KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI

THE EFFECT OF SUPPLY CHAIN AMBIDEXTERITY ON SUPPLY CHAIN DISRUPTION RECOVERY: THE MEDIATING ROLE OF SUPPLY CHAIN INTELLIGENCE

By

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DECLARATION

I hereby declare that this submission is my work towards the Master of Science, 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 acknowledgment has been made in the text.

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DEDICATION

I dedicate this work first to Almighty God who has been there right from the beginning to this point. Special dedication also to my supportive parents, for their relentless support and compassion towards me during my study.

Furthermore, I want to dedicate this report to my lecturers for their continual impact on knowledge.

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ABSTRACT

The main purpose of the study is to examine the mediating role of supply chain intelligence on the effect of supply chain ambidexterity on supply chain disruption recovery in Ghana. Explanatory research design was used. This survey was quantitative. Convenience and purposive sampling was adopted and selected 200 participants. Data gathering relied on a questionnaire. Statistical study using SPSS v26 and SmartPls v4. Data was analyzed descriptively and inferentially. The result shows that SC ambidexterity positively influenced SC disruption recovery and SC intelligence. The result reveals that SC ambidexterity positively influenced SC intelligence. The result also concludes that SC intelligence positively influences SC ambidexterity and SC disruption recovery. The study concluded that managers should improve on innovative activities, discover new innovative activities from supplier and customer technical expertise, and use competitor goods as a standard in product design and know their strengths and limitations well in order to concentrate on improving supply chain process skills, aggressively seek supply chain innovations, and seek innovative supply chain improvements to improve on innovative activities, discover new innovative activities from supplier and customer technical expertise, and use competitor goods as a standard in product design and know their strengths and limitations well.

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CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Natural disasters, political unrest, terrorism, and energy crises are just a few of the recent catastrophic events that have severely disrupted production and distribution methods (Fiksel, 2015; Wan et al., 2015; Sawik, 2013). However, the coronavirus 2019 (COVID-19) pandemic had a far more severe negative impact on businesses. The massive disruption of supply chains caused significant losses for organizations all over the world including the oil and gas industry. The oil and gas (OandG) industry is one of the major industries in terms of dollar value and employs hundreds and thousands of people worldwide (Piya et al., 2022).

Despite a substantial burst in the OandG industry with a slowdown in production and a decrease in revenue (Abboud et al., 2021), the industry is still the major contributor to the GDPs of many countries and plays a major role in the generation of significant employment opportunities. As the world economy heads toward renewables, OandG will still play an important role in energy systems (Aastvedt et al., 2021; Piya et al., 2022).

The OandG industry can be categorized into three major sections. The upstream section consists of the exploration and production of hydrocarbon fields by bringing crude oil and natural gas from underground to the surface. The midstream section consists of processes such as setting up gas plants, producing liquefied natural gas, and transporting crude oil and gas from upstream to refineries. The downstream section is concerned with processes such as the refinement, marketing, and distribution of crude oil and related products. As a large number of service and technology companies assist the operation of these three sections (Piya et al., 2022; Yusuf et al., 2014), a high level of cooperation among OandG supply chain (SC) partners and an integration of their capabilities are needed (Piya et al., 2020; Rejeb et al., 2021; Saad et al., 2014; Ebrahimi et al.,

2018; Liao et al., 2017). Sudden disruption to any link within the chain will have adverse effects on the entire chain. Therefore, the OandG SC needs to be resilient to adapt to the changes orchestrated by market dynamics.

Supply chain disruption is defined as any unintended and unexpected event that occurs in the upstream supply chain, the inbound logistics network or the downstream, that threatens the normal course of business operations of the focal firm (Bode and Macdonald, 2017; Bode et al., 2011). It is critical for the firm to understand and employ strategies to mitigate obstacles caused by unforeseen disasters and maintain business growth. This is especially true during the COVID-19 pandemic, where more than 80% of global organizations are severely affected by the crisis (Sujan et al., 2022). The pandemic has affected every facet of human existence and all types of industries, including OandG. One recent example of the effect of the pandemic on an OandG SC was seen in many economies, with severe disruption to the chain to the extent that the government had to take drastic measures to relieve the impact of such a disruption.

With uncertainty becoming the new norm for businesses, all supply chains are susceptible to disruptions (Ambulkar et al., 2015). Studying how firms are capitalising from previous disruptions to refine mitigation strategies is an important step towards shortening the recovery time during future disruptions (Macdonald and Corsi, 2013; Messina et al., 2020). Supply chain ambidexterity remains an essential strategy to refine mitigation strategies is an important step towards shortening the recovery time during disruptions.

The recent advancements in other fields like organizational theory, networks, innovation, and inter-organizational linkages have expanded the overall idea of ambidexterity strategy. Supply chain ambidexterity represents the simultaneous pursuit of both exploration and exploitation (Sahi et al., 2020; Makhashen et al., 2020; Tarba et al., 2020). Im and Rai (2014) make the argument

that "exploration refers to the pursuit of new information and opportunities, whereas exploitation relates to the use and improvement of current knowledge.

Initially, exploitation and exploration were seen as alternatives to each other due to the limited firm resources and managerial scope (or trade-offs). According to conventional wisdom, organizations would benefit more if they either focused on enhancing and expanding their current supply chain competencies or on acquiring new ones. Others, on the other hand, contend that exploitation and exploration are complementary skills (Marx and Fuegi, 2021; Im and Rai, 2014). to The ability to refine mitigation strategies towards shortening the recovery time during disruptions requires both exploitation and exploration to achieve persistent success. Dixon et al. (2017) argues that firms competing in a hypercompetitive and dynamic environment cannot be supported by exploitation or exploration alone. A firm's strategic decision (i.e., managerial emphasis) to simultaneously pursue both supply chain exploitation and exploration (hereafter, SC exploitation and exploration) practices is described by the researcher as an ambidextrous supply chain strategy (hereafter, an ambidextrous SC strategy) from the perspective of manufacturers. The study defines exploitation as a set of practices that enhance and expand on already-existing knowledge and capabilities in supply chain management. In contrast, exploration relates to techniques that boost supply chain disruption recovery.

1.2 Problem Statement

Supply chain disruption recovery (SCDR) represents a highly studied topic (Blackhurst et al., 2005; Ivanov et al., 2017; Zsidisin and Wagner, 2010), researchers have so far mainly focussed their attention on the response to catastrophic events as primary causes for supply chain disruptions and less on everyday operational disruptions, which are less severe, but more frequent (Marley et al., 2014). This study addresses this important gap of lack of studies related to operational

disruptions and thus contributes to broadening the picture of disruptions in supply chains (Messina et al., 2020). Whilst the two types of events require similar responses to deal with supply chain disruptions, the causes that generate them, the information needed to select the recovery strategy and especially the redesign actions are different. Therefore, this study aims at filling this gap by identifying and analysing the actions taken and the information used by decision makers during and after operational disruptive events, in order to propose a conceptual model that supports decision makers in the recovery from disruptions.

Supply chain disruption recovery (SCDR) is the ability of an organization to rebound after disruption (Messina et al.,2020). It involves preventing recognizable risks, meeting business objectives in the face of disruptions and achieving the required performance level after the disruptions have occurred (Sawyerr and Harrison, 2020). SCDR helps in adapting swiftly to impulsive events (Adobor and McMullen, 2018; Chen et al., 2019; Darom et al., 2018; Chen et al., 2021; Barman et al., 2021) by minimizing instabilities (Bag et al., 2019; Barman et al., 2021; Ali et al., 2017). It does not merely deal with one-time crises. At the core of this capability are the organizational mechanisms that continuously anticipate and make adjustments to constant changes impairing the earning potential of an organization's businesses (Hamel and Valikangas, 2004; Chen et al., 2021). As the world population increases and the climate changes become more erratic and obvious, the occurrences of supply chain disruptions are on the rise (Guha-Sapir and Ph, 2015). It has therefore become important to understand and develop supply chain disruption recovery for the future of enterprise (Sawyerr and Harrison, 2020; van der Westhuizen and Niemann, 2022). Thought there is numerous studies on the concept, existing studies have looked at the significance of organizational ambidexterity, its causes, and its effects. Existing literature is evident that studies have looked at how ambidexterity affects a firm's capacity to maintain competitive advantage

(O'Reilly and Tushman, 2011), improve organizational performance (Boumgarden et al., 2012; Junni et al., 2013), find new knowledge (Borzillo et al., 2012), promote high performance work practices (Patel et al., 2013), and create new products (Wei et al., 2014). Other researchers studied variables like knowledge asset alignment (Lin et al., 2017), top management diversity (Li, 2013), and strategic orientations in decision-making to identify the antecedents of organizational ambidexterity (Kortmann, 2015). Other studies (Ricciardi et al., 2016; D'Souza et al., 2017; Zhang et al., 2017) have also used organizational ambidexterity as a framework to examine organizational dynamism, relative ambidexterity, and innovation. However, there is a dearth of research on supply chain ambidexterity in particular (Lee and Rha, 2016).

Again, literature does not present a holistic picture (Polyviou et al., 2020) since it severely lacks a developing country perspective (Tukamuhabwa et al., 2017). This is in spite of the fact that developing countries are the ones most affected by the supply chain disruptions whether natural calamities or man-made disasters (such as wars). Furthermore, meta-analytic evidence also suggests a relative scarcity of empirical research compared to non-empirical studies in the area (Ali et al., 2017). Researchers have also highlighted the importance of integrating developments in recovery from outside SCM (Pettit et al., 2019). Our study contributes toward settling some of these issues. In this research, the author envisages SCA as antecedents of SCDR. Though prior studies suggest that supply chain ambidexterity (SC-Ambidexterity) leads to SC-Resilience (Lee and Rha, 2016; Aslam et al., 2018; Jermsittiparsert and Pithuk, 2019; Aslam et al., 2020; Makhashen et al., 2020; Gu et al., 2021; Wang et al., 2021), it is still unclear how SCA could be useful in supply chain disruption recovery. Despite the fact that SC-Ambidexterity and SCDR have been rarely considered in conjunction with each other, there has been recent calls on how SCDR could be built (Nguyen et al., 2022; Rozhkov et al., 2022; Drozdibob et al., 2022; Moosavi

et al., 2022; Pujawan and Bah, 2022; Sombultawee et al., 2022). This study further propose that supply chain intelligence plays a mediating role in the relationship between SC-Ambidexterity and SCDR. Competitive, complex, dynamic and uncertain business environment necessitates prompt, rapid and speedy response to the market changes and customer needs (Anwer, 2017; Dubey et al., 2018). This rapid and prompt response is best achieved through SC intelligence (Brusset, 2016). Supply chain intelligence is a kind of threat intelligence that focuses on identifying, detecting, and fighting virtual competitors that seek to hurt enterprises by launching cyber espionage, social manipulation assaults, and other criminal ruses against corporate supplier global production networks (Riahi et al., 2021).

By adopting SCI, firms can reduce instabilities and improve their response capacity exclusively in a dynamic environment (Fayezi et al., 2015, 2017; Swafford et al., 2008). This study will use the dynamic capabilities view (DCV) as a theoretical anchor for this study (Teece, 2007; Eisenhardt and Martin, 2000; Teece et al., 1997). DCV suggests that in order to survive and sustain competitive advantage in constantly changing market conditions, firms require dynamic capabilities (Teece et al., 1997). O'Reilly and Tushman (2013) suggested that DCV is the most pertinent theoretical frame for the study of SC-Ambidexterity. This study expects that SC-Ambidexterity affects SCDR and SCI mediates this relationship. The study therefore seeks to bridge this gap by assessing the mediating role of supply chain intelligence on the effect of supply chain ambidexterity on supply chain disruption recovery in Ghana.

1.3 Objectives of the Study

The main purpose of the study is to examine the mediating role of supply chain intelligence on the effect of supply chain ambidexterity on supply chain disruption recovery in Ghana. The specific objectives includes:

1. To ascertain the effect of supply chain ambidexterity on supply chain disruption recovery.
2. To examine the impact of supply chain ambidexterity on supply chain intelligence.
3. To establish the mediating role of supply chain intelligence on the effect of supply chain ambidexterity on supply chain disruption recovery in Ghana.

1.4 Research Questions

The study will focus on addressing the following questions:

1. What is the effect of supply chain ambidexterity on supply chain disruption recovery?
2. What is the impact of supply chain ambidexterity on supply chain intelligence?
3. What is the mediating role of supply chain intelligence on the effect of supply chain ambidexterity on supply chain disruption recovery in Ghana?

1.5 Significance of the Study

The study's first contribution is to offer empirical proof of the relationship between SCA and SCDR. Second, the study offers proof of the interaction between ambidexterity supply chain strategy and SCI and SCDR aspects. The results of this study can greatly assist businesses in reducing the catastrophic effects of COVID 2019, one of the greatest issues humanity has ever encountered. The study advances knowledge of the relationship between ASCS and SCI by advocating ASCS-driven SCI as a tool for obtaining SCR. This report is relevant to the global business agenda and is timely in another way.

