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SUPPLY CHAIN DISRUPTION AND PERFORMANCE: THE ROLE OF INFORMATION TECHNOLOGY AND SUPPLY CHAIN MANAGERIAL CAPABILITY

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A thesis submitted to the Department of Procurement and Supply Chain Management, submitted to the School of Graduate Studies in partial fulfilment of the requirements for the award of the degree of

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DECLARATION

Candidate's Declaration

I affirm that this thesis represents my own original work conducted for the partial fulfilment of the MPhil in Procurement and Supply Chain Management. To the best of my knowledge, it does not contain any content that has been previously published by others or used to obtain any other degree from any institution, except where proper acknowledgments have been duly provided.

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DEDICATION

To my father, my late Mum, and My Manager (Ms. Alice Khambo)

ACKNOWLEDGEMENT

I appreciate the following individuals who have been instrumental in my academic journey and personal development: To my exceptional team lead/manageress, Ms. Alice Khambo, I am deeply grateful for your understanding and flexibility, which allowed me to strike a balance between work and personal growth. Your support made it possible for me to pursue this academic endeavour. To Dr. Mawuko Dza, thank you for instilling the belief that this journey was achievable. Your encouragement and guidance have been pivotal in my pursuit of this MPhil degree. To my research supervisors, Mr. Evans Kyeremeh and Ms. Mavis Agbogdza, your mentorship and dedicated time spent guiding me throughout this research have been invaluable. Your insights and feedback have shaped this work significantly.

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LIST OF ABBREVIATIONS

Abbreviations	Meaning
SCD	Supply Chain Disruption
SCP	Supply Chain Performance
SCMC	Supply Chain Managerial Capability
IT	Information Technology
PR	Process Risk
SR	Supply Risk
ER	Environmental Risk
SEM	Structural Equation Model
PLS	Partial Least Squares
AMOS	Analysis of Moment Structure
LISREL	Linear Structural Relations
VIF	Variance Inflation Factor
CFA	Confirmatory Factor Analysis
AVE	Average Variance Extracted
CR	Composite Reliability
CMV	Common Method Variance

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ABSTRACT

The dynamic and uncertain business landscape renders companies susceptible to supply chain disruptions. The complexity and dynamism of supply chains, intensified by globalization and technological progress, further escalate the risk of such disruptions. Notably, the healthcare supply chain has encountered severe setbacks due to disruptions like the COVID-19 pandemic, leading to medical supply shortages, heightened costs, reduced revenue, and decreased patient satisfaction. This upheaval has underscored the vulnerability of supply chains, necessitating enhanced resilience and preparedness. This study delves into the impact of supply chain disruption on supply chain performance, examining the mediating role of supply chain managerial capability and the moderating effect of information technology. Rooted in structural contingency theory and dynamic capability, the research formulates and investigates five objectives and corresponding hypotheses. Employing an explanatory research design with a quantitative approach, the study collected primary data through standardized questionnaires completed by 289 professionals from various health facilities in Ghana. Utilizing SmartPLS 4 for data processing and partial least square-structural equation modelling (PLS-SEM) for analysis, the hypotheses were tested. Findings revealed that supply chain disruptions significantly influence supply chain performance in the healthcare sector. However, this impact is reduced by information technology, and supply chain managerial capabilities act as a partial mediator in this relationship. Supply chain disruption negatively affects both supply chain performance and managerial capabilities. Remarkably, supply chain managerial capability transforms this negative effect into a positive one on performance. In light of these outcomes, the study underscores the importance for policymakers, practitioners, and management to closely monitor supply chain disruptions, given their adverse effects on supply chain performance. Furthermore, the study highlights the significance of fostering supply chain managerial capabilities to enhance network performance during disruption.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Supply Chain Performance (SCP) stands as a vital process for evaluating the effectiveness and efficiency of supply chain operations, relying on the examination of Key Performance Indicators (KPIs) (Lehyani, Moalla, & Siadat, 2021). The evaluation of SCP yields valuable insights for organizations, enabling them to pinpoint areas requiring improvement in Supply Chain Management and align these aspects with strategic objectives (Pretorius, Pretorius & Mostert, 2013). By scrutinizing SCP, organizations can proactively address vulnerabilities, bolster performance, and adapt to the ever-evolving business landscape (Lehyani et al., 2021).

Despite concentrated efforts to optimize SCP, supply chains remain susceptible to disruptions, posing substantial challenges to businesses and affecting performance across various levels (Fan & MacBryde, 2016; Bode & Macdonald, 2017). The intricacies and uncertainties inherent in today's globalized markets, coupled with technological advancements, have amplified the risk of supply chain disruptions (Barnes & Haasis, 2018). Recent research indicates a rising trend in supply chain disruptions, with organizations witnessing a 30% increase in such incidents, and approximately 70% grappling with disruptions in the past year alone (Barnes & Haasis, 2018).

The detrimental consequences of supply chain disruptions on supply chain performance have been extensively examined, with studies revealing heightened costs, reduced revenue, and diminished customer satisfaction as their primary outcomes (Sodhi & Tang, 2012; Lee et al., 2015; Ivanov & Dolgui, 2019). Consequently, mitigating the impact of disruptions and enhancing supply chain resilience emerge as critical priorities for organizations spanning

diverse industries, sizes, and geographical locations. While acknowledging the negative impact of disruptions (Bode & Macdonald, 2017), Chopra and Sodhi (2014) underscore the pivotal role of information technology (IT) in addressing uncertain events. They assert that many companies have invested in various IT systems for monitoring material and information flows, enabling rapid responses to supply chain disruption incidents.

Ding et al. (2020) further emphasize the growing reliance on information technology (IT) solutions to mitigate the effects of supply chain disruptions. Information Technology plays a pivotal role in enhancing supply chain visibility, collaboration, and resilience. Technologies such as advanced analytics, machine learning, and artificial intelligence facilitate the detection and prediction of supply chain disruptions, enabling proactive measures to minimize their impact. Additionally, cloud-based platforms, blockchain, and the Internet of Things (IoT) bolster supply chain transparency, traceability, and accountability, reducing the risk of fraud and counterfeiting (Mishra & Deshmukh, 2021).

Okafor et al. (2021) stress the importance of combining global sourcing with nearshore and local sourcing, utilizing multiple sources, and leveraging information technology to provide extensive and timely information availability, all of which serve as key levers for mitigating supply chain risk.

Research has also underscored the significance of supply chain managerial capability in handling supply chain disruption. For instance, Li et al. (2019) identified supply chain managerial capability as a critical factor in managing supply chain risks, including disruption. Firms with higher levels of supply chain managerial capability demonstrate a greater ability to anticipate and respond to supply chain disruptions. Their conceptual framework for assessing supply chain managerial capability comprises three key dimensions: strategic, operational, and relational. Strategic capability pertains to aligning supply chain strategy with overall business strategy. Operational capability focuses on effectively executing the supply chain strategy,

including inventory, logistics, and production management. Relational capability deals with managing relationships with supply chain partners, such as suppliers and customers.

Balfour (2020) contends that many businesses experience supply chain disruptions due to interruptions in equipment and materials imports and exports. He emphasizes that when global distributors halt or slow down, businesses are adversely affected, impacting cash flow and potentially leading to bankruptcies due to the rapid shutdown of global industries. Consequently, understanding how organizations can manage disruptions and establish contingency plans to respond to supply chain disruptions has become a crucial area of study in supply chain management (Behzadi et al., 2018; Azadegan et al., 2020; Parast, 2020).

The purpose of this study is to examine how supply chain disruptions affect overall supply chain performance. It specifically aims to investigate how information technology influences this relationship. In order to reduce the negative effects of disruptions on supply chain performance, the study also aims to investigate the mediating role of supply chain managerial capability.

1.2 Statement of the Problem

Firms are prone to supply chain disruptions as a result of the uncertainty and complication in the business environment caused by market globalization, advancement in technology, and new processes (Fan & MacBryde, 2016). These interruptions have had a major negative impact on supply chain performance at all levels, including customers, enterprises, and suppliers (Bode & Macdonald, 2017). According to Hale et al. (2017), over 80% of organizations have suffered substantial supply chain disruptions in the last five years, resulting in increased prices, shipment delays, and disgruntled consumers due to a lack of reliability. For example, research has shown that supply chain disruptions increase supply chain costs, decrease revenue, and hinder customer satisfaction (Sodhi & Tang, 2012; Lee et al., 2015;

Ivanov & Dolgui, 2019). Disruptions such as the COVID-19 pandemic have highlighted the critical importance of ensuring a reliable and adequate supply of essential medical products, including personal protective equipment (PPE), diagnostic tests, and medical oxygen (World Health Organisation, 2020).

During the peak of the COVID-19 pandemic, the healthcare supply chain faced significant disruptions due to the increase in the number of COVID-19 cases (Wickramasinghe & Sharma, 2021). Most hospitals and healthcare facilities (both public and private) experienced shortages of beds, medical equipment, and essential supplies (CNN, 2021). To cope with the increased demand, a makeshift treatment center was set up in a park to accommodate COVID-19 patients. The disruption highlighted the fragility of the supply chain and the need for better preparedness and resilience. Healthcare workers face challenges in managing patients with limited resources. It has been identified that shortages or delays in critical supplies can have fatal consequences for mortality rates (Oduro, 2016; Balenmilen, 2021; Haleem et al., 2020; Selmi & Bouoiyour, 2020). Community support and government resources were crucial in reinforcing the field hospital and providing essential supplies. As the situation improved, the supply chain stabilized, and hospitals were able to secure more supplies. The incident prompted discussions on strengthening the supply chain capability to handle future crises effectively. Investments in supply chain resilience strategies became a priority to ensure better responses to disruptions and ensure adequate healthcare for the population (Dzando et al., 2022).

The literature underscores the importance of a contingency plan to mitigate supply chain disruption effects on performance. Quang and Hara (2022) highlight risks' adverse impact on supply chain (SC) performance but suggest positive effects from innovations and SC management practices. They propose integrating these elements to explore and test models where SC risks have the highest or lowest impact. The study emphasizes the positive influence of information technology (IT) on supply chain disruption resilience and performance since the

use of information technology has been recognised as enhancing visibility and monitoring (Ivanov et al. 2022), helping in predictive analysis and risk management (Wang, Li & Wang, 2021), facilitating in agile decision making (Sharma & Deshmukh, 2023) etc which has been identified as a contingent factor used in improving performance within the supply chain in the face of However, existing research lacks a nuanced understanding of how specific computer-based applications, like ERP and real-time tracking systems, moderate the relationship between supply chain disruption and performance. Smith et al. (2020) studied general IT effects but did not delve into the impacts of specific applications. Chen and Wang (2019) discussed IT adoption but did not explore specific IT applications' moderating effects. Furthermore, there is a gap in understanding how contextual factors, such as industry type or geographical location, influence the moderating effect of computer-based applications on supply chain disruption and performance. For example, Li and Zhang (2021) investigated IT's impact in a specific industry but did not analyze how contextual factors influence IT applications' moderating effects. Based on this gaps identified this is the reason for making use of information technology specifically basing on computer-based applications as moderating factor to explain the relationship further.

In light of the existing body of literature concerning supply chain disruption, which underscores the necessity of examining mediating variables such as supply chain flexibility, resilience, risk management, or managerial capabilities to comprehend the intricate interplay among these factors (Yang et al. 2019; Dong et al. 2019; Cheng et al. 2018; Li et al. 2019), this study has chosen to center its focus on supply chain managerial capability as the designated mediating variable. This decision is grounded in the recognition that, within a dynamic and volatile environment, a manager's ability to promptly identify disruptions, leverage them as opportunities, and consequently transform potential threats into favorable outcomes assumes a pivotal role. While the extant literature acknowledges the significance of supply chain managerial capabilities in mitigating the impact of disruptions, a notable research gap exists in

comprehending the mediating role of these capabilities in the relationship between supply chain disruption and performance. Specifically, there is a discernible need for research that systematically explores the mechanisms by which supply chain managerial capabilities mediate the impact of disruptions on the overall performance of the supply chain.

While numerous studies recognize the importance of both supply chain disruptions and managerial capabilities, only a limited few explicitly investigate the mediating pathways through which managerial capabilities exert influence on the relationship between disruptions and performance. For instance, Tan et al. (2018) discussed the importance of managerial capabilities but refrained from exploring their specific mediating role. Moreover, prevailing research often treats managerial capabilities as a broad construct, neglecting a detailed examination of the specific capabilities that may play a mediating role. For instance, Wong et al. (2020) scrutinized the impact of managerial capabilities on supply chain resilience but omitted a specific investigation into their mediating effects on disruption-performance relationships. Additionally, while some studies acknowledge the role of managerial capabilities, they frequently overlook the crucial distinction between static and dynamic capabilities. The study by Chen and Lee (2019) concentrated on managerial capabilities but did not explore how dynamic capabilities, encompassing adaptation and response to disruptions, mediate the relationship between supply chain disruption and performance.

This research aims to address these gaps by delving specifically into the nuanced role played by supply chain managerial capabilities in mediating the relationship between supply chain disruptions and overall supply chain performance.

1.3 Purpose of the Study

The purpose of the study is to examine the effect of supply chain disruption on supply chain performance: The mediating effect of supply chain managerial capability and the moderating effect of information technology.

1.4 Research Objectives

i. To assess the relationship between supply chain disruption and supply chain performance.

ii. To examine the relationship between supply chain disruption and supply chain managerial capability.

iii. To identify the relationship between supply chain managerial capability on supply chain performance.

iv. To assess the moderating role of information technology (IT) on supply chain disruption and supply chain performance.

v. To examine the mediating role of supply chain managerial capability (SCMC) in the relationship between supply chain disruption and supply chain performance.

1.5 Research Questions

i. What is the relationship between supply chain disruption and supply chain performance?

ii. What is the relationship between supply chain disruption and supply chain managerial capability?

iii. What is the relationship between supply chain managerial capability and supply chain performance?

iv. To what extent does IT moderate the relationship between supply chain disruption and supply chain performance?

v. What is the mediating role of supply chain managerial capability on the relationship between supply chain disruption and supply chain performance?

1.6 Scope of the Study

This research aimed to investigate supply chain disruption and supply chain performance through supply chain managerial capability under the boundary condition of information technology. Conceptually, the study covers literature on supply chain disruption, supply chain managerial capability, information technology, and supply chain performance. The study focuses on data from the focal firm of the healthcare supply chain within the Greater Accra Region of Ghana. The focal firm acts as a central player, coordinating activities with health sector suppliers, customers, and logistics partners. Their inability to perform during disruption has serious repercussions on the entire health supply chain network (Kouvelis & Zhao, 2018). The health sector has been highly affected by supply chain disruption on a daily basis and this remains a major challenge bedeviling the Ghanaian health sector (Oduro et al., 2020).

1.7 Significance of the Study

The study's findings serve as a source of empirical data and a point of reference for other scholars interested in the topic, particularly those who are eager to learn more about the effect of supply chain disruption on supply chain performance in the health sector.

It adds to existing knowledge on how supply chain disruption affects performance within the focal firm, precisely in the health sector. The findings of this study provide valuable insights into the specific ways in which supply chain disruption can influence the performance

of health organizations. It takes into account the unique characteristics of healthcare supply chains, such as the criticality of medical supplies, the need for timely delivery, and the importance of maintaining quality and safety standards. It not only highlights the negative consequences that disruptions can have on operational efficiency, cost-effectiveness, and customer satisfaction but also explores potential strategies and interventions that can mitigate these effects (Smith & Brown, 2020).

It tends to add to the literature and close gaps identified in previous studies which include contributing to existing knowledge on how high application of information technology can help reduce the negative effect of supply chain disruption and performance. The study adds to the existing body of knowledge by examining the relationship between information technology applications and supply chain performance in the context of disruption. It considers how the effective utilization of technology, such as advanced analytics tools, cloud computing, and artificial intelligence, can provide organizations with real-time insights, predictive capabilities, and enhanced decision-making tools to effectively manage disruptions and maintain operational efficiency (Chen & Wang, 2018).

This study also contributes to elucidating the impact of supply chain managerial capability on performance and underscores the imperative for healthcare organizations to enhance their resilience and adaptability in the contemporary dynamic business landscape. This is crucial for optimizing performance in the face of supply chain disruptions. The study offers insights into the specific competencies and strategies that healthcare organizations can leverage to mitigate the negative effects of disruptions and improve overall performance. It underscores the need for organizations to invest in developing and nurturing supply chain management skills and capabilities that enable them to respond effectively to disruptions, adapt to changing market conditions, and maintain a competitive edge (Lui & Shih, 2021).

