begins Tr = time in which recovery begins, and Ta = maximum recovery time.

Having stated the parameters used by Tukamuhabwa et al. (2015) in Figure 2.1, the statement below elucidates the four criteria for evaluating the definition of supply chain resilience. During Period A, a disruptive event begins at Po (ordinary performance before disruption), and performance drops as depicted by the curve until recovery begins. During recovery, two scenarios will exist: Pw (worst outcome anticipated after recovery), at which there is a shortfall of performance after recovery, or Pb (best performance after recovery), where the operations exceed their Po after recovery. Tukamuhabwa et al. (2015) assert that a more compelling argument would be made between the disruptive events occurring in Period A and Period B. The rate of disruption between Period A and Period B will indicate if the supply chain is getting more resilient.

Furthermore, as supply chain resilience knowledge expands, Wieland and Durach (2021) have identified that the resilience perspective has focused on two disparate fields: engineering resilience and socioecological resilience. In line with the equilibrium-focused state, engineering resilience propounds that, systems, when faced with a disturbance must strive to return to stability by the time it takes to recover and the system's ability to resist disturbances (i.e., 'time-to-recover and time-to-survive") (Wieland and Durach, 2021). Contrary to the engineering resilience argument, socio-ecological resilience avows that the stability motive (absorption and recoverability) of close-loop resilience engineering is not sufficient to achieve supply chain resilience. Rather, supply chains can be viewed as a socio-ecological system that is interconnected with other social-ecological systems that function on other levels, such as the political economy and the Earth, making it difficult to manage a socio-ecological system as a close-loop engineering resilience (Wieland and Durach, 2021). The socio-ecological resilience literature posits that as systems face disturbances, they cannot immediately return to stability; hence, resilience in a system must also be seen as a complex adaptive system (Wieland and

Durach, 2021). Therefore, social-ecological systems must adjust over time, and managers must strive to adapt and transform them. So, Wieland and Durach (2021) assert that supply chains must be viewed from both engineering and socioecological perspectives of disruption absorption, recoverability, adaptation, and transformation, where both engineering resilience and socioecological resilience must go hand in hand.

This current study examines the firm's operations resilience to supply chain disruptions. Extant literature defines operational resilience as the ability to maintain functioning and recover from supply chain disruptions (Essuman et al., 2022, 2020; Li et al., 2022). The two primary manifestations of operational resilience are disruption absorption and recoverability (Essuman et al., 2020). While Wieland and Durach (2021) argue that engineering resilience and socioecological resilience must go hand in hand, socio-ecological resilience captures adaptability and transformation over time (Essuman et al., 2023). But when disruptions strike, a firm first point of call is stability (Brandon-Jones et al., 2014), defined by "time-to-recover" and "timeto-survive" (Essuman et al., 2023; Wieland and Durach, 2021). Again, in identifying organizational interpretations of supply chain disruptions with resilience, it is worthwhile to consider the temporal manifestation of disruption absorption and recoverability (Essuman et al., 2023, 2022) rather than the complex adaptive system of transformation and adaptability (Wieland and Durach, 2021).

The two-dimensional construct of operational resilience, namely disruption absorption and recoverability are operationalised as the study's outcome variables. Disruption absorption refers to the ability of a firm to continue functioning despite the occurrence of disruptive events it may face, while recoverability refers to the ability of a firm's operations to bounce back to their normal operational performance level after encountering a disruption (Essuman et al., 2020). Disruption absorption and recoverability are two distinct dimensions of operational

resilience, and their manifestation within the operations of a firm can differ (Essuman et al., 2020).

2.2.2 Threat interpretation bias

Top managers in organisations make decisions from time to time concerning their organisation. The issues upon which the decisions are made are confounding and require interpretation (Jackson and Dutton, 1988). The Merriam-Webster dictionary defines interpretation as "a statement that makes something clear". Top managers must first scan their environment to identify issues for interpretation (Thomas et al., 1993). Environmental scanning, as established by Costa (1995), is the process by which top managers ascertain information about the occurrence of events outside the organisation and the future actions that can be taken. Environmental scanning is a process that helps decision-makers and managers identify and make sense of problems occurring externally outside the organisation (Anderson and Nichols, 2007; Chattopadhyay et al., 2001; Costa, 1995; Thomas, 1980).

Thomas et al. (1993) emphasise that the antecedent to the interpretation of environmental changes in an organisation is environmental scanning. Therefore, top managers, in making strategic decisions, must make sense of intricate and ambiguous events through scanning to make interpretations (Anderson and Nichols, 2007; Chattopadhyay et al., 2001; Haney, 2017). Decision makers and top managers in their interpretation, characterize environmental changes as either **opportunities or threats** (Anderson and Nichols, 2007; Chattopadhyay et al., 2001; Haney, 2017; Jackson and Dutton, 1988; Sharma, 2000; Sund, 2015). Jackson and Dutton (1988) findings concluded that "negative, uncontrollable events that have the likelihood to cause losses are threat-consistent and opportunity discrepant". Also, "opportunity consistent and threat discrepant are issues that are positive, controllable, and have the likelihood to cause gains" (Jackson and Dutton, 1988).

Furthermore, Chattopadhyay et al. (2001) assert that two contradictory bodies of knowledge exist about issues regarded as threats or opportunities. One argument related to the threat rigidity concept state that managers view threats as negative situations over which they have "little or no control" and carry the risk of losses (Chattopadhyay et al., 2001). Moreover, opportunities are seen as positive situations over which managers do have control, and which may result in gains. Chattopadhyay et al's (2001) contradictory thesis, related with the prospect theory, claims that managers in threatening situations have risk affinity since they do not have much to lose; hence, such managers will engage in the activity to maximise their potential for gains. Additionally, the prospect theory avows that, managers who are in favourable situations despite the opportunity that an event presents, are inclined to be risk aversive.

From the extant literature on strategic management that lends to the threat rigidity thesis, issues characterised as threats have the potential to be negative, uncontrollable, and involve potential loss (Endres and Van Bruggen, 2021; Haney, 2017; Jackson and Dutton, 1988; Sharma, 2000; Sund, 2015). This study lends itself to the theoretical lens of threat rigidity theory (Staw et al., 1981) and operationalizes threat interpretation bias as the degree to which top managers frame disruptive events as threats rather than opportunities (Sharma, 2000).

2.2.3 Supply Chain Disruptions

Disruption is an unavoidable risk that firms' supply chains encounter across the world.(Essuman et al., 2020; Riley et al., 2019). As firms spread their tentacles by widening their supply chains and increasing the complexities of their operations, they become more vulnerable to disruption risk (Riley et al., 2019). A disruption is an unplanned incident that disrupts the usual flow of products, finances, and information along the supply chain. (Ambulkar et al., 2015; Queiroz et al., 2022; Riley et al., 2019). Ivanov (2021) characterizes disruption as a risk with high impact and low frequency that impacts supply chains. Recent examples of disruption that have occurred are man-made and natural disasters, terrorism,

political crises, strikes, financial crises, legal and contract issues, pandemics and epidemics, cyber-attacks, infrastructural failure, power crises, and many more (Essuman et al., 2022; Ivanov, 2021; Parker and Ameen, 2018).

Wong et al. (2020) categorise supply chain disruptions as supply-side disruption (e.g., unreliability of suppliers), catastrophic disruption (e.g., disasters, political and financial crises), and infrastructure disruption (e.g., system breakdowns or failures). Owing to the distinctiveness of supply chain disruptions that encumber firms, this study defines supply chain disruption as the extent to which unexpected occurrences directly damage or interfere with the regular movement of goods, information, and services within a supply chain.

2.2.4 Disruption orientation

When firms are faced with increasing disruption along their supply chains, there becomes necessary to create disruption orientation to mitigate or eliminate the impact of the disruptions (Yu et al., 2019). Disruption orientation is "a firm's general awareness and consciousness of, concerns about, seriousness towards, and recognition of the opportunity to learn from supply chain disruptions" (Bode et al., 2011 p. 837). Past resilience studies have posited that organisations with robust disruption orientation initiatives mitigate or eliminate disruptions they face (Brandon-Jones et al., 2014a; Riley et al., 2019).

This study conceptualises disruption orientation in two dimensions: high and low disruption orientation. Accordingly, this study states that highly disruption-oriented firms are conscious of their environment to spot any disruption that may ensue, actively strive to learn from prior disruptions, and appreciate the opportunity to do so (Brandon-Jones et al., 2014). Therefore, firms with a greater disruption orientation can plan, organise, react, and recover from disruptions that they may face (Brandon-Jones et al., 2014; Stephens et al., 2022; Wong et al., 2019). On the contrary, firms with low disruption orientation are inactive in searching for information about their environment, are passive, and accept the environment as it is

(BrandonJones et al., 2014). Low disruption-oriented firms are hesitant to implement disruption mitigating measures and are slow to return operations to pre-disruptions levels (Riley et al., 2019).

2.2.5 Similarities and differences between threat interpretation bias and disruption orientation

The concepts of threat interpretation bias and disruption orientation are not mutually exclusive. Both concepts share some similarities in that they both interpret supply chain disruptions as threats and recognise the need to strive for stability and continuity by developing a motivation to respond to supply chain disruptions (Brandon-Jones et al., 2014; Olson et al., 2020; Staw et al., 1981).

Also, threat interpretation bias and disruption orientation engage in information processing to be able to decipher the occurrence of a threatening event, such as supply chain disruptions. But the information processing in threat interpretation bias engenders information restriction and control constriction (Staw et al., 1981). Restriction of information manifests in the form of reducing the amount of information managers attend to through minimising information channels and reducing the number of information codes used (Staw et al., 1981). Additionally, constriction of control includes centralisation of authority (where the dominant response among managers prevails) and increased formalisation (Staw et al., 1981). Consequently, restricting information and control constriction induces rigidity to act (Staw et al., 1981). However, in the case of disruption orientation, firms become actively vigilant about their environment and engage in information search which bolsters information acquisition and processing that induces the motivation to act to enhance recovery and continuous improvement (Riley et al., 2019).

Moreover, supply chain disruptions induce uncertainties (*the difference in the amount of information required to understand supply chain disruption and the amount of information that a firm already possesses*) (Galbraith, 1974) in both disruption orientation and threat interpretation bias. But threat interpretation bias through information restriction and control constriction may intensify the ambiguity and unpredictability surrounding a disruption (Sharma, 2000). This further amplifies uncertainty clouding supply chain disruptions and consequently results in uncertainty enhancement. Contrastingly, disruption orientation serves as an information processing capacity that meets the information requirement on supply chain disruption (Yang et al., 2021). Therefore, disruption orientation as an information processing capacity clarifies the uncertainty surrounding a supply chain disruption and certainly leads to a reduction in uncertainty.

Furthermore, threat interpretation bias and disruption orientation both motivate firms to maintain stability (Brandon-Jones et al., 2014a; Olson et al., 2020; Staw et al., 1981). However, the differences in information processing systems leading to varying uncertainty categorisation (i.e., uncertainty reduction and uncertainty enhancement) will result in divergent responses. In the context of threat interpretation bias, reduced information processing magnifies uncertainties. This will occasion rigidity to act by engendering risk aversive behaviour and hesitancy in responding to a supply chain disruption because supply chain disruption will continually be seen as a threat (negative-uncontrollable-losses) and managers will attempt to reduce losses rather than maximise profits (Jackson and Dutton, 1988). Consequently, rigidity in threat interpretation bias results in the efficiency motive where managers will conserve their resources (Staw et al. 1981). In contrast, disruption orientation as an information processing capacity induces active information search, develops a preoccupation to learn from supply chain disruptions, and adequately deploy resources to mitigate disruption impacts (Riley et al., 2019). So, this study argues that whereas threat interpretation bias give rise to conservation of

resources, disruption orientation leads to deployment of resources to mitigate supply chain disruptions.

To recapitulate, threat interpretation bias and disruption orientation involve information processing, have the same level of uncertainty, and take actions during threatening situations. But threat interpretation induces rigidity, uncertainty enhancement, and conservation of resources, while disruption orientation engenders increased information search and acquisition, uncertainty reduction, and proactively deploying resources to mitigate supply chain disruption impacts.

2.3 Theoretical Review

Upon the plethora of literature reviews conducted on issue interpretation, disruption orientation and supply chain disruptions-operational resilience linkage, the predominant theories that expound on the relationship among the concepts are threat-rigidity theory, and organisational information processing theory.

2.3.1. Threat-rigidity theory

The threat rigidity theory emanates from the thesis of Staw, Sandelands, and Dutton (1981), who researched threat rigidity effects on organisational behaviour. The study begins with the notion that the collapse of many corporate organisations is because of decision-makers' inability to respond to environmental changes. Staw et al. (1981) contend that when a threatening situation occurs, people, groups, and organisations exhibit restrictions in information processing, constriction of control, and conservation of resources. Information processing becomes restricted when attentional regions are shrunk, information codes are simplified, and the number of channels used is reduced. Also, constriction of control occurs among organisations where control of power and influence is consolidated or elevated up the hierarchy. The threat rigidity theory posits that the restriction of information and the

constriction of control result in a reduction in the variety of reactions or flexibility (Jackson and Dutton, 1988; Staw et al., 1981) and this has a significant impact on how managers make decisions (Harrington et al., 2002).

Again, threat rigidity results in a maladaptive response in novel or big crises (Plotnick et al., 2009; Staw et al., 1981). A maladaptive response is any behaviour that prevents a person from adjusting, participating, or adapting to new situations in an organisation (Cuncic, 2022). Threat rigidity justifies maladaptive responses among individuals, groups, and organisations that in times of threatening situations, the maladaptive response suggest that well-learned reactions may not be acceptable in new situations (Plotnick et al., 2009). Therefore, maladaptive responses result in rigidity among managers in the face of adversity or the emergence of a big crisis.

2.3.2. Organisational information processing theory

The organisational information processing theory, grounded in open system theory posits that uncertainties and complexities are inevitable and ingrained within the environment of an organisation (Wong et al., 2019). Uncertainties, known as the "difference between the amount of information required to perform a task and the amount of information already possessed by the organization" (Galbraith, 1974) are an inherent issue that frustrates the stability of organisations (Brandon-Jones et al., 2014). Organisational information processing theorists assert that uncertainties emanating from the internal and external environments of organisations can be reduced by bolstering information processing capabilities (Galbraith, 1974). This is because the greater the environmental uncertainty, the more information must be gathered and processed to attain a certain level of performance (Brandon-Jones et al., 2014).

The tenet of information processing theory posits that to overcome uncertainties, firms must match their information processing requirements with their information processing capacities

(Yang et al., 2021). This study recognises that the occurrence of disruptions in the internal and external environments of organisations creates uncertainties, and it is important to develop information processing capacity to spot disruptions and countermand them. Therefore, this study conceptualises disruption orientation as an important information processing capacity that will actively seek to search for information about their environment concerning disruptions, strive to learn from the occurrence of prior disruptions, and use the information gathered to offset their uncertainties concerning disruptions (Yang et al., 2021).

2.4 Empirical Review

This section of the literature review seeks to discuss past empirical research on the determinants of operational/organisational/supply chain resilience. It also reviews the outcomes of threat interpretation bias and disruption orientation. In doing so, the studies highlight the key findings, methodological approaches, theoretical approaches and context and unit of analysis of each empirical study.

2.4.1 Determinants of operational/organisational/ supply chain resilience

Empirical research on the determinants and antecedents of operational, organisational and supply chain resilience has been investigated in different contexts, using various methodological approaches, and varying theoretical lenses to generate a vast expanse of evidence. These empirical studies have mostly used diverse kinds of theories to explain how the determinants influence resilience-building (see Table 2.1). Major theories used to investigate resilience are Resource Base View (RBV), Systems Theory, Organisational Information Processing Theory, Contingency Theory, Attention Base View (ABV), Relational Theory, Complex Adaptive Systems Theory, Resource Dependency Theory, and Dynamic Capabilities Theory.