This discovery is relevant to a wide variety of fields, including DCV, SC ambidexterity, and SCDR. Previous studies have demonstrated that dynamic capacities are fundamental to achieving Resilience (Gunessee et al., 2018). Therefore, we enrich both the dynamic capabilities literature and the SCDR literature by proposing a supply chain-related capability (i.e., SC-Ambidexterity) that contributes to SCDR. This study adds to the SC-Ambidexterity literature by giving a novel

operationalization of the concept. The authors of this study model SC-Ambidexterity as contextual ambidexterity, translating the argument put forth by Gibson and Birkinshaw (2004) into the supply chain context to argue that the ability to strike a balance between exploitative and exploratory activities depends on the specific circumstances at hand and may necessitate supply chains to allocate resources between the goals of SC-Adaptability and SC-Alignment. The results of this research provide new insights on the concept of ambidexterity.

1.6 Research Methodology

In the quest to unearth the mediating role of supply chain intelligence on the effect of supply chain ambidexterity on supply chain disruption recovery in the Oil and Gas Industry in Ghana, a quantitative methodology will be employed. The study will combine both descriptive and explanatory research design. The research design will aid the researcher to gather primary data from procurement officers and top managers of startups within a specific time frame which aided in the correct prediction and interpretation of results. According to Collis and Hussey (2003), the survey method is convenient when collecting data from a sample in order to make inferences. Questionnaire will be used to as the main instrument of data collection in this study. All the items of variables in the study will be adapted and modified from existing literature. The population of the study included procurement officers and top managers in public facilities in Ghana. Data collected will be analyzed using SPSS version 23. Both Exploratory and Confirmatory factor analysis will be conducted to validate the suitability of the item. Regression analyses using the process procedure to test both direct and indirect relationships. Descriptive analysis was based on information provided by respondents concerning their organization (demographical data), which include profile of the organization and the respondents. The essence of the descriptive analysis

was to test for normality and this included frequencies, percentages, means, skewness and kurtosis statistics.

1.7 Scope of the Study

The research will be conducted Oil and Gas firms in the Greater Accra Region of Ghana. Due to time constraints, the study will be limited to determining the mediating role of supply chain intelligence on the effect of supply chain ambidexterity on supply chain disruption recovery in Ghana.

1.8 Organisation of the thesis

This thesis was divided into five (5) chapters. The following are all included in Chapter One: the study background, problem statement, study objectives, research questions, study significance, methodology summary, study scope, study limitations, and study organization.

The Chapter Two includes the literature review, which conducts a conceptual review, theoretical review, and empirical review in line with the study's objectives. It ends with the conceptual framework and its hypotheses. The research technique is covered in Chapter Three, which includes the research design, study population, sample size and sampling methods, data sources, data collection instruments and processes, data interpretation, research standards, and ethical considerations.

Chapter Four describes the results of field research, analysis, and discussion of results in accordance with the study's objectives. Finally, Chapter Five, which is the last chapter, provides a summary of findings, conclusions drawn, and proposed theoretical and practical recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of related studies on the topic "Effect of Supply chain Ambidexterity on Supply chain disruption recovery, mediating role of Supply Chain Intelligence". The chapter is organized into six (6) main sections. Section 2.2 presents a review of the conceptual literature, and covers concepts including Supply chain Ambidexterity, Supply chain disruption recovery, and Supply Chain Intelligence. Section 2.3 discusses the theoretical literature and covers theories such as the Dynamic Capabilities View (DCV) and Information processing theory. Section 2.4 discusses the empirical review whiles section 2.5 talks about the conceptual framework and the final section discusses the hypothesis.

2.2 Conceptual Review

This section provides definitions of variables and how they have been used in the study. The research work consists of three (3) variables (Supply chain Ambidexterity, Supply chain disruption recovery, and Supply Chain Intelligence). However, these variables have been operationalized in the subsequent sections below.

2.2.1 Supply chain Ambidexterity

To survive and remain competitive, organizations must be simultaneously efficient and adaptive (Aghina et al., 2015) hence ambidexterity is recognized as a situation of tension in ensuring company survival (Mierzejewska 2022). The term supply chain ambidexterity refers to the ability to maintain daily operations excellence while looking for constant innovation and the ability to keep balance. (Güemes-Castorena and Ruiz-Monroy., 2020). Khan et al. (2021) define ambidexterity as attaining the advantages of exploitation and exploration simultaneously within a

supply chain. Also, SC-Ambidexterity is the ability to modify supply chain design to adapt according to the dynamic market environment while aligning the incentives of the supply chain partners (Liu et al., 2018). This current study defines SC ambidexterity as an organization's efforts to refine/extend its existing resources and to establish new SC competencies and yield performance benefits (Partanen et al.,2020) This concept is focused on exploration and exploitation trade-offs between units in one organization or between supply chain partners (Aoki and Wilhelm 2017). Exploration-related practices focuses on new possibilities and involve search, risk-taking and innovation. Exploitation practices, on the other hand, target efficiency, improvement and implementation (Aslam, et al. 2020). Firms focused on exploration target long-term success whereas those targeting exploitations are focused on short-term outcomes (Wang et al., 2019). Ojha et al. (2018) posit that exploration practices yield new knowledge and ideas, but only after the ideas are exploited can they create value". According to Wang et al. (2021) supply chain ambidexterity increases the flexibility to quickly and effectively solve problems which results in a competitive advantage. Rojo et al. (2016) revealed that supply chain ambidexterity enables businesses to achieve supply chain flexibility, which, in turn, build supply chain competence and also improves performance. Lee and Rha (2016) found that supply chain ambidexterity helps businesses to reduce the negative impacts of supply chain disruptions which in turn improves business performance.

2.2.2 Supply chain disruption recovery

Industries across the world have experienced losses from a variety of disruptions like massive floods, hazardous chemical explosions, industrial strikes, pandemics, technological shifts, and political events etc. (Darom et al. 2018). These disruptions can have a severe negative impact on firms and wisdom demands that this impact can be mitigated by quick responses. According to Lee and Rha (2016) SC disruption recovery is defined as "the ability of a system to return to its

normal state or move to a new, more desirable state after being disturbed". This study defines SC disruption recovery as the "ability of a supply chain to develop the required level of readiness, response, and recovery capability to manage disruptions risks, get back to the original state or even a better state after disruptions" (Chowdhury et al., 2019). Different studies have defined supply chain disruption recovery from different point of views. However few studies have extended the relationship between digitization, diversification and collaboration and supply chain disruption recovery (Remko, 2020; Ivanov et al., 2019), where digital technology creates transparency across the supply chain. To successfully recover from a SC disruption, a firm needs to activate effective methods (Katsaliaki et al., 2021). Studies have confirmed that businesses need to respond to disruptive incidents by following three identified stages of response, identifying the volume of disruption, designing or selecting a predesigned recovery method to tackle the disruption and then implementing the solution (Bode and Macdonald, 2017). For instance, the floods in Thailand, earthquake and tsunami in Japan in 2011 depicts a high level of global SC disruption (Kauppi et al., 2016; Shekarian et al., 2020). Once a disruptive event is identified, the two phases representing the core of managing supply chain disruptions are discovery and recovery (Bode and Macdonald, 2017). Extant Literature has shown that firms address disruptions most commonly with increased safety-stock, dual or multi-sourcing, and better forecasting. Although they consider coordination between the SC network very significant to recover from disruptions, in reality they act in isolation and their visibility of the SC extends only to one tier above and one tier below (Scheibe and Blackhurst 2018). Real-time supply-chain reconfiguration software could enhance responsiveness against disruptive events and also improved coordination and decision-making by using digital technologies minimize penalties and delay costs due to the disruption (Katsaliaki et al. (2021). For example, Toyota extends its SC networks to multiple-sourcing and building new facilities on the

supply side. Amazon prefers holding fast-moving items in distribution centres while slow-moving items tend to be stored centrally. Apple localized production in China but the distribution network is global. These SC networks helps to reduce disruption risk implications since they have created a contingency policy for such disruptions. (Ivanov et al. 2016). Supply chain disruptions affects performance through lost sales, stockouts, production shutdowns, premium freight charges, and product substitutions related to operations, finance, and relationships (Bode and Macdonald 2017). Firms that are able to minimize the duration and severity of disruptions to their supply chains relative to their competitors are more resilient and are able to use it as a strategic weapon to achieve competitive advantage (Scholten et al., 2020). Thus, supply chains can expect and lessen the negative effects of disruptive events while reducing the time of recovery to normal activity in a meaningful way (Ruiz-Benıtez et al., 2018). This current study shows that an ambidextrous supply chain directly influences disruption recovery. (Kwak et al., 2018; Birkie et al., 2017; Chowdhury et al., 2019; Chunsheng et al., 2020; Altay et al., 2018).

2.2.3 Supply Chain Intelligence (SCI)

The intelligence of a supply chain has become a strategic asset, since it can be used to build supply chain skills that add value to a company's competitive position (Jenkins et al., 2020). Incorporating the views, values, data, and knowledge of a company's suppliers, customers, and supply chain infrastructure helps creates novel insights and approaches. (Yan and Azadegan, 2017).

The concept of supply chain intelligence is the process of blending and presenting supply chain information to provide collaborative planning, monitoring, measurement, analysis and management of the supply network (Stefanovic and Milosevic 2019) According to (Munir et al. 2020) SCI refers of strategic position and interconnection of a firm and its supply chain partners, consisting of internal (cross-functional) and external (customer and supplier) integration. This study conceptualizes SCI as the ability to proactively or reactively align strategies and operations

according to constantly changing conditions (Aslam et al. 2020). SCI assists in extending SC disruption recovery efforts throughout the supply chain and improve performance. External supplier and customer integration allow the collection of accurate, timely and reliable information, providing businesses with the knowledge that can improve risk detection, prevention, and reaction capabilities (Ardito et al. 2018). Internal integration enhances information sharing within internal functions and creates the capability to process, absorb, analyze and implement the information collected from supplier and customer (Katsaliaki et al., 2021). Increased integration among supply chain partners may lead to increased relationship and persistency in dynamic market environmental. Thus, SCI may increase exposure to disruptions as events become inevitable in tightly complex supply chain system (Munir et al. 2020). To effectively tackle disruptions in supply chains, it is important for businesses to share information and integrate with upstream and downstream partners via IT use that crosses firm boundary (Burin et al. 2020). This mean that businesses would have to improve visibility and coordination generated by using technologies such as advanced planning systems and IT systems (Yoon et al., 2016) to achieve disruptive recoveries, since it enables businesses sense and seize opportunities in external environment. Thus, adopting SCI reduces instabilities and improve quick response capacity exclusively in a constantly changing business environment. (Fayezi et al., 2017).

2.3 Theoretical Review

In this section, the research work discusses the theory that forms the basis to investigate "Effect of Supply chain Ambidexterity on Supply chain disruption recovery, mediating role of Supply Chain Intelligence". A theoretical framework explains the context and the connections between the various factors and dimensions. In this study, all research concepts are related or expressed based on the dynamic capabilities view (DCV) and Information processing theory

2.3.1 Dynamic Capabilities View (DCV)

Teece and Pisano's (1994) notion of dynamic capabilities theory (DCT) originated from Barney's (1986, 1991) resource-based view (RBV) and has become one of the most influential theories in recent years (Forkmann et al., 2018). The RBV claims that valuable, rare, imperfectly imitable, and non-substitutable (VRIN) resources are a source of competitive advantage, but it doesn't explain how these resources evolve through time or how they may adapt to rapidly changing contexts (Barney, 1986, 1991). On the other hand, the DCV suggests that to survive and sustain competitive advantage in constantly changing market conditions, firms require dynamic capabilities (Teece et al., 1997). Dynamic capability explains how market uncertainty and a dynamic business environment form business condition in which competitive advantage arises from the firm's capability to adapt to environmental uncertainty and change (Eisenhardt and Martin, 2000; Lacerda et al., 2014). Teece (2007) developed a combined framework for dynamic capability, consisting of: sensing opportunities and threats, seizing opportunities, and reconfiguring a firm's tangible and intangible assets. Sensing opportunities and threats is related to a scanning creation, learning, and interpretive activities both within and outside the firms supply chain (Teece, 2007). As a result, the DCT addresses some of these flaws by focusing on a company's ability to renew and rearrange its resources in response to changing business situations (Ambrosini et al., 2009; Eisenhardt and Martin, 2000; Teece et al., 1997) . O'Reilly and Tushman (2013) suggested that DCV is the appropriate frame for the study of SC-Ambidexterity. Other studies have also used DCV in the study of SC ambidexterity. (Russell, 2015; Blome et al., 2013b; Gligor et al., 2015). Ambidexterity based on a dynamic capability improves competencies and helps firms address uncertain and unexpected environments. Thus, ambidexterity as a dynamic

capability (Jansen et al., 2009; O'Reilly and Tushman, 2007) can make a SC strong to effectively handle the negative effects of SC disruption. (Lee and Rha., 2016).