The findings of this study give hospital managers and governmental bodies compelling justification on how supply chain disruption can contribute to their chain performance and the essence of making use of information technologies to build resilience to counter the negative effect of disruptions that will affect the success of their operations and also how developing supply chain managerial capabilities can help improve the overall performance of the sector in times of disturbance within the supply chain. This theory makes managers aware of how supply chain disruption risks affect various organizational performance outcomes since these risks may have varied effects on firm performance and supply chain performance (Parast & Subramanian, 2021) and get to know the implications of information technology and supply chain managerial performance have on supply chain disruption and performance.

1.7 Delimitation of the Study

The study focuses exclusively on the Greater Accra Region of Ghana. Other regions or countries were not included in the analysis. This is to ensure a specific and manageable geographic scope. It also concentrates on standard health facilities within the health sector therefore other sectors or industries were not considered. While information technology was the central focus, the study specifically investigated the role of information technology in mitigating the effect of supply chain disruption. It did not comprehensively delve into other aspects of information technology in healthcare.

1.8 Limitation of the Study

The study collected data from healthcare providers in the Greater Accra Region of Ghana, which may limit the generalizability of the findings to other regions or healthcare settings. A larger sample size and a more diverse geographical representation could provide a broader perspective on the phenomenon examined in this study. Also, it utilized a cross-sectional survey research strategy, which captures data at a specific point in time. This design

limits the ability to establish causal relationships between variables. Longitudinal studies that track changes in supply chain disruption, supply chain performance, and the mediating and moderating variables over time would provide more robust insights into the dynamics of these relationships. The study relied on closed-ended and rating scale-type question items which limited the amount of information to be obtained from respondents, especially in regard to the variable under study.

1.9 Organisation of the Study

Chapter One provides the basis of this study. It specifically covers the background of the study, statement of the problem, objectives of the study, research questions, purpose, and significance of the study. Chapter two presents the literature review to identify and examine what has been done by other scholars and researchers and also assist researchers in limiting the problem to define it better. Methodology, procedures, and modalities in data collection cover research design, determination, and identification of the population sample size, sampling design, sampling procedure, the instruments of data collection, validity, and reliability of data collected were presented in chapter three. Chapter four contains the data analyses, a presentation, and a discussion of the findings. And then the final chapter which is chapter five contains the conclusion and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter offers an extensive examination of the research objectives of the study. It condenses information from related literature by discussing key concepts, empirical reviews, theories, and building hypotheses. It culminates by introducing the conceptual framework of the study. Regarding the theoretical review, the study selected structural contingency and dynamic capabilities theories due to their direct alignment with the study's core subject matter.

2.2 Conceptual Review

The aim of the conceptual review is to describe the various concepts relevant to the topic of study. Various concepts underpinning the study have been reviewed. The concepts of supply chain disruption, information technology, supply chain managerial capability, and supply chain performance have been reviewed.

2.2.1 The Concept of Supply Chain Disruption

The term "supply chain disruption" refers to unforeseen and significant events or disturbances that disrupt the normal flow of goods, services, or information within a supply chain network (Ivanov, 2018). It encompasses occurrences that negatively affect the standard processes of product or service flow, resulting in delays, disruptions, and potential failures in delivering products or services to customers (Ivanov, 2018). Various authors have also contended that supply chain disruptions are any events causing interruptions in the regular flow of goods and services within a supply chain network, leading to reduced productivity, revenue, and customer satisfaction (Revilla & Saenz, 2017; Truong & Hara, 2018).

The concept of "supply chain disruption" emerged in the early 2000s, denoting significant transformations in global supply chains due to economic, political, and technological developments that impact production, transportation, and distribution (Hale et al., 2017). These disruptions are often attributed to the growing complexity of global supply networks (Hale et al., 2017) and the increasing frequency of natural disasters (Haber, 2017). They can affect inventory by influencing costs, availability, and lead times across various production and distribution points (Hale et al., 2017). On the production side, disruptions can limit goods' availability, cause production delays, or reduce their quality (Bes et al., 2019). Concerning distribution, supply chain disruptions may result in delays in costs, lead times, and customer service (Haber, 2017). Furthermore, disruptions can hinder the efficient movement of goods to their intended destinations, leading to customer dissatisfaction and financial losses (Haber, 2017).

The consequences of these disruptions on global businesses are significant. Research conducted by Hale et al. (2017) indicated that over 80% of companies experienced major supply chain disruptions within the past five years, resulting in increased costs, shipment delays, and dissatisfied customers due to a lack of reliability. Consequently, it has become increasingly crucial for companies to recognize the risks associated with supply chain disruptions and prepare strategies to mitigate them. The concept of supply chain disruption is multifaceted, with various meanings, classifications, and interpretations (Wagner & Bode, 2008). There is an issue in the general discussion of risk between two opposing opinions on risk definitions; Risk as pure danger and as both danger and opportunity

According to scholars who adhere to this perspective, risk is predominantly associated with negative consequences, aligning with the typical human perception of risk. For instance, in the realm of supply chain management, Ellis, Henry, and Shockley (2010) defined supply chain risk as "an individual's evaluation of the potential overall loss linked to the disruption of

the supply of a specific purchased item from a particular supplier." March and Shapira (1987) researched how managers perceive and react to risk, revealing that many managers tend to magnify its shortcomings. Similarly, Dela Rama (2012) conducted interviews with 40 board members from private corporations and high-ranking public sector officials regarding corruption. The study uncovered that in a hostile business environment characterized by corruption, an inefficient institutional framework leads to less effective corporate structures.

Also, in various domains such as finance and classical decision theory, risk is commonly conceptualized as the deviations or fluctuations around the expected value of a performance metric. Scholars who adhere to this perspective argue that risk is synonymous with variance and therefore encompasses both 'upstream' and 'downstream' aspects. In this regard, Jüttner (2005) defined supply chain risk as "the fluctuation in the distribution of potential outcomes within a supply chain, encompassing their likelihood and subjective value." Ho et al. (2015) offered an innovative and more comprehensive perspective within this framework by categorizing risks based on their degree of impact. Specifically, supply chain risk was characterized as the "probability and impact of unforeseen macro and/or micro-level events or circumstances that have adverse effects on any component of a supply chain, resulting in operational, tactical, or strategic level failures or irregularities. There are two types of risk based on this approach, that is Macro-risk and Micro-risk.

Macro-risk refers to adverse and typically rare external events or phenomena that possess the potential to exert substantial and detrimental impacts on businesses or their supply chains. Examples of such events include occurrences like the 9/11 terrorist attacks, Hurricane Katrina, the 2004 Tsunami, pandemics, wars, and similar incidents. On the other hand, micro-risk on the other hand are incidents that encompass relatively common occurrences that arise directly from internal company activities and/or the interactions among partners within a supply chain network, such as supplier losses or quality issues, and delays. Based on these

classifications, scholars have identified a range of factors driving risk and disruptions, including external/environmental risk, time risk, financial risk, information risk, demand risk, supply risk, operational/process risk, regulatory, legal, and bureaucratic risk, infrastructure risk, catastrophic risk, production disruption, disasters, delays, systems, forecasts, intellectual property, procurement (exchange rate risk), receivables (number of customers), inventory, and capacity (Wagner & Bode, 2008; Chen et al., 2013; Parast, 2020; Dolgui, 2018; Parast & Subramanian, 2021; Quang & Hara, 2022; Shekarian & Parast, 2021; Katsaliaki et al., 2020).

However, it has been argued that supply risk, environmental risk, demand risk, and process/operation risk have a significant impact on supply chain performance (Wagner & Bode, 2008; Parast & Subramanian, 2021; Chen et al., 2013). For this study and within the context of the health sector, the drivers of supply chain disruption were specifically identified as supply risk, environmental risk, and process/operation risk.

2.2.2 Sources of Supply Chain Disruption

2.2.2.1 Supply Risk

Supply risk may manifest due to various factors including operational inefficiencies of suppliers, fluctuations in product quality and quantity, delays in logistics and transportation, or a lack of effective coordination between the supplier and the firm (Kumar et al., 2010; Chen et al., 2013; Sarker et al., 2016). Notably, the quality of products and services can play a pivotal role in mitigating supply disruptions, particularly when such quality considerations span the entirety of the supply chain (Tse & Tan, 2012). Additionally, suppliers must possess the agility to respond to shifts in market demand, such as changes in customer preferences, and maintain competitiveness through the development of new products (Zsidisin & Ellram, 2003; He et al., 2020). Supply disruptions can have adverse consequences on outbound logistics, resulting in diminished supply chain performance in terms of delivery timelines (Chen et al., 2013). These

risks can lead to failures in delivering inbound goods or services to the procuring firm, subsequently affecting the downstream segments of the supply chain (Wu & Olson, 2010).

2.2.2.2 Operation and Process Risk

Operational and process risk pertains to disruptions stemming from challenges within an organization's internal boundaries, encompassing aspects like alterations in design and technology, accidents, and labor disputes (Wu, Blackhurst, & Chidambaram, 2006; Tuncel & Alpan, 2010; Xie et al., 2011; Samvedi, Jain, & Chan, 2013). Process disruptions occur when a company's internal operations encounter issues, including capacity constraints, machine failures, quality deficiencies, and inadequate IT infrastructure (Chopra & Sodhi, 2004; Talluri et al., 2013; Gunessee & Subramanian, 2020). With increased reliance on IT infrastructure to sustain supply chain operations, firms become more vulnerable to IT-related problems such as cyberattacks or hardware failures (Chopra & Sodhi, 2004). Hopp and Spearman (2000) assert that alterations in process selection, production design, and management decisions contribute to heightened process variability.

One pivotal aspect of organizational processes is their adaptability to changes in both the internal and external environment (Valença et al., 2013). Companies can mitigate process variability by establishing cross-functional teams, enhancing communication systems across departments, and effectively employing knowledge-sharing protocols (Flynn et al., 1995; Chen et al., 2013). In practice, the adoption of management programs like comprehensive quality management gained popularity due to their ability to reduce process variability (Schmenner & Swink, 1998). According to Kate (2013), a significant proportion of work-related accidents resulting in employees taking more than three days off work, or affecting their ability to perform daily tasks over this period, were attributed to handling accidents. Statistics from the Health and Safety Executive (HSE) indicated that nearly 27 million working days were lost

between 2011 and 2012 due to occupational illnesses or personal injuries. This underscores the substantial consequences even seemingly minor workplace accidents can have.

2.2.2.3 Environmental Disruption

Environmental Disruption pertains to the potential risks to supply chains that can be triggered by economic, geopolitical, or geographical factors. Illustrations of environmental disruption encompass occurrences like pandemics, epidemics, natural calamities (e.g., earthquakes), socio-political unrest, economic downturns, and acts of terrorism (Parast, 2020; Gunessee & Subramanian, 2020). Despite being infrequent and originating externally to the company and its supply chain, these exogenous events can profoundly impact a company's supply network. Given the vulnerability of industrial facilities, logistics, and transportation systems to natural disasters and acts of terrorism, environmental disruptions can exert a substantial adverse influence on supply chains (Kamalahmadi & Parast, 2016; Kamalahmadi & Parast, 2017). Noteworthy instances of environmental disruption include the COVID-19 pandemic and the Russia-Ukraine war, both of which have had far-reaching repercussions on supply chains (Jagtap et al., 2022; Okafor et al., 2021).

In the broader context, supply chain disruptions have emerged as a prominent concern in the global business landscape, characterized by diverse dimensions and interpretations. These disruptions carry significant implications, impacting financial performance, customer service, and a company's reputation. Consequently, it is imperative for organizations to proactively recognize the risks associated with supply chain disruptions and implement measures to mitigate them.

2.2.3 The Concept of Information Technology

Information technology is provided by Laudon and Laudon (2018), who define it as "the hardware and software a business uses to achieve its objectives." This definition highlights

the use of IT to achieve business objectives, such as improving efficiency, reducing costs, and enhancing customer service. According to the American National Standards Institute (ANSI), "Information technology is the activity of designing, developing, creating, using, and managing computer-based information systems and related technologies for storing, processing, and communicating information." Yet, information technology also includes the use of computer networks for communication and collaboration, and automation tools for managing data in a variety of ways. Information technology is concerned with a group of tools used to collect, process, store, alter, and provide users with data and information. In addition to hardware and software, information technology also refers to the methods used to transmit data from an organization's internal systems to the outside world (Lee & Turban, 2001; Angeles, 2009).

Several computer-based applications, including Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM), Decision Support / Expert Systems (DSS), Electronic Data Interchange (EDI), e-business, e-commerce, and Bar Coding, have been introduced, widely adopted, and implemented by businesses to improve the quality of products and services provided to customers (Chopra & Meindl, 2007; Heizer et al., 2017). Ivanov and Dolgui (2019), Pettit et al. (2019), and Lezoche et al. (2020) emphasized the importance of descriptive and predictive data analysis in obtaining visibility and improving forecast accuracy, as well as improving contingency plan activation. According to Prajogo et al. (2012), information technology can improve communication among members of a supply chain network as well as departments within a company. They added that the use of advanced information systems in transaction processing, electronic transfer of purchase orders, invoicing, cash, or tracking and expediting shipments improves the effectiveness of internal processes.

2.2.4 The Concept of Supply Chain Managerial Capability

Supply Chain Managerial Capability refers to a firm's capacity to efficiently oversee its supply chain operations in order to accomplish its strategic goals (Mentzer et al., 2008). This capability encompasses the aptitude to incorporate supply chain partners, harmonize supply chain strategies with organizational objectives, and enhance supply chain procedures (Croxton et al., 2002). In accordance with the definition provided by Cao, Zhang, and Chen (2015), supply chain managerial capability denotes "the firm's competence in proficiently administering and harnessing its resources, processes, and associations throughout the entire supply chain to attain exceptional performance.

Several research studies have explored the factors that precede the development of supply chain management capability. For instance, the implementation of supply chain technologies like RFID and GPS has been identified as a positive driver of supply chain management capability (Liao et al., 2018). Establishing collaborative partnerships with both suppliers and customers has also been found to bolster the supply chain management capability of firms (Chen & Paulraj, 2004). Furthermore, companies that make investments in enhancing their supply chain knowledge and skills are more likely to exhibit elevated levels of supply chain management capability (Croxton et al., 2002).

Research has demonstrated that the capability of supply chain managers yields favorable effects on several important outcomes, such as supply chain performance, customer satisfaction, and organizational competitiveness. For instance, Zheng et al. (2020) have shown that supply chain management capability has a beneficial influence on supply chain performance, encompassing aspects like operational performance, financial performance, and customer satisfaction. Similarly, Paulraj and Chen (2007) have affirmed that supply chain management capability has a constructive impact on both customer satisfaction and the competitive positioning of the organization.

Numerous research studies have explored the impact of supply chain managerial capability within various industry sectors, including healthcare, manufacturing, and logistics. For instance, in the healthcare sector, Rezaei et al. (2021) discovered that supply chain management capability has a favourable effect on enhancing supply chain performance. Similarly, in the realm of manufacturing, Hossain et al. (2018) identified a positive relationship between supply chain management capability and manufacturing performance.

2.2.5 The Concept of Supply Chain Performance

Supply Chain Performance is the extent to which a supply chain can fulfill its performance objectives, including factors like cost, quality, delivery, and responsiveness, while also satisfying customer requirements. Cao, Zhang, and Chen (2015) define supply chain performance as "the extent to which a supply chain achieves its performance objectives, including cost, quality, delivery, flexibility, and responsiveness, and meets the needs of its customers." Additionally, it can be viewed as the measurement of cost, quality, and speed of delivering services and/or products to customers (Lenze et al., 2018). To remain competitive, organizations must evaluate and analyse their supply chain's performance, and subsequently, formulate strategies for enhancing performance and optimizing operations (Bauer et al., 2016; Chu & Lee, 2019).

The research in the field of supply chain performance has predominantly concentrated on devising performance metrics and their practical application in diverse supply chain contexts. Lenze et al. (2018) conducted a comprehensive examination of supply chain performance metrics, encompassing total cost of ownership, on-time delivery, inventory velocity, and supplier scorecard. The authors noted that while selecting appropriate performance metrics is crucial, a lack of standardization across industries poses challenges in comparing results among organizations. Bauer et al. (2016) explored supply chain performance

management across strategic, tactical, and operational levels. Strategic-level indicators included market share, customer satisfaction, and financial performance. Tactical-level indicators covered aspects like supplier communication, transportation optimization, and inventory management strategies. Operational metrics included lead time, cost of goods, and turnaround times.