Through the theoretical lens of RBV, prior studies have examined how logistics capabilities improve resilience (Ponomarov and Holcomb, 2009), how improvements in human and capital resources enhance resilience (Blackhurst et al., 2011) and many others. Also, Systems theory has examined how open systems such as flow activities, flow units, and sources of units act as resilience reducers (Blackhurst et al., 2011). The contingency theory has also been used to explore how increased visibility and information sharing improve resilience (Boone et al., 2013; Brandon-Jones et al., 2014). Again, relational theory explicates that close integration of processes and systems among firms does not reduce firms' vulnerability to disruptions (Wieland and Wallenburg, 2013). In addition, organisational information processing theory explains how supply chain risk management practices augment resilience (El Baz and Ruel, 2021; Wong et al., 2019). The dynamic capabilities of firms through innovation and innovation magnitude have a positive effect on resilience (Golgeci and Ponomarov, 2013). Lastly, the Attention Base View also explored different concepts and evidence suggesting that attention to risk management practices enhances resilience (Lorentz et al., 2021) and that attentional focus on resource slack drives operational resilience (Essuman et al., 2022).

Also, several methodological approaches have been used to conduct empirical studies in relation to operational, firm, and supply chain resilience. Prevalent among these methodological approaches are longitudinal case studies and field studies, online and mailed surveys, interviews, focused group discussions, and scenario-based experiments. Additionally, most of the research have been carried out in developed nations, with a few such as Essuman et al. (2020, 2022) and Parker and Ameen, (2018) being done in developing countries.

Table 2.1: Past empirical research on determinants of operational, organisational and supply chain resilience

Author(s) (Year)	Focus on the determinants of operational, organisational, and supply chain resilience.	Contingency variables	Theoretical Perspective/key argument	Context and data	Key findings
Jüttner and Maklan (2011)	The study assessed supply chain resilience amid the global financial crisis.			A longitudinal case study of three companies in the context of the global financial crisis. Data collections were in two phases of pre-recession data on supply chain risk management in 2007. Post-recession data was collected in 2009 using interviews to assess the three selected companies' performance after the recession.	Supply chain risk management has a positive impact on supply chain resilience. Supply chain risk affects knowledge management and enhances supply chain resilience by improving visibility, collaboration, and flexibility capabilities in the supply chain.
Blackhurst et al. (2011)	The study focused on deriving an empirical framework for global supply resiliency.		Resource base view theory Systems theory	The study was conducted using a case study in two phases. Phase one ascertained data through an indepth investigation of U.S. automobile manufacturers. The second phase was composed of semistructured telephone interviews with six executive managers of firms.	Studies concluded that the resiliency enhancers are human capital resources, organisational and inter-organisational capital resources, and physical capital resources which are they were in harmony with the RBV Supply chain resiliency reducers are flow activities, flow units, and the source of flow units.
Khan et al. (2012)	Study on product alignment and its effect on supply chain responsive and resilience			An in-depth case study of one of the UK's fastest-growing fashion retailers was investigated.	Product alignment has a significant impact on supply chain resilience.

Note: [1] = Mediator, [2] = Moderator

Table 2.1 ***Continued***

Author(s) (Year)	**Focus on the determinants of operational, organisational, and supply chain resilience.**	**Contingency variables**	**Theoretical Perspective/key argument**	**Context and data**	**Key findings**
Johnson et al. (2013)	A study investigated how social capital facilitates supply chain resilience.		Social constructionist approach	Data was collected using a crosssectional survey from three tiers in the supply chain.	Social capital facilitates the development of supply chain resilience through the capabilities of flexibility, velocity, visibility, and collaboration. These capabilities are mutually reinforced to enhance resilience.
Boone et al. (2013)	The study investigates how the implementation of a systems approach to inventory management enhances SCM continuity and resiliency		A systems approach to the assessment of inventory management Contingency theory	Longitudinal field studies of 10 United States Air Force locations over a two-year period were used as the research setting for the studies.	A well-aligned approach to inventory management is essential for improving supply chain resiliency and responsiveness.
Golgeci and Ponomarov (2013)	The study investigated the linkage between firm innovativeness, innovation magnitude, disruption severity, and supply chain resilience.		Dynamic capability theory	Data was collected using a combination of survey methods and scenario-based experiments. Participants were senior logistics and supply chain managers and operations managers in European and United States-based manufacturing companies.	Firm innovativeness and innovation magnitude have a positive association with supply chain resilience.

Note: [1] = Mediator, [2] = Moderator

Table 2.1 ***Continued***

Author(s) (Year)	Focus on the determinants of operational, organisational, and supply chain resilience.	Contingency variables	Theoretical Perspective/ key argument	Context and data	Key findings
Brandon-Jones et al. (2014)	The study examined how information sharing and connectivity, together with visibility, are related to supply chain resilience and robustness.	Geographic dispersion [2] Scale complexity [2] Differentiation [2] Delivery complexity [2]	Contingencybased view theory	Survey data was collected from 264 manufacturing plants based in the UK. The targeted sample unit was composed of managers who were members of the Charted Institute of Procurement and Supply Chain (CIPS)	For firms operating in complex supply chains, the creation of visibility as a capability improves supply chain resilience. For firms operating with simple supply chains, the marginal benefit accrued from supply chain resilience and robustness outweighs the significant investment required. Supply chain connectivity and information sharing result in supply chain visibility that enhances resiliency and robustness. Only scale complexity has a strong contingency effect on supply chain resilience and robustness.
Ambulkar et al. (2015)	The study investigated the firm's resilience to supply chain disruptions using empirical data collected	Resource reconfiguration [1]		The survey monkey online platform was used to deliver the research questionnaires to respondents. Respondents were alumni of universities who were thought as people fully knowledgeable of the content of the questionnaire.	Although disruption orientation is imperative for developing firm resilience, it is not always enough. Also, the fact that a firm has resources and is disruption-oriented is not enough. It is through the mediating effect of resource configuration that we achieve firm resilience.

Note: [1] = Mediator, [2] = Moderator

Table 2.1 ***Continued***

Author(s) (Year)	Focus on the determinants of operational, organisational, and supply chain resilience	Contingency variables	Theoretical Perspective/key argument	Context and data	Key findings
Wong et al. (2020)	The study investigates the supply chain and external conditions under which supply chain resilience pays	Supply-side disruptions [2] Infrastructure disruptions [2] Catastrophic disruptions [2]	Organisational information process theory	The study sampled manufacturing companies listed on the Taiwan Stock Exchange. In all, 142 responses were obtained. The study employed the emailing as a means of data collection.	There is a positive relationship between supply chain resilience and risk management performance. The type of disruption encountered serves as a contingency for the relationship between supply chain resilience, risk management and market performance.
Essuman et al. (2020)	Operational resilience is conceptualised and used to develop empirical evidence for operational efficiency under varying conditions of operational disruptions.		Output-Based Resilience (OBR) Perspective Input-Based Resilience (IBR) Perspective	Primary data from 292 firms was ascertained from the subSaharan African economy.	Both disruption absorption and recoverability have a positive association with operational efficiency. Under conditions of high operational disruption, the effect of disruption absorption on operational efficiency is stronger. Under the condition of low operational disruption, the effect of recoverability on operational efficiency is stronger.
Gu et al. (2021)	The study examined the impact of information technology on supply chain resilience.		Information processing theory	Data was collected from 400 manufacturing firms in China.	Explorative use of IT with suppliers and customer resilience improves supply chain performance. Exploitative and explorative use of IT complement each other in achieving customer resilience.

Note: [1] = Mediator, [2] = Moderator

Table 2.1 ***Continued***

Author(s) (Year)	**Focus on the determinants of operational, organisational, and supply chain resilience.**	**Contingency variables**	**Theoretical perspective/key argument**	**Context and data**	**Key findings**
Lorentz et al. (2021)	The study explored how balancing attention-base bias improves resilience during COVID-19.		Attention base view	The study employed survey research using structured questionnaires. The structured questionnaires were procurement-specifically operationalised. Data were collected from respondents in Germany, Finland, and the UK.	In building firm resilience, organisational attention with a focus on supply chain risk sources and a focus on supply network recoverability are needed to improve resilience in a firm.
El Baz and Ruel, (2021)	The study investigated how risk management practices alleviate disruption and impact supply chains' resilience and robustness.	Supply chain risk management practices [1]	Organisational information processing theory Resource base view theory Dynamic capability theory	A survey using a random sampling administered questionnaires to supply chain managers via emails. In all, 470 completed responses were received. The research was conducted among companies in France.	The study affirms that tenets of organisational information processing, resource base view, and dynamic capabilities help bolster resilience. Also, the mediating roles of supply chain risk management practices help in achieving resilience in firms.
Laguir et al. (2022)	The study examined analytical capability and disruption orientation effects on supply chain resilience.	Environmental uncertainty [1]	Resource Base View Dynamic Capabilities View	The study administered a structured questionnaire to 3000 manufacturing companies in France. In all, 405 key informants who are vested in analytical, supply chain, and operations management were made to answer the questions.	There is a positive association between analytical capabilities and supply chain resilience. There exist a positive association between analytical capabilities and operational performance through supply chain resilience.

Note: [1] = Mediator, [2] = Moderator

Table 2.1 ***Continued***

Author(s) (Year)	Focus on the determinants of operational, organisational, and supply chain resilience.	Contingency variables	Theoretical Perspective/key argument	Context and data	Key findings
Essuman et al. (2022)	The study examined how resource slack relates to operational resilience.		Resource-based theory Attention-base view	Primary data comprising of 259 firms in Ghana were collected.	The building of resource slack as an input-based untapped resource can be leveraged to build capabilities that improve operational resilience. It is further noted that resource slack in driving operational resilience is channelled through organisational attention.
Li et al. (2022)	The study explores how matching internal competencies and external resources improves operational resilience.		Matching the perspective of internal competency with external resources	The study generated its sample size from public firms on the Shanghai Stock Exchange. The data was collected from the Accounting Research database and other private research databases.	The matching of internal competencies and supply chain network resources in an appropriate manner helps bolster operational resilience. Aligning internal flexibility with external stability and internal stability with external flexibility improves firms' operational resilience. Firms in a central position within the supply chain network with high product diversity and greater operational efficiencies can properly absorb the impact of the COVID-19 pandemic.

Note: [1] = Mediator, [2] = Moderator

Table 2.2. Critical gaps identified in the empirical review on determinants of supply chain/ operational resilience that presents the path for the current study.

Author (s)	Gaps
Jüttner and Maklan (2011)	• The study indicates that further studies should examine behavioural antecedents in improving resilience at the firm and supply chain level. • Also, further studies should explore organisational attitude towards supply chain disruptions.
Bode et al. (2011)	• The study used the organisational information processing theory as the theoretical lens for explaining the hypothesised relationship of firm's response to supply chain disruptions. • But the study ignored firm interpretation and managerial motivation to respond in a supply chain disruption erupts.
Golgeci and Ponomarov (2013)	• The study calls for further studies to examine how innovation within and among firms reduces supply chain disruptions and enhances supply chain resilience.
Ambulkar et al. (2015)	• The study calls for further investigation on supply chain disruption relationship with other dimensions of resilience such as operational and supply chain resilience. • Future studies should collect data on the dependent variable (firm resilience) from two or more respondents in each firm.
Wong et al. (2020)	• Further studies should explore how environmental uncertainties emanating from supply disruptions and environmental munificence and suppliers' relationship affect supply chain resilience.
El-Baz and Ruel (2021)	• States that information processing during supply chain disruptions is key for building robust and resilient systems. Therefore, further studies should complement the organisational information processing theory with other theories to help firms in effectively understand the mechanisms that enhances resilience building.

2.4.2 Outcomes of threat/opportunity interpretation bias

Building on the backdrop of the much research work that has been conducted about issue interpretation, this section reviews the empirical context, theoretical perspective, contingency variables, and key findings on the outcomes of opportunity and/or threat interpretation. To begin with, the empirical context of issue interpretation as opportunity or threat has been examined particularly in developed countries and in diverse industrial settings. Sharma and Nguan (1999) explored issue interpretation among North American biotechnology and pharmaceutical companies and their strategies for the adoption of biodiversity conservation. Sharma (2000) examined how the Canadian oil and gas sector implemented environmental policies because of regulations and environmental pressures. Dewald and Bowen (2010) studied how U.S. real estate brokerage firms respond to disruptive innovation as threats or opportunities. Haney (2017) investigated threat interpretation response and innovation in relation to changes in climate. The consistent data collection methods were mail-in surveys of managers from different groups of the study's sample under investigation.

In relation to the theoretical approaches used, the predominant theories were prospect theory and threat rigidity theory relating to issue interpretation in strategic management. In the studies of opportunity and threat interpretations and their effects on organisational actions, the prospect theory posits that interpretation as a threat reveals a risk-seeking behaviour, whereas the threat rigidity theory predicts risk-averse behaviour and loss of control when a threatening interpretation is induced (Chattopadhyay et al., 2001; Dewald and Bowen, 2010). Table 2.2 is a compendium of past empirical studies on the outcomes of threat/opportunity interpretation bias.

Table 2.

3: Past empirical research on the outcomes of threat/opportunity interpretation bias

Author(s) (Year)	**Threat/opportunity interpretation in different contexts**	**Outcome variables**	**Theoretical perspective/key arguments**	**Moderators/ mediators**	**Key findings**
Staw et al. (1981)	The study looked at the threat rigidity effect in terms of people, groups, and organisational behaviour.	Information processing	Threat rigidity hypothesis		The findings reveal that at each level of analysis (individual, group, and organisation), when people are faced with threatening situations or crises, they exhibit restriction in information processing, constriction of control, develop an efficiency motive of resource conservation during threatening circumstances.
Harrington et al. (2002)	Threat rigidity, which leads to threat interpretation bias, was investigated among newly formed teams.	Decision making	Threat rigidity theory.		Among newly founded groups, there is adequate information sharing and processing. When compared to organisations that have been working together for a longer amount of time, newly established groups seemed to place more emphasis on the internal attribution of danger and respond differently.
Dewald and Bowen (2009)	Threat/opportunity Interpretation was examined in the context of small Incumbent Real Estate firms.	Resisting change Adopting change	Prospect theory, Threat rigidity and issue interpretation	Urgency and Experience	Managers of small incumbent firms exhibit resistance when they perceive disruptive business models as a threat. Risk-experienced managers of small incumbent firms adopt disruptive business models. Therefore, risk experience moderates the opportunity for the adoption of disruptive business models.

Table 2.

3. Continued

Author(s) (Year)	Threat/opportunity interpretation in different contexts	Outcome variables	Theoretical perspective / key arguments	Moderators/ mediators	Key findings
Sharma and Nguan (1999)	this study investigated the managerial interpretation of threat/opportunity and the strategies for the conservation of biodiversity in the biotechnology industry	Biodiversity preservation strategies	The study draws an argument from the findings of Sharma, (2000) that when there is a higher level of managerial interpretation of environmental issues as opportunities there arises a greater level of organisations demonstrating voluntary environmental strategy	-	Biotechnology companies that recognize biodiversity strategies as a threat to the growth and profitability of their firm will develop reactive strategies that involve reduced participation in biodiversity conservation. Contrastingly, biotechnology companies that interpret biodiversity strategies as opportunities for growth, profitability and competitiveness will lead to proactive participation that will increase their involvement in biodiversity conservation
Chattopadhyay *et al.* (2001)	The study explored organisational actions in response to threats and opportunities	Organisational action	Threat rigidity theory and Prospect theory	Strategic type Slack resources	The study affirms the prospect theory that managers who are faced with losses are more likely to be risk-seeking whilst managers who are in control of organisational activities are more likely to be risk averse which is in line with the threat rigidity theory.

Table 2.