2.3.2 Information processing theory

According to information processing theory, an organization is essentially a system for interpreting data that is designed to reduce uncertainty and risk by improving its ability to collect and interpret data from the environment (Daft et al., 1987; Daft and Weick 1984; Tushman and Nadler 1978). The founding principle of information processing theory is that organizations use a variety of strategies to address their unique information processing needs (Trautmann et al. 2010).The use of this idea has been widespread in many fields, including international markets and organizational planning (Rogers et al., 1999; Trentin et al., 2012). (Rogers et al., 1999; Trautmann et al.,2010). Firms can reduce the negative impacts of uncertainties by improving information processing capability (Galbraith, 1974). In an unstable business environment, streamlined information is needed to generate more synchronized decision making and coordinated actions. In other words, firms will suffer from misunderstandings of environmental stimuli and conflict in risk management practices if their information processing capability is poor (Daft and Lengel, 1986). Wang et al (2013) posit that sharing information between SC partners reduces information distortions and generates more solutions, also reducing information sources by standardizing information formats enhances rapid decisions and responsive actions. Thus, IT is an intermediary for information sharing in supply chains which helps business disseminate information across boundaries effectively. (Huo et al., 2015; Iyer, 2011; Li et al., 2009; Patnayakuni et al., 2006; Song et al., 2007; Yu et al., 2017). Furthermore, to improve efficiency, information processing capabilities should match information processing requirements (Trautmann et al., 2009). A mismatch may lead to poor organizational performance; for example, when information processing capacity is

inadequate to meet processing needs, it may cause integration and coordination difficulties, dissatisfactory decision-making and organizational inefficiency (Bergh, 1998; Tushman and Nadler, 1978).This study is of the views that exploitative use of IT improves information processing capability by standardizing information formats which helps firms to respond quickly and immediately to disruption within their SC's . On the other hand, explorative use of IT allows for information sharing in the supply chain network which in turn creates innovative solutions among SC partners in achieving competitiveness in the long-run. (Gu et al., 2021)

2.4 Empirical Review

This section assessed the research on prior studies that addressed the study's objective which has also been summarized in **Table 2.1**

2.4.1 Effect of Supply chain Ambidexterity on Supply chain disruption recovery.

Wang et al. (2021) conduct a study on the role of organizational ambidexterity on Supply chain disruption recovery. The study adopts a single case study approach to gather data using interviews, and other secondary sources of data obtained from media report and official website of the company. Also, Zong-Teng Group a cross-border e-commerce organization was used as the sample. Data was analyzed based on content analysis. Results show that ambidexterity in connection with corporate social responsibility practices enhances disruption recovery in the supply chain networks. Further works should repeat the study in other countries and also adopt a cross -sectional case study approach.

Sheng and Saide (2021) conducts a study on systems-oriented and environment-oriented approach towards supply chain disruption recovery. The study adopts a survey research design to collect data using questionnaires. A sample size 700 firms was considered for study and it was made up CEOs, supply chain manager or top managements. The study employs the SEM-SmartPLS and SPSS to analyze data. Findings show that explorative and exploitative Knowledge capability

aligned with IT integrations have an impact towards disruptions recovery in supply chains. Future studies may consider an explorative knowledge capability in other industries.

Gu et al. (2021) examines the link between the effective use of IT, supply chain disruption recovery and firm performance. Data was collected using questionnaires, a sample size of 206 middle or top managers from a total of 2820 randomly selected organizations. The study employed the structural equation modeling technique to analyze data. Findings show that the explorative use of IT with suppliers and customers have positive effect on supply chain disruption recovery whereas the exploitative use of IT have no impact on supply chain disruption recovery. Further studies may consider intra-firm IT patterns and its effects on supply chain disruption recovery.

Aslam et al. (2020) investigates the relationship between supply chain ambidexterity and supply chain disruption recovery. The study implements cross- sectional survey research method to collect using questionnaires with a sample size of 129 respondents from Pakistan manufacturing industries. Data was analyzed using structural equation modeling (SEM) technique. It was found that supply chain ambidexterity has an effect on supply chain disruption recovery. Further works should collect data from multiple respondents in order to get significant evidence on the variables used in the study.

Lee and Rha (2016) examine the relationship between supply chain ambidexterity, dynamic capability and supply chain disruption recovery. The study adopts an observational research design to collect data using questionnaires. A sample size of 316informants made up of top manager and engineers. The study employs the Confirmatory factor analysis (CFA) and structural equation modeling (SEM) techniques to analyze data. Findings show that dynamic SC capability has a positive link between SC visibility, SC agility, and SC flexibility. Further studies may adopt the

time-series data to examine the relationship between supply chain ambidexterity, dynamic capacity-building process and supply chain resilience.

2.4.2 The relationship of Supply chain Ambidexterity on Supply Chain Intelligence

Benzidia et al. (2021) examines the role of blockchain technology and relational social capital in an ambidextrous supply chain network. Data was gathered using questionnaires, a sample size of 379 informants made up of procurement managers French manufacturing firms. The study employed the structural equation modelling (SEM) tool using the AMOS 23 software to analyze data. Findings show a direct effect of internal integration, blockchain technology and relational social capital in buyer–supplier relationships. Future works should repeat the study in other countries and also consider using longitudinal research design.

Abdalla and Nakagawa (2021) conducts a study on how digital technologies affects supply chain ambidexterity. The study adopts an observational research method to collect data using questionnaires with a sample size of 46 respondents obtained from a total population of 584 Japanese manufacturing industries. The study employed the hierarchical multiple regression analysis by using the RStudio® (RStudio Team, 2020) to analyze the hypotheses. Findings indicate that digital technologies have a direct effect on suppliers' and customers' adaptability to ambidexterity in the supply chain. Further works should repeat the research in other countries and also consider longitudinal studies.

Shukor et al. (2020) examines the impact of organizational ambidexterity on supply chain integration. The study adopts a cross-sectional research design to gather data using questionnaires. A sample size of 526 informants from the service and manufacturing sector in Malaysia was considered for the study. Also, the study employed the structural equation modeling (SEM) method and the using the partial least square (SmartPLS 3.0) tool to analyze data. It was found that

organizational ambidexterity has a direct impact on supply chain integrations. Further studies should focus on longitudinal research design to ensure the validity of the measurement instruments Burin et al. (2020) examines the role of IT competencies on the relationship between SC ambidexterity and supply chain Flexibility. Data was collected using questionnaires, a sample size of 2 517 Spanish manufacturing companies made up procurement or supply chain managers. Data was analyzed using hierarchical regression analysis with STATA v.14 software. Findings indicate that knowledge management competencies and IT competencies have a direct impact on supply chain flexibility. Further works may consider exploration and exploitation practices at the same time at both the firm and the supply chain levels.

2.4.3 The role of supply chain intelligence on Supply chain disruption recovery

Modgil et al. (2021) conducts a study on the impacts of artificial intelligence on supply chain disruption recovery. The study adopts a case study research design to gather data using structured interviews with a sample size of 31 professional in charge of supply chain was considered for the study. Data was analyzed using thematic analysis. Results indicate that artificial intelligence in supply chains have a significant effect on disruptive events. Further studies may consider an exploratory study of the impact of artificial intelligence on supply chain disruption recovery.

Katsaliaki et al. (2021) conduct a study on supply chain disruption and recovery strategies. The study adopts a systematic literature review to collect data from secondary sources using Web of Science (WoS) database and involves a total of ten (10) articles. Data was analyzed using content analysis. Results indicate that digital technologies have a positive impact on supply chain disruption recovery.

Messina et al. (2020) examines the role of effective information management systems on disruptive recoveries. The study adopts qualitative research method to gather data using interviews, a sample size of three firms was obtained through the purposive sampling method.

Also, data was analyzed based on qualitative analysis by using MAXQDA® software. Findings indicate that internal and external information among supply chain network in terms of risks and contingency plans have a positive impact on disruption recoveries. Further studies should conduct a study on how visibility of upstream and downstream supply chains affects the disruptive recovery process.

2.4.4 The mediating role of supply chain intelligence on the relationship between Supply chain Ambidexterity and Supply chain disruption recovery.

Khan et al (2022) examined the role of Supply chain data analytics (SCDA) and supply chain strategies (SCS) on disruption performance. Data was gathered based on a cross-sectional survey research design using questionnaires. A sample size of 163 supply chain professionals was considered for the study. Also, data was analyzed using the structural equation modeling method. Findings show that Supply chain strategies have a positive effect on SCDA and disruption performance. The study suggest that further studies collect objective data from real-time events.

Dubey et al. (2022) investigate the role of Artificial intelligence big data analytics (AI-BDA) on Supply chain ambidexterity (SCA), supply chain disruption recovery (SCR) and performance. The study adopts a cross-sectional survey method to collect data using questionnaires with a sample size of 171 informants made up of top managers from Int. NGOs. Data was analyzed using Partial Least Squares (PLS) method. The findings reveal that AI-BDAC has positive impact on SCA, SCR, and the performance of the humanitarian supply chain.

Tarigan et al. (2021) conducts a study on the relationships between internal integration, supply chain partnership, supply chain agility, and supply chain resilience on firm performance. The study adopts a cross-sectional survey method to gather data using questionnaires. A sample size of 456 informants made up of senior -level managers from the manufacturing sector. The study employs Partial least squares (PLS) regression method to analyze data. Results show that internal

integration within a unit using data sharing affects supply chain (SC) partnerships, SC agility, and SC resilience. Further works should repeat the same study and use other variable like supply chain risk management and customer relationship management to engage more stakeholders and elements of the supply chain network.

2.5 Conceptual Framework

This study sought to examine the mediating role of SC intelligence in the relationship between supply chain ambidexterity and supply chain disruption recovery. Supply chain ambidexterity formed the independent variable while supply chain disruption recovery is the dependent variable. Figure 2.1 illustrates the interrelationship between these variables.

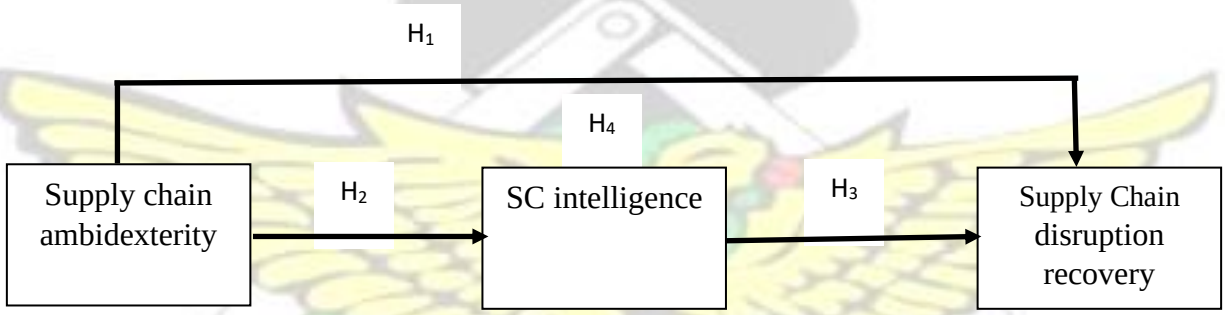

Figure 2. 1: Conceptual framework

2.6 Hypothesis Development

The following hypotheses were developed based on the conceptual framework presented in the previous section.

2.6.1 Effect of Supply chain Ambidexterity on Supply chain disruption recovery

Globalization coupled with the complex nature of supply chains is forcing organizations to shift simultaneously from traditional operations to a more disruptive adaption approach.

(Gualandris et al., 2018). Supply chain ambidexterity refers to a firms ability to simultaneously engage in opportunity seeking (entrepreneurship) and advantage-seeking (strategic management) activities (Sinha and Lu, 2019) for survival. That notwithstanding organization must make decision with most beneficial relationships towards risk and contingency plans in the face of disruption and difficulty. Thus, a strategic inter-sectional and inter-organizational relationships within supply chains is important (Gölgeci and Kuivalainen, 2020). Extant literature has shown the effects of ambidexterity on varied measures like organizational performance, supply chain competence, supplier product innovation, cooperative innovation, which creates competitive advantage and firm value (Gualandris et al., 2018; Bravo et al., 2018; Wang et al., 2018; Crescenzi and Gagliardi, 2018). For instance, Tuan (2016) found that knowledge sharing among supply chain networks has a significant effect on disruption recovery. According to Gu et al. (2021) explorative use of IT with suppliers and customers have positive effect on supply chain disruption recovery whereas the exploitative use of IT have no impact on supply chain disruption recovery. Also, Jermsittiparsert and Pithuk (2019) found that supply chain ambidexterity has a significant effect on supply chain disruption recovery. From the literature above the study propose the hypothesis below:

H1. Supply chain ambidexterity has a significant effect on supply disruption recovery.

2.6.2 The relationship of Supply chain Ambidexterity on Supply Chain Intelligence

SC-Ambidexterity is the ability to modify supply chain design to adapt according to the dynamic market environment while aligning the incentives of the supply chain partners (Liu et al., 2018). On the other hand, supply chain intelligence is the process of blending and presenting supply chain information to provide collaborative planning, monitoring, measurement, analysis and management of the supply chain network (Stefanovic and Milosevic 2019). Prior studies have examined the relationship between supply chain ambidexterity on supply chain intelligence. For

instance, Benzidia et al. (2021) examines the role of blockchain technology and relational social capital in an ambidextrous supply chain network. It was found that internal integration, blockchain technology and relational social capital directly affects upstream and downstream supply network. Also, Abdalla and Nakagawa (2021) conducts a study on supply chain ambidexterity and supply chain intelligence and found a significant impact of ambidexterity on supply chain intelligence. Therefore, the study hypothesizes that

H2. There is a significant relationship between supply ambidexterity and supply chain intelligence.