Chu and Lee (2019) provided an extensive review of supply chain performance management, emphasizing inventory, order fulfillment, delivery, and supplier performance. The authors concluded that by concentrating on enhancing performance in inventory management, order fulfillment, delivery time, and supplier relationships, organizations can enhance their overall supply chain performance. In the context of health service supply chains, it has been argued that non-profit institutions like hospitals should assess their success in terms of cost-effectiveness, quality, delivery, flexibility, patient satisfaction, medical quality, and medical safety (Ahmad et al., 2010; Phan et al., 2011).

In summary, the research literature on supply chain performance offers comprehensive insights into various facets of supply chain performance. From the literature review, it is evident that organizations must address strategic, tactical, and operational aspects of their supply chains to enhance performance. By implementing performance metrics and strategic and tactical initiatives, organizations can elevate their supply chain performance to gain a competitive edge.

2.3 Empirical Review

This section provides an overview of the relevant literature on the study's research objectives. This was carried out in order to critique existing studies by contrasting their findings.

2.3.1. Supply Chain Disruption and Supply Chain Performance

Supply chain disruptions can exert significant and adverse effects on supply chain performance, leading to a multitude of consequences, including decreased efficiency, heightened costs, diminished customer satisfaction, and reduced profitability. A considerable body of research has delved into the repercussions of supply chain disruptions on supply chain performance, particularly within the healthcare sector. In healthcare, disruptions possess the potential to severely hinder advancements in medical research, patient care, and health product delivery. Therefore, it is crucial to comprehend the implications of supply chain disruption and their potential influence on supply chain performance.

For instance, Chen et al. (2018) unearthed that supply chain disruptions in the healthcare sector can profoundly impact patient care. These disruptions encompass delayed access to essential medical treatments, the costly stockpiling of critical medical supplies, and a reduction in clinical practice. The study meticulously analyzes the causes, costs, and mitigation strategies of supply chain disruptions in the healthcare industry. The research findings point to natural disasters, supplier issues, and inadequate inventory management as the primary culprits behind supply chain disruptions in healthcare. Furthermore, the costs associated with such disruptions are substantial, with overtime pay and emergency procurement being the most significant expenditures. The authors of the study propose several strategies to minimize the frequency and cost of supply chain disruptions in healthcare. These strategies encompass enhanced supply chain planning and management, predictive risk assessment, and improved communication among stakeholders. Additionally, proactive measures like supplier monitoring and "just-in-time" inventory control are advocated to mitigate supply chain disruptions.

Similarly, a study conducted by Bak, Radhakrishnan, and Littler in 2019 explored the impact of supply chain disruptions on the performance of primary care physician practices in the United States. The research revealed that the most prevalent consequences of supply chain

disruptions were delays in the delivery of medical supplies, increased costs, and fluctuations in patient demand. This investigation, published in the International Journal of Logistics Management, sought to fathom the effects of supply chain disruptions on primary care physician practices, considering various variables such as the type, duration, and regional disparities of disruptions. The findings unveiled that supply chain disruptions negatively affected the performance of primary care physicians, with the most pronounced impact observed in practices located in remote areas susceptible to prolonged disruptions. Severe weather events and unreliable suppliers were identified as the most impactful disruptors. In light of these findings, the study recommends diversifying supply chains, reducing reliance on single suppliers, preparing for prolonged disruptions caused by severe weather events, and comprehensively understanding the long-term effects of supply chain disruptions to enhance healthcare delivery.

Li et al. (2020) conducted an investigation into the influence of supply chain disruptions on hospital supply chain performance. This comprehensive study systematically explores the impact of supply chain disruptions on hospital supply chain performance through an empirical survey of Chinese hospitals. The research encompasses various variables, including the types of supply chain disruptions, strategies for disruption mitigation, supplier selection strategies, firm-level environmental factors, and hospital supply chain performance. The findings unequivocally indicate that supply chain disruptions exert a detrimental effect on hospital supply chain performance. Consequently, the research emphasizes the necessity of proactive measures, such as effective supplier selection strategies and the cultivation of a culture of preparedness, to ameliorate the adverse impacts of supply chain disruptions. Moreover, the results underscore the role of environmental variables, including government policies, environmental monitoring, and evolving consumer expectations, in determining hospital supply chain performance.

In conclusion, Li et al.'s (2020) study offers a comprehensive analysis of the ramifications of supply chain disruptions on hospital supply chain performance, providing insights into influential variables and strategies for managing disruption risks. The study's findings and recommendations hold significant implications for healthcare organizations aiming to enhance hospital supply chain performance amidst supply chain disruptions. The research underscores that effective supply chain management strategies are imperative to mitigate the impacts of supply chain disruptions, including reduced inventory levels, increased costs, and diminished customer satisfaction.

The existing literature consistently underscores the substantial adverse effects of supply chain disruptions on performance. For instance, Yan and Gray (2018) observed that supply chain disruptions significantly elevate operational costs and depress the overall performance of health supply chain networks, affirming the causal link between supply chain disruption and supply chain performance. The body of literature pertaining to supply chain disruption and its impact on supply chain performance unequivocally corroborates that supply chain disruptions exert a pronounced, detrimental influence on performance. By delving into strategies and mechanisms for risk reduction, healthcare organizations can enhance their performance, reduce costs, and augment the quality and reliability of product delivery.

Furthermore, Parast and Subramanian (2021) conducted a study to scrutinize the impact of supply chain disruption risk drivers on organizational performance in Chinese supply chains. This research sought to identify these risk drivers and assess their influence on organizational performance within Chinese supply chains. The study elucidated that both internal and external supply chain disruption risk drivers have an adverse impact on organizational performance in Chinese supply chains. Moreover, the research revealed that risk management practices hold the potential to mitigate the detrimental effects of supply chain disruption risk drivers on organizational performance. The study's conclusion underscores the importance of

implementing effective risk management practices to safeguard organizational performance against the adverse consequences of supply chain disruptions. The authors recommend that firms involved in Chinese supply chains prioritize risk management practices to ensure that supply chain disruptions do not undermine their performance.

2.2.2 Supply Chain Disruption and Supply Chain Managerial Capability

The literature has established that supply chain disruptions can exert a detrimental influence on the managerial capabilities of firms involved in supply chain management. Such disruptions can impair a firm's capacity to effectively oversee its supply chain operations by hindering access to crucial resources, diminishing its adaptability to demand fluctuations, and compromising its ability to manage risks (Niranjan & Mehta, 2020). Niranjan and Mehta's (2020) research focuses on assessing the repercussions of supply chain disruptions on the managerial capabilities of Indian manufacturing firms. The study employs concepts related to supply chain disruption, and supply chain managerial capabilities, and mediates the impact through supply chain resilience. The outcomes reveal that supply chain disruptions negatively impact the managerial capabilities of supply chains; nevertheless, this adverse effect can be mitigated through supply chain resilience. The study also identifies various factors influencing supply chain resilience, including supplier diversification, information sharing, and supply chain visibility.

In a parallel investigation conducted by Yang and Burns (2016), the study explores the ramifications of supply chain disruptions on small and medium-sized enterprises (SMEs) within the manufacturing sector. The findings demonstrate that supply chain disruptions significantly undermine the supply chain management capabilities of these firms. Yang and Burns provide a concise background highlighting the significance of SMEs in the global economy and their vulnerability to supply chain disruptions. They offer an extensive literature

review on supply chain disruptions and SMEs, forming a solid foundation for their study. The study's objectives are clearly articulated, and the research questions are well-defined, aiming to examine the effects of supply chain disruptions on SMEs in terms of financial and operational performance.

Likewise, Li, Chen, and Cheng's (2019) study delve into the impact of supply chain disruptions on the supply chain risk management capabilities of firms in the Chinese manufacturing sector. Their research uncovers that supply chain disruptions negatively affect a firm's risk management capabilities, with a more pronounced impact on firms grappling with complex supply chain structures. They investigate the influence of supply chain disruptions on risk management capabilities, seeking to provide a comprehensive understanding of how firms can enhance their ability to manage supply chain risks. The study acknowledges the growing importance of risk management capabilities in supply chains and the necessity of identifying factors conducive to effective risk mitigation. The findings reveal that supply chain disruptions have a significant detrimental effect on supply chain risk management capabilities, underlining the importance of bolstering these capabilities to address supply chain disruptions.

In contrast, a study conducted by Dong, Chen, and Chen (2019) uncovers a potential positive impact of supply chain disruptions on a firm's supply chain managerial capabilities, alongside a negative influence on supply chain innovation capabilities within the Chinese manufacturing industry. Their research suggests that supply chain disruptions can create opportunities for firms to enhance their innovation capabilities by necessitating the adoption of novel practices and technologies. Dong et al. (2019) concentrate on the interplay between supply chain disruption and supply chain innovation capabilities in the Chinese context. While supply chain disruption poses a significant challenge to supply chain management with recognized negative impacts on performance, there is a research gap regarding how supply chain disruption influences the innovation capacity of supply chains. This study aims to address

this gap by exploring the effects of supply chain disruption on supply chain innovation capabilities.

The study's findings indicate that supply chain disruption exerts a negative influence on supply chain innovation capability, particularly for firms encountering frequent disruptions. Furthermore, the study reveals that the negative impact of supply chain disruption on supply chain innovation capability is more pronounced in firms with weaker innovation orientations. In conclusion, Dong, Chen, and Chen's (2019) research contributes to the field of supply chain management by providing empirical evidence of the impact of supply chain disruption on supply chain innovation capability within the Chinese context. The findings hold important implications for supply chain managers and policymakers, underscoring the necessity for firms to cultivate robust supply chain innovation capabilities to mitigate the adverse effects of supply chain disruption.

In summary, the existing literature highlights the significant influence of supply chain disruptions on a firm's supply chain managerial capabilities, with effects that can be both detrimental and advantageous, contingent on the specific contextual factors surrounding the disruption.

2.2.3 Supply Chain Managerial Capability and Supply Chain Performance

According to Cao et al. (2015), the capability of managing the supply chain is significantly and positively associated with the performance of the supply chain. The researchers discovered that companies possessing a high degree of supply chain managerial capability demonstrated superior supply chain performance compared to those with a lower level of such capability. To enhance their supply chain performance, the authors recommended that organizations should make investments in the development of their supply chain managerial capabilities. The authors of this particular study underscored the critical role of

supply chain management in today's globalized market and the imperative for firms to cultivate a competitive edge. They emphasized that supply chain managerial capability stands as a pivotal factor in augmenting supply chain performance, even though research in this domain is somewhat restricted. Hence, the authors embarked on an investigation to explore the correlation between supply chain managerial capability and supply chain performance, employing a resource-based perspective.

Similarly, Jiang et al. (2017) arrived at a similar conclusion by establishing a positive influence of supply chain managerial capability on supply chain performance. In their research, they delved into the connection between supply chain managerial capability and supply chain agility, discovering that organizations possessing a high level of supply chain managerial capability exhibited enhanced responsiveness to market changes, ultimately leading to superior supply chain performance. These researchers also acknowledged the growing significance of supply chain agility in today's dynamic business landscape. However, research exploring the interplay between supply chain managerial capability, supply chain agility, and supply chain performance is relatively scarce, particularly within the context of China. Consequently, the authors aimed to delve into the impact of supply chain managerial capability on both supply chain agility and performance within the Chinese context. The primary objective of their study was to scrutinize the intricate relationship among supply chain managerial capability, supply chain agility, and supply chain performance in the Chinese business environment.

In another study conducted by Song et al. (2018), the authors scrutinized the influence of supply chain managerial capability on supply chain innovation. Their findings revealed that organizations with robust supply chain managerial capability were more inclined to innovate in their supply chain practices. This research emphasized the pivotal role of supply chain managerial capability in driving supply chain innovation and enhancing overall supply chain performance. As a recommendation, the authors proposed that firms should allocate resources

to bolster their supply chain managerial capability to facilitate supply chain innovation. They further suggested that organizations could achieve this by enhancing their coordination, collaboration, and communication within the supply chain network. Additionally, they advised companies to closely monitor and adapt to environmental uncertainties to better support their endeavours in supply chain innovation. Future research endeavours could explore the intricate connections between supply chain managerial capability, environmental uncertainty, and supply chain innovation across various industries and nations. Furthermore, it would be valuable to investigate the impact of other factors, such as organizational culture and leadership, on the innovation dynamics within supply chains.

2.4 Theoretical Review and Hypothesis Development

2.4.1 Theoretical Review

The theoretical review section of the study provides a comprehensive overview and analysis of the relevant literature and theoretical frameworks that underpin the research area. It serves as the foundation for understanding the key concepts, constructs, and relationships that were examined in the empirical investigation. This section further explores and discusses key theories and models that are pertinent to the research objective of examining the mediating and moderating roles of supply chain managerial capability and information technology in the relationship between supply chain disruption and supply chain performance. Various theories, such as the Structural Contingency Theory and the Dynamic Capability Theory are discussed in this section.

2.4.1.1 Structural Contingency Theory

Structural Contingency Theory (SCT) represents an essential approach to management that scrutinizes organizational structures and their intricate interactions with the external

environment (Lawerance & Lorsch, 1967). Emerging in the 1960s, this theory was formulated to comprehend how organizations can effectively utilize their resources to attain operational efficiency. It firmly posits that there is no universally ideal organizational structure. Instead, each organization grapples with unique environmental conditions, demanding a highly tailored structure specifically aligned with the organization's context (Lawerance & Lorsch, 1967). Mintzberg (1979) further elaborates on the core concept of contingency theory, emphasizing that there is no universally correct approach to managing an organization under all circumstances. Success hinges on achieving an optimal alignment between the organization's structure and its external environment (Mintzberg, 1979).

Thompson (2016) articulated several foundational assumptions underpinning contingency theory. Firstly, it asserts that a fundamental relationship exists between an organization's environment and its structure. Secondly, it acknowledges the perpetual dynamism of the organizational environment, necessitating an organization's ability to swiftly adapt to these changes. The third assumption posits that distinct structures and strategies may be requisite for different environments, enabling organizations to effectively respond and adapt to evolving circumstances (Thompson, 2016). Importantly, SCT encompasses a holistic perspective, encompassing the internal dynamics of an organization, and centers on crafting well-suited strategies and structures congruent with the external environment (Lewis et al., 2015).

This theory supports the examination of how the structural alignment of a supply chain, in response to disruptions, impacts overall performance outcomes. As proposed by Lawrence and Lorsch (1967), organizational structures adapt to environmental contingencies, thereby influencing performance outcomes in response to disruptions, also provides a framework for understanding how disruptions influence the managerial capability within the supply chain structure. As disruptions demand adaptability, Structural Contingency Theory suggests that

organizational structures adjust to foster managerial capabilities that effectively respond to disruption events and if the adjustment is not possible managerial capabilities will be adversely affected (Woodward, 1965). By incorporating Structural Contingency Theory into the examination of supply chain disruption, this theoretical framework illuminates the dynamic relationships between disruptions, performance, and managerial capability. It asserts that the responses to disruptions are contingent upon the alignment between the environmental demands of disruptions and the internal structural elements of the supply chain, thus enriching our understanding of the complex interplay within this context.

In the context of this study, Structural Contingency Theory serves as a framework for assessing the risk inherent in supply chain disruptions and their potential impact on supply chain performance. This theory provides a foundation for developing a contingency plan aimed at mitigating these risks.

2.4.1.2 Dynamic Capabilities Theory

The Dynamic Capabilities Theory, originally proposed by Teece, Pisano, and Shuen (1997), is a widely accepted framework that elucidates how organizations respond to external forces and formulate strategies to address them. This theory revolves around a firm's capacity to continuously reconfigure and adapt its capabilities in response to evolving external conditions. In the context of supply chains, dynamic capabilities are regarded as critical sources of competitive advantage and superior performance (Eisenhardt & Martin, 2000). Eisenhardt and Martin (2000) assert that it is a leading framework for comprehending organizational change and achieving business success in a perpetually changing environment. This framework posits that successful organizations possess the ability to consistently maintain a strategic advantage over their competitors by swiftly and effectively adapting to external changes to optimize their resource management. This capacity to sustain a strategic advantage is made

possible by an organization's "dynamic capabilities," which encompass a blend of processes, strategies, and structures designed to promote and support innovation, resource utilization, and learning.

Supply chain disruption is an area where the principles of Dynamic Capabilities Theory have been applied to grasp how organizations can better manage and respond to disruptions, whether they are internal disruptions arising from shifts in customer demand or external disruptions stemming from technological advancements, changes in economic trends, or shifts in regulatory environments. Enhancing dynamic capabilities within organizations has been posited as a means to enhance agility and resilience when confronted with supply chain disruption, ultimately leading to improved supply chain performance and organizational success (Timmermans & Van Hoek, 2006).