3. continued

Author(s) (Year)	Threat/opportunity interpretation in different contexts	Outcome variables	Theoretical perspective/key arguments	Moderators/ mediators	Key findings
Sharma (2000)	Sharma (2000) investigated the managerial interpretation of firms' selection of environmental policy.	Environmental strategy	An organization's environmental strategy is influenced by management's assessment of environmental concerns as opportunities rather than dangers.		The study's findings show that more organisations would adopt a voluntary environmental strategy when there is a higher level of managerial interpretation of environmental concerns as opportunities.
Yu et al. (2019)	The study assessed the mediating role of managerial interpretation in the relationship between dynamic capability and the adoption of environmental innovation	The voluntary intention of adopting an emission trading scheme	Dynamic capability Issue interpretation	Managerial interpretation	Organisations with greater dynamic capability tend to adopt environmental innovation voluntarily even when it is of greater risk to them. Also, organisations with higher levels of dynamic capabilities interpret the adoption of environmental innovation as an opportunity.
Haney (2015)	Threat interpretation was studied in the context of climate change from an ethical perspective.	Innovation	Dynamic capability	Moral legitimacy and enlarged responsibility to society	The two ethical mechanisms of enlarged responsibility to society and moral legitimacy positively mediate the relationship between threat interpretation and innovation.

Table 2.

2.4.3 Outcomes of disruption orientation

As supply chains globally face the risk of disruptions, numerous research studies have investigated disruption orientation in different contexts, perspectives, and theoretical lenses to explain its effect on resilience. The following are some of the outcomes of disruption orientation. Bode et al. (2011) used the organisational information processing viewpoint as a theoretical framework to analyse how businesses respond to supply chain disruptions. The study collected email survey results from senior managers of manufacturing firms located in Switzerland, Austria, and Germany. Based on the information processing perspective, the study explains that firms with a greater disruption orientation tend to develop and implement strategies for lowering the probability and effects of future supply chain disruptions (BrandonJones et al., 2014).

Ambulkar et al. (2015) explored how the influence of disruption orientation on firm resilience is mediated by resource reconfiguration. The study proposed that supply chain disruptionoriented firms can reconfigure resources. The study created a multi-item scale where new scales were established for firm resilience and pre-existing scales were combine. Ambulkar et al.'s (2015) findings reveal that disruption orientation is imperative for developing firm resilience. The study expounds that in disruption orientation, managers learn from past disruptions, continuously monitor their environments, and become cognizant, allowing them to manage future disruptions.

Parker and Ameen (2018) investigated how the resilience capabilities of firms shape their response to disruptions. The study collected data from South African firms that are connected to the Eskom electricity supply. The context of an electricity supplier was chosen because Eskom was facing a capacity shortage that resulted in blackouts that impacted firms in the country. The study used a web-based survey to collect data from key informants. Lending on the theoretical lenses of RBV and dynamic capability theory, the study finds that proactive risk

management and firm resilience are positively correlated with disruption orientation (Parker and Ameen, 2018). Additionally, Parker and Ameen (2018) discovered that resilience capabilities such as disruption orientation have a positive association with firm resilience. Parker and Ameen (2018) further mention that firm resources alone are not sufficient for creating resilience, but proactive risk management strategies through the mediation of disruption orientation are what augment firm resilience. Parker and Ameen, (2018) therefore conclude that for firms to mitigate the impacts of disruptions, it is necessary to become disruption oriented.

Riley et al. (2019) examined how recovery and continuous improvement capabilities reduce supply chain disruptions. The study used a survey method to collect data from 219 procurement managers. The dynamic capability theory was used as a theoretical lens to support the assertion that disruption orientation improves recovery and continuous improvement (RCI) capabilities. Findings reveal that firms with a greater supply chain disruption orientation have increased levels of RCI capabilities. This relationship consequently leads to an increase in operational performance, as there is a significance in the relationship between RCI capabilities and operational performance (Riley et al., 2019).

Yu et al. (2019) investigated disruption orientation and resilience in the supply chain and their impact on financial performance. The study lends on dynamic capability view to collect empirical data from 249 Chinese firms using a survey instrument. The findings uncover that as firms want to enhance their financial performance, they decide on whether to promote supply chain resilience strategies or develop disruption orientation. The study shows that firms should make it a priority to choose both strategies. Although choosing resilience capabilities provides firms with the opportunity to utilise their limited resources, however, it impedes firms from adopting disruption orientation (Yu et al., 2019). The study, therefore, lends support to the fact that disruption orientation precedes supply chain resilience. Thus, managers may strengthen

their supply chain by adopting a greater level of disruption orientation. Therefore, when disruption orientation and supply chain resilience capability are embraced, it leads to the creation of increased financial performance (Yu et al., 2019).

To conclude, the major theoretical perspectives on disruption orientation have been the resource base view, dynamic capability theory, and organisational information processing theory. Also, the context of empirical research on disruption orientation has been in both developed and developing countries. Surveys have been the major data collection instrument for supply chain disruption orientation. Lastly, all the reviewed empirical findings attest that supply chain disruption orientation improves resilience-building at the operational, firm, and supply chain levels.

2.4.4 Major issues in prior studies and the path for the present study

Clearly, research on the determinants of supply chain resilience has flourished expansively by investigating multifaceted contexts and perspectives. After the investigation of the literature, these are the important deficiencies that serve as an avenue for future studies.

I. There is limited research work concerning empirical studies on operational resilience. Most of the studies on building resilience have been conducted at the firm and supply chain levels.

II. There is a paucity of empirical studies on organisational responses to threatening situations such as disruptions. Specifically, there exists an empirical gap on how managerial interpretation of supply chain disruption as a threat or opportunity influences organisational action to develop resilience in their operations.

III. Previous studies assert that disruption orientation enhances resilience through learning from past disruptions, becoming aware of their environment, and further developing recovery and continuous improvement capabilities to lessen the impacts

of disruptions. Yet, prior studies have not examined its interaction with threat interpretation bias in affecting operational resilience. This study therefore incorporates disruption orientation to examine its moderated effect on the relationship between supply chain disruption-operational resilience linkage mediated by managerial threat interpretation bias.

2.5 Conceptual Model and Hypothesis Development

This study uses threat rigidity theory and organisational information processing theory to theorise the role and boundaries of threat interpretation bias in the supply chain disruptionoperational resilience linkage. Also, the study investigates how the moderating role of low and high disruption orientation affect supply chain disruption-operational resilience linkage through threat interpretation bias. Drawing upon threat rigidity theory and organisational information processing theory, the study proposes an integrated conceptual framework (see figure 2.2) to examine the relationship between the variables.

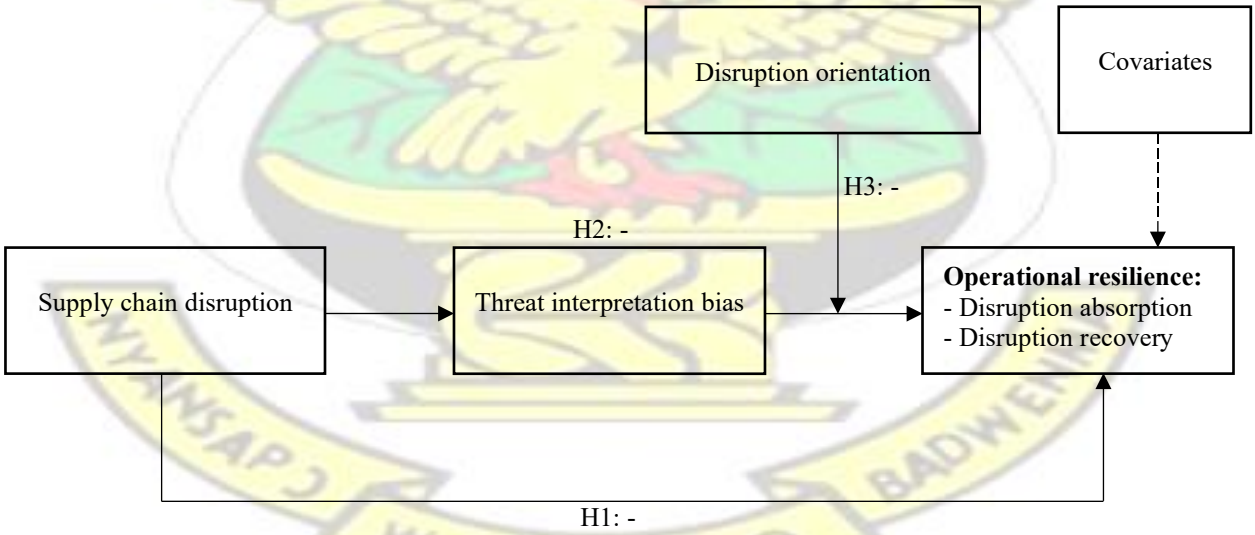

Figure 2.2: the conceptual model of the study

Source: Author's construct

2.5.1 The relationship between supply chain disruption and operational resilience

Anecdotal evidence and prior research suggest that supply chain disruptions have the capability to hinder firm performance (Forbes, 2022; Juan and Li, 2023; Li et al., 2022). However, past resilience studies have produced inconclusive findings about the relationship between supply chain disruption and resilience (see El Baz and Ruel, 2021; Parker and Ameen, 2018; Wong et al., 2020). For example, El Baz and Ruel (2021) discovered that disruption impact correlates negatively with supply chain resilience. Contrastingly, Parker and Ameen (2018) show that disruption impact has no effect on firm resilience. Also, Wong et al. (2020) identified that supply chain resilience has a positive relationship with risk management practices, market performance, and financial performance within the boundaries of infrastructure disruptions, catastrophic disruptions, and supplier side disruptions.

Lending on the threat rigidity theory, this study states that supply chain disruptions can be characterised as negative events that are uncontrollable and exposes the efficacy to cause loses to firm operations (Staw et al., 1983). Also, this study maintains that supply chain disruptions are idiosyncratic (Iyengar et al., 2021), and their frequency of occurrence and degree of severity on the operations of firms differ (Craighead et al., 2007; Essuman et al., 2020). Therefore, the threat rigidity theorist may assert that when a disruption strikes, managers may engage in rigidity to act because of their tendency to constrict control, prioritise efficiency by conserving resources and restrict information processing. Hence, disruption impact at the operational level may encounter difficulties implementing absorption and recovery capabilities which inhibit operational resilience development. So, in light of the above statements, this study argues that:

H1: Supply chain disruption has a negative relationship with operational resilience.

2.5.2 Mediating role of threat interpretation bias

In the era of increasing disruption, every supply chain is prone to disruption risk (El Baz and Ruel, 2021; Riley et al., 2019; Wong et al., 2019). Supply chain disruptions, an unexpected event that interrupts the regular flow of materials, finance, and information that moves across the entire supply chain (Ivanov, 2021; Queiroz et al., 2022; Riley et al., 2019), manifest in varying forms. Examples of supply chain disruptions are disasters, political and financial crises, system breakdowns, electricity and power crises, currency and exchange rate volatility, unreliable suppliers, diseases, strikes, cyber-attacks, and many more (Essuman et al., 2022; Ivanov, 2021; Parker and Ameen, 2018; Wong et al., 2019). The uncertainties and unpredictability that supply chain disruptions present have engendered serious managerial concerns (Pettit et al., 2019). Nonetheless, despite the significant losses associated with supply chain disruptions, they also create opportunities and inspiration for firms to innovate (Yan et al., 2022). Consequently, managers can regard supply chain disruption as either a threat to avoid or an opportunity to exploit.

From issue interpretation literature, managers scan their environment and interpret environmental issues as either threats or opportunities (Chattopadhyay et al., 2001; Haney, 2017; Jackson and Dutton, 1988; Sharma, 2000). Accordingly, the threat rigidity theory maintains that uncontrollable and negative issues that have the potential for losses are characterised as threats (Chattopadhyay et al., 2001; Olson et al., 2020; Staw et al., 1981). Thus, based on the threat rigidity theory, supply chain disruptions that have the potency to decimate firms' performance and survival, contributing to losses (Essuman et al., 2020; Li et al., 2022), can be characterised as threats, and this may induce threat interpretation bias among managers.

Additionally, this study contends that threat interpretation bias emanating from supply chain disruptions may reduce operational resilience due to the following reasons: Firstly, threat interpretation bias results in reduced information processing through restriction of information

(Staw et al., 1981). Information restriction in the awakening of a threatening situation manifests in the form of reduced information channels used and a minimisation the information codes employed (Staw et al., 1981). Information restriction shrinks information search and information processing but does not reduce the uncertainty shrouding a threatening situation (supply chain disruption). Meanwhile, past studies have identified that information sharing, attention to issues, and information technology improve firms' resilience (e.g., Brandon-Jones et al., 2014; Essuman et al., 2022; Gu et al., 2021). For instance, Brandon Jones et al.'s (2014) empirical findings affirm that information sharing enhances supply chain visibility and improves supply chain resilience. Hence, information restriction in threat interpretation bias hinders information processing of supply chain disruptions that might undermine operational resilience.

Secondly, in the unlikely event of a threatening situation such as supply chain disruptions occurring, high levels of threat interpretation bias will result in control constriction (Staw et al., 1981). Control constriction manifests in the form of centralisation of authority and increased formalisation (Staw et al., 1981). Centralisation of authority and in the event of a supply chain disruption may occasion narrow consultation or non-participation with employees of the firm and may lead to myopic managerial decision making with regards to the supply chain disruptions. Also, increased formalisation that emphasises explicit guidelines and implementation of standard practices within the firm will result in rigidity in taking alternative measures to mitigate supply chain disruption impacts (Staw et al., 1981). However, evidence suggests that the flexibility of firm's operations increases resilience (Zsidisin and Wagner, 2010). Following the argument made above, this study hypothesize that:

H2: Supply chain disruption has a negative relationship, through threat interpretation bias, with operational resilience.

2.5.3 The moderating role of disruption orientation

The organisational information processing theorists hold that uncertainties within an organisation can be overcome by bolstering information processing capabilities (BrandonJones et al., 2014a; Galbraith, 1974; Yang et al., 2021). Past studies have identified disruption orientation as an antecedent of the organisational information processing system (Ambulkar et al., 2015; Brandon-Jones et al., 2014a) that enhances risk management capabilities (Yang et al., 2021) and improves firm resilience (Ambulkar et al., 2015; Parker and Ameen, 2018; Yu et al., 2019).

The premise of disruption orientation is established that firms that are actively attentive to their environment act proactively and ensure they maintain a consciousness of their environment to counteract disruptions that may ensue (Bode et al. 2011). According to Bode et al. (2011), firms with a higher level of disruption orientation attach greater importance to supply chain disruptions and recognize the increased need for stability. This study argues that organisations with a higher disruption orientation are aware and conscious of disruptions and appreciate the opportunity to learn from them. Therefore, disruption-oriented organisations can learn from past disruptions, plan, prepare, respond, and recover from disruptions (Ambulkar et al., 2015; Brandon-Jones et al., 2014a). On the contrary, organisations with low disruption orientation are unconcerned, unserious towards disruptions, and do not recognise the chance to learn from disruptions (Riley et al., 2019).

Additionally, this study contends that disruption orientation and threat interpretation bias do not exist exclusively in isolation from each other in the sense that both view disruptions as threats (Brandon-Jones et al., 2014a; Staw et al., 1981) and recognise the need to act. Also, both disruption orientation and threat interpretation bias engage in information processing to clarify uncertainties pertaining to supply chain disruptions. However, disruption-oriented firms engage in information searches and learn from prior disruptions, which encourages

proactiveness to act towards supply chain disruptions (Brandon-Jones et al., 2014a; Parker and Ameen, 2018). Threat interpretation bias, on the other hand, due to information restriction and control constriction may act rigidly towards supply chain disruption (Staw et al., 1981). As such, it is likely that highly disruption-oriented firms may exhibit low threat interpretation bias.