2.6.3 The role of supply chain intelligence on Supply chain disruption recovery

SCI is the ability to proactively or reactively adjust tactics and operations according to changing conditions (Aslam et al. 2020). Related studies have found a relationship between supply chain intelligence and Supply chain disruption recovery. Messina et al. (2020) investigated the role of effective information management systems on disruptive recoveries and discovered that internal and external information among supply chain network in terms of risks and contingency plans have a positive impact on disruption recoveries. A study conducted by Modgil et al. (2021) found that artificial intelligence in supply chains have a significant effect on disruptive events. Again Katsaliaki et al. (2021) also argued that digital technologies have a positive impact on supply chain disruption recovery. Consequently, the study suggests that

H3. Supply chain intelligence have a significant effect on supply chain disruption recovery.

2.6.4 The mediating role of supply chain intelligence

Exploratory and exploitative knowledge is not enough to sustain disruptive events. Firms can respond to constantly changing market environments by using intelligence strategies within their supply chain network. (Saide and Sheng 2021). Therefore, integrating IT competencies and tools like virtual enterprise, IOT, and big data analytics would enhance supply chain ambidexterity and mitigate the negative impact of disruptive events. Empirical studies have shown that the use of

supply chain intelligence mediate the relationships between explorative knowledge and supply chain disruption recovery (Pinto et al., 2019). Again Tarigan et al. (2021) found that internal integration within a unit using data sharing affects supply chain (SC) partnerships, SC ambidexterity, and SC disruption recovery. Finally, Rojo et al. (2020) posit that a high IT competence facilitates mediates the relationship between supply chain ambidexterity and supply chain disruption recovery. Thus, this study proposes that

H4. Supply chain intelligence mediates the relationship between ambidexterity and disruption recovery.

Table 2.1: Summary on Literature Review

Author/Year	Country	Purpose	Theory	Method	Findings	Future studies
Gu et al. (2021	China	To examines the link between the effective use of IT, supply chain disruption recovery and firm performance.	Information Processing Theory (IPT)	Quantitative	Findings show that the explorative use of IT with suppliers and customers have positive effect on supply chain disruption recovery whereas the exploitative use of IT have no impact on supply chain disruption recovery.	Further studies may consider intra-firm IT patterns and its effects on supply chain disruption recovery.
Wang et al. (2021)	China	To conduct a study on the role of organizational ambidexterity in improving Supply chain disruption	Information processing theory	Qualitative	Results show that ambidexterity in connection with corporate social responsibility practices enhances disruption recovery in the supply chain networks.	Further works should repeat the study in other countries and also adopt a cross -sectional case study approach.

		recovery. examines the link between the effective use of IT, supply chain disruption recovery and firm performance.				
Aslam et al. (2020)	Pakistan	To investigates the relationship between supply chain ambidexterity and supply chain disruption recovery.	Dynamic capabilities view (DCV)	Quantitative	It was found that supply chain ambidexterity has an effect on supply chain disruption recovery.	Further works should collect data from multiple respondents in order to get significant evidence on the variables used in the study
Sheng and Saide (2021)	Indonesia	To conducts a study on systems-oriented and environment-	Viable system model (VSM)	Quantitative	Findings show that explorative and exploitative Knowledge capability aligned	Future studies may consider an explorative knowledge capability in other industries.

		oriented approach towards supply chain disruption recovery			with IT integrations have an impact towards disruptions recovery in supply chains. Findings show that Knowledge ambidexterity capability have diverse impacts and are combined in different ways towards disruptions recovery in supply chains.	
Lee and Rha (2016)	South Korea	To examine the relationship between supply chain ambidexterity, dynamic capacity -	Not Stated	Quantitative	Findings show that dynamic SC capability has a positive link between SC visibility, SC agility, and SC flexibility	Further studies may adopt the time-series data to examine the relationship between supply chain ambidexterity, dynamic capacity-building process and supply chain resilience.

		building process and supply chain resilience.				
Benzidia et al. (2021)	, France	To examines the role of blockchain technology and relational social capital in an ambidextrous supply chain network	Dynamic capability and Supply chain ambidexterity theory	Quantitative	Findings show a direct effect of internal integration, blockchain technology and relational social capital in buyer–supplier relationships.	Future works should repeat the study in other countries and also consider using longitudinal research design
Shukor et al. (2020)	Malaysia	To examines the impact of organizational ambidexterity on	Not Stated	Quantitative	It was found that organizational ambidexterity has a direct impact on supply chain integrations.	Not Stated

		supply chain integration.				
Abdalla and Nakagawa (2021)	Japan	To conducts a study on how digital technologies affects supply chain ambidexterity.	Not stated	Quantitative	Findings indicate that digital technologies have a direct effect on suppliers' and customers' adaptability to ambidexterity in the supply chain.	Further works should repeat the research in other countries and also consider longitudinal studies.
Burin et al. (2020)	Spain	To examines the role of IT competencies on the relationship between SC ambidexterity and supply chain Flexibility	Resource Orchestration Theory	Quantitative	Findings indicate that knowledge management competencies and IT competencies have a direct impact on supply chain flexibility	Further works may consider exploration and exploitation practices at the same time at both the firm and the supply chain levels

Messina et al. (2020)	Portugal	To examines the role of effective information management systems on disruptive recoveries.	information processing theory (IPT	Qualitative	Findings indicate that internal and external information among supply chain network in terms of risks and contingency plans have a positive impact on disruption recoveries.	Further studies should conduct a study on how visibility of upstream and downstream supply chains affects the disruptive recovery process.
Modgil et al. (2021)	India	To conducts a study on the impacts of artificial intelligence on supply chain disruption recovery.	information processing theory	Qualitative	Results indicate that artificial intelligence in supply chains have a significant effect on disruptive events.	Further studies may consider an exploratory study of the impact of artificial intelligence on supply chain disruption recovery.
Katsaliaki et al. (2021)	Greece	To conduct a study on supply chain	Not Stated	Qualitative	Results indicate that digital technologies have a positive	Not Stated

		disruption and recovery strategies			impact on supply chain disruption recovery	
Khan et al (2022)	Pakistan	To examined the role of Supply chain data analytics (SCDA) and supply chain strategies(SCS)on disruption performance	Not stated	Qualitative	Findings show that Supply chain strategies have a positive effect on SCDA and disruption performance.	The study suggest that further studies collect objective data from real-time events.
Tarigan et al. (2021)	Indonesia	To conducts a study on the relationships between internal integration, supply chain partnership, supply chain	Not Stated.	Quantitative	Results show that internal integration within a unit using data sharing affects supply chain (SC) partnerships, SC agility, and SC resilience.	Further works should repeat the same study and use other variable like supply chain risk management and customer relationship management to engage more stakeholders and

		agility, and supply chain resilience on firm performance				elements of the supply chain network
Dubey et al. (2022)	France	To investigate the role of Artificial intelligence big data analytics (AI-BDA) on Supply chain agility(SCA), supply chain resilience(SCR) and performance.	Practice - Based view and Contingency theory	Quantitative	Findings reveal that AI-BDAC has positive impact on SCA, SCR, and the performance of the humanitarian supply chain	The findings reveal that AI-BDAC has positive impact on SCA, SCR, and the performance of the humanitarian supply chain

CHAPTER THREE

RESEARCH METHODOLOGY AND PROFILE OF ORGANIZATION

3.0 Introduction

This section presents and justifies the research design and the methodology used in testing the hypothesis stated in the preceding chapter. The tools, methods, techniques and strategies employed to help achieve the stated objectives of this study are presented in this chapter. It encapsulates the Research Design, Population, Sampling Techniques, Sample Size, Respondents of the study, Analytic Method, Research Instruments, Validity and Organizational Profile. The entire chapter describes the methods and techniques implemented to obtain the right data from the right respondents for quality analysis.

3.1 Research Design

The literature points that there essentially three purposes for conducting a research study and these include: exploratory, descriptive and explanatory (Leavy, 2017Creswell and Creswell, 2018; Cohen et. al., 2018). Exploratory aids in learning about a new topic or phenomenon. When an issue is under-researched, an exploratory purpose in indispensable as it helps in filling the gap in our knowledge about the new topic. Whiles descriptive research aims to generate thick descriptions involving details, meanings and context, chiefly from the perspective of the people living it, explanatory research aims to explicate causes and effects, correlations or why things are the ways they appear (Leavy, 2017:5-6). In this light, this study can be placed under the rubric of explanatory research because it examines the conceptual framework under consideration and also investigates relationship between the various constructs. The study therefore further employed an explanatory research design to understand the mediating role of supply chain intelligence on the effect of supply chain ambidexterity on supply chain disruption recovery in Ghana.

3.2 Population of the Study

This is considered to be the totality of elements through which sampling can be selected Bryman and Bell, 2018). This general population often contains elements or units or individuals whose inclusion would violate the goals, context and/or assumptions of the study as this population is characteristically crude (Asiamah, Mensah and Oteng-Abayie, 2017). The two refined research populations defined from the general population are the target and accessible. Target population refers to all individuals or groups of individuals to which researchers are interested in generalizing the conclusions (Asiamah, Mensah and Oteng-Abayie, 2017). This is the refined part of the general population. The target population which is also known as the theoretical population normally has varying characteristics. Thus, a refined form of the target population is the accessible population. The accessible population is the population in research to which the researchers can apply their conclusions. This form of the population is defined by excluding all individuals of the target population that are not accessible to the researcher during the period of the study (Bartlett et al., 2001). This population which is termed as study population serves as the source of the study sample. In the context of this study, the general population constitutes members of the tender committee, procurement Officers and selected OandG firms in Ghana.

3.3 Sampling Technique and Sample Size

Sampling is mainly about choosing individuals as a subset of a defined population to evaluate the characteristics of the entire population (Collis and Hussey, 2009). It can also be used to designate the process of selecting a section from the entire population (Bryman, 2012). It is very suitable in situations where the researcher cannot reach the whole sample or population due to challenges such as time constraints and cost (Saunders et al., 2007). There are two (2) main techniques used in sampling, they are; probability (random) and non-probability sampling. With probability or

random sampling, every participant in the population has an equal chance of selection. However, in the instance of non-probability sampling not all the subjects in the population have the chance of being selected (Bhattacherjee, 2012; Kothari, 2004). The subject of sample size in research remains a dilemma. Different views have been said by different authors. Some authors argue that smaller sample size is well suited for larger populations while others also believe that it should be representative (Krejcie and Morgan, 1970), relatively homogeneous, or heterogeneous in the population. In the view of Gorsuch (1990) and Kline (1979), the sample size should be at least 100. Others also advise that researchers should get the maximum sample size possible (Rummell, 1970; Humphreys, Ilgen, McGrath, and Montanelli, 1969; Guertin and Bailey, 1970; Press, 1972). Thus, if the sample size is unsuitable or insufficient it may harm the outcome or findings of the research (Bartlett, Kotrlik, Higgins, 2001). To achieve an appreciable statistical test power and avoid the tendency of using few sample cases, which will affect the results, (Habib, Magruder-Habib, Kupper, 1987) the study targeted procurement officers in the public sector organizations in Ghana. The study, therefore, sampled two (2) respondents from each of the 100 sampled organizations, making a total sample of 200. The study further employed the purposive and convenience sampling techniques to select the participants in the study.

3.4 Data Collection Procedure

Primary data refers to the data originated by the research for the first time. Primary data is real-time data and is collected by addressing the problem at hand and it also involves a process. Primary data sources include surveys, observations, experiments, questionnaires, and personal interviews (Saunders et al., 2007). Primary data for this study were through a questionnaire. The questionnaire was well-structured and was designed in line with the posited objectives of the study. The questionnaire will be designed based on existing measures in the literature. To ensure the quality of its design, the researcher employed Saunders et al. (2009), an indication that underscores

instrument design. According to Saunders et al. (2009), data obtained from respondents through the use of a questionnaire can be considered stable, constant, and has a uniform measure of variation. It also reduces the researcher's preconceived notion or idea concerning the presentation of study variables. The questionnaire was sourced from studies.

The questionnaire was presented to respondents at their offices considering their position in the organization. Respondents utilized not less than 30 minutes the filling out the questionnaire. The researcher adopted one-on-one data collection administration to make clarifications and explanations when the need arose. The researcher personally collected the questionnaire after it has been filled by the respondents.

The purpose of pilot testing is to identify the flaws in the questionnaires and instruments to be used for the study to do the necessary corrections before using them for the actual research. The pilot study gives a clear picture of the estimation of cost and logistics needed for data gathering and analysis. According to Hertzog (2008), the ideal sample size for pilot testing is 35-40, Lackey and Wingate (1998) propose 10 percent of the population for the study whereas Nieswiadomy (1998) suggests 10 respondents. Others, like Israel (1992) and Krejcie and Morgan, (1970), are of the view that the sample size provided should be the same or near value. This research has resorted to Hertzog (2008) where a sample size of 35 respondents will be enough to perform the pilot testing.

There are several methods from which a researcher can adopt to collect data depending on the type of research being conducted (qualitative, quantitative and mixed methods). Saunders et al. (2016) posit that the two main questionnaires are the self-completed and interview completed. Face-to-face and telephone questionnaires, according to Saunders et al. (2016), form part of the interviewer questionnaire. Zikmund (2013) has given questionnaires, interviews and observation as the main

instruments for the methods survey. Data for this research was collected through face-to-face interaction using a questionnaire. The Face-face approach enabled the researcher to obtain timely responses, especially during data collection. Face-to-face data collection helped the researcher build rapport and seek clarification of ambiguous responses, enhancing the data collected (Szolnoki and Hoffmann, 2013).