According to the dynamic capability framework, organizations employ various methods to integrate, restructure, acquire, and release resources in response to and in anticipation of market changes (Eisenhardt & Martin, 2000). These dynamic capabilities enable businesses to enhance their performance by managing factors like efficiency, quality, speed, and flexibility (Chen et al., 2015). Gupta et al. (2019) elaborate on how companies utilize their resources, focus on learning and adaptive functionality, and relate these aspects to organizational performance. Supply chains must have the ability to sense disruptions, such as demand fluctuations or supply chain breakdowns, and respond effectively to them (Christopher & Lee, 2004). This necessitates the integration of technology, processes, and human resources within the supply chain management process, as highlighted by Lee and Padmanabhan (1997).

Furthermore, the transformation of disruptions into opportunities mandates a proactive approach to risk management and a strategic perspective (Faisal & Banwet, 2013). Proactive risk identification, assessment, and mitigation are pivotal components in enhancing supply chain resilience. Moreover, an approach to supply chain management that aligns with the

organization's long-term objectives and goals is instrumental in turning disruptions into opportunities (Christopher, 2016).

In the context of this study, the theory is instrumental in explaining how IT functions as a dynamic capability in moderating the relationship between supply chain disruption and performance. Teece et al. (1997) propose that dynamic capabilities involve the ability to integrate, build, and reconfigure internal and external competencies, highlighting the role of IT in enhancing adaptive responses to disruptions, also dynamic capability theory is equally relevant in understanding how supply chain managerial capability, as a dynamic capability, mediates the relationship between supply chain disruption and performance. Eisenhardt and Martin (2000) argue that dynamic capabilities involve sensing, seizing, and transforming capabilities, emphasizing the role of managerial capabilities in transforming disruptions into strategic advantages.

In summary, the dynamic capabilities theory serves as a crucial framework for comprehending how organizations can effectively navigate supply chain disruptions and elevate their overall performance. The linkage between Dynamic Capabilities Theory and the research topic lies in its assertion that organizations with dynamic capabilities, including effective use of IT and managerial adaptability, are better equipped to respond to disruptions and enhance overall performance. The theory, therefore, enriches the theoretical foundation by illustrating how dynamic capabilities mediate and moderate the intricate relationships between IT, managerial capability, and supply chain performance in the face of disruptions.. Leveraging the insights provided by this comprehensive framework empowers organizations to enhance their capabilities and increase their prospects for success in today's dynamic business landscape.

2.4.2 Hypothesis Development

2.4.2.1 Supply Chain Disruption and Supply Chain Performance.

Structural contingency theory posits that organizations need to align their structures and strategies with the environmental conditions they face to optimize performance. In the context of supply chains, disruptions in the external environment represent a critical factor that can significantly affect an organization's performance. These disruptions can lead to increased costs, reduced revenue, customer dissatisfaction, and operational inefficiencies (Sodhi & Tang, 2012; Ivanov & Dolgui, 2019). When supply chain disruptions occur, organizations are forced to adapt their structures and strategies to mitigate the negative impact. These adaptations may involve changes in supplier relationships, distribution channels, inventory management, and production processes. The ability of an organization to make effective adjustments in response to disruptions is influenced by its structural characteristics and its capacity to implement contingency plans.

According to the structural contingency theory, organizations with flexible and adaptable structures are more likely to respond effectively to disruptions and minimize their negative consequences on performance. Conversely, organizations with rigid and inflexible structures may struggle to adapt, leading to more significant disruptions and performance deterioration (Donaldson, 2015). This review supports the hypothesis that there is a negative relationship between supply chain disruption and performance, consistent with the tenets of structural contingency theory. Organizations that acknowledge the contingent nature of disruptions and proactively adjust their structures and strategies to address these challenges are more likely to maintain better supply chain performance even in the face of disruptions. Based on the above, the study hypothesizes that;

H1: *There is a negative relationship between supply chain disruption and supply chain Performance.*

2.4.2.2 Supply Chain Disruption and Supply Chain Managerial Capability

Supply chain disruptions have become increasingly prevalent and pose significant challenges to organizations across industries. These disruptions can lead to various adverse outcomes, including increased costs, reduced revenue, and decreased customer satisfaction (Sodhi & Tang, 2012; Lee et al., 2015; Ivanov & Dolgui, 2019). In response to these disruptions, organizations have sought ways to enhance their supply chain resilience and adaptability. The Structural Contingency Theory offers valuable insights into understanding the relationship between supply chain disruptions and supply chain managerial capability. According to this theory, the effectiveness of managerial practices is contingent upon the alignment of the organizational structure with external and internal contingencies (Donaldson, 2001). In the context of supply chain management, this theory suggests that the impact of disruptions on managerial capability may vary depending on the structural alignment of the organization.

Sodhi and Tang (2012) found that supply chain disruptions can lead to increased operational complexities, making it challenging for supply chain managers to coordinate and manage the supply chain effectively. Additionally, Ivanov and Dolgui (2019) highlighted that supply chain disruptions often necessitate rapid decision-making and resource allocation, which can strain managerial capability when organizational structures are not aligned for agility and responsiveness. Lee et al. (2015) also suggested that organizations with inflexible supply chain structures may experience greater challenges in adapting to disruptions, negatively affecting supply chain managerial capability. Based on the above, the study hypothesizes that;

H2: *Supply Chain Disruption has a significant negative relationship on Supply Chain Managerial Capability.*

2.4.2.3 Supply Chain Managerial Capability and Supply Chain Performance

Supply chain performance is a critical determinant of an organization's success, encompassing factors such as cost efficiency, customer service, and operational effectiveness (Sodhi & Tang, 2012; Lee et al., 2015; Ivanov & Dolgui, 2019). To achieve and maintain superior supply chain performance, organizations need to possess and cultivate the necessary capabilities, including supply chain managerial capabilities. The Dynamic Capability Theory offers valuable insights into understanding the relationship between supply chain managerial capability and supply chain performance. According to this theory, dynamic capabilities refer to an organization's capacity to adapt, learn, and innovate in response to changing external conditions (Teece, 2007). In the context of supply chain management, this theory suggests that supply chain managerial capability can serve as a dynamic capability, enabling organizations to effectively respond to challenges and improve their supply chain performance.

The Dynamic Capability Theory emphasizes the significance of dynamic capabilities in an organization's ability to adapt and respond to external changes (Teece, 2007). Within this framework, supply chain managerial capability is regarded as a dynamic capability that enables organizations to enhance their responsiveness, adaptability, and efficiency in managing supply chain operations. Such capabilities are expected to contribute positively to supply chain performance. According to Ivanov and Dolgui (2019), organizations with strong managerial capabilities are better equipped to handle supply chain disruptions, leading to improved overall supply chain performance. Sodhi and Tang (2012) suggest that supply chain managerial capability plays a critical role in mitigating risks and optimizing supply chain processes, ultimately contributing to better performance outcomes. Teece (2007) also underscores the importance of dynamic capabilities, including managerial capabilities, in enhancing an organization's ability to adapt and respond to changing competitive environments, resulting in superior performance. Based on the above, the study hypothesizes that;

H3: *There is a positive relationship between supply chain managerial capability and supply chain performance*

2.4.2.4 Moderating relationship of Information Technology on Supply Chain Managerial Capability and Supply Chain Performance.

Supply chain disruptions have become a recurring challenge for organizations, impacting supply chain performance across various dimensions, such as cost, customer service, and operational efficiency (Sodhi & Tang, 2012; Lee et al., 2015; Ivanov & Dolgui, 2019). In response to these disruptions, organizations have increasingly turned to information technology (IT) solutions to enhance their supply chain resilience and adaptive capabilities. The Dynamic Capability Theory offers a valuable perspective on understanding the role of IT in moderating the relationship between supply chain disruption and performance. This theory posits that organizations with dynamic capabilities are better equipped to sense, seize, and transform resources and capabilities in response to changing external conditions (Teece, 2007). In the context of supply chain management, this theory suggests that IT can act as a dynamic capability, enabling organizations to adapt and respond effectively to disruptions.

The Dynamic Capability Theory emphasizes the importance of an organization's ability to adapt and transform its resources and capabilities to address changing external conditions (Teece, 2007). In the context of supply chain disruptions, IT can serve as a dynamic capability by providing real-time data, facilitating agile decision-making, and enabling rapid response to disruptions. This aligns with the notion that organizations with dynamic capabilities are more resilient and better positioned to leverage disruptions as opportunities for growth (Teece, 2007). Ivanov and Dolgui (2019) argue that IT solutions can enhance supply chain visibility, agility, and responsiveness, allowing organizations to better manage disruptions. Teece (2007) also suggests that dynamic capabilities, including the effective use of IT, enable organizations

to build resilience and adaptability, contributing to improved supply chain performance during disruptions. Sodhi and Tang (2012) highlight that organizations with advanced IT capabilities are better equipped to monitor and manage supply chain disruptions, resulting in improved performance outcomes. Based on the above, the study hypothesizes that;

H4: *IT plays a positive significant moderating role between SCD and SCP.*

2.4.2.4 Mediating Relationship of Supply Chain Managerial Capability on Supply Chain Managerial Capability and Supply Chain Performance.

Supply chain disruptions have emerged as a critical challenge for organizations, impacting various facets of supply chain performance, including cost efficiency, customer service, and operational effectiveness (Sodhi & Tang, 2012; Lee et al., 2015; Ivanov & Dolgui, 2019). To effectively address these disruptions, organizations have increasingly recognized the importance of developing supply chain managerial capabilities. The Dynamic Capability Theory offers valuable insights into understanding the mediating role of supply chain managerial capability in the relationship between supply chain disruption and performance. According to this theory, dynamic capabilities refer to an organization's capacity to adapt and respond to changing external conditions through the acquisition and deployment of resources and capabilities (Teece, 2007). In the context of supply chain management, this theory suggests that supply chain managerial capability can act as a dynamic capability, enabling organizations to effectively navigate disruptions and enhance performance.

The Dynamic Capability Theory emphasizes the significance of an organization's dynamic capabilities in responding to external changes (Teece, 2007). Within this framework, supply chain managerial capability can be considered a dynamic capability, allowing organizations to build resilience, adaptability, and responsiveness in the face of disruptions. This aligns with the idea that organizations with strong managerial capabilities are better

positioned to leverage disruptions as opportunities for improvement (Teece, 2007). Ivanov and Dolgui (2019) argue that organizations with strong managerial capabilities are more adept at handling disruptions and mitigating their negative impact on supply chain performance. Sodhi and Tang (2012) suggest that supply chain managerial capability plays a crucial role in effectively managing and mitigating the consequences of supply chain disruptions, ultimately influencing performance outcomes. Based on the above, the study hypothesizes that;

H5: *SCMC plays a significant mediating role between SCD and SCP.*

2.5 Conceptual Framework

The conceptual framework is a set of concepts developed as a map to show the link between variables in the study (Mugenda & Mugenda, 2003). The framework was created expressly to describe the relationship between the independent, dependent, and moderating study variables in Figure 1.

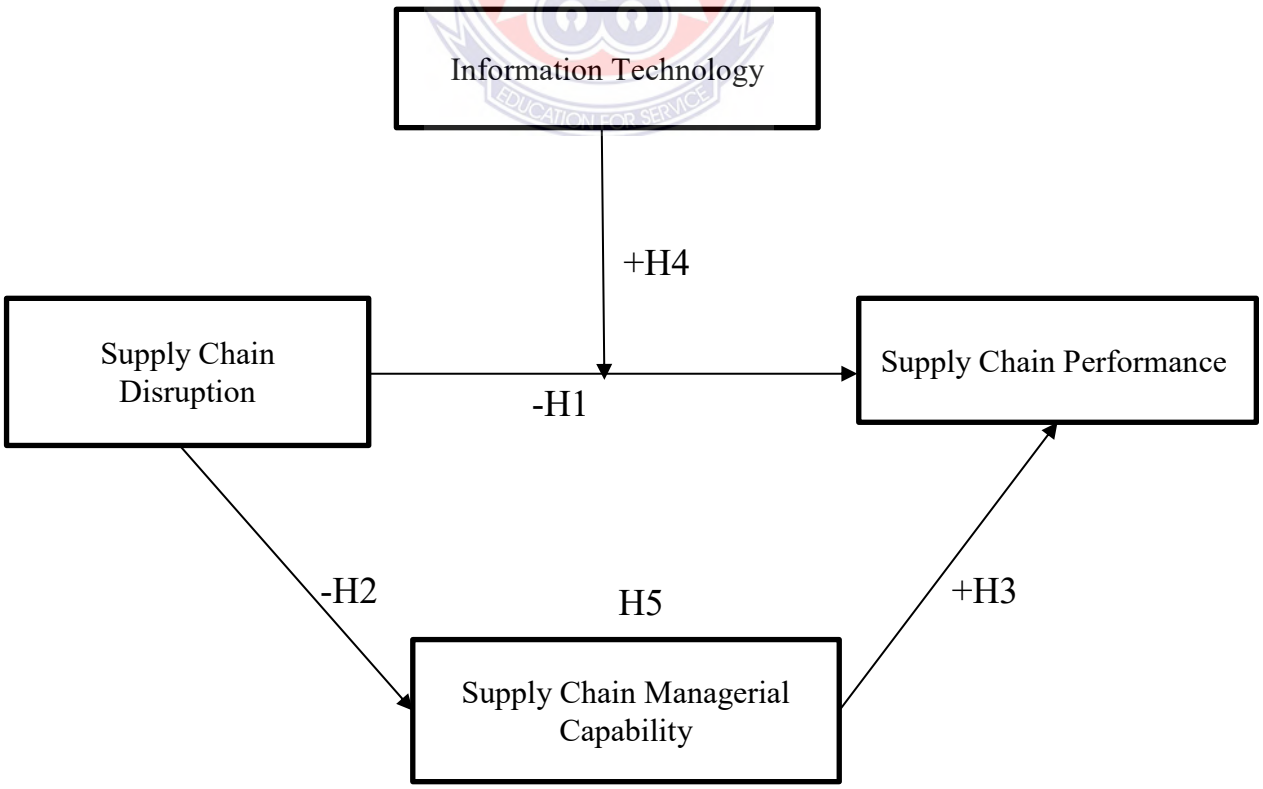


Figure 2.1: Conceptual Framework

The conceptual framework, as illustrated in Figure 1, reveals critical insights from the reviewed literature. It highlights a negative correlation between supply chain disruptions and both supply chain performance and supply chain managerial capability. This observation aligns with the principles of structural contingency theory (Lawrence & Lorsch, 1967). The theory posits that in volatile and uncertain business environments characterized by rigid and inflexible structures, organizations may encounter challenges in adapting their strategies. This struggle to adapt often results in more pronounced disruptions and a decline in overall performance (Donaldson, 2015). Furthermore, supply chain disruptions, typically necessitating swift decision-making and resource allocation, can constrain managerial capabilities when organizational structures lack agility and responsiveness (Ivanov & Dolgui, 2019).

Conversely, a positive relationship is evident between supply chain managerial capability and supply chain performance. Information technology emerges as a valuable tool capable of mitigating the adverse effects of supply chain disruptions on performance. Additionally, supply chain managerial capability assumes a pivotal role as a mediator between supply chain disruptions and supply chain performance. These observations harmonize with the tenets of dynamic capability theory, which recognizes information technology as one of an organization's abilities to adapt and respond to external changes. This theory underscores that organizations equipped with robust managerial capabilities are better prepared to manage supply chain disruptions. Consequently, they are well-positioned to either reduce the impact of risk or, intriguingly, transform it into opportunities (Ivanov & Dolgui, 2019). In summary, this framework affords a comprehensive understanding of the intricate interplay among the key variables within the supply chain. It unravels the dynamics at play in supply chain performance when disruptions occur, shedding light on the potential pathways for both risk mitigation and the conversion of challenges into opportunities.

2.6 Chapter Summary

The chapter conducted a comprehensive review of the literature related to the study. Specifically, the chapter focused on the structural contingency theory and dynamic capabilities theory. It also discussed the precise evaluations and logical frameworks of the research. The next section of the chapter examines the research methods used in the study.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The research methodology describes how the researcher conducted his study and the reasoning behind each method used. This is to assist the researcher in solving the research challenge in a systematic manner. This section covers the design of the study, the population of the study, sample and sampling procedure, sources of data, instruments for data collection, Approach for data collection, and Data analysis approach.

3.1 Research Paradigm

According to the insights of Peng and Shiyu (2019), the concept of a research paradigm pertains to a foundational principle that reflects a researcher's philosophical convictions about the world and the nature of research endeavours. Saunders and Lewis (2017) underscore the paramount importance of a research philosophy, asserting that it serves as the bedrock for any research undertaking. They spotlight two pivotal paradigms, namely, social constructivism and positivism, also known as objectivism, which fundamentally shape the approaches researchers adopt in the pursuit of knowledge generation. Žukauskas, Vveinhardt, and Andriukaitienė (2018) substantiate this perspective by affirming that social constructivism aligns harmoniously with a qualitative research approach. This paradigm places a strong emphasis on acknowledging the socially constructed nature of reality and encourages a nuanced comprehension of individuals' experiences. Furthermore, Žukauskas et al. (2018) expound that social constructivism finds its roots in subjectivism, wherein an individual's worldview is profoundly influenced by their interactions with the external world.