Furthermore, supply chain disruptions are regarded as unexpected occurrences that interrupt the survival and functions of firms, increasing the uncertainties that confront them (BrandonJones et al., 2014a). Accordingly, the information processing theory posits that when firms are faced with uncertainties concerning their environment, they must match their information requirements with their information processing capacities (Yang et al., 2021). This study considers disruption orientation as an information processing capacity that matches information requirements on supply chain disruptions (Yang et al., 2021). Disruption orientation as an information processing capacity induces firms' consciousness and alertness towards supply chain disruptions, enables firms to learn from the experience of past disruptions, and quickly responds against disruptions to ensure recovery (Yang et al., 2021). Thus, disruption orientation as an information processing capacity provides the needed information on supply chain disruption requirements, thereby reducing uncertainty about supply chain disruptions and augmenting resilience (Yang et al., 2021).

Contrastingly, threat interpretation bias in processing information about supply chain disruptions may engage in reliance on existing experience and knowledge (Staw et al., 1981) without acknowledging the idiosyncrasies and novelty of supply chain disruptions, which may require alternative ideas. As a result, information processing under threat interpretation bias response may not satisfy the information requirement about supply chain disruption incidences and might further enhance the uncertainties regarding a supply chain disruption (Gu et al., 2021). Consequently, supply chain disruptions through threat interpretation bias may hinder operational resilience, while the moderation of high disruption orientation can reduce supply

chain disruption uncertainties and weaken threat interpretation effects. In view of that, this study argues that:

H3: The negative relationship between supply chain disruption and operational resilience through threat interpretation bias is weaker in high than low disruption orientation situations.

CHAPTER 3

METHODOLOGY

3.1 Introduction

The methodology for the study is presented in this chapter. Specifically, the chapter discusses the philosophical perspective, research approach and design, empirical setting and population of the study, sample and sampling approach, unit of analysis, construct operationalisation, questionnaire development, the process for data collection, data analysis and the ethical considerations of the study.

3.2 Philosophical Perspective

The positivist philosophical approach is the foundation of this study. The positivist viewpoint holds that scientific inquiry is recognised as a method for discovering the truth and that there exists an objective truth that exists out there (Sekaran and Bougie, 2016). The positivist perspective is based on the idea that current research uses existing theories to form hypotheses. The statements offer hypothetical explanations that can be verified or denied by testing (Saunders et al., 2019). The positivist approach often uses prior theories to empirically test quantitative data with the aim of making a generalisation.

In accordance with the positivist philosophical approach, this study relies on existing theoretical lenses of threat rigidity theory and organisational information processing theory to formulate the study's hypotheses of threat interpretation bias effects on supply chain disruptions-operational resilience linkage, and how the contingency effect of disruption orientation affects the relationship of the independent and dependent variables. Also, this study tested the hypotheses quantitatively to generate evidence for accepting or refusing the stated hypotheses and making generalisation about them.

3.3 Research Approach and Design

In line with the positivist philosophical approach, the study uses the deductive approach to generate its outcomes. The positivist-deductive approach to empirical research emphasises explaining causal relationships and establishing controls to test hypotheses. Bruce (2022) highlights that there are five successive stages for investigating a phenomenon empirically using a deductive approach. These are the deduction of hypotheses, stating of hypotheses operationally, testing of the hypotheses, examination of the specific findings of the test, and the making contribution or modification of the theory. Consistent with the deductive approach of the positivist perspective, this study deduced hypotheses about the association between managerial threat interpretation bias and supply chain disruption-operational resilience linkage, operationalised the hypotheses, quantitatively tested the variables, generated findings among the associations, and made contributions to the theories used.

A research design is a plan for gathering, measuring, and analysing data to address your research questions and research objectives (Sekaran and Bougie, 2016). The appropriateness of a research design for a specific study is dependent on the research objectives, research questions, limitations of the study, and availability of funds and time (Sekaran and Bougie, 2016). Experiments, case studies, observations, grounded theory, action research, mixed methods, and surveys (cross-sectional and longitudinal) are some research designs that are used to collect data. However, among research works that are grounded in deductive reasoning, surveys and experiments have mostly been used to collect quantitative data to test hypotheses (Lee and Lings, 2008).

Previous studies on operational, firm, and supply chain resilience (see Table 2.1) predominantly gathered data for analysis using survey designs. Therefore, following the example of previous research on the determinants of operational resilience (Essuman et al., 2022, 2020; Li et al.,

2022) and limited time and resources, this study employs a cross-sectional survey design as its research design.

3.4 Research Purpose

Research can be classified as exploratory, descriptive, or explanatory based on the research objectives that it seeks to achieve (Sekaran and Bougie, 2016). Exploratory research is a kind of research that is used when there is not much information about the phenomenon of study, and when there is not enough theory available to guide the development of a hypothesis for testing (Sekaran and Bougie, 2016). Moreover, exploratory studies mostly involve gathering qualitative data and generalisation cannot be made from the results (Sekaran and Bougie, 2016). Descriptive research on the other hand seeks to describe a phenomenon that is of interest to a researcher (Zikmundet al., 2010). Descriptive research can be both quantitative or qualitative and are collected to describe characteristics of a person, firm, organisation, event, or situations (Sekaran and Bougie, 2016).

This study can be described as explanatory research as it seeks to test the hypothesized relationship between variables by drawing on theoretical underpinnings to explain the effect of one variable over another (Saunders et al., 2012). So, this study seeks to explain the effect of supply chain disruption on operational resilience by delving deeper to explicate how the roles of threat interpretation bias and disruption orientation explains the linkage between supply chain disruptions and operational resilience by using the threat rigidity and OIP theories.

3.5 Empirical Setting and Population

The study's hypotheses were tested on data from manufacturing and service sector firms in Ghana. The research setting and characteristics of the population were chosen due to their relevance to the research questions and objectives. To begin with, the manufacturing and service organisations in Ghana face several disruptions as opposed to firms in developed

countries, which makes it suitable for testing resilience models (FM Global Resilience Index Report, 2022). Some of these disruptions that the Ghanaian manufacturing and service sectors face include exchange rate fluctuations (The Business and Financial Times Online, 2022), floods, fire outbreaks, transportation failures because of poor transportation infrastructure and weak regulatory enforcement (World Bank, 2018). Also, Dey (2016) notes that other forms of disruption to the manufacturing and service sectors in Ghana are transportation accidents, vehicular breakdowns, production and delivery delays, and unreliable power supply.

Owing to the continual occurrence of disruptions that face manufacturing and service firms in Ghana, it, therefore, becomes important to investigate how managerial interpretation of disruptions influences their decisions to either become rigid or take initiatives to mitigate disruptions and their impact on operational resilience. Also, this study argues that firms in the setting of the study are resource constrained, partly because of an unstable capital market (Essuman et al., 2020; Parker and Ameen, 2018). Therefore, firms in resource constrained environmental settings are likely to focus on their financial inability to characterise disruptions as threats to their operations and survival. This will inevitably lead to threat interpretation bias among managers and may reduce operational resilience. Yet, research on organisational responses to disruptions (threatening situations) in resource constrained environments is limited.

The study's target population is autonomous manufacturing and service firms in Ghana. Firms in the service sector include Health and Social work, Information and Communication, Education, Transportation and Storage, Finance and Insurance, Real Estate, Public Administration and Defence, and Social Security (Ghana Statistical Service, 2022). The service sector contributes a total of 44.4% to the Gross Domestic Product (GDP) of Ghana (Ghana Statistical Service, 2022). Also, the manufacturing firms are mostly firms that produce household and non-household goods, and the manufacturing firms contribute 7.4% to the GDP of Ghana (Ghana Statistical Service, 2022). Consequently, the manufacturing and service firms generate significant revenue and profit,

making them worthwhile to be considered for this study. Moreover, using manufacturing and service sector firms with varying internal and external environmental characteristics affords the study the opportunity to increase the heterogeneity with regards to the independent, moderating, and dependent variables, which helps bolster the generalisability of the findings (Bouquet et al., 2009).

The study focused on manufacturing and service firms that operated in the two major cities in Ghana, namely Kumasi and Accra in the Ashanti Region and Greater Accra Region, respectively. According to the integrated business establishment survey phase II (Ghana Statistical Service, 2018), most firms in the industries (including manufacturing) and service sector are in the Accra Metropolis and Kumasi Metropolis. Since Kumasi and Accra contain the highest concentration of the country's economic and commercial activities and service firms, the study deemed it salient to test the conceptual model.

3.6 Sample and Sampling technique

In Ghana, there is a lack of reliable information about businesses (Boso et al., 2013). Various institutional databases, such as that of the Registrar General Department, the Association of Ghana Industries, and the Ghana Business Directory, provide different types of information about businesses in Ghana. The study relied on the Ghana Business Directory- Ghana Yello online database to identify some firms of interest within the selected sample of the study (cf. https://www.ghanayello.com). The Ghana Yello database enabled the researcher to access readily available information on businesses in the country. Also, the Ghana Yello database provided information on firm size and firms' date of commencement, making it easy for the researcher to identify the firm that falls within the category that is required to administer the questionnaire of the study. Further, the database is frequently updated, which makes it an easily accessible database to obtain current details of firms.

The study focused on firms in Accra and Kumasi to ascertain an appropriate sample for the study. The study relied on prior research (see, e.g., Essuman et al., 2022) to define a sample selection criterion of (1) Firms located in Accra or Kumasi, (2) Firms that operate in the manufacturing or service sector, (3) firms that are autonomous business organisations, (4) have five to five hundred full-time employees, and (5) have existed for a minimum of 3 years. Using the stated criterion, about seven hundred and fifty manufacturing and service firms in Kumasi and Accra were collated from the Ghana Business Directory- Ghana Yello database.

In line with prior studies (e.g., Essuman et al., 2022) the study used a multi-sampling technique to ascertain data from informants. Based on the figures of Ghana Statistical Service (2018) the study determined the representative sample of firms using quota and stratified sampling. Also, purposive sampling was used to administer questionnaires to key informants based on the selection criteria and availability of capable and literate informants to respond to the questionnaire (Chowdhury and Quaddus, 2017; Essuman et al., 2022).

3.7 Unit of Analysis

The study's unit of analysis is at the firm level, specifically manufacturing and service firms located in Kumasi and Accra, Ghana. Unlike some studies that rely on multiple informants (for instance, Blackhurst et al., 2011; Jüttner and Maklan, 2011; Staw et al., 1981) from the same organisation by receiving data on the independent variable from one person and the outcome variable from a different individual, this study acquired data on all variables from a single key informant (for instance, Ambulkar et al., 2015; Essuman et al., 2022, 2020; Parker and Ameen, 2018). Rindfleisch et al. (2008) emphasise that using many informants to gather information on the independent and outcome variables from various informants may be appropriate in large firms but challenging to put into practise in small firms where the owner-manager is in control of everything. In this study, only a small portion of the firms we collected data from can be considered large firms, while many are smaller firms. Hence, it becomes important for the study

to collect data on all variables from one individual. Mostly, in these firms, the managers are involved in the strategic, tactical, and operational activities of the firms, which makes them capable of providing accurate responses about the study's variables. Consequently, the study collected data from a single key informant in each firm.

3.8 Construct Operationalisation and Survey Questionnaire

To augment the reliability and validity of the data, the measurement indicators were adapted from existing literature and field interviews with managers. Altogether, the study captured six variables as reflective indicators and one as a formative indicator. The reflective indicators are threat interpretation bias, disruption orientation, disruption recoverability capability, disruption absorption capability, environmental dynamism, and resource slack. The formative indicator is supply chain disruption. Except for supply chain disruption, which combined existing indicators from literature and interviews with senior managers, all other constructs were adapted from existing literature. Also, an effort was made to ensure that the identified indicators tapped into the operational definitions of the constructs to fit the empirical setting and enable the key informants to comprehend the content. Additionally, the study's supervisors reviewed the output and offered constructive critiques to help with the creation of the final questionnaire. Lastly, the updated survey was tested among a few senior executives in firms that share the characteristics of the study's target population. Indicators that were used in the study's questionnaire are as follows:

Dependent variable: Operational resilience

Extrapolating from previous studies, this study operationalizes operational resilience into a two-dimensional construct consisting of disruption absorption and recoverability (Essuman et al., 2022, 2020). The study defines disruption absorption as the ability of a firm to maintain structure and functioning despite the disruption that it may be encountering. Respondents were asked to indicate the extent to which they agree or disagree on a scale of "1= strongly disagree"

to "7= strongly agree". Specifically, the study used six indicators adapted from (Brandon-Jones et al., 2014b) to measure disruption absorption: In the past three years, whenever we faced a disruption, (1) our company is able to carry its regular functions; (2) our company grants us much time to consider a reasonable response; (3) our company is able to carry out its functions despite some damage done to it; (4) without much deviation, we are able to meet normal operational and market needs; (5) without adaptations being necessary, our company performs well over a wide variety of possible scenarios; (6) our company's operations retain the same stable situation as it had before disruptions occur for a long time.

Also, recoverability refers to the ability of firms to restore their operations to the normal level they used to after a disruption. Respondents were asked to indicate the extent to which they agree or disagree on a scale of "1= disagree" to "7= agree". Respondents were asked to indicate the extent to which they agreed or disagreed. The study identifies five indicators of recoverability from Brandon-Jones et al. (2014) and Wieland and Wallenburg (2012) as follows: Over the past 3 years, whenever our operations breakdown due to a disruptive event, (1) it does not take long for us to restore normal operations; (2) our company reliably recovers to its normal operating state; (3) our company easily recover to its normal operating state; (4) our company effectively restores operations to normal quickly; (5) we are able to resume operations within the shortest possible time.

Independent variables: supply chain disruptions and threat interpretation bias

Gleaning from previous studies, this study operationalised supply chain disruption as the frequency of exposure to unexpected events that interrupt the normal flow of products and processes in a firm's supply chain (Brandon-Jones et al., 2014a). The study integrated insights from previous literature (Ambulkar et al., 2015; Bode et al., 2011) with in-person interviews with senior managers to assess the extent to which businesses experienced supply chain

disruptions in the previous three years. Nine formative indicators used to determine supply chain disruptions are as follows: (1) some of our employees leave their posts (i.e., quit their job); (2) some of our suppliers fail to make deliveries; (3) we experience vehicular breakdowns; (4) we experience service/product failure, (5) we run out of cash for running day-to-day operations; (6) we experience machine/technology downtime/failure; (7) we experience a shortage of raw materials; (8) we experience power cuts; and (9) some of our service providers fail to honour their promises.

Furthermore, this study operationalises threat interpretation bias as the degree to which supply chain disruptions are regarded as threats rather than opportunities (Chattopadhyay et al., 2001; Jackson and Dutton, 1988; Sharma, 2000). Based on a seven-point scale (1= strongly disagree, and 7= strongly agree), four indicators used for measuring threat interpretation bias are stated as: (1) our top management often saw problems rather than opportunities; (2) our top management worried more about the losses from the events than the benefits; (3) our top management tended to lose focus on the potential bright side of the events; (4) our top management became quite worried about the fate of the company.

Moderating variable: disruption orientation

The study introduces disruption orientation as the moderator to examine the magnitude of its effect on the association between threat interpretation bias and operational resilience, and supply chain disruption-operational resilience linkage through threat interpretation bias. Disruption orientation of firms is their "general awareness and consciousness of, concerns about, seriousness toward, and recognition of the opportunity to learn from supply chain disruptions" (Bode et al., 2011 p.837). Using an indicator of 1 to 7 scales where "1= strongly disagree" and "7=strongly agree", the respondents were asked to indicate their extent to which they agree or disagree. The following are the indicators used for measuring disruption

orientation: (1) We always feel the need to be alert to possible disruptive events; (2) Previous unplanned disruptions show us where we can help improve our company's operations; (3) We think a lot about how threatening events could have been avoided; (4) After an unplanned operational disruption has occurred, our management lead in analysing it thoroughly.