Studies have shown that face-to-face administered questionnaires work better than posted and phone surveys (Szolnoki and Hoffmann, 2013). However, it can be expensive and requires a lot of time. With an introductory letter obtained from the school, the researcher visited firms selected for the study with a questionnaire. This assisted the researcher to obtain the needed responses for the study. A self-administered questionnaire technique has been adopted because the number of sampling frame are considered high and they are located in different parts of the region.

3.5 Data Analysis

The method of data analysis forms an essential component of any research such that the choice of the method of analyzing data plays important role in the quality of findings, conclusions and recommendations that are drawn from the data. Being a quantitative study, this study employed multiple quantitative techniques in analyzing the data to fulfill the goal outlined in chapter one. After gathered was gathered, all the data was compiled in excel for scrutiny. After the scrutiny, few questionnaires that were found incomplete were discorded. The analysis employed both Statistical Package for Social Sciences (SPSS) version 26.0 and Smart PLS 3. The Statistical Package for Social Sciences (SPSS) was used for the analysis such as frequencies, means, standard deviations, independent sample t test, correlation and exploratory factor analysis. Smart PLS-SEM was used for Confirmatory Factor analysis, Structural Model evaluation and other model fit indices that were explored in this study.

3.6 Validity and Reliability

To ensure external validity, the participants were randomly selected to avoid selection bias. The selected participants were assured of the benefits from the study to the organisation to ensure minimum dropout rate. Both the content and the construct validity of this study were also ensured. The validity and reliability of a research study are two research criteria for consistency (Straus, 2017). Alpha coefficient of 0.70 is used as a cut-off point for assessing the internal consistency of the research item and scales to guarantee study reliability (Singh, 2017; Hair, Biasutti and Frate, 2017)). To eliminate logical flaws and biases in the study, the researcher emphasizes the validity and reliability of the results. This was done by adopting all of the constructs and conducting a pilot study using ten employees from the company.

3.7 Ethical Consideration

A consent was sought from the authorities of all respondents to inform them of all benefits and risks involved in the participation and further sought their consent for their inclusion in the study. Selected farmers had the right to decline their participation in the study. The researcher indicated all forms of anonymity and confidentiality would be observed. Privacy of farmers in terms of freedom to define the time, extent and the conditions of sharing information was also observed. The researcher avoided any form of action in their relation with participants that amounts to deception. All forms of plagiarism and falsification of data were also avoided by the researcher.

3.8 Profile of the Oil and Gas Industry in Ghana

Ghana is a rising oil and gas operator with operations in the upstream (exploration and production), midstream, and downstream sectors. After the discovery of commercial quantities of oil and gas in 2007, Ghana made tangible moves to establish a viable oil and gas industry. The Jubilee field began commercial production in 2010, and the Ghanaian government established the Petroleum

Commission in 2011 to manage the upstream business. Currently, Ghana produces 126,000 barrels of oil per day, with the possibility of an increase in the near future. Consequently, numerous multinational corporations have established a foothold in the upstream industry.

Despite its emergence as a major oil and gas producer, Ghana has been severely impacted by the recent spike in international fuel and energy costs. Ghana continues to import five times as much oil and gas as it exports. It lacks significant downstream value addition in sectors like refining. The infrastructure must also be improved so that Ghana's natural gas can reach its domestic power plants. Ghana may also be in a better position to capitalize on the predicted increase in global demand for liquid natural gas (LNG). Moreover, Ghana is the leading importer of chemical fertilizers in West Africa. Domestic production is limited to the blending of imported fertilizer. The global shortage of chemical fertilizer creates incentives for Ghana to develop a downstream ammonium nitrate and urea business using its natural gas to meet domestic fertilizer needs.

There is an urgent demand for oil and gas service companies capable of partnering with indigenous Ghanaian firms to assist the offshore operations of foreign oil majors. Despite local content laws mandating a minimum amount of local participation, Ghanaian enterprises lack the capacity to deliver a comprehensive range of services. Joint venture companies in which international partners contribute technology and expertise to a partnership with a reputable local firm will be in great demand.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION, AND INTERPRETATION

4.0 Introduction

The fourth chapter conducts an analysis on the data presented in the third chapter. This chapter is broken up into four parts. The findings of the exploratory data analysis are presented in the first chapter, while information on the demographics is presented in the second chapter. Both descriptive and correlational aspects of the study were taken into consideration. The third component contains both the Confirmatory Factor Analysis as well as the Model Fit Index. The hypotheses of the investigation are tested using a structural model. The discussion will conclude with the key outcomes.

4.1 Exploratory Data Analysis

The nature of the first investigation of the data was exploratory. Early on, the data quality was evaluated using exploratory factor analysis. The most important tool was SPSS. Response rate, non-response bias, and typical method bias or variance are the subsections that are included in this section. Detailed explanations of the early data quality assessment tests and interpretation may be found in the sections that follow.

4.1.1 Response Rate

Response rates to surveys are often provided in the form of a percentage. To arrive at this figure, just divide the total number of questionnaires that were sent in by the final count of respondents who filled them out. Response rates in surveys that are higher than 50 percent are unusual. The dates were from October 5th to December 22nd, 2022 for the data collection. The research therefore surveyed 200 participants. After determining whether or not each questionnaire is valid, an acceptable response rate for analysis is determined to be 100.0%, as seen in the table below. This results in 200 questionnaires that may be used.

Table 4.1: Data Response Rate

Distributed	Collected	Percentage of Usable
Response	200	100.0
Non-Response	0	0.0
Total	**200**	**100.0**

Source: Field Survey (2023)

4.1.2 Test for Common Method Bias and Sampling Adequacy

In the field of survey research, testing for CMB is essential because problems with CMB may lead the connection between predictors and the dependent variable to be distorted due to reliance on a single respondent (Podsakoff and Organ, 1986; Bahrami et al., 2022). As a consequence, incorrect judgments are made. Podsakoff et al. (2003) state that the origin of CMB may be traced back to either consistency or social desirability. Because CMB has the potential to affect data production, a variety of techniques may be used to reduce its effects. The results of the Exploratory Component analysis showed that the maximum amount of variation that could be attributed to a single factor was less than fifty percent, which provided support for Harman's strategy of focusing on a single factor. By utilizing principal component analysis, the study found that the variables accounted for 49.9% of the variance.

Table 4.2: Test for Common Method Variance (CMV)

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	16.460	49.964	49.964	16.460	49.964	49.964
2	2.993	22.087	72.050	2.993	22.087	72.050
3	1.304	4.829	76.880	1.304	4.829	76.880
4	1.062	3.935	80.815	1.062	3.935	80.815
5	.790	2.925	83.740			
6	.687	2.546	86.286			

7	.538	1.992	88.278
8	.414	1.532	89.809
9	.338	1.252	91.062
10	.285	1.057	92.119
11	.264	.978	93.097
12	.241	.892	93.990
13	.212	.786	94.776
14	.192	.712	95.488
15	.176	.653	96.141
16	.164	.607	96.748
17	.145	.539	97.287
18	.127	.471	97.758
19	.109	.403	98.161
20	.103	.381	98.542
21	.094	.349	98.891
22	.076	.282	99.173
23	.071	.262	99.435
24	.058	.213	99.648
25	.036	.134	99.782
26	.033	.123	99.905
27	.026	.095	100.000

Extraction Method: Principal Component Analysis.

Source: Field Survey (2023)

The accuracy of the samples was further evaluated using the Bartlett sphericity test and the Kaiser-Meyer-Olkin (KMO) test. Based on the information in Table 4.3, the Kaiser-Meyer-Olkin Sampling Adequacy score was 91.7%, and Bartlett's test demonstrated statistical significance (χ^2 = 7450.902, df: 120, $p < 0.000$). This provides proof that correct sampling procedures were followed.

Table 4.3: Bartlett's Test of Sphericity and KMO Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.917
Bartlett's Test of Sphericity	Approx. Chi-Square	7384.480
	df	351
	Sig.	.000

Source: Field Survey (2023)

4.1.3 Non-Response Bias

Non-response bias was investigated. Non-response bias occurs when a survey has fewer responders than the population. Low survey response rates induce non-response bias, which may undermine sample reliability and study generalizability. In this study, early and late responders were compared to reduce non-response bias. Oppenheim (2001) specified that "early responders" and "late respondents" should not differ in any model input variables. This demonstrates that non-response bias is not a concern and that the samples accurately represent the population. Early answers were 100 and late responses were 100. T-tests checked for non-response bias. The t-test showed no difference (see Table 4.4). The study shows that construct data from the first and last months are identical.

Table 4.4 Results of Independent-Samples t-Test for Non-Response Bias

			Levene's Test for Equality of Variances		
	Group	**Mean**	**F**	**Sig.**	**t**
SC Ambidexterity	1	6.56	0.246	0.848	-0.535
	2	6.77			-0.535
SC Disruption Recovery	1	15.13	2.753	0.976	-0.335
	2	15.42			-0.335
SC Intelligence	1	13.1	1.538	0.987	-0.081
	2	13.16			-0.081

Source: Field Survey (2023)

4.2 Respondent's Profile

This section provides background information and context for the study by detailing the demographics of the sample population. Respondents' demographic information, such as their age, gender, and education level, is crucial.

Table 4.5: Respondent's Profile

Variables	Categories	Frequency	Percent
Gender	Female	83	41.5
	Male	117	58.5
Age	18-30 years	20	10.0
	31-40 years	105	52.5
	41-50 years	60	30.0
	Above 50 years	15	7.5
Level of Education	Bachelor Degree	88	44.0
	Diploma	22	11.0
	Graduate Studies (Master / Ph.D.)	90	45.0
	Total	**200**	**100.0**

Source: Field Survey (2023)

Only 41.8% of the acceptable responses came from females, whereas 58.5% came from males. Evidence suggests that more males than females participated in the research. 10% were between the ages of 18 and 30, 52.5% were between the ages of 31 and 40, 30.0% were between the ages of 41 and 50, and 7.5% were beyond the age of 50. Those between the ages of 31 and 40 made up the largest demographic of responders. Only 45.0% had completed post-graduate education (Master's or Ph.D.) after earning a bachelor's degree (44.0%), whereas 11.00% had a diploma. Most respondents have either a Master's or Doctorate, as shown by the findings.

4.3 Correlation Analysis

The data shown in Table 4.6 reveals that there are very significant correlations between the three variables of SC ambidexterity, SC disruption recovery, and SC intelligence ($r = 0.772$, $P < 0.05$; $r = 0.910$, $P < 0.05$; and $r = 0.766$, $P < 0.05$, respectively). For instance, a correlation value of 0.0 indicates that there is absolutely no link, 0.30 indicates that there is just a moderate correlation, and 0.70-0.90 indicates that there is a considerable association. There is a considerable relationship between all of the different factors.

Table 4.6: Descriptive and Correlation Analysis

Construct	1	2	3
Supply Chain Ambidexterity	1.000		
Supply Chain Disruption Recovery	0.772	1.000	
Supply Chain Intelligence	0.910	0.766	1.000

Source: Field Data, 2023

4.4 Confirmatory Factor Analysis

It is essential to do validity analysis on study model. The authors of the research used Cronbach's alpha in conjunction with the Composite reliability test in order to examine the consistency of the model. The study used AVE and indicator loadings so that we could evaluate the model's degree of dependability. A value of 0.7 was determined to represent Cronbach's alpha, and a composite reliability score was used in order to investigate the extent to which the many different constructs investigated in this study were consistent with one another. Cronbach's alpha and the composite dependability index both have values that are more than.80, as seen in Table 4.7. (Hair, et al., 2016). These findings provide strong evidence in favour of the features of the measurement model. There was not a single sign that had a loading of less than 0.7. It is possible to demonstrate convergent validity. Convergent validity was demonstrated for AVE values that were greater than

0.5. (Here's everything you need to know about Table 4.7.) According to the results shown in Table 4.7, the T test determined that all of the variables had a statistically significant relationship with one another at the 1.96-percentile level and Sig. 0.05. Table 4.7 provides descriptive statistics. Taking into account: (Mean and Standard Deviation). The values in the table range from 1.91 to 3.32 for the average. 1.167–1.574 was the range that the standard deviations covered.