Moreover, among the most prominent philosophical convictions is positivism, a framework rooted in the works of Auguste Comte (1789-1857). Positivists posit that logical and empirical methods, measurement, and deductive reasoning are suitable tools for investigating phenomena and establishing absolute truths (Ballard, 2018; Rahi, Alnaser, & Ghani, 2019). In the context of this study, we propose the application of objective and scientific research methods to yield results pertaining to the specific research objectives. The outcomes of this study aim to assist stakeholders in making decisions that are firmly grounded in objective evidence. Positivism, as an inherent philosophy, posits that the reality perceived by human beings implies the existence of an objective, universal reality governed by universal laws and principles (Kankam, 2019).

Within the positivist paradigm, a strong emphasis is placed on objectivity and detachment, along with the rigorous testing of theories or hypotheses, wherein both the researcher and the subject of investigation are regarded as independent entities (Kumar et al., 2019; Kankam, 2019). Consequently, the role of the researcher within this philosophical stance is one of impartiality and detachment, seeking universal truths and rigorously assessing hypotheses and theories in the quest for unbiased, widespread knowledge (Burns & Grove, 2011). Quantitative tools are employed to amass data for hypothesis testing. Positivism is founded on the belief in the existence of a singular, measurable, and observable reality (ontological assumption) and holds that authentic knowledge is derived through quantitative and objective means (Ryan, 2019; Bell, Bryman, & Harley, 2018). This philosophical standpoint extends theoretical frameworks and places a strong emphasis on the utilization of scientific methods to attain genuine knowledge. Furthermore, it assumes that objectivity and precision are desirable qualities, while subjectivity is inherently considered misleading (Ragab & Arisha, 2018).

The current study was conducted within the positivist paradigm, grounded in the ontological assumption that there exists a singular reality or truth concerning the impact of supply chain disruption on supply chain performance (Klakegg, 2016). The adoption of the positivist paradigm enabled the researchers to employ survey research methods and collect data through questionnaires administered to a scientifically sampled group of respondents (Kember & Corbett, 2018). This approach was chosen to investigate the disruptions encountered by the health sector and their relationship with supply chain performance, with a specific focus on the moderating effect of information technology and the mediating effect of supply chain managerial capability (Kember & Corbett, 2018). The study aimed to quantitatively explore the relationships among the four variables: supply chain disruption, supply chain performance, supply chain managerial capability, and information technology, necessitating the need for objective and quantifiable responses.

3.2 Research Approach

Creswell (2014) delineated three principal research methodologies: mixed methods, qualitative, and quantitative approaches. The quantitative approach, one of these methodologies, centers on the development of generalizable theories and the empirical testing of hypotheses, with a primary objective of procuring numerical data (Creswell & Creswell, 2017; Creswell & Curtis, 2018). In contrast, the qualitative approach, as expounded by Creswell (2014), entails an exploration of social or human issues by cultivating a comprehensive understanding through the use of descriptive narratives and deep insights from study participants, employing systematic procedures within a naturalistic setting.

For this particular research endeavour, the quantitative approach was deemed most suitable due to its emphasis on quantification throughout the data collection and interpretation processes (Creswell & Creswell, 2017). This approach aligns with the tenets of the natural

scientific model, particularly positivism, which conceives the social reality of supply chain disruption within the health sector as an external, objective phenomenon amenable to quantitative measurement using reliable and valid instruments (Hollway & Schwab, 2018). The selection of the quantitative approach was premised on the research's specific objectives, inquiry framework, and hypotheses, as it presents distinct advantages over both qualitative and mixed methodologies.

Through the adoption of the quantitative research approach, this study endeavors to amass dependable and quantifiable data to elucidate the ramifications of supply chain disruption on the performance of the health sector.

3.3 Research Design

In this research study, a cross-sectional research approach employing both descriptive and explanatory surveys was utilized to enhance data variability and broaden the generalizability of findings (Farmer et al., 2011). According to Babbie (2016), the cross-sectional research approach is a study design that entails the collection of data from a specific population at a single point in time. This approach enables researchers to examine relationships among variables and identify trends within the population. The descriptive survey design was employed to allow the researcher to comprehensively depict and comprehend the attributes of the study variables. This design involves gathering data to portray the characteristics of a population or phenomenon, such as demographics, attitudes, or behaviors. It is particularly valuable for gaining insights into the prevalence and distribution of specific factors within a given population (Fowler, 2013).

In contrast, the explanatory survey sought to establish relationships between variables. This approach entails identifying independent variable(s) that may exert an influence on the dependent variable(s) and determining the strength and direction of the relationship between

them. Explanatory surveys are often conducted to analyze the impact of specific changes in existing norms, processes, and other factors (Creswell & Creswell, 2017). By incorporating both descriptive and explanatory survey elements, this study aimed to provide a more comprehensive understanding of the research phenomenon.

3.4 Population of Study

The scope of this research is centered on healthcare providers within the public sector, whether fully or partially owned, operating in the Greater Accra Region of Ghana. To be specific, this study focuses on the Greater Accra Region, which is home to a total of 1087 healthcare facilities, as reported by the Ghana Health Service (2018). Furthermore, the Greater Accra Region stands out in terms of its substantial concentration of healthcare facilities and healthcare professionals, according to data from the Ghana Statistical Service (2018). This prominence makes the region a particularly significant choice for conducting a study within the healthcare sector. By concentrating our research efforts in the capital city of Ghana, we aim to obtain a more comprehensive and representative sample of the nation's healthcare landscape and population.

Moreover, an investigation conducted in the capital city of Ghana, Accra, offers the opportunity for an in-depth exploration of the myriad factors influencing healthcare service delivery and quality in Ghana. This aligns with the assertion made by Boateng and Awunyo-Vitor (2017), who contend that Accra plays a pivotal role as the central hub for healthcare delivery throughout the country. Consequently, focusing this study on the healthcare sector in Accra is instrumental in gaining a more profound understanding of Ghana's healthcare system and in identifying strategies for enhancing the provision of healthcare services.

3.5 Sample and Sampling Procedure

The sample is essentially the representative percentage of the population chosen for the study (Ofori & Dampson, 2011). Since the study is quantitative in nature, a probability sampling technique that justifies collecting a representative sample from the target population as well as making statistical inferences from data can be the most appropriate (Ofori & Dampson, 2011), therefore for the purpose of this study, simple random sampling technique was adopted. According to Creswell (2014), simple random sampling is useful in studies where the research question is generalizable to a larger population. Simple random sampling also allows researchers to estimate population parameters with a known level of precision (Sekaran & Bougie, 2016).

To determine the appropriate sample size using a simple random sampling technique, several factors should be considered, including the level of precision desired, the level of confidence desired, and the variability in the population. Kothari (2014) recommends using a formula to calculate the sample size based on these factors, also making use of Krejcie & Morgan's (1970) sampling table. Based on the population of 1087 health facilities in the Greater Accra Region of Ghana, a sample size of 285 was calculated using the formula provided by Krejcie & Morgan (1970) with a population size (NN) of 1087 health facilities, a Z-score of 1.96 for a 95% confidence level, and a margin of error (EE) of 5% (0.05) and an assumed population proportion/standard deviation of 50% expressed in decimal (0.5) since each element has an equal chance of been selected therefore these are the representation of the population.

3.6 Sources of Data

The use of surveys is well-established in scholarly research as an effective method for obtaining results that can be generalized and replicated (Mikalef et al., 2020; Pinsonneault & Kraemer, 1993). In healthcare studies, the preference for primary data collection methods, including surveys, interviews, and observations, is rooted in their ability to provide detailed insights into health-related behaviours, attitudes, and outcomes. The flexibility of primary data collection methods allows researchers to tailor data collection to their specific research questions and context, enhancing data accuracy and completeness. While primary data collection may require more time, resources, and expertise compared to secondary data analysis, it offers invaluable insights into the complex factors influencing the health of a given population.

Survey methods are particularly prevalent in healthcare research, as Bowling (2009) points out. They are versatile tools for collecting data on a wide range of variables in a standardized and systematic manner. Surveys enable the gathering of information on health behaviours, attitudes, beliefs, and experiences from large and diverse populations, offering a comprehensive understanding of the health status and needs of specific groups. Surveys are not only cost-effective and efficient but also allow for easy replication or adaptation to different contexts or populations. Moreover, surveys generate quantitative data that can be subjected to rigorous statistical analysis, facilitating the identification of patterns, relationships, and trends. Although survey methods may have limitations, such as potential issues with response rates and response bias, they continue to be a valuable resource for researchers seeking to gain insights into the intricate determinants of health across diverse populations.

3.7 Data Collection Approach and Instruments

The study used a simple random sampling method to select staff from various health facilities in Greater Accra. This method provides a representative and unbiased sample from the target population, giving each element of the population an equal chance to be included in the sample, increasing the validity and representativeness of the findings (Ofori & Dampson, 2011; Sekaran & Bougie, 2016; Kothari, 2014). The list of health facilities was obtained from the Health Facilities Regulatory Agency (HeFRA) under the Ministry of Health, which is responsible for licensing facilities that adhere to the established standards and requirements for delivering public and private healthcare services in Ghana. These facilities encompass a wide range, including hospitals, clinics, district hospitals, municipal hospitals, polyclinics, teaching hospitals, psychiatric hospitals, and others. This comprehensive selection aimed to evaluate the impact of various variables on these diverse health institutions.

To gather data, the primary instrument used was a closed-ended questionnaire administered to the staff within the health facilities in Greater Accra, Ghana. In order to ensure the questionnaire's validity, the study incorporated constructs and corresponding survey items from prior research. Specifically, the study drew upon constructs related to Supply Chain Disruption (Wagner & Bode, 2008; Parast & Subramanian, 2021; Chen et al., 2013) , IT (Wong, Wong & Boon-Itt., 2019; Lee & Turban, 2001; Angeles, 2009 **)** and supply chain managerial capability (Cao, Zhang & Chen, 2015), and supply chain performance (Ahmad et al., 2010; Phan et al., 2011), as established in previous studies. In the questionnaire, all constructs and items were evaluated using a seven-point Likert scale, where respondents indicated the extent to which supply chain disruption classifications affected supply chain performance and the moderating influence of IT. The Likert scale assigns values to responses, ranging from 1, signifying "strongly disagree," to 7, indicating "strongly agree." Intermediate values, such as "somewhat disagree" and "somewhat agree," were also provided to capture nuanced responses

(Likert, 1932). This approach, commonly employed in social research, allows for the measurement of attitudes, perceptions, and experiences.

Respondents in the study consisted of various roles within the healthcare sector, including Stores Officers/Managers, Medical Professionals in Operations, Procurement Managers, Logistic Managers/Officers, and Supply Officers. These roles were selected as they are directly or indirectly influenced by the study's variables and play pivotal roles in healthcare delivery within the different health facilities (Oduro et al., 2020). It is worth noting that certain respondents were unable to participate in the data collection process due to various reasons, including concerns regarding confidentiality, inconvenient schedules, and perceptions that the questions did not pertain to their specific field of work. Additionally, the study encountered challenges related to strict sector regulations and ethical codes of behaviour, leading to some respondents declining to participate. To address these challenges and enhance participant engagement, assurances were provided that their involvement was solely for academic purposes. Furthermore, flexibility was offered to respondents who preferred to complete the questionnaires at their convenience. These measures aimed to encourage participation and ensure the valuable input of respondents, which was integral to the study's outcomes.

3.8 Data Analysis Approach

In the course of conducting this study, the researcher employed Microsoft Excel as the primary tool for data input. Subsequently, data analysis was carried out using the Partial Least Squares Structural Equation Model (PLS-SEM) version 4. The dataset comprised two hundred and eighty-nine (289) valid questionnaire responses, which were meticulously entered into Microsoft Excel. Following this data preparation phase, the information was seamlessly transferred to PLS-SEM version 4 to facilitate structural equation modeling and a comprehensive examination of the dataset. To gain insights from the quantitative data, a

multifaceted approach was adopted, encompassing both descriptive and inferential statistical techniques.

In the initial stages of analysis, descriptive statistics, such as frequencies and percentages, were judiciously applied to scrutinize the background characteristics and profiles of the study's respondents. This encompassed an exploration of demographic factors (e.g., gender, age) and work-related attributes (e.g., work experience, department affiliations, and job positions). Furthermore, the study employed Smart PLS 4 software to compute the mean and standard deviation, enhancing the assessment of the descriptive variables within the research context. The research study opted for SMART PLS as the chosen data processing tool, accompanied by Structural Equation Modeling (SEM) for the analysis. This choice was substantiated by the findings of previous comparable studies, which highlighted the efficacy of this approach in simultaneously evaluating the theoretical model and adjusting the correlations among variables as deemed necessary (Hair et al., 2017). It is noteworthy that the PLS-SEM methodology plays a pivotal role by elucidating the extent of change in the latent dependent construct within the model (Hair, Hult, & Ringle, 2016; Henseler, Hubona, & Ray, 2016).

In essence, PLS-SEM transcends mere exploration of relationships between components; rather, it centers on optimizing the variance explanation independent variables, thereby augmenting the model's predictive capabilities. The development of the PLS model involves two distinct steps: 1) the construction of the measurement model and 2) the formulation of the structural model (Hair, Matthews, Matthews, & Sarstedt, 2017).

3.9 Validity and Reliability

Validity, as defined by Sürücü and Maslakci (2020), pertains to the degree to which an instrument effectively and accurately assesses the intended constructs. In the context of this research, meticulous steps were taken to ensure validity by selecting participants in a manner

that minimized biases, thereby ensuring a faithful representation of the phenomena being investigated. This approach aimed to guarantee that the instrument genuinely measured what it was designed to measure.

Conversely, reliability, which relates to the consistency with which an instrument measures a particular attribute, was rigorously addressed in this study. Prior to the commencement of data collection, the questionnaire underwent a pretest to ascertain the reliability of the data collection process. In addition to this precautionary step, the research employed an array of methodological tests aimed at assessing both the validity and reliability of the findings. This encompassed scrutiny of Common Method Variance (CMV) using Harman's Single-Factor approach and the examination of Variance Inflationary (VIF) factors within the framework of Structural Equation Modelling (SEM). Furthermore, content validity was evaluated through cross-loading and confirmatory factor analysis (CFA), while convergent validity was assessed via the calculation of the average variance derived (AVE).

To further bolster the validity of the questionnaire, the research inquiries were meticulously formulated based on the study objectives, and the questionnaire underwent a thorough review by the supervisor to ensure its alignment with the research's overarching objectives.

Reliability was assessed through the application of the Cronbach Alpha Coefficient test, which gauges the internal consistency of the research items incorporated in the questionnaire. The grouped research items were evaluated using Cronbach's Alpha Coefficient, providing an indication of the instrument's reliability. It is important to note that a reliability coefficient ranging from 0.7 to 1.0 is generally considered acceptable (Hair, Babin, & Anderson, 2019). By meticulously conducting these validity and reliability tests, the study aimed to establish that the collected data was not only precise but also consistent, thus enhancing the overall quality and trustworthiness of the research findings.

3.9 Response Rate

A total of 360 questionnaires were distributed, out of the 360 questionnaires distributed to respondents, 301 were successfully retrieved. However, twelve (12) questionnaires were disqualified from analysis due to significant incompleteness and non-responses. After collecting 289 valid data sets, thorough data analysis was conducted. These 289 data sets represent a response rate of 80.27% and were used for the study's analysis. The response rate of the pertinent data collected for analysis is presented in Table 3.1.

Table 3.1: Response Rate

Categories	Number of firms	Percent (%)
Sample size	360	100.00
Reachable Sample Size	301	83.61
Incomplete/Non-responses	12	3.33
Total usable responses	289	80.28

Source: Field Survey (2023)

Table 3.1 presents the response rate of the study, aligning with Krejcie & Morgan (1970), 360 questionnaires were distributed which is above the sample size of 285. The survey received a total of 301 responses, representing a response rate of 83.61%. However, 12 responses (3.33%) were deemed unusable due to significant incompleteness and non-responses. It is important to exclude these incomplete responses to ensure the integrity of the study's findings, as suggested by Babbie (2005). Handling very incomplete responses appropriately is crucial to avoid missing data that could impact the study's conclusions. With a usable response rate of 80.28%, it is acceptable to disregard partial responses according to the decision rule.