Control variables and firm characteristics

Previous research indicates that external and internal factors can influence resilience variables and their predictors (Pettit et al., 2019). The study controlled for the effects of resource slack, environmental dynamism, firm size, industry type, and firm age on the roles and boundaries of threat interpretation bias on supply chain disruptions and operational resilience linkage.

Resource slack is the number of discretionary resources at a firm's disposal that are used to support operational activities. The discretionary resources available for firm utilisation can enhance firms' preparedness where the resources become available to be unleashed to mitigate supply chain disruption impacts (Essuman et al., 2022). Hence, resource slack increases managerial perceived controllability of threatening situations such as supply chain disruptions and results in managers seeing threatening issues as opportunities rather than threats (Sharma, 2000). Also, using a scale of 1 to 7, where "1= strongly disagree" and "7=strongly agree" this study adapted five indicators from Atuahene-Gima et al. (2005) to measure resource slack. The following are the measures of resource slack: (1) our company often has uncommitted resources that can quickly be used to fund new strategic initiatives; (2) our company usually has adequate resources available in the short run to fund its initiatives; (3) we are often able to obtain resources at short notice to support new strategic initiatives; (4) we often have substantial resources at the discretion of management for funding strategic initiatives; (5) our company usually has a reasonable amount of resources in reserve.

Additionally, the study controlled for environmental dynamism referred as to level of occurrence of irregular changes in a firm's task environment (Dess and Beard, 1984). Firms

that operate in a highly dynamic environment face greater uncertainty and a heightened threat to their stability (Dess and Beard, 1984). On a scale of 1 to 7 where 1= strongly disagree and 7= strongly agree, six indicators were adapted from Dess and Beard (1984). The indicators begin by stating that: over the past three years, there have been irregular changes in (1) the needs and preferences in our demand/customer market; (2) the actions of our competitors, in terms of their promotions, innovations, etc.; (3) terms, conditions, and structures in our supply markets; (4) government policies and programmes for our industry; (5) laws and regulations governing our industry; (6) technological needs and advancement in our industry.

Firm size is indicative of a firm's number of employees, sales volume, total assets, the market value of equity etc… As opposed to smaller firms, larger firms are complementarily characterised by complexity. Blackhurst et al. (2011) note that complexity within a firm's operations acts as a resilience reducer. Firm size was operationalised as the natural log of the number of full-time employees. Firm age is the number of years that the firm has existed in a particular industry and usually serves as a proxy for organisational experience. Organisational experience is vital for successful business operations. And so, older firms, due to their experience and their exposure to past disruptions, can learn and respond more adequately than nascent firms. So, firm age was operationalised as the natural log of the number of years in operation. Lastly, this study considers firm industry as a variable that needs to be controlled because manufacturing and service firms have quite different operational setups and experience varying disruptions. For instance, manufacturing firms, due to the interdependence of processes and operations, finds that smaller disruptions spread into larger ones, which are difficult to contain. The study, therefore, operationalised firm industry type as a dummy variable: service industry= 1; otherwise = 0).

Informants profile

To ensure that only managers who satisfy the study's key informant criteria are used for testing the hypotheses, important indicators such as the informant's position, education level, industry experience, and position occupied were captured in the questionnaire. In addition, following previous resilience studies in Ghana (see, for example, Essuman et al., 2022, 2020), this study evaluated the competence of the informants by assessing their knowledge about the questions, their confidence in their response, and the extent to which their responses reflect the company's situation using a scale of "1= strongly disagree to 7= strongly agree"

3.9 Data Collection

Survey studies collect data using telephones (via interviewing through a phone call), online/web-based surveys, postal/mail, and delivery-and-collection (involves selfadministration and completion) (Sekaran and Bougie, 2016). In the context of operational, firm, and supply chain resilience, the commonly used survey approaches are email and webbased surveys (Ambulkar et al., 2015; Parker and Ameen, 2018; Riley et al., 2020; Wong et al., 2020) and delivery-and-collection surveys (self-administered/completed) (Essuman et al., 2022, 2020). Using a structured questionnaire, this study employed a delivery-and-collection survey (self-administered and completed), which comprised distributing questionnaires and cover letters to the key informants using trained fieldworkers and afterwards retrieving the completed surveys (Essuman et al., 2022).

3.10 Data Analysis

Since this is a quantitative study, statistical tools and procedures are used to analyse the data. The quantitative analyses conducted for this study are descriptive analysis, psychrometric analysis (reliability and validity tests), and structural model analysis.

Descriptive analysis: the study utilised descriptive statistical tools such as frequency tables, percentages, mean, and standard deviation to determine respondents' and firms' categories and understand the central tendency and distribution of the measurement's items and constructs.

Measure of reliability and validity: the data in the study consisted of seven latent variables, of which six were captured as reflective indicators and one as a formative indicator. The reflective indicators are threat interpretation bias, disruption orientation, recoverability capability, disruption absorption capability, environmental dynamism, and resource slack. The formative indicator is supply chain disruption. For the reflective indicators, the study used a six-factor co-variance-based confirmatory factor analysis (CFA) and maximum likelihood estimator in Mplus 7.4 to assess the psychometric properties of reliability and validity. The reliability test of the reflective indicators is concerned with the stability and consistency with which the instrument measures the latent construct and assists in ascertaining a good measure (Hair et al., 2019). So, to measure the reliability of a construct, the study assessed the internal consistency which indicates homogeneity among the indicators of a construct (Hair et al., 2019). Since this study used the CFA in analysing construct reliability, a composite reliability test ranging from 0 to 1 with a standard loading greater than 0.70 was used to assess the reliability of the items (Bagozzi and Yi, 2012). Also, the study conducted a Cronbach's alpha test to validate the factor loadings obtained for the composite reliability. Specifically, Hair et al. (2019) state that Cronbach's alpha values obtain similar threshold values as the composite reliability; however, the values of Cronbach's alpha are a bit lower than the loadings of the composite reliability. It is expected that the values obtained for the Cronbach's alpha should be above threshold value of 0.70 which indicates high internal consistency (Hair et al., 2019).

This study further assessed the construct validity, referred to as the extent to which the items measure the theoretical latent construct that they designed to capture (Hair et al., 2019). To assess construct validity, tests on discriminant validity and convergent validity were conducted.

Discriminant validity assesses whether a set of theoretical indicators is empirically distinct from other theoretical indicators; convergent validity measures the extent to which a set of theoretical indicators captures a high proportion of variance in common (Hair et al., 2019).

This study used confirmatory factor analysis instead of exploratory factor analysis because the scales of each construct are pre-developed in prior studies and help to test hypotheses based on the theoretical assumption (Bagozzi and Yi, 2012).

Using confirmatory factor analysis to measure the validity of the indicators, the study assessed convergent validity where both indicators were to load at 0.50 (ideally, 0.70 or higher) (Hair et al., 2019). Also, the study used Fornell and lacker's average variance extracted-shared variance (AVE-SV) to assess discriminant validity by comparing the average variance extracted (AVE) values for two constructs (Hair et al., 2019; Voorhees et al., 2016). To demonstrate discriminant validity, the average variance extracted should be greater than the squared correlation (Voorhees et al., 2016). Thus, the study used a six-factor CFA model at the same time to assess the reflective indicators' validity and reliability. Multiple recommended model fit criteria were used: Chi-square ($\chi 2$) index, normed Chi-square ($\chi 2$/degree of freedom) index, root mean square error of approximation (RMSEA), non-normed fit index (NNFI), comparative fit index (CFI), standardized root mean square residual (SRMR) (Bagozzi and Yi, 2012; Hair et al., 2019).

Lastly, to analyse the formative indicator, the study used the variance inflation factor, where all the indicators of supply chain disruption were regressed with indicators of disruption absorption. Hair et al. (2019) estimate that if variance inflation factor is 5 or higher, then there is a potential problem with collinearity. The study then created a formative measure to capture the supply chain disruption construct using an unweighted linear sum scale (Brandon-Jones et al., 2014a).

Structural model analysis: this study used covariance-based structural equation modelling (SEM) and maximum likelihood estimator in Mplus 7.4 to test the stated hypotheses of the study. The use of SEM allows the study to assess all the hypothesised and control-effect associations and concurrently control for measurement errors (Bagozzi and Yi, 2012). The study controlled for factors that could affect the independent variable, dependent variable, or their relationship to achieve a consistent estimate and address concerns of the likelihood endogeneity(Lu et al., 2018). Accordingly, the study controlled for the potential effects of resource slack, environmental dynamism, firm size, firm industry, and firm age on the roles and boundaries of threat interpretation bias on supply chain disruptions and operational resilience linkage.

Furthermore, the study adheres to the recommendation made by Stride et al. (2015) and employs the bootstrap procedure to estimate the bootstrap confidence for the indirect and conditional indirect effects at specific low and high values of the moderator. Based on past studies, this work considered operational resilience as a two-dimensional construct consisting of disruption absorption capability and disruption recovery (Essuman et al., 2022, 2020). Hence, this study used disruption absorption capability and disruption recovery as the dependent variables. The study controlled for multicollinearity by creating the moderation term as a product of the mean-centred scales of the direct and the moderating effect variables.

Table 3.1 presents the variables used in testing the hypotheses of the study. In testing the study's hypotheses, five nested models are estimated. Model one examines the relationship between supply chain disruption and operational resilience. Model two examines the direct relationship between threat interpretation bias and operational resilience. Model three examines the indirect effect of supply chain disruption on operational resilience through threat interpretation bias. Model four examines the conditional effect of disruption orientation on the relationship between threat interpretation bias and operational resilience. Model five examines the

moderation of disruption orientation on the indirect relationship between supply chain disruptions and operational resilience through threat interpretation bias.

Table 3.1 Regression model description

Estimated models	Outcome variable	Predictor (s) variable	Control variables
Model 1	Operational resilience	Supply chain disruption	Dynamic environment Slack resources Firm age Firm industry Firm size
Model 2	Disruption absorption capability Disruption Recovery	Threat interpretation bias	Dynamic environment Slack resources Firm age Firm industry Firm size
Model 3	Disruption absorption capability Disruption Recovery	Supply chain disruption (predictor) Threat interpretation bias (interacting variable)	Dynamic environment Slack resources Firm age Firm industry Firm size
Model 4	Disruption absorption capability Disruption Recovery	Threat interpretation bias (predictor) Disruption orientation (moderator)	Dynamic environment Slack resources Firm age Firm industry Firm size
Model 5	Disruption absorption capability Disruption Recovery	Supply Chain disruption (predictor) Threat interpretation bias (mediator) Disruption Orientation (moderator)	Dynamic environment Slack resources Firm age Firm industry Firm size

3.10 Ethical Consideration

The ethical requirements of the study were well adhered to. First, the faculty's ethics committee approved the questionnaire and the field study. After stating the study's purpose and potential managerial implications using a cover letter, all respondents consented to participate in the study by tricking "I agree to participate in the study" on the cover letter. The anonymity of the respondents was assured as the questionnaire did not capture the informants' or their firms'

identities. Moreover, all data analysed, and conclusions drawn about the study were done at the aggregate or average level.

Chapter 4

DATA PRESENTATION AND ANALYSIS

4.1 Introduction

In this chapter, the study presents the results and discussion of primary data obtained from empirical studies of manufacturing and service firms in Kumasi and Accra. This chapter is divided into four sections. The first section presents results from response analysis and profile information; second section presents results from measurement model analysis. The third section present results of the structural models estimated to test the study's hypothesised relationships, and the last section presents the study's discussions.

4.2 Response Analysis and Profile Information

The study administered seven hundred and fifty questionnaires to manufacturing and service firms based in Kumasi and Accra. Three hundred questionnaires were administered in Kumasi, while the remaining four hundred and fifty questionnaires were administered to respondents in Accra. The researcher inspected all the questionnaires to ensure their quality. In all, four questionnaires were filled by informants who did not hold a managerial position, eight of the questionnaires were filled by informants who scored below the average score (where the average score is 4) measuring informants' competence, six questionnaires were filled by informant who had less than one-year experience in their current position, and finally seven questionnaires had many missing data. All the above-stated issues from the obtained questionnaires were excluded. Table 4.1. shows that a total of two hundred and fifty-nine

questionnaires, representing an effective response rate of 34.53% were ascertained and used for analysing the hypotheses of the study.

Although the effective response rate of 34.53%, (sample size = 259) was relatively lower, it compares satisfactorily with past resilience-based surveys and issue interpretation research. For instance, the following past resilience studies had: Wong et al. (2020) (sample size= 236), Ambulkar et al. (2015) (sample size = 199), and Parker and Ameen (2018) (sample size = 159), whereas issue interpretation studies such as Chattopadhyay et al. (2001) (sample size = 117), Sharma (2000) (sample size = 110), and Haney (2017) (sample size = 99). Also, an important aspect of this study's sample size is that it satisfies the minimal sample criterion for confirmatory factor analysis based on covariance (Bagozzi and Yi, 2012) and structural model using moderated regression analysis (Hair et al., 2019).

Since some of the intended respondents did not respond to the questionnaire administered, it became mandatory to investigate the possibility of non-response bias. The study followed Armstrong and Overton's (1977) proposed approach of conducting an independent sample ttest and chi square test to compare responses that were collected within 14 days (early responders) to those that were obtained after 15 days to 28 days (late responders) to examine the possibility of non-response bias.

Table 4.1: Results of Response Rate Analysis

Questionnaires administered (A)		*Questionnaires received*		*Questionnaires used (C)*		*Effective response rate = (C/A)*100%*
Study area	*No.*	*Percent*	*No.*	*Percent*	*No.*	*Percent*
Kumasi	300	40.0	151	53.17	136	52.5	45.33
Accra	450	60.0	133	46.83	123	47.5	27.33
Total	750	100	284	100	259	100	34.53

- Early response represents questionnaires obtained within 14 working days whiles late response represents questionnaires obtained between 15 and 28 working days.

2. Non-response bias test using firm characteristics

Firm and respondent characteristics	*Response category*	*N*	*Mean*	*SD*	*t*	*DF*	*p*
Size (no. of full-time employees)	Early response	162	43.16	70.78	0.911	257	0.363
	Late response	97	36.07	37.827			
Age (no. of years)	Early response	162	16.13	11.043	1.06	257	0.29
	Late response	97	14.72	9.18			

- Early response represents questionnaires obtained within 14 working days whiles late response represents questionnaires obtained between 15 and 28 working days.

Table 4.2 continued

crosstab and chi-square test					
	Firm characteristics: industry				
Response category	*Manufacturing*	*Service*	χ^2	***DF***	***Sig.***
Early response	61.4%, N=43	63.0%, N=119	*0.51*	1	0.821
response	38.6%, N=27	37.0%, Late N= 70			

As shown in Table 4.4 below, 66% of the informants are males, whereas 34% are females. This corroborates the findings of the Ghana Statistical Service (2018) that there are more males than females in the formal sector, to which the manufacturing and service sectors are no exception. Also, more than 70% of the informants have at least a 1st degree, and the average age in their current position is 7.13 years (standard deviation = 5.583). This indicates that the informants have a higher educational background, which helps them to better understand the questionnaire

Table 4.

administered. Additionally, the average of 7.13 years of experience of key informants in their current position helps the informants to have an in-depth understanding of the firms' dealings and helps to offer responses that reflect their firm's situations.

In addition, the study assessed the informants' competence (Table 4.5) to examine the extent to which the informants understood the questions raised in the instrument. The study adapted informants' competence scale items from Boso et al. (2013). Accordingly, this study used a three-item scale of 1 to 7, where "strongly disagree =1" and "strongly agree =7" to ask informants about how knowledgeable they are about the questions, how accurate their responses were, and their level of confidence in their responses. As stated in Section 4.2, eight responses were dropped because the informants who responded to the questionnaire scored below 4. From Table 4.5, the average score of informants on knowledge about the question, accuracy in response, and confidence about response were 5.79 (standard deviation= 1.032), 5.81 (standard deviation=0.961) and 5.99 (standard deviation= 0.835), respectively. Finally, the results prove that the informants, on average were knowledgeable about the questions raised, furnished accurate information, and had a higher level of confidence about their answers given.