Table 4.7: Confirmatory Factor Analysis

Scales	Codes	Outer loadings	Mean	Std. Dev	Skewness	T statistics (|O/STDEV|)	P values
Supply Chain Ambidexterity (CA = 0.968; CR = 0.974; AVE = 0.840)	SCA1	0.898	1.93	1.29	1.538	32.037	0.000
	SCA2	0.935	1.91	1.297	1.61	61.280	0.000
	SCA3	0.880	2.17	1.289	1.176	40.965	0.000
	SCA4	0.910	1.88	1.283	1.486	45.348	0.000
	SCA5	0.929	1.94	1.248	1.484	59.119	0.000
	SCA6	0.929	2.00	1.241	1.424	65.850	0.000
	SCA7	0.936	1.99	1.269	1.38	69.810	0.000
Supply Chain Disruption Recovery (CA = 0.836; CR = 0.876; AVE = 0.586)	SCDR2	0.782	2.89	1.509	0.241	25.545	0.000
	SCDR3	0.765	2.21	1.532	0.988	26.425	0.000
	SCDR4	0.796	1.92	1.301	1.411	29.795	0.000
	SCDR5	0.781	2.74	1.56	0.296	32.384	0.000
	SCDR6	0.702	3.32	1.574	-0.261	20.261	0.000
Supply Chain Intelligence (CA = 0.966; CR = 0.970; AVE = 0.731)	SCI1	0.773	2.2	1.342	1.031	19.258	0.000
	SCI10	0.880	2.18	1.186	1.239	38.030	0.000
	SCI11	0.818	2.24	1.226	1.173	20.100	0.000
	SCI12	0.866	2.25	1.22	1.043	33.095	0.000
	SCI2	0.870	2.29	1.202	1.094	35.977	0.000
	SCI3	0.879	2.11	1.224	1.272	42.049	0.000
	SCI4	0.830	2.39	1.191	0.962	28.302	0.000
	SCI5	0.841	2.19	1.23	1.125	27.327	0.000
	SCI6	0.830	2.14	1.241	1.376	23.164	0.000
	SCI7	0.902	2.17	1.167	1.377	47.725	0.000
	SCI8	0.875	2.21	1.177	1.215	36.839	0.000
	SCI9	0.884	1.98	1.216	1.516	37.061	0.000

Source: Field Data, 2023

4.3.1 Discriminant Validity

The variations between different constructs were also investigated in this research (Hair et al., 2010; Henseler et al., 2016b). When determining the validity of the discriminant, it is necessary that the square root of the AVE (diagonal value) for each latent variable be greater than the highest correlation of the construct. The discriminant validity is shown in Table 4.8. Once again, there is no evidence of multicollinearity (Byrne, 2013). As can be seen in Table 4.8, discriminant validity has been established due to the fact that all of the HTMT values fall outside of the range of 0.90 to 0.85. Using HTMT Table 4.8. The HTMT as well as the criteria developed by Fornell and Larcker demonstrated discriminant validity. According to Table 4.8, the ambidexterity of the SC is 0.917 with itself, 0.772 with SC disruption recovery, and 0.910 with SC intelligence. The score for SC disruption recovery by itself was 0.787, and with SC intelligence it was 0.766. The correlation between SC intelligence was 0.855.

Table 4.8: Fornell-Larcker criterion

Construct	1	2	3
Supply Chain Ambidexterity	0.917		
Supply Chain Disruption Recovery	0.772	0.787	
Supply Chain Intelligence	0.910	0.766	0.855

Source: Field Data, 2023

4.3.2 Model fitness indices

Extracted-Index Fitness, SRMR, Root Mean Square of Approximation, and Chi-Square all have values that are acceptable for their respective measures (Table 4.9). The extracted and rare indices are both much lower than the 0.9 mark that indicates acceptance as a standard. The fact that the square of the residual is not very near to zero suggests that the residual is unsatisfactory, as may be seen by examining its root. The Total Residual Value and the Root Mean Square Approximation

are both unsuitable in this case. These figures are much higher than 0.1 and 3. This hints that future study has to take into consideration each and every component that is pertinent to the topic at hand. Table 4.9 revealed an SRMR of 0.114, which is within the range of values that are acceptable according to the findings of this study. Chi square was calculated to be 2183.983, while the normed fit index was calculated to be 0.686.

Table 4.9: Model fitness indices

Model fitness indices	Estimated model
SRMR	0.114
d_ULS	3.876
d_G	2.397
Chi-square	2183.983
NFI	0.686

Source: Field Data, 2023

4.3.3 Predictive Relevance (R^2 and Q^2)

According to the results of studies using the coefficient of determination, the independent variables do in fact account for some of the variation in the dependant variable (R2). The degree to which the outcome could have been anticipated using the independent variables may be determined by calculating R2. Falk and Miller established the threshold for predictive significance as an R2 value of 0.10 or above (1992). The results presented in Table 4.10 demonstrate that both SC disruption recovery and SC intelligence have extremely high levels of prediction accuracy (R2).

Using Q2 is a second strategy that may be used to validate PLS models (Hair et al., 2020). This statistic is produced by deleting a data point at random, then determining the model's phase after replacing the point with a suitable value (Zhang, 2022). Q2 makes advantage of the explanatory capacity of the model as well as the sample data predictions (Hair et al., 2020). This rough number provides the blind approach with some assistance in making sense of the output data. The accuracy

of the projections improves when the results of Q2 are better than predicted and when the predictions are close to the baseline (Zhang, 2022). In order for endogenous estimates to be considered reliable, Q2 has to be positive and bigger than zero. The PLS path model gives low, medium, and low predictions when Q2 is larger than 0, 0.25, and 0.50, respectively. (Zhang, 2022). The research obtained ratings of 0.634 and 0.826, respectively, for SC disruption recovery and SC intelligence during the second quarter (Table 4.10). All Q-square values that are more than 0.5 suggest that the model fits the data very well.

Table 4.10: Predictive Relevance (R^2 and Q^2)

Construct	R-square	Q^2predict
Supply Chain Disruption Recovery	0.638	0.634
Supply Chain Intelligence	0.827	0.826

Source: Field Data, 2023

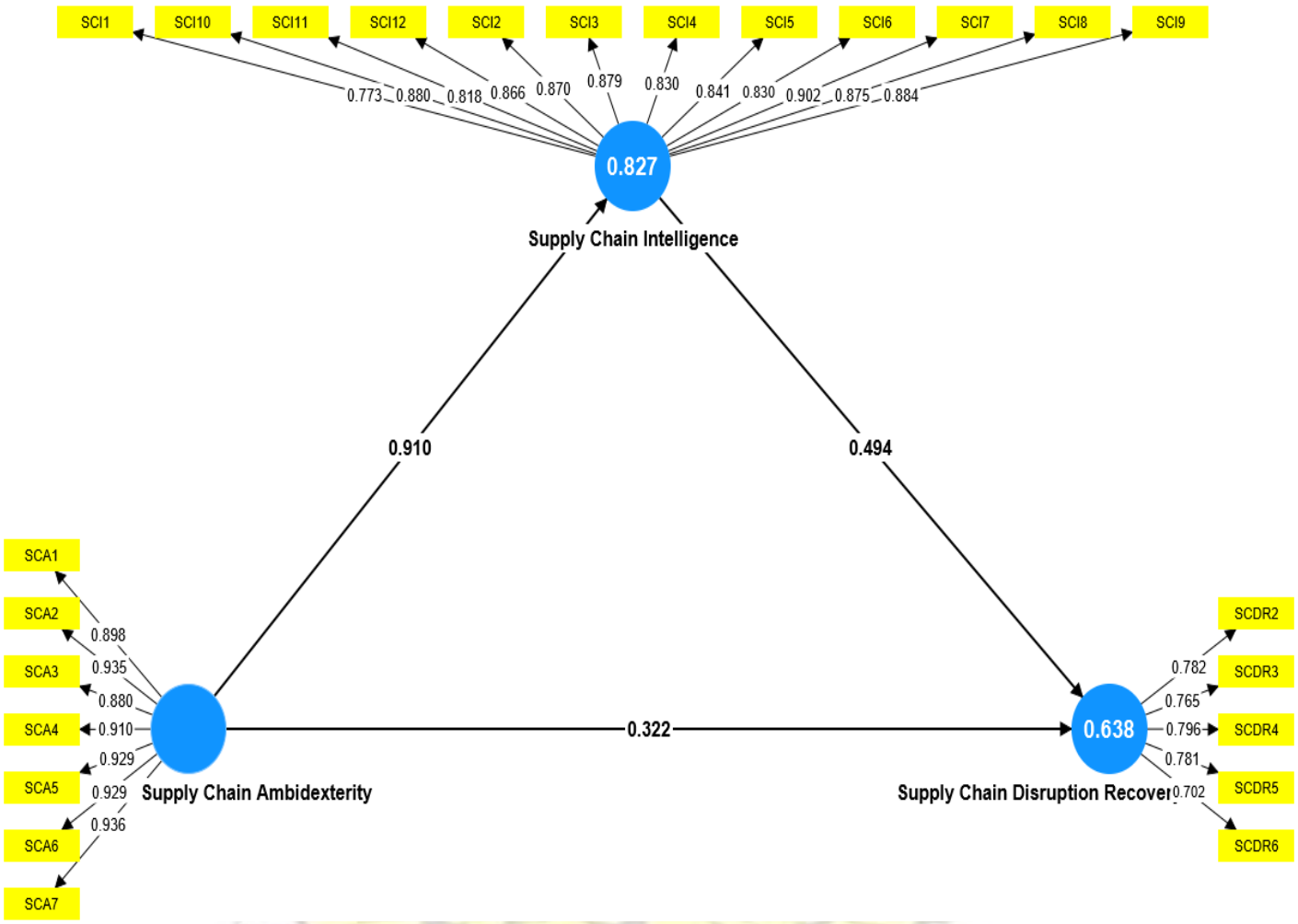

Figure 4.1: Measurement Model Assessment

4.5 Hypotheses for Direct and Indirect Relationship

Figure 4.2 depicts the second phase of the study, which focuses on the assessment of the structural model. This part of the analysis deals with the interpretation of the data. Table 4.11 and Figure 4.2 both provide the findings that were obtained from the examination of the structural model. The relevance of the model's four (4) different paths was evaluated using PLS bootstrapping, which was performed with 5,000 different data. In this work, the study investigate how the impact of SC ambidexterity on SC disruption recovery is influenced by the mediating effect of SC intelligence. Within this part, the analyses of the direct and indirect links that are shown in Table 4.11 and Figure 4.2 will be discussed.

Table 4.11: Hypotheses for Direct and Indirect Relationship

Path	Path Coefficient	T statistics (|O/STDEV|)	P values	Hypothesis Validation
Supply Chain Ambidexterity -> Supply Chain Disruption Recovery	0.322	2.814	0.005	Accepted
Supply Chain Ambidexterity -> Supply Chain Intelligence	0.910	47.356	0.000	Accepted
Supply Chain Intelligence -> Supply Chain Disruption Recovery	0.494	4.489	0.000	Accepted
Supply Chain Ambidexterity -> Supply Chain Intelligence -> Supply Chain Disruption Recovery	0.450	4.382	0.000	Accepted

Source: Field Data, 2023

Table 4.11 reveals that SC ambidexterity and SC disruption recovery are significant (B = 0.322, t = 2.814, P = 0.005, and Sig < 0.05). SC ambidexterity positively influenced SC disruption recovery since the p-value for H1 was less than 0.05 and the path coefficient was positive. SC ambidexterity enhances SC disruption recovery. SC disruption recovery is predicted to improve by 32.2% when SC ambidexterity goes up by one unit.

SC ambidexterity impacts SC intelligence (B = 0.910; t = 47.356; P = 0.000; Sig < 0.05). SC ambidexterity positively influenced SC intelligence, since the path coefficient was positive and the p-value for H2 was less than 0.05. With SC ambidexterity, SC intelligence improves. SC intelligence is predicted to improve by 91.0% when SC ambidexterity goes up by one unit.

SC intelligence influenced SC disruption recovery (B = 0.494; t = 4.489; P = 0.000; Sig < 0.05). SC intelligence positively influenced SC disruption recovery, corroborating the third hypothesis (H3). With SC intelligence, SC disruption improves. SC disruption recovery is predicted to improve by 49.4% when SC intelligence goes up by one unit.

SC intelligence indirectly influenced SC ambidexterity and disruption recovery (B = 0.450; t = 4.382; P = 0.000; Sig < 0.05). Since H4 was smaller than 0.05 and the path coefficient was positive, SC intelligence positively influences SC ambidexterity and SC disruption recovery. The positive path coefficient shows that SC intelligence largely influences SC ambidexterity-SC disruption recovery relationships. SC intelligence mediates 45.0% of SCA-SCDR link.