3.10 Ethical Consideration

In the conduct of this study, ethical considerations held paramount significance, and this emphasis was placed on addressing the ethical challenges that are commonly associated with research within the realm of social sciences. Prior to commencing the study, formal approvals were diligently sought from pertinent organizations as an ethical safeguard (Green, 2019; Wax, 2019). All participants, including those who volunteered, were comprehensively informed about the study's objectives and the potential benefits it could offer (Bell et al., 2018; Iphofen & Tolich, 2018). Furthermore, it's essential to note that participation in the study was entirely voluntary, and the informed consent of each participant was explicitly obtained through verbal communication. Moreover, any difficulties encountered by the respondents while responding to specific questions were proactively addressed to ensure their comfort and ethical treatment throughout the research process.

To safeguard confidentiality, privacy, and anonymity, meticulous attention was given to the design of a well-structured questionnaire (Chambers & Nimon, 2019; Chiauzzi & Wicks, 2019; Lo, Grotevant & McRoy, 2019). The data processing and subsequent analysis were carried out with the utmost integrity, ensuring that no data manipulation occurred in order to maintain the accuracy and reliability of the results. These ethical precautions were taken to uphold the ethical standards of this study.

3.11 Justification for Using the Structural Equation Modelling

Two commonly employed methods for conducting Structural Equation Modelling (SEM) involving latent variables are the factor-based covariance fitting approach and the component-based Partial Least Squares (PLS) approach (Bagozzi & Yi, 2012). The factor-based covariance fitting approach, as exemplified by software applications like LISREL, EQS, and AMOS, derives latent variables through the assessment of covariance relationships among

observed measures (Bagozzi & Yi, 2012; Hair, Ortinau & Harrison, 2010). In contrast, the component-based PLS approach, chosen for this study, offers several notable advantages. Firstly, PLS addresses two critical challenges: inadmissible solutions and factor indeterminacy (Fornell & Bookstein, 1982). By estimating latent variables as precise linear combinations of observed measures, PLS provides explicit definitions of component scores and mitigates indeterminacy concerns (Chin, 2010).

Secondly, the PLS approach facilitates the exploration of indirect relationships among factors (Ringle, Wende & Becker, 2015). It is particularly suitable for analyzing intricate relationships where multiple factors interact and influence the outcome of interest. PLS presents a more efficient method for assessing indirect effects when compared to multiple regression analysis and other methodologies (Hamid, Sami & Sidek, 2017). Furthermore, the PLS approach has the advantage of concurrently assessing an entire model, rather than focusing solely on the relationship between two variables (Hair et al., 2010). This comprehensive evaluation empowers researchers to meticulously scrutinize and refine a given theory. Unlike certain other approaches, PLS does not necessitate stringent assumptions regarding normality for estimating model parameters, observation independence, or variable metrics. Instead, it employs an iterative algorithm that applies a series of ordinary least squares analyses (Jannoo, Auchoybur, & Lazim, 2014). The PLS algorithm incorporates diverse techniques such as canonical correlation, redundancy analysis, multiple regression, multivariate analysis of variance, and principal components. A noteworthy advantage of PLS is its capacity to address the issue of multicollinearity, which pertains to correlations between observed variables that may impact the predictability or explanatory power of any individual variable in the analysis (Dippe & Wold, 1985). Furthermore, the PLS approach imposes relatively flexible requirements on sample size (Hair et al., 2010). The determination of an adequate sample size for structural equation modeling has been a subject of debate in the literature. As suggested by

Hair et al. (2010), a minimum sample size should ideally be at least ten times the number of parameters estimated within the model.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

In this chapter, we present an analysis of the data collected concerning the research objectives. The chapter commences by offering a concise overview of the demographic and business characteristics of both the respondents and the organizations participating in the study. Subsequently, it delves into an investigation of the extent of supply chain disruptions and the level of information technology and supply chain managerial capability demonstrated by the various health centers. The chapter also scrutinizes the effects and relationships between supply chain disruptions, information technology, supply chain managerial capability, and supply chain performance in detail. To accomplish these objectives, we employ the partial least squares (PLS) approach and structural equation modeling (SEM) techniques for data analysis. These analytical methods allow for a comprehensive exploration of the research objectives and facilitate the examination of interrelationships among the variables of interest.

4.2 Demographic Characteristics of Respondents

In the first section of this chapter, the socio-demographic characteristics of the respondents are examined. Specifically, the gender, age, educational background, years of working experience, and healthcare size based on the number of beds and positions held in their respective firms are analyzed. The findings of this analysis are summarized and presented in Table 3, which provides a comprehensive overview of these characteristics. By examining these socio-demographic factors, a better understanding of the profile of the respondents can be gained, allowing for insights into how these factors may influence their perceptions and behaviours related to the study topic.

Table 4.1 Demographic Statistics of Respondents

Category	Frequency	Percent (%)
Sex		
Male	159	55.0
Female	130	45.0
Total	**289**	**100**
Age Range		
20 – 30 years	81	28.0
31 – 40 years	162	56.1
41 – 50 years	45	15.6
51 years and above	1	0.3
Total	**289**	**100**
Educational Background		
Senior High School	7	2.4
Higher National Diploma	44	15.2
Bachelor's Degree	206	71.3
Postgraduate Degree	31	10.7
Others	1	0.3
Total	**289**	**100**
Years of Working Experience		
1 – 5 years	95	32.9
6 – 10 years	141	48.8
11 – 15 years	32	11.1
16 – 20 years	21	7.3
Total	**289**	**100**
Position		
Supply officer	85	29.4

Operations Manager	26	9.0
Procurement/Purchasing Manager	58	20.1
Store manager	41	14.2
General Manager	24	8.3
Logistics Managers	39	13.5
Administrator	16	5.5
Total	**289**	**100**

Source: Field Survey (2023)

In Table 4.1, an analysis of the demographic characteristics of the respondents reveals interesting findings. The majority of the participants, comprising 159 individuals, were males, accounting for 55.0% of the total sample. Conversely, the remaining 130 respondents, representing 45.5%, were females. The study's focus on supply chain management being relatively male-dominated is not surprising, as this field historically has had fewer women in leadership positions ((Smith, Johnson, & Brown, 2022) but the ratio is close enough.

Regarding the age ranges of the respondents, the age group between 31 and 40 years exhibited the highest turnout, with 162 individuals, constituting 56.1% of the total sample. The second-highest frequency was observed in the age group of 20 to 30 years, with 81 respondents, accounting for 28.0%. Among the participants, 45 individuals fell into the age range of 41 to 50 years. Interestingly, the age group of 51 years and above had the fewest number of respondents, comprising only 0.30% of the total sample. These findings suggest that the health sector primarily consists of individuals in the middle age bracket and this has been identified as being current, strong thinking abilities, technology savvy, and good at making strategic decisions within the firm especially when occupying a managerial role (Castro, Terlizzi, & Surprenant, 2020).

Table 4.1 also presents the educational background of the survey participants. The majority of respondents, with a total of 206 individuals, held a Bachelor's degree, accounting for 71.3% of the sample. Following closely were respondents with a Higher National Diploma (HND), representing 44 responses and making up 15.2% of the sample. Postgraduate degree holders accounted for 31 responses, indicating 10.7% of the total sample. It is worth noting that the presence of postgraduate degree holders is relatively rare in the health sector. In terms of lower educational qualifications, Senior High School certificate holders represented 7 responses, making up 2.4% of the sample. Additionally, there was one respondent with other certificates, representing 0.3% of the total sample. These findings provide an overview of the educational background of the survey participants, highlighting the dominance of Bachelor's degree holders and the relatively smaller presence of higher qualifications such as postgraduate degrees.

Further analysis was conducted on the working experiences of the respondents. The results, as shown in the table above, indicate that the majority of respondents, with a total of 141 individuals, had 6 to 10 years of working experience. This category represented 48.8% of the sample. Following this, 95 respondents (32.9%) reported having 1 to 5 years of working experience. The next two categories, 11 to 15 years and 16 to 20 years of working experience, received responses from 32 individuals (11.1%) and 21 individuals (7.3%), respectively. It is interesting to note that there were no responses from individuals who have worked for more than 20 years. These findings provide insights into the distribution of working experiences among the survey participants. The results reflect that the majority of the respondents have been around between 6 to 10 years which shows that they have enough experience to give accurate responses to the questionnaires. The absence of responses from individuals with extensive working experience beyond 20 years may indicate a relatively younger workforce or a turnover of staff within the health sector.

Finally, Table 4.1 provides information on the current job positions of the respondents. The findings indicate that the highest number of responses, accounting for 29.4%, came from individuals in Supply manager roles. This was followed by the Procurement/Purchasing Manager, representing 20.1% of the responses, and, accounting for 14.2% of the responses. Logistics managers accounted for 13.5% of the responses, with a total of 39 individuals. The Operations Manager role represented 9.0% of the responses with 26 individuals. General Manager accounted for 8.3% of the responses, totaling 24 individuals. Lastly, the administrator recorded 5.5% of the responses with a frequency of 16. These findings provide insights into the appropriate staff within the health facility with the knowledge and expertise to provide accurate and valid responses to the questionnaire.

4.3 Statistics of Variables

The main focus of the study was to analyze the mediating role of supply chain managerial capabilities and the moderating role of information technology (IT) in the relationship between supply chain disruption and supply chain performance. To gather data for investigating the research objectives, a structured questionnaire was administered to health facilities located in Greater Accra. The questionnaire utilized a 7-point Likert scale to measure the respondents' agreement or disagreement with specific items related to the constructs under study. This section provides a summary of the descriptive statistics for the measurement items used in the study, including the mean and standard deviation, which reflect the level of agreement or disagreement expressed by the respondents towards each item. The findings are presented in tables for easy reference and analysis.

Table 4.2 Supply Chain Disruption

Our health center is not adversely affected by:

SUPPLY CHAIN DISRUPTION	N	Min	Max	Mean	SD
SUPPLY RISK					
Inconsistent product quality	289	1	7	2.799	1.735
Poor delivery performance from suppliers (e.g., inconsistent delivery)	289	1	7	2.671	1.563
Unexpected capacity fluctuations or shortages.	289	1	7	2.474	1.617
The reliability of our suppliers	289	1	7	2.567	1.517
PROCESS RISK					
Machine breakdowns	289	1	7	2.654	1.718
Utility outages	289	1	7	2.640	1.744
Limited access to the capacity to deliver services to our patients.	289	1	7	2.567	1.716
Regularly unforeseen technology failures during our service delivery.	289	1	7	2.367	1.625
ENVIRONMENTAL RISK					
Political instability, socio-political, and war crises (tax, new health policies, and laws, Russian-Ukraine war)	289	1	7	2.592	1.682
International restrictions	289	1	7	2.730	1.663
Stakeholder opinion exerts significant pressure on our Operations.	289	1	7	2.194	1.175
Natural disasters and disease outbreaks (e.g., earthquake, flooding, extreme climate, tsunami, measles, pandemic e.g., covid 19, SARs)	289	1	7	2.176	1.446

Source: Field Survey (2023)

With this table, respondents are required to respond if they are in agreement or disagreement if they have not been adversely affected by any of the three dimensions of supply chain disruption (Supply Risk, Process Risk and Environmental Risk). Based on the responses given it reflected that most of the responses fall within the disagreement Likert scaling signaling that their health facility has been adversely affected by supply chain disruption. Twelve (12) items were utilized in total and four for each specific dimension. Here the least means the stronger the agreement. Environmental Risk specifically "Natural disasters and disease outbreaks (e.g., earthquake, flooding, extreme climate, tsunami, measles, pandemic (e.g., Covid 19, SARs)" had the strongest disagreement with 2.179, followed by "stakeholder opinion exerts significant pressure on our operations" with a mean score of 2.194. Items with the least disagreement were "Inconsistent product quality" with a mean score of 2.799 followed by "International restriction" with a mean score of "2.730" of which were within the "somewhat disagreement" with a value of 3.

It has been observed that the various health center was majorly impacted by the environmental risk, followed by Process risk collective mean of 2.432 and 2.557 respectively and also the least dimension impaction is Supply risk items but then all in the opposite direction of how the items were structured.

Table 4.3 Information Technology

Items	N	Min	Max	Mean	SD
Improved communication and collaboration among our stakeholders.	289	1	7	4.702	2.030
Improved the tracking and monitoring of inventory	289	1	7	5.502	1.415
Improved traceability and transparency.	289	1	7	5.478	1.479
Increased the speed in processing information	289	1	7	5.453	1.569

Source: Field Survey (2023)

Table 4.3 presents the results of measuring information technology using five items. The mean scores for these items ranged between 4.702 and 5.516. Two of the items had mean scores that align approximately with 6, indicating agreement on the Likert scale. The item "Assisted in extracting valuable data and analytics to make more informed decisions" obtained the highest mean score of 5.516. This indicates that respondents perceived information technology as effectively supporting the extraction of valuable data and analytics, enabling them to make more informed decisions. This suggests that the utilization of technology plays a crucial role in data-driven decision-making processes within the healthcare supply chain.

The item "Improved the tracking and monitoring of inventory" had a mean score of 5.478 and a standard deviation of 1.525. This suggests that respondents recognized the positive impact of information technology in enhancing the tracking and monitoring of inventory. Effective inventory management is essential for mitigating risks and ensuring the availability of necessary supplies in the healthcare sector. Similarly, the items "Improved traceability and transparency" and "Increased the speed in processing information" had mean scores of 5.478 and 5.453, respectively. Although these mean scores were on the lower side of agreement on the Likert scale, they still indicate a positive perception of the contributions of information technology in improving traceability, transparency, and information processing speed within the healthcare supply chain. The item with the lowest mean score of 4.702 is "Improved communication and collaboration among our stakeholders." This suggests that respondents perceived room for improvement in utilizing information technology to enhance communication and collaboration among stakeholders in the healthcare supply chain. Effective communication and collaboration are crucial for coordinating activities and ensuring seamless information flow among different parties involved in the supply chain.

Overall, the findings highlight the positive impact of information technology in areas such as data extraction and analytics, inventory tracking and monitoring, traceability, and

information processing speed within the healthcare supply chain. However, there is a need to focus on improving communication and collaboration among stakeholders through the effective use of information technology. Strengthening these areas can lead to further advancements in supply chain performance and overall operational efficiency in the healthcare sector.

Table 4.4 Descriptive of Supply Chain Managerial Capability

Items	N	Min	Max	Mean	SD
Adapt new practice to respond to changes	289	1	7	5.401	1.630
Reconfigure resources to respond to changes	289	1	7	5.401	1.520
Develop skills to respond to changes	289	1	7	5.429	1.468
Partner with its supplier/customers (patients)	289	1	7	5.554	1.396
Enhance knowledge through professional engagement	289	1	7	5.571	1.410

Source: Field Survey (2023)

Five items were used to measure supply chain managerial capability in the study. As presented in Table 4.4, the mean scores for these items ranged from 5.401 to 5.554. One of the items had a mean score that aligns approximately with 6, indicating agreement on the Likert scale. The item "Partner with its supplier/customers (patients)" received the highest mean score of 5.554, suggesting that respondents perceived this aspect of supply chain managerial capability to be performed well by managers in the health sector. This indicates a positive perception of the ability to establish and maintain effective partnerships with suppliers and customers (patients). The item "Develop skills to respond to changes" had a mean score of 5.429 and a standard deviation of 1.468, indicating a relatively high level of agreement. This suggests that respondents recognized the importance of developing skills to effectively respond

to changes in the supply chain context. It highlights the significance of continuous learning and acquiring new competencies to adapt to evolving circumstances.

On the other hand, the items "Adapt new practice to respond to changes" and "Reconfigure resources to respond to changes" had the lowest mean scores of 5.401. These items had standard deviations of 1.630 and 1.520, respectively. This suggests a slightly lower level of agreement compared to the other items, indicating that there may be some room for improvement in terms of adapting to and reconfiguring resources in response to changes. It implies that managers may need to focus more on these aspects to enhance their supply chain managerial capability. Overall, the findings suggest that managers in the health sector are perceived to excel in partnering with suppliers and customers (patients) and have a relatively strong capability to develop skills to respond to changes. However, there is room for improvement in terms of adapting new practices and reconfiguring resources to effectively respond to changes in the supply chain environment. Enhancing these aspects of supply chain managerial capability can contribute to better overall performance and responsiveness in the healthcare supply chain.

Table 4.5 Supply Chain Performance.