4. Profile information

Variable	Category	frequency	Percent
Gender	Male	171	66
	Female	88	34
Age (years)	20 to 29	25	9.7
	30 to 39	105	40.5
	40 to 49	110	42.5
	50 or more	19	7.3
Education level	Senior high level	4	1.5
	Diploma	56	21.6
	1st Degree	118	45.6
	2nd Degree	76	29.3
	PhD	5	1.9
Respondent Position	CEO	32	12.4
	Managing Director	31	12
	General Manager	55	21.2
	Operations Manager	62	23.9
	Other Middle-level Managerial Positions	79	30.5
Firm age (number of years of operation0	03- 10	95	
	10.01-20	104	36.7 40.2
	20.1-60	60	23.2
Firm industry	Manufacturing	70	27.0
	Service	180	73.0
Firm size (number of full-time employees)	5 – 30	165	63.7
	31 – 99	70	27
	100 – 500	24	9.3

Variable	Mean	SD
Respondent's years in current position	7.13	5.58
Firm size (number of full-time employees	40.5	60.59
Firm age (number of years in operations)	15.6	10.39

Table 4.

Table 4.5. Test of Informants competence

Variable	N	Min	Max	Mean	SD
The questions deal with issues I am very knowledgeable about	259	4	7	5.79	1.032
My answers to the questions in the questionnaire are very accurate	259	4	7	5.81	0.961
I am completely confident about my answers to the questions	259	5	7	5.99	0.835

4.3 Measurement Model Analysis

In this section, the study presents results on the descriptive statistics and the normality assessment of skewness and kurtosis. Also, the study conducted an analysis of validity and reliability. Results on reliability are presented as the composite reliability (CR) values and Cronbach's alpha values. Furthermore, the study assessed the validity by testing using confirmatory factor analysis. Positive and significant factor loadings are identified as having convergent validity. Discriminant validity was identified by using the average variance extracted (AVE), and the formative indicator was analysed using the variance inflation factor (VIF).

Table 4.6 shows the mean score for each scale of the reflective indicators, which ranges between 4.39 and 5.40. slightly above the median point of 4.00 on the seven-point scale. Also, the results on each item showed a relevant dispersion where each standard deviation was greater than 1.00. Furthermore, the normality assessment of skewness and kurtosis indicates highest values of |0.998 | and |0.982 | respectively, showing that both normality indicators are within the suggested threshold of less than |3| (Kline, 2023).

In addition, Table 4.7 shows the results of the reliability and validity the constructs. For the reliability assessment, the values of Cronbach's alpha and composite reliability were above 0.90 and 0.85, respectively, indicating strong internal consistency within the items of measurement (Hair et al., 2019). For the validity assessment, all the factor loadings on Table 4.6 were significant at 1% and greater than 0.60, which shows convergent validity (Bagozzi and Yi, 2012). Again, all the values of the average variance extracted are greater than the

threshold value of 0.50, indicating discriminant validity where the average variance extracted are greater than their shared variances (see Table 4.7) (Voorhees et al., 2016). Finally, the formative indicator variance inflation factors were lower than 2, indicating that multicollinearity did not apply to the indicator of supply chain disruption.

6. Items descriptive statistics

Measurement items [1]	Min	Max	Mean	SD 1.635	Skewness	Kurtosis
Threat interpretation bias 1	1	7	3.43		0.565	-0.468
Threat interpretation bias 2	1	7	3.62	1.464	0.468	-0.438
Threat interpretation bias 3	1	7	3.55	1.414	0.490	-0.338
Threat interpretation bias 4	1	7	3.55	1.604	0.467	-0.557
Supply chain disruptions 1	1	7	3.40	1.859	0.496	-0.760
Supply chain disruptions 2	1	7	3.11	1.670	0.192	-1.192
Supply chain disruptions 3	1	7	2.87	1.577	0.523	-0.659
Supply chain disruptions 4	1	6	2.72	1.517	0.560	-0.713
Supply chain disruptions 5	1	7	2.74	1.575	0.669	-0.443
Supply chain disruptions 6	1	7	3.19	1.585	0.346	-0.742
Supply chain disruptions 7	1	7	2.83	1.558	0.471	-0.794
Supply chain disruptions 8	1	7	3.33	1.797	0.407	-0.856
Supply chain disruptions 9	1	7	3.90	1.519	0.190	-0.982
Disruption Absorption 1	1	7	5.36	1.427	-0.998	0.845
Disruption Absorption 2	1	7	5.40	1.315	-0.920	0.608
Disruption Absorption 3	1	7	5.37	1.217	-1.058	1.507
Disruption Absorption 4	1	7	5.32	1.243	-0.874	0.874
Disruption Absorption 5	1	7	5.25	1.269	1.120	1.120
Disruption Absorption 6	1	7	5.10	1.244	1.375	1.375
Recoverability 1	1	7	4.83	1.724	-0.691	-0.408
Recoverability 2	1	7	5.07	1.496	-0.763	-0.020
Recoverability 3	1	7	4.90	1.531	-0.771	-0.070
Recoverability 4	1	7	4.81	1.503	-0.717	0.035
Recoverability 5	1	7	4.85	1.514	-0.830	0.293
Disruption Orientation 1	1	7	5.463	1.288	-1.222	2.087
Disruption Orientation 2	1	7	5.460	1.165	--1.005	1.746
Disruption Orientation 3	1	7	5.401	1.236	-1.049	1.367
Disruption Orientation 4	1	7	5.401	1. 194	- 1.256	2.464
Slack Resources 1	1	7	4.39	1.729	-0.232	-0.782
Slack Resources 2	1	7	4.47	1.556	-0.318	-0.725
Slack Resources 3	1	7	4.42	1.577	-0.288	-0.734
Slack Resources 4	1	7	4.47	1.482	-0.422	-0.470
Slack Resources 5	1	7	4.54	1.530	-0.326	-0.594

Table 4.

Environmental Dynamism 1	1	7	4.88	1.907	-0.799	-0.411
Environmental Dynamism 2	1	7	4.60	1.921	-0.665	-0.731
Environmental Dynamism 3	1	7	4.84	1.644	-0.906	0.114
Environmental Dynamism 4	1	7	4.95	1.692	-0.855	-0.048
Environmental Dynamism 5	1	7	4.93	1.795	-0.835	-0.197
Environmental Dynamism 6	1	7	5.23	1.714	-0.951	0.122

Note: [1]item statements are presented in Table 4.7 SD= standard deviation

Table 4.7. Results from reliability and validity analyses using confirmatory factor analysis

Construct/indicator	Loadings	T-values	VIF
Threat interpretation bias [a] (ρ_C = 0.937; CA = 0.936; AVE = 0.789).			
When we faced threatening events in the last three years, our top management often saw problems rather than opportunities	0.873	17.538	-
our top management worried more about the losses from the events than the benefits	0.903	18.528	-
our top management tended to lose focus on the potential bright side of the events	0.893	18.210	-
our top management became quite worried about the fate of the company	0.884	17.899	-
Disruption orientation [a] (ρ_C = 0.845; CA = 0.843; AVE = 0.578).			
We always feel the need to be alert to possible disruptive events	0.773	13.738	-
Previous unplanned disruptions show us where we can help improve our company's operations	0.832	15.162	-
We think a lot about how threatening events could have been avoided	0.739	12.826	-
After an unplanned operational disruption has occurred, our management lead in analysing it thoroughly	0.691	11.721	-
Disruption absorption capability [a] (ρ_C = 0.921; CA = 0.920 AVE = 0.662).			
For the past 3 years, whenever disruptive events occur, our company is able to carry out its regular functions	0.827	16.001	-
our company grants us much time to consider a reasonable response	0.711	12.858	-
our company is able to carry out its functions despite some damage done to it	0.832	16.158	-
without much deviation, we are able to meet normal operational and market needs	0.866	17.235	-
without adaptations being necessary, our company performs well over a wide variety of possible scenarios	0.847	16.626	-
our company's operations retain the same stable situation as it had before disruptions occur for a long time	0.788	14.880	-
Disruption recovery capability [a] (ρ_C = 0.957; CA = 0.956; AVE = 0.815).			
Over the past 3 years, whenever our operations breakdown due to a disruption event, it does not take long for us to restore normal operation	0.888	18.146	-
our company reliably recovers to its normal operating state	0.880	17.889	-
our company easily recovers to its normal operating state	0.913	19.056	-
our company effectively restores operations back to normal quickly	0.917	19.186	-
we are able to resume operations within the shortest possible time	0.915	19.136	-
Resource slack [a] (ρ_C = 0.955; CA= 0.937; AVE = 0.810).			
Our company often has uncommitted resources that can quickly be used to fund new strategic initiatives	0.871	17.587	-
Our company usually has adequate resources available in the short run to fund its initiatives	0.902	18.657	-
We are often able to obtain resources at short notice to support new strategic initiatives	0.910	18.953	-
We often have substantial resources at the discretion of management for funding strategic initiatives	0.924	19.442	-
Our company usually has a reasonable amount of resources in reserve	0.892	18.315	-
Environmental dynamism [a] (ρ_C = 0.881; CA = 0.879; AVE = 0.555).			
Over the past three years, there have been irregular changes in … the needs and preferences in our demand/customer market	0.772	13.891	-
the actions of our competitors, in terms of their promotions, innovations, etc.	0.784	14.177	-
terms, conditions, and structures in our supply markets	0.805	15.017	-
government policies and programs for our industry	0.778	13.932	-
laws and regulations governing our industry	0.683	11.535	-
technological needs and advancement in our industry	0.632	10.777	-
Supply chain disruption [b].			
Unexpectedly,	-	-	

			1.493
some of our employees leave their posts (i.e., quit their job)			
some of our suppliers fail to make deliveries	-	-	1.587
we experience vehicular breakdowns	-	-	1.548
we experience service/product failure	-	-	1.542
we run out of cash for running day-to-day operations	-	-	1.512
we experience machine/technology downtime/failure	-	-	1.381
we experience a shortage of raw materials	-	-	1.698
we experience power cuts	-	-	1.252
some of our service providers fail to honour their promises	-	-	1.627

Notes: [a]= reflective indicators; [b]= formative indicators; ρ_c= construct reliability; CA= Cronbach's alpha, AVE= average variance extracted; VIF= variance inflation factor.

4.3 Structural Model Analysis and Hypothesis Evaluation

Table 4.8 shows the results for the correlation between the variables of the study while Table 4.9 shows the results for the structural model. According to Table 4.8, all the correlations are below 0.6, indicating that multicollinearity was not a concern in the structural model analysis. Also, according to Table 4.9, the results show that supply chain disruption has a positive relationship with threat interpretation bias (β = 0.051, $p<0.001$). Also, results indicate that threat interpretation bias has a significant negative relationship with disruption (β = -0.211, p= 0.010) and disruption recovery (β = -0.183, p= 0.021). Moreover, the results reveal that the interaction between threat interpretation bias and disruption orientation has a significant positive relationship with disruption absorption (β = 0.181, $p <0.001$) and disruption recovery (β = 0.108, p = 0.025). Again, the results show that under condition of low disruption orientation, threat interpretation bias has a stronger negative relationship with disruption absorption (β = -0.394, 95% CI [-0.554, -0.022]) and disruption recovery (β = -0.292, 95% CI [-0.436, -0.143]). Contrastingly, under conditions of high disruption orientation, threat interpretation bias has insignificant relationship with disruption absorption (β = -0.029, 95% CI [-0.200, 0.124]) and disruption recovery (β = -0.075, 95% CI [-0.232, 0.086]).

4.3.1 Supply chain disruption relationship with operational resilience

For the main hypothesised path of the study, the results from Table 4.9 indicate that supply chain disruption is negatively related with operational resilience dimensions of disruption absorption (β= -0.003, p= 0.791 SE= 0.010) and disruption recovery (β= -0.005, p=0.567, SE= 0.080). But the obtained p-value for the association between supply chain disruption and disruption absorption and disruption recovery is statistically insignificant, which means that although the association is negative, it occurs at random. Therefore, H1 is rejected.

Also, figure 4.1 shows the curvilinear relationship between supply chain disruption and operational resilience. For the curvilinear relationship between supply chain disruption and disruption recovery, the R-square value (*representing the total variation in the dependent variable accounted for by the independent variable*) is R^2 = .019 (see appendix iii for model summary table). This means that only 1.9% of the total variation in the dependent variable is accounted for by the independent variable. Also, the curvilinear relationship between supply chain disruption and disruption absorption is R^2 = .011(see appendix iii for model summary table) and means that only 1.1% of the total variation in disruption absorption is explained by supply chain disruption. Therefore, other variables such as threat interpretation bias, disruption orientation and covariates may better explain the relationship between supply chain disruption and disruption recovery and disruption absorption.

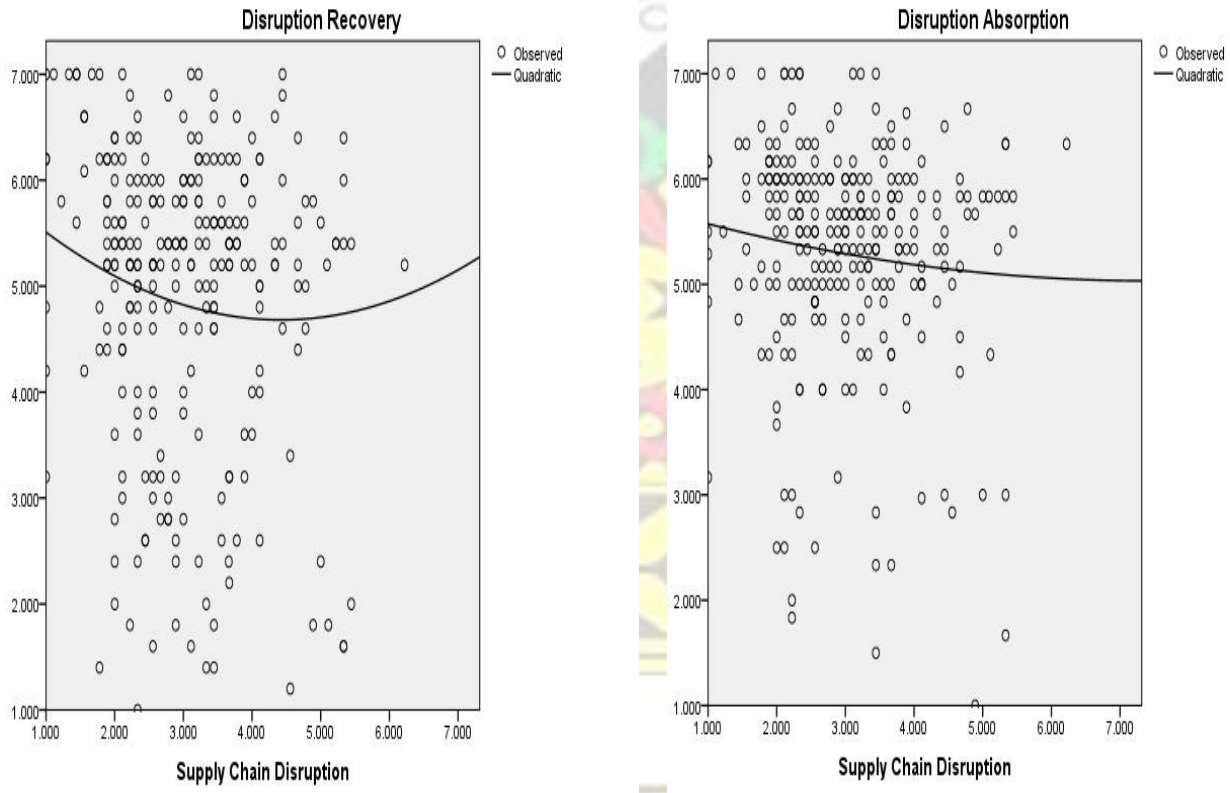

Figure 4.1. a scatterplot showing the curvilinear relationship between supply chain disruption and operational resilience dimensions of disruption recovery and disruption absorption

4.3.2 the mediating role of threat interpretation bias on the relationship between supply chain disruption and operational resilience

Further results from table 4.9 shows that supply chain disruption through the indirect effect of threat interpretation bias is negatively related with disruption absorption (indirect β = -0.011, 95% CI [-0.019, -0.004]) and disruption recovery (indirect β = -0.009, 95% CI [-0.016, 0.003]). In addition, given that confidence interval of both disruption absorption and recovery do not include a zero means that the relationship is significant (Hayes, 2013). Therefore, the study's finding lends support to H2.