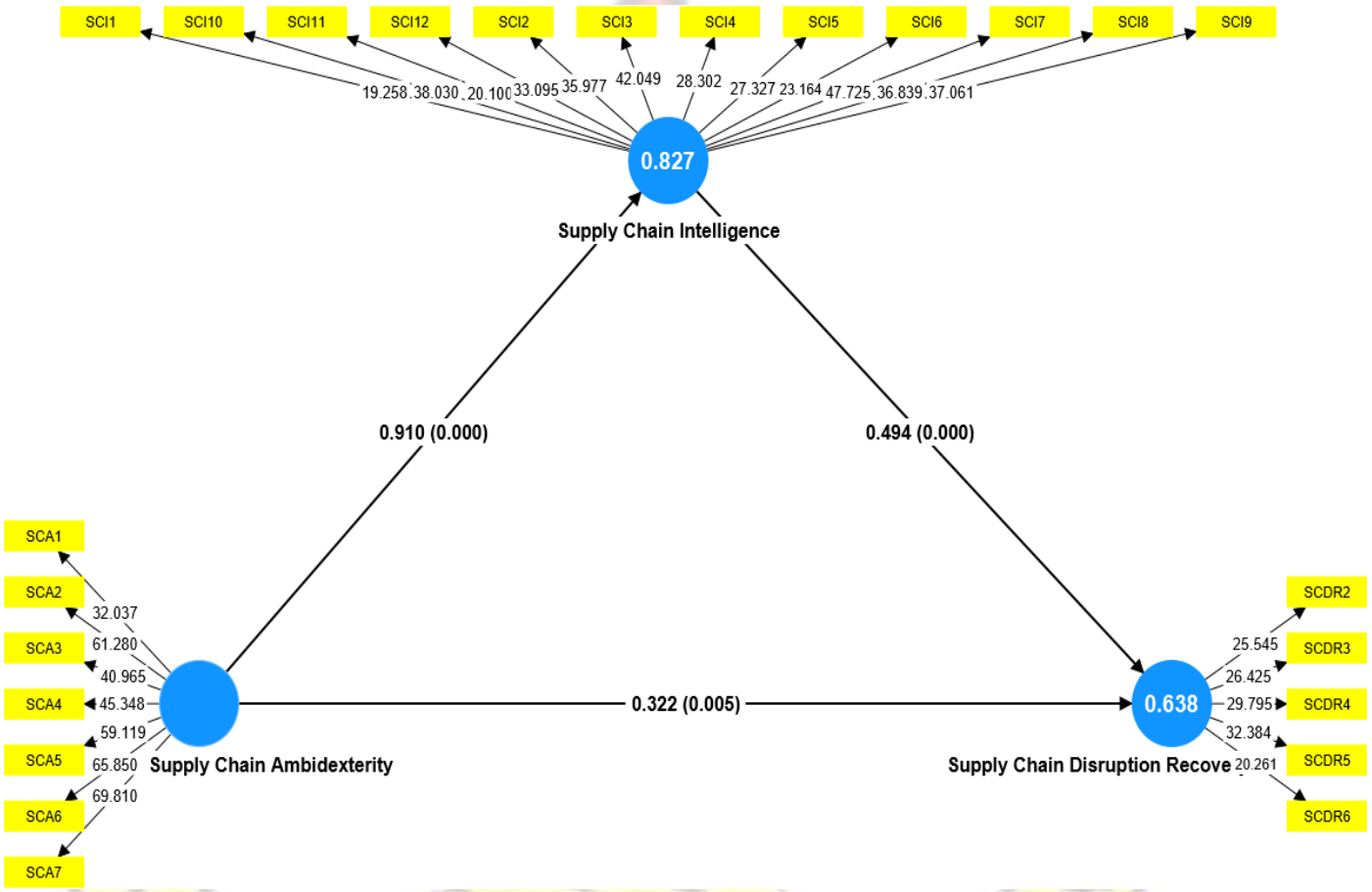

Figure 4.2: Structure Model Evaluation

4.6 Discussion of Results

This research examined SC ambidexterity and SC disruption recovery through SC intelligence. This section discussed major results in light of previous ideas and investigations.

4.6.1 Effect of SC Ambidexterity on SC Disruption Recovery

The initial objective of this study ascertain the effect of supply chain ambidexterity on supply chain disruption recovery. The result shows that SC ambidexterity positively influenced SC disruption recovery since the p-value for H1 was less than 0.05 and the path coefficient was positive. SC ambidexterity enhances SC disruption recovery. SC disruption recovery is predicted to improve by 32.2% when SC ambidexterity goes up by one unit. The result also concluded that managers should concentrate on improving supply chain process skills, aggressively seek supply chain innovations, and seek innovative supply chain improvements to gain ability to deal with challenges mitigates the effects of loss and reduced expenditures during crisis recovery. The findings that supply chain (SC) ambidexterity positively influences supply chain disruption recovery align with the principles of the Dynamic Capabilities View (DCV) and are supported by existing literature on supply chain management and resilience. The positive influence of supply chain ambidexterity on disruption recovery suggests that organizations with the capability to balance exploration and exploitation are better equipped to adapt and respond to disruptions dynamically. Teece (2007) emphasizes that dynamic capabilities involve the ability to sense changes in the environment, seize opportunities, and reconfigure resources. Ambidextrous organizations are known for their adaptability and flexibility in responding to both routine and disruptive changes (O'Reilly and Tushman, 2008). Supply chain ambidexterity involves the integration of exploration (innovation, flexibility) and exploitation (efficiency, stability) capabilities. This integration enables organizations to simultaneously explore new opportunities and exploit existing competencies, contributing to robust recovery after disruptions. The concept of ambidexterity is rooted in the idea that organizations need to balance exploration and exploitation to achieve long-term success (March, 1991). Ambidextrous capabilities are crucial for firms facing environmental uncertainty and turbulence, characteristics often associated with

disruptions (Tushman and O'Reilly, 1996). The findings that supply chain ambidexterity positively influences supply chain disruption recovery are consistent with the principles of the Dynamic Capabilities View. Organizations with the capacity to balance exploration and exploitation exhibit resilience and resource redeployment capabilities, enabling them to recover more effectively from disruptions. These findings resonate with established literature on ambidextrous supply chain management, resilience, and the resource-based view, emphasizing the significance of dynamic capabilities in navigating and recovering from disruptions in the supply chain. Prior studies suggest that supply chain ambidexterity (SC-Ambidexterity) leads to SC-Resilience (Lee and Rha, 2016; Aslam et al., 2018; Jermsittiparsert and Pithuk, 2019; Aslam et al., 2020; Makhashen et al., 2020; Gu et al., 2021; Wang et al., 2021). Ambidexterity has been shown to improve organisational performance (Boumgarden et al., 2012; Junni et al., 2013), discover new knowledge (Borzillo, 2012), incentivize high-performance work practices (Patel et al., 2013), and develop new products (O'Reilly and Tushman, 2011; Wei et al., 2014). To understand organisational ambidexterity, scholars have examined knowledge asset alignment (Lin et al., 2017), top management diversity (Li, 2013), and strategic decision-making orientations (Kortmann, 2015). Organizational transformation, relative ambidexterity, and innovation have been studied using organizational ambidexterity (Ricciardi et al., 2016; D'Souza et al., 2017; Zhang et al., 2017). Previous research (O'Reilly and Tushman, 2013; Gibson and Birkinshaw, 2004; Duncan, 1976) also suggests that supply chain ambidexterity (SC-Ambidexterity) leads to SC-Resilience.

4.6.2 Effect of SC Ambidexterity on SC Intelligence

The second objective examine the impact of supply chain ambidexterity on supply chain intelligence. The result reveals that SC ambidexterity positively influenced SC intelligence, since the path coefficient was positive and the p-value for H_2 was less than 0.05. With SC ambidexterity, SC intelligence improves. SC intelligence is predicted to improve by 91.0% when SC

ambidexterity goes up by one unit. The result also concluded that managers should concentrate on improving supply chain process skills, aggressively seek supply chain innovations, and seek innovative supply chain improvements to improve on innovative activities, discover new innovative activities from supplier and customer technical expertise, and use competitor goods as a standard in product design and know their strengths and limitations well. The research shows how SC-Ambidexterity helps businesses thrive, particularly in the face of supply chain disruptions, through the mediating function of SC intelligence. The findings that supply chain (SC) ambidexterity positively influences supply chain intelligence align with the principles of Information Processing Theory (IPT) and are supported by existing literature on supply chain management and decision-making. SC ambidexterity involves the ability to process and utilize information effectively for both exploratory and exploitative activities. The positive influence of SC ambidexterity on SC intelligence indicates that organizations with the cognitive capacity to handle diverse information types are more adept at making informed decisions. Information Processing Theory posits that organizations process information to make decisions (March & Simon, 1958). In the context of supply chain management, ambidextrous organizations are better equipped to process diverse information related to both innovation and efficiency (Bierly & Chakrabarti, 1996). SC intelligence involves the integration of information from various sources to enhance decision-making. The positive influence of SC ambidexterity suggests that organizations with the capacity to integrate information from both exploratory and exploitative activities exhibit higher SC intelligence. IPT emphasizes the importance of integrating information from diverse sources for effective decision-making (Daft & Lengel, 1986). Ambidextrous organizations are known for their ability to integrate information related to exploration and exploitation, contributing to enhanced decision-making in the supply chain (Gupta et al., 2006).

Ambidextrous organizations are inherently adaptive in their information processing. The positive influence of SC ambidexterity on SC intelligence implies that adaptability in processing information contributes to a more intelligent and responsive supply chain. IPT suggests that adaptive information processing is crucial for organizations facing environmental uncertainty (Galbraith, 1973). Ambidextrous organizations, by processing information adaptively, can navigate uncertainties in the supply chain and enhance their intelligence (Volberda et al., 2010). Literature highlights the importance of supply chain intelligence for overall performance. Organizations that excel in processing and leveraging information in their supply chain activities tend to outperform their counterparts (Chopra & Meindl, 2007; Gligor et al., 2013). Dynamic capabilities, including ambidexterity, are associated with improved supply chain intelligence. Organizations with dynamic capabilities are better positioned to process and utilize information effectively, contributing to their intelligence in managing supply chain activities (Teece, 2007; He et al., 2010). In conclusion, the findings that supply chain ambidexterity positively influences supply chain intelligence are consistent with the principles of Information Processing Theory. Organizations that are ambidextrous in their supply chain activities demonstrate a heightened ability to process, integrate, and adaptively utilize information. This, in turn, contributes to enhanced supply chain intelligence, enabling more informed and effective decision-making. These findings resonate with the broader literature on ambidexterity, information processing, and the strategic importance of intelligence in supply chain management. In this way, we extend the research of Tuan (2016) by suggesting the practical implications of the link between ambidexterity and intelligence. Strategic corporate transformation requires understanding of current and future environmental changes (Boronat-Navarro, Escribá-Esteve, and Navarro-Campos, 2021). Liboni, Cezarino, Donaires, and Zollo, (2022) use the dynamic capacities viewpoint and organisational

learning approach to recognise external stimuli in the knowledge development cycle, which affects exploration and exploitation. Sensing is essential to dynamic capabilities' micro foundations (Baden-Fuller and Teece, 2020). Sensing requires "ability to see, sense, and influence developments" and enough information (Baden-Fuller and Teece, 2020 pp.105). Hunt and Madhavaram (2020) and other business professors have underlined the need of monitoring company environments. Afshari and Hadian Nasab (2021) propose competitive intelligence and knowledge management are strategic.

4.6.3 Mediating Role of SC Intelligence

The third objective establish the mediating role of supply chain intelligence on the effect of supply chain ambidexterity on supply chain disruption recovery in Ghana. The result concludes that SC intelligence positively influenced SC disruption recovery, corroborating the third hypothesis (H_3). With SC intelligence, SC disruption improves. SC disruption recovery is predicted to improve by 49.4% when SC intelligence goes up by one unit. The result also concluded that managers should improve on innovative activities, discover new innovative activities from supplier and customer technical expertise, and use competitor goods as a standard in product design and know their strengths and limitations well to gain ability to deal with challenges mitigates the effects of loss and reduced expenditures during crisis recovery. The result also concludes that SC intelligence positively influences SC ambidexterity and SC disruption recovery. The positive path coefficient shows that SC intelligence largely influences SC ambidexterity-SC disruption recovery relationships. SC intelligence mediates 45.0% of SCA-SCDR link. The result also concluded that managers should improve on innovative activities, discover new innovative activities from supplier and customer technical expertise, and use competitor goods as a standard in product design and know their strengths and limitations well in order to concentrate on improving supply chain process skills, aggressively seek supply chain innovations, and seek innovative supply chain

improvements to improve on innovative activities, discover new innovative activities from supplier and customer technical expertise, and use competitor goods as a standard in product design and know their strengths and limitations well. According to the findings of this study, supply chain intelligence may potentially play a role in the relationship between SC-Ambidexterity and SCDR by acting as a mediator. Companies need to be flexible and fast to adjust to changing market circumstances and fulfil the expectations of their consumers in today's highly competitive, difficult, volatile, and unpredictable business environment (Anwer, 2017; Dubey et al., 2018). SC intelligence is the best option if you want to ensure the shortest possible response time (Brusset, 2016). Supply chain intelligence is a subset of threat intelligence that aims to uncover and combat online adversaries that target businesses through cyber espionage, social manipulation attacks, and other criminal ploys directed at their suppliers' worldwide supply chains. The supply chains of these suppliers can be found all over the world (Riahi et al., 2021). Businesses are only able to reap the benefits of SCI's capacity to reduce instabilities and boost their response capabilities in highly dynamic environments (Fayezi et al., 2015, 2017; Swafford et al., 2008).

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

5.0 Introduction

This section outlines and concludes the study's findings. The empirical results from the preceding chapter are summarized below. This chapter summarizes the study's results and conclusions on how SC ambidexterity enhances SC disruption recovery and how SC intelligence affects the connection. The chapter discusses study limitations and suggests further research.

5.1 Summary of Findings

5.1.1 Effect of SC Ambidexterity on SC Disruption Recovery

The initial objective of this study ascertain the effect of supply chain ambidexterity on supply chain disruption recovery. The result shows that SC ambidexterity positively influenced SC disruption recovery. SC ambidexterity enhances SC disruption recovery. An increase of one unit in SC ambidexterity is anticipated to enhance disruption recovery by 32.2%. The result also concluded that managers should concentrate on improving supply chain process skills, aggressively seek supply chain innovations, and seek innovative supply chain improvements to gain ability to deal with challenges mitigates the effects of loss and reduced expenditures during crisis recovery.