Item	N	Min	Max	Mean	SD
Reduction in the rate of patients' complaints	289	1	7	5.318	1.612
Speedy service delivery	289	1	7	5.606	1.485
Timely responses to patient requests with seamless processes.	289	1	7	5.616	1.470
Clear, complete, and accurate information within the supply chain	289	1	7	5.713	1.435
Fair and affordable service charges to patients.	289	1	7	5.657	1.376
Improvement in inventory management cost	289	1	7	5.661	1.403
Increase in Patient Satisfaction	289	1	7	5.713	1.391

Improvement in Health Center-Supplier relationship	289	1	7	5.619	1.352
Improved and quick registration and admission processes	289	1	7	5.837	1.466

Source: Field Survey (2023)

Nine items were used to measure supply chain performance in the study. As shown in Table 4.5, the mean scores for these items ranged from 5.318 to 5.837. The mean scores for eight out of the nine items were approximately within the agreed range of 6, indicating a generally positive perception of supply chain performance. The item "improved and quick registration and admission processes" received the highest mean score, suggesting that respondents perceived this aspect of supply chain performance to be particularly favorable. Furthermore, it is noteworthy that the item "clear, complete, and accurate information within the supply chain" and the item "increased patient satisfaction" had the same mean score of 5.713. This suggests a relationship between the two factors, indicating that when there is clear, complete, and accurate information within the supply chain, it tends to lead to increased patient satisfaction. This emphasizes the importance of effective information management and communication within the supply chain to enhance patient satisfaction. On the other hand, the item "Reduction in the rate of patient complaints" had the lowest mean score of 5.318, indicating a slightly lower level of agreement compared to the other items.

This can be attributed to the fact that individuals may have varying expectations and preferences, and it highlights the need for effective managerial processes and stakeholder engagement to address and minimize patient complaints. Implementing efficient processes and engaging stakeholders can help mitigate issues and reduce the occurrence of complaints, although they may still arise to some extent. Overall, the findings suggest that the supply chain

performance, as perceived by the respondents, is generally positive with room for improvement in certain areas to further enhance patient satisfaction and reduce complaints.

4.4 Measurement: Partial Least Squares Structural Equation Modelling (PLS-SEM)

To investigate the study objectives and analyse the relationships between variables, Partial Least Squares Structural Equation Modelling (PLS-SEM) is employed in this study. The PLS-SEM model consists of two main steps: the measurement model and the structural model.

In the measurement model, the relationships between latent variables and their observed indicators are assessed. This step involves evaluating the reliability and validity of the measurement model by examining the factor loadings, composite reliability, average variance extracted, and discriminant validity for each latent variable (Hair et al., 2017). These measures indicate the strength and consistency of the relationships between the variables. Once the measurement model is established, the focus shifts to the structural model. This model examines the relationships between the latent variables and tests the hypotheses proposed in the study. The structural model helps to determine the direct and indirect effects of the variables on each other, providing insights into the causal relationships (Hair et al., 2017). By using the PLS-SEM approach, this study aims to comprehensively understand the relationships and effects among the variables of interest. It allows for examining complex relationships and provides a robust statistical analysis framework for drawing meaningful conclusions.

4.4.1 Measurement of Model Assessment

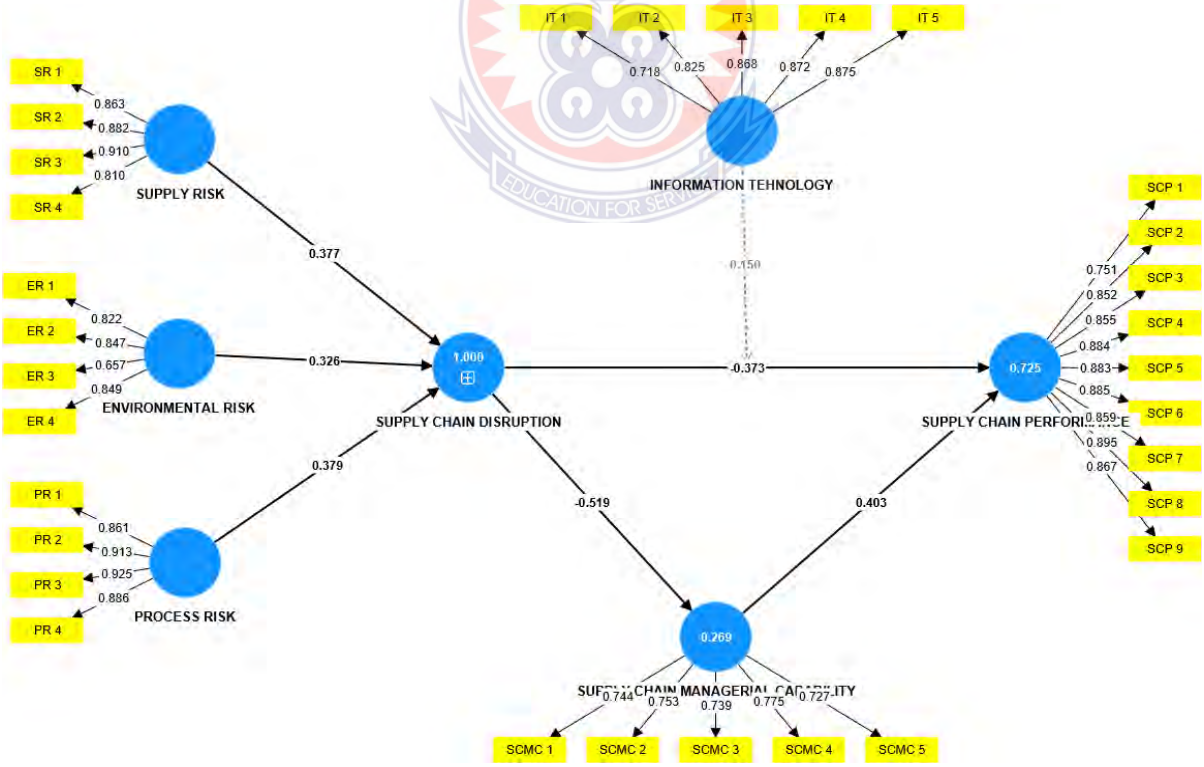
4.4.1.1 Conceptual Model Structure (Indicator factor loadings)

Indicator factor loadings in Partial Least Squares Structural Equation Modelling (PLS-SEM) represents the strength and direction of the relationship between observed indicators and underlying latent variables. They indicate how well each indicator measures the construct it

represents. Higher factor loadings indicate a stronger relationship, while statistical significance determines if the relationship is significantly different from zero. Evaluating factor loadings helps assess the measurement model's quality and guides decisions on indicator revision or elimination. They provide valuable insights into the relationships between indicators and latent variables, enhancing understanding of the constructs being studied.

In this section, the conceptual model structure is presented, outlining the independent, moderating, mediating, and dependent variables of the study along with their respective indicators. The model comprises one independent variable, one moderating variable, one mediating variable, and a dependent variable. Figure 2.2 below illustrates the structure of the model, providing a visual representation of the relationships among these variables.

Figure 2.2: Outer and inner model loadings



Source: Field Survey, (2023)

In Figure 2.2, the independent variable consists of Twelve (12) indicators representing supply Risk (SR1, SR2, SR3, and SR4), Process Risk (PR1, PR2, PR3, and PR4), and Environmental Risk (ER1, ER2, ER3 and ER 4). The moderating variable is represented by five (5) indicators: Information Technology (IT1, IT2, IT3, IT4, and IT5). The mediating variable is also represented by five (5) indicators: Supply chain managerial capability (SCMC 1, SCMC 2, SCMC 3, SCMC 4, and SCMC 5) The dependent variable, Supply Chain Performance (SCP), is measured by nine (9) indicators: SCP1, SCP2, SCP3, SCP4, SCP5, SCP6, SCP7, SCP8 and SCP9. The model includes Seven (7) paths represented by arrows that indicate the relationships among these variables. Three (3) arrows move to the exogenous variable forming the exogenous variable. Another arrow moving from the exogenous variable (SCD) to the endogenous variable (SCP) represents the relationship between them. Another arrow from the moderating variable (IT) points between the exogenous variable (SCD) and the endogenous variable (SCP), representing the relationship between the moderating variable and both the exogenous and endogenous variables. Also, an arrow from the exogenous variable to the mediating variable (SCMC) and from the mediating variable to the endogenous variable (SCP). To ensure the quality of the model, the indicator loadings of the constructs were assessed. The decision rule states that each indicator's loading should be greater than or equal to 0.70 to be considered a quality measure of its construct. In Figure 2, indicators ER 3 had loadings less than 0.70 and was therefore removed from the model as it did not meet the quality criteria. Removing such indicators aligns with the recommendation of Hair et al. (2019) to maintain the quality of the model's outcomes. Therefore, indicator loadings < 0.70 in Figure 2 were duly removed (ER 3).

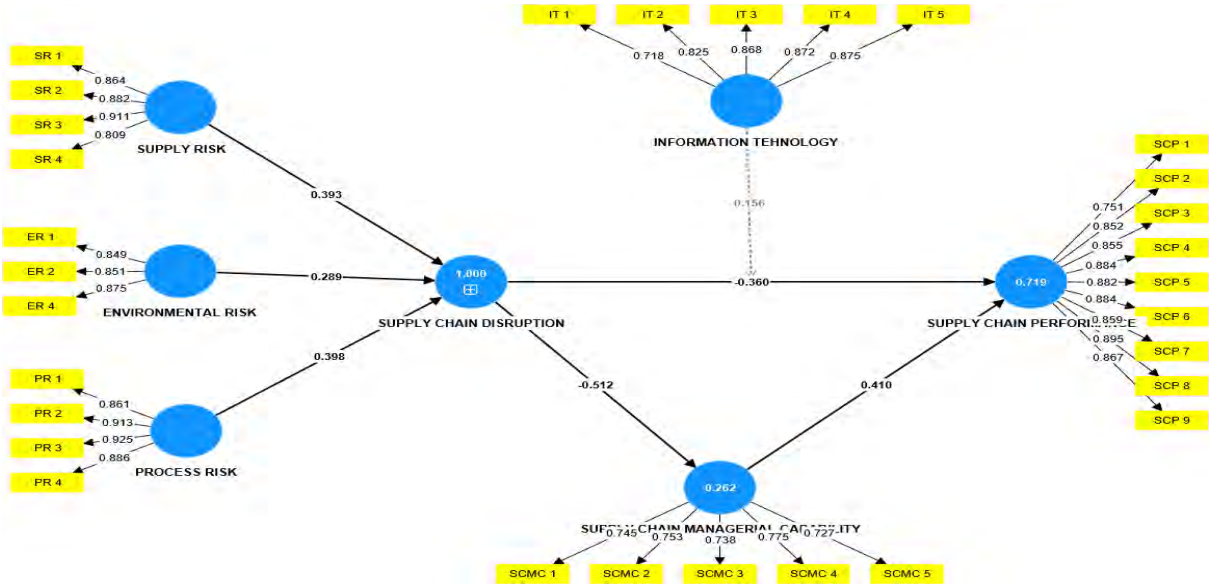
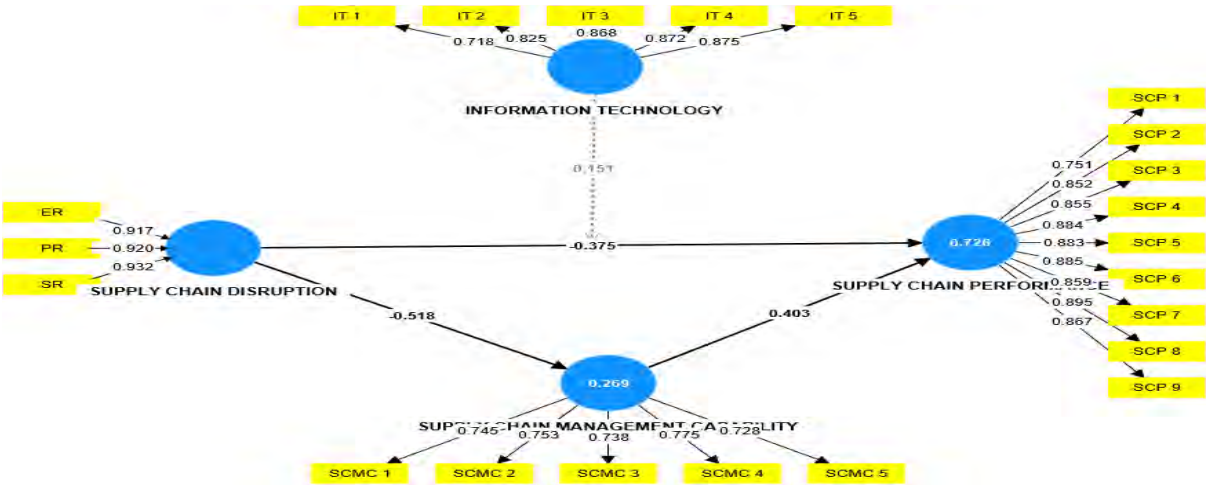


Figure 2.3: Model extracted

Source: Field survey, (2023)

In Figure 2.3, the item loadings of the indicators were assessed to determine their reliability. The minimum threshold of 0.70, as recommended by Henseler, Ringle, and Sinkovics (2009), was used to evaluate the indicator reliability. The figure provided a clear picture of the item loadings and indicated whether the indicators met the reliability criterion of 0.70 or higher.

Figure 2.4: Item Loadings (Structural and Measurement) for Higher-order construct



Source: Field survey, (2023)

Figure 2.4 presents the loadings of the indicators for each latent variable in the model, namely supply chain disruption (Supply Risk, Process Risk, and Environmental Risk), Information Technology, Supply Chain Managerial Capability, and Supply Chain Performance. The lowest loading observed was 0.728, indicating a substantial association between the indicator and its corresponding latent variable. Moreover, the analysis revealed that all the Composite Reliability (CR) loadings for the indicators exceeded 0.70, with the lowest CR loading being 0.917 for the indicators of supply chain disruption. This finding suggests that each indicator showed a strong and reliable relationship with its respective latent variable. In summary, the results from Figure 4 and the CR loadings indicate that the assigned indicators for each latent variable demonstrated robust associations, validating the measurement model's ability to effectively capture and measure the underlying constructs in the study.

4.4.1.2 Reliability Analysis

Reliability assessment in PLS-SEM involves examining the internal consistency and stability of the measurement items used to operationalize the latent variables. Cronbach's alpha and composite reliability (CR) are commonly used to assess reliability (Hair et al., 2019). Higher values of Cronbach's alpha and CR indicate greater reliability and consistency among the measurement items. To evaluate the internal consistency reliability of the constructs, composite reliability, Cronbach's alpha, and Rho_A were assessed. The criterion for construct reliability is that composite reliability should be equal to or greater than 0.70. Similarly, Cronbach's alpha and Rho_A values should be greater than 0.70 to ensure construct validity.

The results presented in Table 4.6 indicate that Cronbach's alpha values range from 0.803 to 0.956, Composite reliability (rho_a) values range from 0.805 to 0.957, and Composite reliability (rho_c) values range from 0.864 to 0.962. These findings demonstrate that the

constructs have satisfactory internal consistency reliability. Therefore, the results in Table 3 confirm the achievement of construct validity.

Table 4.6: Reliability Analysis

Variables/Items	Indicator loadings	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)
Supply Chain Disruption		**0.913**	**0.921**	**0.945**
ER	0.917			
PR	0.920			
SR	0.932			
Information Technology		**0.889**	**0.897**	**0.919**
IT 1	0.718			
IT 2	0.825			
IT 3	0.868			
IT 4	0.872			
IT 5	0.875			
Supply Chain Managerial Capability		**0.803**	**0.805**	**0.864**
SCMC 1	0.745			
SCMC 2	0.753			
SCMC 3	0.738			
SCMC 4	0.775			
SCMC 5	0.728			

Supply Chain Performance		**0.956**	**0.957**	**0.962**
SCP 1	0.751			
SCP 2	0.852			
SCP 3	0.855			
SCP 4	0.884			
SCP 5	0.883			
SCP 6	0.885			
SCP 7	0.859			
SCP 8	0.895			
SCP 9	0.867			

Source: Field Survey, (2023)

4.4.1.3 Convergent validity

To assess the convergent validity of the measurement model, the researcher examined factor loadings (λ), composite reliability (CR), and average variance extracted (AVE) following the guidelines proposed by Hamid, Sami, and Sidek (2017). Convergent validity is considered acceptable when AVE exceeds 0.50 and CR values surpass 0.70. The findings of the study revealed that all model constructs exhibited factor loadings (λ) exceeding 0.50, indicating a significant level of agreement with the underlying latent variables (Hamid, Sami, and Sidek, 2017). This suggests that the measurement items effectively capture the constructs they intend to measure, enhancing the reliability of the measurement model.