4.3.3 the moderating role of disruption orientation on the relationship between supply chain disruption and operational resilience through threat interpretation bias

For the hypothesis three, result from table 4.9 indicates that the negative relationship between supply chain disruption and operational resilience through threat interpretation bias is weaker in high disruption orientation (indirect β = -0.004, 95% CI [-0.011, 0.004]) than under low disruption orientation (indirect β = -0.015, 95% CI [-0.024, -0.007]). The result reveals that under low disruption orientation the indirect effect of threat interpretation bias is negative and significant. However, under high disruption orientation conditions, the β = -0.004 which indicates that the co-efficient nearly approaches zero. Also, the confidential interval at high disruption orientation is CI [-0.011, 0.004] which includes a zero making the indirect effect insignificant. Therefore, the study asserts that under high disruption orientation conditions, supply chain disruption has a weaker negative relationship with operational resilience through threat interpretation bias in support of H3.

Lastly, figure 4.2 shows the slope analysis of the indirect relationship between low and high threat interpretation bias through high and low level of disruption orientation against disruption

absorption and disruption recovery. Figure 4.1 illustrates that disruption orientation lessens the effect of threat interpretation bias of supply chain disruptions on operational resilience.

Figure 4.2. moderating effect of disruption orientation

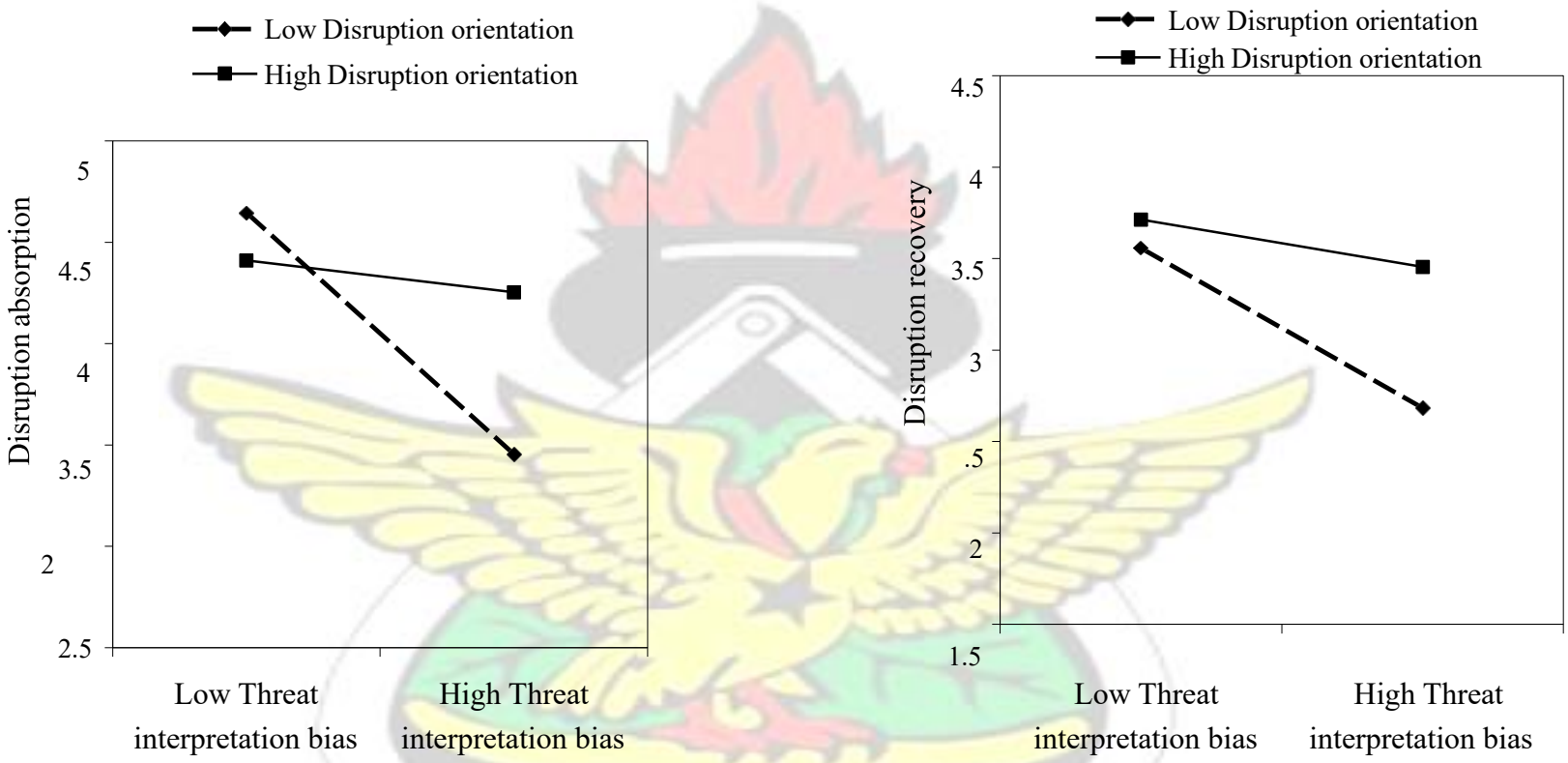

Table 4.8. Correlation and descriptive results

Variables	1	2	3	4	5	6	7	8	9	10
1. Threat interpretation bias	*0.789*									
2. Disruption orientation	0.039	*0.578*								
3. Disruption recovery capability	-0.170**	0.203**	*0.815*							
4. Disruption absorption capability	-0.185**	0.164**	0.556**	*0.662*						
5. Supply chain disruption	0.414**	-0.016	-0.119	-0.104	n/a					
6. Resource slack	0.149*	0.172**	0.145*	0.160*	-0.014	*0.810*				
7. Environmental dynamism	0.109	0.119	0.194**	0.154*	0.035	0.231**	*0.555*			
8. Industry (service =1)	-0.033	-0.022	-0.065	-0.012	-0.061	-0.078	-0.086	n/a		
9. Firm size (log)	-0.040	0.142*	0.266**	0.233**	-0.062	0.252**	0.251**	-0.107	n/a	
10. Firm age (log)	-0.105	0.023	0.140*	0.087	-0.067	0.004	0.010	-0.059	0.554**	n/a
Minimum	1	1	1	1	9	1	1	0	2	1
Maximum	7	7	7	7	56	7	7	1	6	4
Mean	3.54	5.43	4.89	5.30	27.27	4.46	4.91	0.73	3.09	2.55
Standard deviation	1.403	1.008	1.434	1.088	9.327	1.450	1.406	0.445	1.013	0.639

Notes: Correlations are below the principal diagonal. Average variance extracted values are presented on the principal diagonal, *p < 0.05(2tailed), **p < 0.01(2-tailed), n/a = not applicable.

Table 4.9. Covariance-based structural equation modelling results

	Threat interpretation bias			Disruption absorption			Disruption recovery		
Direct and interaction effects:	β	SE	p	β	SE	p	β	SE	p
Non-hypothesized paths:									
Supply chain disruption	0.051	0.009	<0.001	-0.003	0.010	0.791	-0.005	0.008	0.567
Threat interpretation bias (TIB)				-0.211	0.083	0.010	-0.183	0.080	0.021
TIB × DO				0.181	0.054	0.001	0.108	0.048	0.025
Disruption orientation (DO)				0.209	0.100	0.036	0.227	0.078	0.003
Resource slack				0.113	0.081	0.163	0.066	0.082	0.420
Environmental dynamism				0.115	0.093	0.218	0.148	0.092	0.109
Industry				0.075	0.142	0.596	-0.064	0.143	0.653
Firm size				0.216	0.079	0.006	0.192	0.075	0.011
Firm age				-0.048	0.125	0.701	0.051	0.131	0.699

Conditional direct effects:	Levels of moderator	β	95% Bootstrap CI
TIB → DA	Low (- 1SD of mean)	-0.394	[-0.554, -0.222]
	High (+1SD of mean)	-0.029	[-0.200, 0.124]
TIB → DR	Low (- 1SD of mean)	-0.292	[-0.436, -0.143]
	High (+1SD of mean)	-0.075	[-0.232, 0.086]

Hypothesized Paths

Indirect effects:	Indirect β	95% Bootstrap CI
SCD → TIB → DA	-0.011	[-0.019, -0.004]
SCD → TIB → DR	-0.009	[-0.016, -0.003]

Conditional indirect effects:	Levels of moderator	Indirect β	95% Bootstrap CI
SCD → TIB → DA	Low (- 1SD of mean)	-0.020	[-0.031, -0.011]
	High (+1SD of mean)	-0.001	[-0.010, 0.007]
SCD → TIB → DR	Low (- 1SD of mean)	-0.015	[-0.024, -0.007]
	High (+1SD of mean)	-0.004	[-0.011, 0.004]

Model fit indices:

χ^2 = 851.243, DF = 532, Normed χ^2 = 1.600, RMSEA = 0.048, NNFI = 0.944, CFI = 0.950, SRMR = 0.061.

R^2 for model of threat rigidity bias = 0.181, R^2 for model of disruption absorption = 0.210, R^2 for model of disruption recovery = 0.182

Notes:

1. SCD = supply chain disruption; TIB = threat interpretation bias; DA = disruption absorption, DR = disruption recovery.
2. All relationships were estimated simultaneously in Mplus 7.4.
3. Bootstrap sample = 5000.
4. Unstandardized estimates are reported.
5. p = p-value (2-tailed).

Table 4.10. Summary of hypothesis results

Hypothesis	Path	β	p-value	t-values	Remarks
H1	SCD → DA	-0.003	0.791	-0.300	Not supported
	SCD → DR	-0.005	0.567	-0.625	
				95% CI	
H2	SCD→ TIB → DA	-0.011		[-0.019, -0.004]	Supported
	SCD → TIB → DR	-0.009		[-0.016, -0.003]	
	SCD→TIB→ DA			95% CI	
H3	low DO	-0.020		[-0.436, -0.143]	
	high DO	-0.001		[-0.232, 0.086]	Supported
	SCD → TIB → DR			95% CI	
	low DO	-0.015		[-0.024, -0.007]	
	high DO	-0.004		[-0.011, 0.004]	

SCD= supply chain disruption, TIB= threat interpretation bias, DA= disruption absorption, DR= disruption recovery, DO= disruption orientation

Overall, the study finds that supply chain disruption is not directly negatively related to operational resilience as proposed in H1 and prior research. Rather, evidence from the study shows that the relationship between supply chain disruption and operational resilience is indirect, and is channelled through threat interpretation bias, providing support for the study's argument in H2. Lastly, the indirect relationship between supply chain disruption and

operational resilience through threat interpretation bias is negative and significant under low level of disruption orientation and becomes weakened and insignificant under high level of disruption orientation supporting H3.

4.5 Discussions

To advance the literature on the determinants of operational resilience, this study uses threat rigidity and organisational information processing perspectives to examine the linkage between supply chain disruption and operational resilience through threat interpretation bias under varying conditions of disruption orientation. First and foremost, the findings from the study reveals that supply chain disruption is negatively related to operational resilience but insignificant. This finding is consistent with existing studies on the supply chain disruptionresilience linkage (El Baz and Ruel, 2021; Parast and Subramanian, 2021; Parker and Ameen,

2018; Wong et al., 2019). For instance, this study corroborates the finding of El Baz and Ruel (2021) who identified that disruption correlates negative with resilience. However, Parast and Subramanian's (2021) study on environmental disruption among Chinese logistics, service and IT firms indicate that environmental disruptions is positively related with supply chain and financial performance.

Furtherance, this study finds that supply chain disruption has a positive relationship with threat interpretation bias. Undeniably, supply chain disruptions have the efficacy to decimate the survival and stability of firms (Brandon-Jones et al., 2014a; Li et al., 2022). So, managers in the wake of a supply chain disruption foresee disruption as a negative event that threatens their firms' operations and sustainability (Juan and Li, 2023). As a result, supply chain disruption engenders threat interpretation bias among managers, which is consistent with prior studies that reveal that managerial interpretation of threats aligns with events that are negative,

uncontrollable, and involve potential losses (Anderson and Nichols, 2007; Chattopadhyay et al., 2001; Haney, 2017; Staw et al., 1981).

Also, this study finds that threat interpretation bias is negatively related to disruption recoverability and disruption absorption capabilities of operational resilience. This study asserts that threat interpretation bias due to information restriction, control constriction, and resource conservation results in rigidity to act (Staw et al., 1981). This finding supports past research on issue interpretation that lends to the threat rigidity thesis that threat interpretation bias of environmental changes results in a managerial averseness to act. For example, Sharma (2000) found that managerial interpretation of environmental issues as threat arises a lower level of managers demonstrating environmental voluntary participation. Also, disruptions are idiosyncratic happenings (Iyengar et al., 2021) with high impact and low frequency (Ivanov, 2021), which require flexibility in decision making to manage and mitigate their occurrence. Consequently, firm rigidity through information restriction, control constriction and resource conservation leading to threat interpretation bias during disruption occurrences will undermine operational resilience dimensions of disruption recovery and disruption absorption capabilities. Accordingly, this study supports past studies that found flexibility (rather than rigidity) enhances resilience building (Tukamuhabwa et al., 2015; Zsidisin and Wagner, 2010). Particularly, Tukamuhabwa et al. (2015) note that increasing flexibility where minimum time and effort are spent on adapting to changes in the environment leads to resilience development.

In addition, this study identifies that there is a negative relationship between supply chain disruption with disruption absorption (β= -0.003, p= 0.791) and disruption recovery (β= -0.005, p = 0.567). Moreso, there exists a negative relationship between supply chain disruption with disruption absorption and disruption recovery through threat interpretation bias. These findings support previous studies on resilience, which identify that there exist a negative association between supply chain disruption and supply chain resilience (Craighead et al., 2007; El Baz

and Ruel, 2021; Wong et al., 2019). Again, these findings provide empirical support to the threat rigidity literature, which states that organisations engage in conservative internal actions towards a threatening event (Chattopadhyay et al., 2001; Staw et al., 1981). Therefore, conservative internal actions towards threatening events emanating from threat interpretation bias result in supply chain disruptions having a negative association with disruption absorption and disruption recovery.

Additionally, the study finds that disruption orientation reduces the negative relationship between threat interpretation bias and operational resilience (i.e., disruption recoverability and disruption absorption). Specifically, under the moderation of high disruption orientation, there exists an insignificance between threat interpretation bias and operational resilience. However, under conditions of low disruption orientation, threat interpretation bias has a negative association with the operational resilience dimensions of disruption recoverability and disruption absorption. This study posits that the reasons that account for the findings are that more disruption-oriented firms engage in information searches and learn from prior disruptions. This increases their understanding of disruption occurrences and lessens the ambiguity surrounding disruptions. Hence, a higher disruption orientation will result in characterising disruption more as an opportunity than as a threat. Thus, this study supports the findings of Anderson and Nichols (2007), whose study finds that the time spent acquiring information and the variety of information have an influence on how people perceive threats and opportunities.