5.1.2 Effect of SC Ambidexterity on SC Intelligence

The second objective examine the impact of supply chain ambidexterity on supply chain intelligence. The result reveals that SC ambidexterity positively influenced SC intelligence. With SC ambidexterity, SC intelligence improves. An increase of one unit in SC ambidexterity is anticipated to increase SC intelligence by 91.0%. The result also concluded that managers should concentrate on improving supply chain process skills, aggressively seek supply chain innovations,

and seek innovative supply chain improvements to improve on innovative activities, discover new innovative activities from supplier and customer technical expertise, and use competitor goods as a standard in product design and know their strengths and limitations well.

5.1.3 Mediating Role of SC Intelligence

The third objective establish the mediating role of supply chain intelligence on the effect of supply chain ambidexterity on supply chain disruption recovery in Ghana. The result concludes that SC intelligence positively influenced SC disruption recovery. With SC intelligence, SC disruption improves. When the SC's intelligence increases by one unit, disruption recovery is expected to improve by 49.4 percent. The result also concluded that managers should improve on innovative activities, discover new innovative activities from supplier and customer technical expertise, and use competitor goods as a standard in product design and know their strengths and limitations well to gain ability to deal with challenges mitigates the effects of loss and reduced expenditures during crisis recovery.

The result also concludes that SC intelligence positively influences SC ambidexterity and SC disruption recovery. The positive path coefficient shows that SC intelligence largely influences SC ambidexterity-SC disruption recovery relationships. SC intelligence mediates 45.0% of SCA-SCDR link. The result also concluded that managers should improve on innovative activities, discover new innovative activities from supplier and customer technical expertise, and use competitor goods as a standard in product design and know their strengths and limitations well in order to concentrate on improving supply chain process skills, aggressively seek supply chain innovations, and seek innovative supply chain improvements to improve on innovative activities, discover new innovative activities from supplier and customer technical expertise, and use competitor goods as a standard in product design and know their strengths and limitations well.

5.2 Conclusion

The main purpose of the study is to examine the mediating role of supply chain intelligence on the effect of supply chain ambidexterity on supply chain disruption recovery in Ghana. Explanatory research design was used. This survey was quantitative. Convenience and purposive sampling was adopted and selected 200 participants. Data gathering relied on a questionnaire. Statistical study using SPSS v26 and SmartPls v4. Data was analyzed descriptively and inferentially. The result shows that SC ambidexterity positively influenced SC disruption recovery and SC intelligence. The result reveals that SC ambidexterity positively influenced SC intelligence. The result also concludes that SC intelligence positively influences SC ambidexterity and SC disruption recovery. The study concluded that managers should improve on innovative activities, discover new innovative activities from supplier and customer technical expertise, and use competitor goods as a standard in product design and know their strengths and limitations well in order to concentrate on improving supply chain process skills, aggressively seek supply chain innovations, and seek innovative supply chain improvements to improve on innovative activities, discover new innovative activities from supplier and customer technical expertise, and use competitor goods as a standard in product design and know their strengths and limitations well.

5.3 Recommendations for Management

This section offers stakeholder suggestions based on study results. These suggestions should be considered by management and academics.

- The result shows that SC ambidexterity positively influenced SC disruption recovery. The study concluded that managers should concentrate on improving supply chain process skills, aggressively seek supply chain innovations, and seek innovative supply chain

improvements to gain ability to deal with challenges mitigates the effects of loss and reduced expenditures during crisis recovery.

- The result reveals that SC ambidexterity positively influenced SC intelligence. The study also concluded that managers should concentrate on improving supply chain process skills, aggressively seek supply chain innovations, and seek innovative supply chain improvements to improve on innovative activities, discover new innovative activities from supplier and customer technical expertise, and use competitor goods as a standard in product design and know their strengths and limitations well.
- The study concludes that SC intelligence positively influenced SC disruption recovery. With SC intelligence, SC disruption improves. When the SC's intelligence increases by one unit, disruption recovery is expected to improve by 49.4 percent. The result also concluded that managers should improve on innovative activities, discover new innovative activities from supplier and customer technical expertise, and use competitor goods as a standard in product design and know their strengths and limitations well to gain ability to deal with challenges mitigates the effects of loss and reduced expenditures during crisis recovery.
- The result also concludes that SC intelligence positively influences SC ambidexterity and SC disruption recovery. The study concluded that managers should improve on innovative activities, discover new innovative activities from supplier and customer technical expertise, and use competitor goods as a standard in product design and know their strengths and limitations well in order to concentrate on improving supply chain process skills, aggressively seek supply chain innovations, and seek innovative supply chain improvements to improve on innovative activities, discover new innovative activities from

supplier and customer technical expertise, and use competitor goods as a standard in product design and know their strengths and limitations well.

5.5 Implications of the study

5.5.1 Practical implications

The practical implications of the findings that both Supply Chain (SC) Ambidexterity and supply chain intelligence positively influence SC Disruption Recovery, with supply chain intelligence partially mediating the relationship between SC Ambidexterity and SC Disruption Recovery, are significant for organizations seeking to enhance their resilience and responsiveness to disruptions. Organizations should adopt an integrated approach that combines both SC Ambidexterity and investment in supply chain intelligence to enhance disruption recovery capabilities. Develop strategies that simultaneously foster the ability to explore and exploit (ambidexterity) and invest in technologies and practices that enhance the collection, processing, and utilization of supply chain intelligence. This integrated approach strengthens overall resilience against disruptions. Recognizing the mediating role of supply chain intelligence, organizations should strategically invest in technologies, analytics, and talent that enhance their ability to gather, analyze, and act upon relevant information. Allocate resources to technologies such as advanced analytics, artificial intelligence, and real-time monitoring systems. Additionally, invest in training and developing talent capable of leveraging intelligence to make swift and informed decisions during disruptions. Emphasize the importance of balancing both exploration and exploitation activities in the supply chain to achieve ambidexterity. Develop a strategic supply chain management approach that allows for flexibility and innovation (exploration) while optimizing efficiency and stability (exploitation). This requires fostering a culture that values adaptability and continuous improvement. In summary, the practical implications of these findings emphasize the need for organizations to

adopt a holistic approach that integrates both SC Ambidexterity and supply chain intelligence to enhance disruption recovery capabilities. This requires strategic investments in technology, talent development, collaborative relationships, and a continuous commitment to learning and improvement.

5.5.2 Theoretical implications

The theoretical contributions of the findings that both Supply Chain (SC) Ambidexterity and supply chain intelligence positively influence SC Disruption Recovery, with supply chain intelligence partially mediating the relationship between SC Ambidexterity and SC Disruption Recovery, are significant in advancing our understanding of the dynamics in supply chain management, resilience, and decision-making. The findings contribute to the integration of Dynamic Capabilities and Information Processing Theories in the context of supply chain management. SC Ambidexterity, rooted in Dynamic Capabilities Theory, emphasizes the ability to balance exploration and exploitation. The mediating role of supply chain intelligence aligns with Information Processing Theory, highlighting the importance of effective information utilization for decision-making. The study enhances our understanding of the factors influencing SC Disruption Recovery by highlighting the joint contributions of ambidextrous capabilities and supply chain intelligence. By recognizing the complementary roles of SC Ambidexterity and supply chain intelligence, the findings provide a more nuanced understanding of how organizations can recover from disruptions. This goes beyond a unidimensional view and emphasizes the multifaceted nature of resilience. The study underscores the strategic role of supply chain intelligence in mediating the relationship between SC Ambidexterity and SC Disruption Recovery. Explanation: This finding positions supply chain intelligence not only as a standalone capability but also as a strategic enabler that facilitates the effective translation of ambidextrous practices

into successful disruption recovery. It highlights the importance of informed decision-making supported by intelligence. The findings contribute to the operationalization of theoretical constructs in the supply chain context. SC Ambidexterity and supply chain intelligence are often conceptualized at a theoretical level. This study provides empirical evidence of their impact on disruption recovery, offering practical insights into how these constructs can be operationalized and leveraged by organizations. The study contributes to the literature on balancing exploration and exploitation in decision-making. The positive influence of SC Ambidexterity on SC Disruption Recovery emphasizes the importance of organizations maintaining a balance between exploring new opportunities and exploiting existing capabilities. This aligns with the broader literature on organizational learning and adaptability. The identification of supply chain intelligence as a partial mediator adds depth to the understanding of the relationship between SC Ambidexterity and SC Disruption Recovery. This finding suggests that while SC Ambidexterity directly contributes to disruption recovery, part of its impact is channeled through the effective utilization of intelligence. This nuanced perspective contributes to discussions on the mechanisms through which dynamic capabilities influence organizational outcomes. The study contributes to the development of a holistic framework for supply chain resilience. By recognizing the joint impact of SC Ambidexterity and supply chain intelligence, the findings contribute to the development of a more comprehensive framework that considers both strategic capabilities and information processing as integral components of supply chain resilience. In summary, the theoretical contributions of these findings extend and integrate key concepts from Dynamic Capabilities and Information Processing Theories. The study enhances our understanding of how organizations can effectively recover from disruptions by leveraging ambidextrous capabilities and harnessing the strategic power of supply

chain intelligence. These theoretical insights provide a foundation for further research and the development of strategic frameworks for resilient supply chain management.

5.6 Suggestion for Future Research

This study restricts several research opportunities. First, managers from O&G firms were sampled. A comparable research on employees may provide more generalizable findings. Explanatory research is hard to show causality. Longitudinal and cross-sectional data may be used in future causality studies. Quantitative analysis assessed the mediating role of supply chain intelligence on the effect of supply chain ambidexterity on supply chain disruption recovery. Comparable studies may need qualitative research. This study shows additional statistical analysis approaches may help future research. This study may be repeated in other countries to confirm findings.

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APPENDIX I

SURVEY QUESTIONNAIRE

Dear Sir/ Madam,

My name is …….., a postgraduate student at the Kwame Nkrumah University of Science and Technology, Kumasi, Department of Supply Chain and Information Systems. This survey instrument has been designed to enable me carry out research on the topic: **"The effect of innovation orientation on supply chain disruption recovery, the mediating role of supply chain robustness"**. Any information provided will be used for academic purposes ONLY. There are no risks associated with your participation, and your responses will remain confidential and anonymous.

SECTION A: RESPONDENT'S BIOGRAPHY AND COMPANY PROFILE

When completing this questionnaire, please tick **[**√**]** in the applicable box or provide an answer as applicable.

Please answer the following questions:

Gender: Male ☐ Female ☐

Age

18-30 years ☐ 31-40 year's ☐ 41-50 years ☐ Above 50 years ☐

Level of Education

Junior High School ☐ Senior High School ☐ Diploma ☐ Bachelor Degree

Graduate Studies (Master / Ph.D.) ☐ Others ☐ For Others, Please specify:……

SECTION B: Supply Chain Ambidexterity

*Please use a 5-point scale which measures from "**1 = strongly disagree"** to **"5 = strongly agree"** to indicate whether or not you agree with the following statement:*

	1	**2**	**3**	**4**	**5**
In order to stay competitive, our supply chain managers focus on reducing operational redundancies in our existing processes	☐	☐	☐	☐	☐
Leveraging our current supply chain technologies is important to our firm's strategy	☐	☐	☐	☐	☐

In order to stay competitive, our supply chain managers focus on improving our existing technologies.	☐	☐	☐	☐	☐
Our managers focus on developing stronger competencies in our existing supply chain processes	☐	☐	☐	☐	☐
We proactively pursue new supply chain solutions.	☐	☐	☐	☐	☐
To improve our supply chain, we continually explore new opportunities.	☐	☐	☐	☐	☐
We are constantly seeking novel approaches to solve supply chain problems.	☐	☐	☐	☐	☐
We continually experiment to find new solutions that will improve our supply chain					

Araceli et L 2016; Zailani et al.'s (2012)

SECTION C: Supply Chain Disruption Recovery

Over the last three years, in this company: (from 1–strongly disagree to 5–strongly agree):

Item	Supply Chain Disruption Recovery	1	2	3	4	5
SCDR1	We can respond quickly to disruptions					
SCDR2	We can undertake adequate response to crisis					
SCDR3	We have response team for mitigating crisis Recovery					
SCDR4	We have the ability to get recovery in short time					
SCDR5	We have the ability to absorb huge loss					
SCDR6	We can reduce impact of loss by our ability to handle crisis					
SCDR7	We can recovery from crisis at less cost					

SECTION D: Supply Chain Intelligence (Yli-Renko, Autio, and Sapienza, (2001), Song, Almeida, and Wu, (2003), and Song and Di Benedetto (2008); Tobias Schoenherr, Morgan Swink, 2015.

To what extent do the following statements using the scale1 to 5: Not at all – A very great extent

Statement	1	2	3	4	5
As soon as we acquire new knowledge from suppliers, we try to find applications for it					

The suppliers' technological knowledge has enriched the basic understanding of our innovation activities					
The suppliers' technological knowledge has reduced the uncertainty of our innovation activities					
The suppliers' technological knowledge helps us to identify new aspects of innovation activities that would otherwise go unnoticed					
As soon as we acquire new knowledge from customers, we try to find applications for it					
The customers' technological knowledge has enriched the basic understanding of our innovation activities					
The customers' technological knowledge has reduced the uncertainty of our innovation activities					
The customers' technological knowledge helps us to identify new aspects of innovation activities that would otherwise go unnoticed					
We regularly collect information about our competitors' product and strategies					
We systematically process and analyze competitor information					
We fully integrate information about competitors' products as a benchmark in our product design					
Our knowledge of competitors' strengths and weaknesses is thorough					

Thank you for participating in the survey.