Moreover, under the moderation of a low disruption orientation, there exists a strong and significant negative relationship between supply chain disruption and operational resilience through threat interpretation bias. But the study finds that under high disruption orientation, threat interpretation has an insignificant relationship with the indirect effects of supply chain disruption on operational resilience through threat interpretation bias. This finding attests that high disruption orientation lessens the indirect negative effects of supply chain disruption on

operational resilience through threat interpretation bias. Further, these findings lend support to the organisational information processing theorization that information requirements with regards to uncertainties such as supply chain disruptions should be matched with information processing capacities such as disruption orientation to enhance resilience building (Yang et al., 2021). Therefore, the empirical findings of this study suggest that uncertainty enhancers such as threat interpretation bias should be matched with uncertainty reducers such as disruption orientation to improve resilience (Yang et al., 2021).

The findings from this study have implications for operational resilience research, disruption orientation literature, and threat rigidity thesis. First, with the inconclusiveness of the empirical findings on the effect of supply chain disruption on resilience building, this study uses the threat rigidity theory to conceptualise threat interpretation bias and suggests that threat interpretation bias is an important factor that clarifies the effect of supply chain disruption on operational resilience.

Secondly, this study broadens the literature on disruption orientation by showing its differences and similarities with threat interpretation bias in achieving operational resilience. Whereas past studies on disruption orientation (e.g., Ambulkar et al., 2015; Laguir et al., 2022; Liu and Wei, 2022; Stephens et al., 2022; Yu et al., 2019) have explored how disruption orientation, directly and indirectly, affects resilience, studies on threat interpretation bias on operational resilience were lacking. This study establishes that both disruption orientation and threat interpretation bias recognise supply chain disruption as a threat and see a motivation to act (Brandon-Jones et al., 2014a; Staw et al., 1981). Hence, this study examined how threat interpretation bias and disruption orientation independently and their interaction with each other affect operational resilience. The findings on the direct and indirect effects of the two concepts on operational resilience offer insight into how firms respond to disruptions.

Lastly, threat rigidity theory has been used as a theoretical lens to understand organisational responses to adversities (Chattopadhyay et al., 2001; Harrington et al., 2002; Staw et al., 1981). However, the theory has been scarcely applied in resilience research. Therefore, combining threat rigidity theory with organisational information processing theory to investigate the roles and boundaries of threat interpretation bias on supply chain disruption and operational resilience linkage offers important insight that helps to comprehend the determinants of operational resilience.

CHAPTER 5

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

In this chapter, a recapitulation of the study's findings is reported. Furthermore, based on the findings of the study, the study highlights the managerial implications of the study and discusses the limitations of the study and avenues for further research.

5.2 Summary of Findings

The study addressed two specific objectives which are: (1) to examine the relationship between supply chain disruption and operational resilience through the mediating role of threat interpretation bias; (2) to determine the moderating role of low and high disruption orientation on the relationship between supply chain disruption and operational resilience through the indirect effect of threat interpretation bias. Accordingly, a conceptual model rooted in threat rigidity theory and organisational information processing theory was used as the theoretical lens to examine the objectives of the study. The hypotheses developed from the model were tested on survey data from 259 manufacturing and service sector firms operating in the two major city centres of Kumasi and Accra. The following are the results of the study:

- Supply chain disruption is insignificantly correlated with disruption absorption and disruption recovery.
- Supply chain disruption has a significant positive relationship with threat interpretation bias.
- Threat interpretation bias has a significant negative relationship with disruption absorption capability and disruption recovery capability.

- At high disruption orientation levels, threat interpretation bias has a weaker negative association with disruption absorption capability and disruption recovery capability, whereas at low disruption orientation levels, threat interpretation bias has a stronger negative relationship with disruption absorption and disruption recovery capabilities.
- Supply chain disruption has a significant negative indirect effect through threat interpretation bias, on disruption absorption and disruption recovery.
- Supply chain disruption effect on operational resilience through threat interpretation bias has a weaker negative relationship with high disruption orientation condition and strong negative relationship with low disruption orientation condition.

5.3 Conclusions from the study

In an era of increasing supply chain disruptions, managerial interpretation of disruptions is crucial to firms that want to maintain stability and survival despite the disruptions they may be encountering. Thus, this study reveals the lenses through which managerial interpretation of disruptive events determines the operational resilience of their firms. To that effect, drawing on threat rigidity theory, this study intended to investigate the association between supply chain disruption and operational resilience. Also, the study used the lens of threat rigidity theory to conceptualise threat interpretation bias to measure the effect of threat interpretation bias on supply chain disruption and operational resilience linkage. This study further integrated the organisational information processing theory to determine the moderating effect of high and low disruption orientation on the association between supply chain disruption and operational resilience linkage through threat interpretation bias. Using primary data from 259 manufacturing and service firms in Ghana, results indicate that threat interpretation bias of supply chain disruption reduces operational resilience, while high disruption orientation attenuates the above relationship. Moreso, this study offers an understanding of how threat interpretation bias serves as an important determinant of operational resilience and offers

noteworthy insight for managers and decision makers to glean from as they seek to maintain operational resilience.

5.4 Recommendations

Findings from the study have important implications for supply chain theory development and managerial practice, which are discussed in the following sections.

5.4.1 Recommendations for supply chain managerial practice

This study's findings make noteworthy recommendations for managers. Firstly, the study indicates that managerial interpretation of supply chain disruptions has the efficacy to affect operational resilience. Particularly, threat interpretation bias reduces operational resilience. Consequently, this study recommends that managers should lessen their propensity to interpret disruptive occurrences as threats. Because managerial threat interpretation bias obscures managerial sensing of opportunities during disruptive events and hinders capabilities to build more resilient operations and supply chains.

Additionally, this study identifies factors that engender a threat interpretation bias response when a supply chain disruption transpires to be information restriction, control constriction, and organisational resource conservation. Thus, instead of managers restricting information through simplification of information codes, reduction of information channels, and relying on existing experience and knowledge to quickly respond to supply chain disruptions, managers should rather engage in broadened information search and use diverse channels to gather information on disruptive events. This is because, information gathering enables managers to comprehend the disruption impact and induces managerial tendencies to emphasize disruptions as opportunities for exploitation and exploration. Also, managers should be aware that relying on prior experience and knowledge to resolve disruptions may prove futile due to the novelty

of some disruptions. So, managers should consult experts with significant understanding of supply chain disruptions and integrate their responses into their decision making.

Moreover, managerial control constriction manifests itself in the form of centralisation of authority and increased formalisation. Hence, for managers to effectively interpret disruptions and mitigate the likelihood of threat interpretation bias, they should decentralise their decisionmaking body by encouraging the participation of lower-level employees, which helps management obtain a broader perspective regarding disruptions. Finally, managerial inclinations to conserve resources by tightening budgets to ensure efficiency in the mist of adversity (supply chain disruption) magnify threat interpretation bias. This may eliminate the motive to invest in capabilities and develop resource slack that creates redundancies within operations and supply chains and enables firms to build resilience against disruptions. As a result, managers should prioritise investing in capabilities such as analytical capabilities that monitor, analyse, spot disruptions, and drive decisions pertaining to disruptions.

5.4.2 Recommendations for future research

The study makes the following recommendations as avenue for future research First, the study uses threat rigidity theory as a lens to conceptualise and operationalise threat interpretation bias as a determinant of operational resilience. However, Chattopadhyay et al. (2001) argue that the prospect theory offers an alternative assumption of threat interpretation. Chattopadhyay et al. (2001) state that risk-seeking organisations, due to the feeling of having little to lose, may engage in interpreting disruptions as opportunities for exploring and exploiting. Accordingly, the prospect theory may offer a divergent assertion that risk seeking organisations may interpret supply chain disruption as an opportunity for gains. Thus, future studies can use the theoretical lens of prospect theory to examine whether the opportunity interpretation bias of disruptions enhances or reduces operational resilience.

Also, the study identified a methodological limitation as it used cross-sectional survey to make causal inferences. Therefore, this study recommends that future studies should use a longitudinal design to test the study's model. Finally, the study combines threat rigidity theory and organisational information processing theory to test the study's model in a developing economy, which is faced with myriad disruptions to firms' operations which makes it worthwhile to test resilience theories (Essuman et al., 2022, 2020). To bolster the external validity of the study, future studies should examine the study's model in different contexts such as the advanced economies.

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APPENDIX I: COVER LETTER

KNUST School of Business

Office of the Dean

COLLEGE OF HUMANITIES AND SOCIAL SCIENCES

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI

University Post Office, Kumasi-Ghana West Africa

Telephone: +233 3220 60962 **Email**: dean.ksb@knust.edu.gh **Website**: www.business.knust.edu

A survey on organizational resilience in Ghana

Dear Respondent,

Thank you for considering participating in this study which seeks to investigate issues that confront the successful operation of businesses in Ghana. As hoped for, the study's findings and discussions will shape learning and, managerial understanding on strategies that contribute to organizational survival and performance.

The study is undertaken by a team of researchers from KNUST. We can assure you that your responses will be treated in the strictest confidence, with the results collected being anonymised and used for statistical and academic purposes only. Please, you are responding to this survey as someone who holds **a senior/managerial position** (preferably, CEO, or general manager, or managing manager, or middle-level manager such as operations manager, etc.) in your company.

The questionnaire has specific instructions to follow and scales to use. Please reflect on your personal experience in your company and its business environment to respond to the statements in the questionnaire. Although some statements appear quite similar, each is different – hence, **kindly do well to respond to each**. The questionnaire will take about 25 minutes to complete, and we think it will be more appropriate if you respond to it at your convenient time. All questions and concerns about the study can be directed to Mr Dominic Essuman (Tel.: +233 560 271 219), a member of the research team.

As a token of appreciation for participating in the study, you will receive a summary report of the key findings and recommendations from the study. You also have a chance to win GH₵500 for your favourite charity (e.g., church choir, school association, etc.). **Please provide your email address here (in case you are interested in these packages):**

_____

Once again, we are most grateful that you take the time to participate in this study. Yours sincerely,

Prof Nathaniel Boso

Project Advisor and Dean of KNUST School of Business, Kumasi

Email: Nboso@knust.edu.gh

Please, indicate your consent for participation here	☐ ***I agree***	☐ ***I disagree***☐

APPENDIX II: QUESTIONNAIRE

>> Based on the respective scales provided, kindly circle a number that best represents your opinion on each statement

*SCALE: **1= "strongly disagree"** to **7= "strongly agree"*** **When we faced threatening events in the last three years**	***Strongly disagree***						***Strongly agree***
Our top management often saw problems rather than opportunities	1	2	3	4	5	6	7
Our top management worried more about the losses from the events than the benefits	1	2	3	4	5	6	7
Our top management tended to lose focus on the potential bright side of the events	1	2	3	4	5	6	7
Our top management became quite worried about the fate of the company	1	2	3	4	5	6	7

*SCALE: **1= "strongly disagree"** to **7= "strongly agree"***	***Strongly disagree***						***Strongly agree***
We always feel the need to be alert to possible disruptive events	1	2	3	4	5	6	7
Previous unplanned disruptions how us where we can help improve our company's operations	1	2	3	4	5	6	7
We think a lot about how threatening events could have been avoided	1	2	3	4	5	6	7
After an unplanned operational disruption has occurred, our management lead in analysing it thoroughly	1	2	3	4	5	6	7

*SCALE**: 1= "strongly disagree"** to **7= "strongly agree"*** **Over the past 3 years, whenever our operations breakdown due to a disruptive event,**	***Strongly disagree***						***Strongly agree***
it does not take long for us to restore normal operation	1			4	5	6	7
our company reliably recovers to its normal operating state	1	2	3	4	5	6	7
our company easily recovers to its normal operating state	1	23		4	5	6	7
our company effectively restores operations back to normal quickly	1	23		4	5	6	7
we are able to resume operations within the shortest possible time	1	23		4	5	6	7

*SCALE**: 1= "strongly disagree"** to **7= "strongly agree"*** **For the past 3 years, whenever disruptive events occur…,**	***Strongly disagree***						***Strongly agree***
our company is able to carry out its regular functions	1	2	3	4	5	6	7

our company grants us much time to consider a reasonable response	1 2 3 4 5 6 7
our company is able to carry out its functions despite some damage done to it	1 2 3 4 5 6 7
without much deviation, we are able to meet normal operational and market needs	1 2 3 4 5 6 7
without adaptations being necessary, our company performs well over a wide variety of possible scenarios	1 2 3 4 5 6 7
our company's operations retain the same stable situation as it had before disruptions occur for a long time	1 2 3 4 5 6 7

*SCALE: **1= "not at all",** to 7= **"to an extreme extent"*** ***Over the past 3 years, there has been irregular changes in...***	***Not at all***						***To an extreme extent***
the needs and preferences in our demand/customer market	1	2	3	4	5	6	7
the actions of our competitors, in terms of their promotions, innovations, etc.	1	2	3	4	5	6	7
terms, conditions, and structures in our supply markets	1	2	3	4	5	6	7
government policies and programmes for our industry	1	2	3	4	5	6	7
laws and regulations governing our industry	1	2	3	4	5	6	7
technological needs and advancement in our industry	1	2	3	4	5	6	7

*SCALE: **1= "strongly disagree"** to 7= **"strongly agree"***	***Strongly disagree***						***Strongly agree***
Our company often has uncommitted resources that can quickly be used to fund new strategic initiatives	1	2	3	4	5	6	7
Our company usually has adequate resources available in the short run to fund its initiatives	1	2	3	4	5	6	7
We are often able to obtain resources at short notice to support new strategic initiatives	1	2	3	4	5	6	7
We often have substantial resources at the discretion of management for funding strategic initiatives	1	2	3	4	5	6	7
Our company usually has reasonable amount of resources in reserve	1	2	3	4	5	6	7

*SCALE: **1= "strongly disagree"** to 7= **"strongly agree"*** ***Unexpectedly,***	***Strongly disagree***						***Strongly agree***
Some of our employees leave their posts (i.e., quit their job)	1	2	3	4	5	6	7

Some of our suppliers fail to make deliveries	1 2 3 4 5 6 7
We experience vehicular breakdowns	1 2 3 4 5 6 7
We experience service/product failure	1 2 3 4 5 6 7
We run out of cash for running day-to-day operations	1 2 3 4 5 6 7
We experience machine/technology downtime/ failure	1 2 3 4 5 6 7
We experience shortage of raw materials	1 2 3 4 5 6 7
We experience power cuts	1 2 3 4 5 6 7
Some of our service providers fail to honour their promises	1 2 3 4 5 6 7

>> *In which industry does your company operate?* ☐ Manufacturing ☐ Service
>> *How many years (approximately) has your company been in existence?* _____ years
>> *Our total number of full-time employees in currently is about*_____

>> *What is your gender?* ☐ Male ☐ Female
>> *What is your age group?* ☐ 20 to 29 ☐ 30 to 39 ☐ 40 to 49 ☐ 50 or more
>> *What is your highest level of education?* ☐ Senior high school ☐ Diploma ☐ 1st Degree ☐ Masters' degree ☐ PhD
>> *What is your position in your company?* ☐ CEO ☐ Managing director ☐ General manager ☐ Operations manager
☐ Other (**kindly indicate**_____)
>> *How long (in years) have you held this current position*? About _____years

To what extent do you disagree or agree with the following statements?	***Strongly disagree***						***Strongly agree***
The questionnaire deals with issues I am very knowledgeable about	1	2	3	4	5	6	7
I am completely confident about my answers to the questions	1	2	3	4	5	6	7
I am confident that my answers reflect the company's situation	1	2	3	4	5	6	7

APPENDIX III: RESULTS

Curvilinear table

RESEARCH OBJECTIVE ONE

A table showing the curvilinear relationship between supply chain disruption and disruption absorption

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.136	.019	.011	1.426

The independent variable is Supply Chain Disruption.

A table showing the curvilinear relationship between supply chain disruption and disruption recovery

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.106	.011	.003	1.086

The independent variable is Supply Chain Disruption.