Furthermore, the study observed composite reliability (CR) values above 0.70 for all constructs, which signifies a high degree of internal consistency and reliability within the measurement model (Hamid, Sami, and Sidek, 2017). This indicates that the constructs demonstrate a strong ability to measure the latent variables consistently. Additionally, the average variance extracted (AVE) values surpassed the recommended threshold of 0.50 for all model constructs, further supporting the convergent validity of the measurement model (Hamid, Sami, and Sidek, 2017). The AVE values indicate the extent to which the constructs explain the variance in their respective measurement items, suggesting a satisfactory level of convergent validity.

The results presented in Table 4.7 indicate that all the AVE values exceed 0.5, indicating the establishment of convergent validity. The AVE values range from 0.560 to 0.852, indicating that the constructs explain a substantial proportion of the variance in their respective indicators. Therefore, the findings confirm the presence of convergent validity in the measurement model.

Table 4.7 Average Variance Extracted (AVE)

Variables	Average Variance Extracted (AVE)
Supply Chain Disruption	0.852
Information Technology	0.695
Supply Chain Managerial Capability	0.560
Supply Chain Performance	0.739

Source: Field Survey (2023)

4.4.1.4 Discriminant validity

Discriminant validity refers to the extent to which a construct is distinct from other constructs in the model, capturing unique phenomena that are not represented by other constructs (Hair et al., 2016). The Fornell and Larcker's (1981) and more recently Heterotrait-Monotrait (HTMT) ratio is commonly used to assess discriminant validity, as it is considered a more robust measure compared to the Fornell and Larcker's (1981) criterion (Hair et al., 2014). Sarstedt et al. (2014) recommend the use of the HTMT ratio for testing discriminant validity. The Fornell and Larcker (1981) criterion also examines whether the factor loadings on the respective constructs are higher than the correlation values among the latent variables. This criterion helps identify any collinearity issues in the model (Hair et al., 2014).

In this study, the HTMT ratio and Fornell and Larcker (1981) were used to evaluate discriminant validity, with a recommended threshold of 0.90 (Hair et al., 2020). The HTMT correlation values were examined to ensure that the correlations between and across individual constructs were below 0.90, particularly when the constructs were conceptually similar (Henseler et al., 2015). The results presented in Table 4.8 reflect the square root of the average variance extracted and constructs are greater than the correlation between the construct and any other construct. Table 4.9 also demonstrates that all correlation values are within the acceptable range of 0.90. This suggests that each construct is distinct from others in the model, capturing unique aspects of the phenomena under investigation. Thus, the findings support the establishment of discriminant validity in the measurement model.

Table 4.8: Fornell and Larcker Criterion

Variables	Information Technology	Supply Chain Disruption	Supply Chain Managerial Capability	Supply Chain Performance
Information Technology	**0.834**			

Supply Chain Disruption	-0.333	**0.923**		
Supply Chain Managerial Capability	0.303	-0.531	**0.748**	
Supply Chain Performance	0.418	-0.720	0.722	**0.860**

Note: Diagonal Elements highlighted in Bold = square root of AVE, beneath the diagonal elements = correlation between constructs.

Source: Field Survey (2023)

The results in Table 4.8 demonstrate that the factor loadings in the individual constructs are higher than the correlation values among the latent variables. This confirms that the study's model satisfies the criterion for discriminant validity, as proposed by Fornell and Larcker. Furthermore, to ensure robust discriminant validity, the Heterotrait-Monotrait (HTMT) ratio was employed as an additional measure. The HTMT ratio, as suggested by Rigdon et al. (2014), is a more advanced measure for assessing the discriminant validity of constructs. It has been shown to provide a more accurate evaluation of the lack of discriminant validity in studies compared to the Fornell and Larcker criterion.

Table 4.9 provides further details on the HTMT ratio and its assessment, contributing to the comprehensive evaluation of discriminant validity in the study.

Table 4.9: Heterotrait-Monotrait (HTMT) ratio

	Information Technology	**Supply Chain Disruption**	**Supply Chain Managerial Capability**	**Supply Chain Performance**
Information Technology				
Supply Chain	0.367			

Disruption			
Supply Chain Managerial Capability	0.359	0.599	
Supply Chain Performance	0.450	0.760	0.823

Source: Field Survey (2023)

4.4.2 Assessment of the Structural Model

After establishing the reliability and validity of the constructs, the next step is to test the research hypotheses. This is accomplished by examining the direction and strength of the relationships using coefficients (β), p-values, multicollinearity (VIF), coefficient of determination (R2), predictive relevance (Q2), and effect size (f2). The significance of the hypotheses is determined by examining the T-statistics, which should be greater than 1.96, and the p-values, which should be lower than 0.05, as recommended by Hair et al. (2014).

The coefficient of determination, denoted as R2, is used to assess the predictive precision and overall significance of the model. It indicates the proportion of variance in the endogenous construct that is explained by the exogenous constructs. R2 values range from 0 to 1, with higher values indicating greater predictive precision. To account for the complexity of the model and control for the number of predictors, the adjusted R2 is often used. This metric is particularly useful when comparing multiple models. It is important to note that the R2 value tends to increase with the number of predictors, emphasizing the significance of using the adjusted R2.

To evaluate the strength of correlations between latent variables, the effect size (f2) is employed, following Wong's (2013) approach. The effect size measures the change in R2 when an exogenous variable is removed from the model. Effect sizes are classified as Small (0.0 < effect size < 0.15), Medium (0.15 < effect size < 0.35), or Large (effect size > 0.35). After

determining the magnitude of R2, the predictive accuracy of the model is assessed based on the works of Stone (1974) and Geisser (1974). The Q2 metric is utilized to evaluate the predictive capability of variables. Q2 values falling within the range of 0 to 0.25, greater than 0.25 to 0.50, and greater than 0.50 are classified as weak, moderate, and strong, respectively, according to Shmueli et al. (2016). The outcomes of the PLS-SEM test for the five hypotheses related to the research objectives are presented in Table 8.

4.4.2.1 Multicollinearity Test

As stated by Hair et al. (2014), a collinearity diagnostic is conducted to ensure that the path coefficients are not biased and to mitigate significant levels of collinearity among the predictor constructs. The VIF (variance inflation factor) values, presented in Table 7, indicate that the paths are free from multicollinearity, with a maximum VIF of 1.556. This value is below the threshold of 5 recommended by Hair et al. (2014), indicating that there is no issue with multicollinearity in the model.

Table 4.10: Multicollinearity Statistics

RELATIONSHIP	VIF
Supply Chain Disruption -> Supply Chain Managerial Capability	1.000
Supply Chain Disruption -> Supply Chain Performance	1.556
Supply Chain Managerial Capability -> Supply Chain Performance	1.495
Information Technology X Supply Chain Disruption -> Supply Chain Performance	1.416

Source: Field Survey (2023)

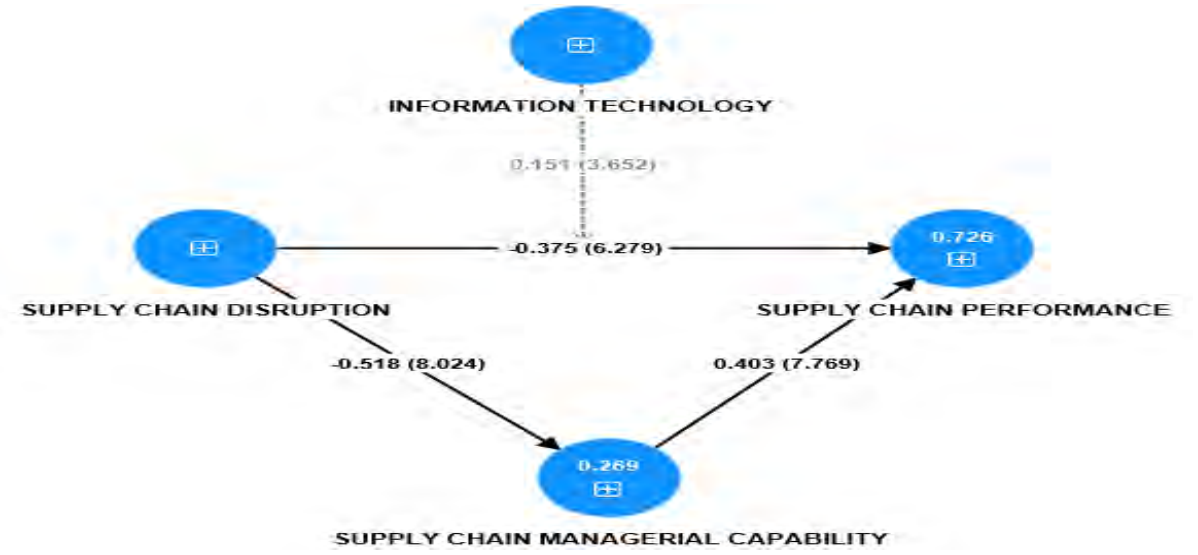


Figure 2.5: Final Model (Path Coefficient and T-values)

Source: Field Survey (2023)

Table 4.11: Assessment of Path Coefficients and Significance Level

Hypotheses: Relationship	β	M	F^2	SD	T statistics	P values	Decision Rule
H1: SCD -> SCP	-0.375	-0.373	0.330	0.060	6.279	0.000	Supported
H2: SCD -> SCMC	-0.518	-0.518	0.367	0.065	8.024	0.000	Supported
H3: SCMC -> SCP	0.403	0.397	0.398	0.052	7.769	0.000	Supported
H4: IT X SCD ->SCP	0.151	0.154	0.298	0.041	3.652	0.000	Supported
H5: SCD -> SCMC->SCP	-0.209	-0.205		0.035	6.004	0.000	Supported

*Note: * = $t > 1.96$; $p < 0.05$*

Source: Field Survey (2023)

4.4.3 Discussion of Findings

The first objective of the study was to examine the impact of supply chain disruption on supply chain performance. The findings revealed a significant negative effect of supply chain disruption on supply chain performance (β =-0.375, T=6.279, P=0.000). The results indicated a negative relationship between supply chain disruption and supply chain performance, supported by the T-value exceeding 1.96 and the P-value being less than 0.05. This suggests that a percentage increase in supply chain disruption leads to a 37.5% reduction in supply chain performance. Additionally, the effect size analysis demonstrated that supply chain disruption has a medium effect size on supply chain performance (f2=0.330). These findings highlight the critical role of supply chain disruption in diminishing the supply chain performance of the healthcare sector in Ghana, encompassing various risks such as demand, supply, process, and environmental risks. It is crucial to implement strategies to mitigate these risks proactively to enhance service delivery quality, reduce costs, and alleviate shortages within the healthcare supply chain.

The results of this study align with previous research by Parast and Subramanian (2021), Li et al. (2020), and Yan and Gray (2018). Parast and Subramanian found that supply chain interruption in China negatively affects the overall operation of the supply chain network. Li et al. investigated the impact of supply chain disruptions on hospital supply chain performance in China and confirmed the negative effect. Similarly, Yan and Gray observed that supply chain disruptions significantly increase operational costs and decrease overall performance in healthcare supply chain networks.

The second objective of the study was to examine the impact of supply chain disruption on supply chain managerial capability. The results of the study indicated a significant negative effect of supply chain disruption on supply chain managerial capability. The analysis revealed a strong and statistically significant relationship between supply chain disruption and supply

chain managerial capability (β = -0.518, T = 8.024, P = 0.000) supported by the T-value exceeding 1.96 and the P-value is less than 0.05. This suggests that a percentage increase in supply chain disruption leads to a 51.8% decrease in supply chain managerial capability. Furthermore, the effect size analysis demonstrated that the relationship between supply chain disruption and supply chain managerial capability has a medium effect size (F2 = 0.367). This indicates that the impact of supply chain disruption on supply chain managerial capability is substantial, with a considerable proportion of the variance in managerial capability being explained by the disruption in the supply chain.

The findings of the study align with Yang and Burns (2016) and Niranjan and Mehta (2020). Yang and Burns (2016) study aims to investigate the impact of supply chain disruptions on small and medium-sized enterprises (SMEs) in the manufacturing sector. The study found that supply chain disruptions had a significant negative impact on the supply chain management capabilities of firms. Similarly, the study by Niranjan and Mehta (2020) aims to investigate the impact of supply chain disruptions on the supply chain managerial capabilities of Indian manufacturing firms. They made use of supply chain disruption, and supply chain managerial capabilities and mediated with supply chain resilience. The results indicate that supply chain disruptions have a negative impact on supply chain managerial capabilities. However, they added that the negative effect can be reduced by the resilience of the supply chain. The study also identifies several factors that affect the resilience of supply chains, including supplier diversification, information sharing, and supply chain visibility.

The third objective examined the effect of supply chain managerial capability on supply chain performance. For hypothesis 4, the study findings revealed a significant and positive relationship between supply chain managerial capability and supply chain performance. The analysis showed that supply chain managerial capability has a substantial impact on enhancing supply chain performance (β = 0.403, T = 7.769, P = 0.000). This indicates that organizations

with stronger managerial capabilities in their supply chain operations are more likely to achieve better performance outcomes. This suggests that a percentage increase in supply chain managerial capability leads to a 40.3% improvement in supply chain performance. Moreover, the effect size analysis demonstrated that the relationship between supply chain managerial capability and supply chain performance is of medium strength (F2 = 0.398). This suggests that supply chain managerial capability explains a considerable proportion of the variance in supply chain performance.

The findings of the study align with Cao et al. (2015) and Jiang et al. (2017). According to Cao et al. (2015), supply chain managerial capability is positively related to supply chain performance. The authors found that firms with high supply chain managerial capability were able to achieve better supply chain performance than firms with low supply chain managerial capability. They suggested that firms should invest in developing supply chain managerial capability to improve their supply chain performance. Also, Jiang et al. (2017) found that supply chain managerial capability has a positive impact on supply chain performance. The authors examined the relationship between supply chain managerial capability and supply chain agility and found that firms with high supply chain managerial capability were able to respond more quickly to changes in the market and achieve better supply chain performance.

The fourth objective of the study also examined the moderating role of information technology in the relationship between supply chain disruption and supply chain performance. The results supported Hypothesis 2, with a t-statistic value of 3.652 exceeding 1.96 (p=0.000). This indicates that information technology has a significant positive effect on the relationship between supply chain disruption and supply chain performance. A β score of 0.151 suggests that information technology mitigates the negative effect of supply chain disruption on supply chain performance. Specifically, a unit increase in information technology weakens the impact of supply chain disruption on supply chain performance by 15.1%. The effect size analysis

revealed a medium effect size (f2=0.298) for information technology in the relationship between supply chain disruption and supply chain performance. These findings highlight the importance of information technology in enhancing supply chain performance during periods of disruption. Information technology encompasses various activities such as designing, developing, and managing computer-based information systems, utilizing computer networks for communication and collaboration, and employing automation tools for data management.

Within the healthcare supply chain, the effective utilization of computer-based applications such as Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), Decision Support/Expert Systems (DSS), Electronic Data Interchange (EDI), e-business, e-commerce, and barcoding is of paramount significance. These advanced technological tools serve as essential enablers, facilitating both descriptive and predictive data analysis, which, in turn, contributes to heightened visibility, enhanced forecast accuracy, and the seamless activation of contingency plans. Consequently, these technological interventions culminate in the notable improvement of product and service quality for customers within the healthcare supply chain, particularly when confronted with disruptions (Chopra & Meindl, 2007; Heizer et al., 2017; Ivanov & Dolgui, 2019b; Pettit et al., 2019; Lezoche et al., 2020).

Finally, a mediation analysis was conducted to assess the mediating effect of supply chain managerial capability on the relationship between supply chain disruptions on supply chain performance. For a mediation analysis, the direct and indirect relationship between the variables is tested to check for the significance among the variables. The results show that supply chain disruption negatively but significantly affects supply chain performance with β =-0.375, T=6.277, P=0.000, and the exogenous variable (supply chain disruption) also had a negative effect on the mediator (Supply chain managerial capability) with β = -0.531, T=8.662, P=0.000 but then had a positive and significant effect on supply chain performance with β = 0.402, T=7.896, P=0.000. This negative effect highlights the challenges faced by the health

sector in maintaining operational effectiveness during disruptive events. Furthermore, the analysis showed a positive and significant effect of supply chain managerial capability on supply chain performance. This indicates that health center with stronger managerial capabilities are better equipped to navigate disruptions and improve their overall supply chain performance.

The mediating effect results demonstrated that the negative effect of supply chain disruption on supply chain performance was partially mediated by supply chain managerial capability. The findings revealed a significant negative direct effect of supply chain disruption on supply chain managerial capability, indicating that when disruptions occur, the capability of managers to effectively respond and mitigate the impact is compromised by 21.3%. Specifically, the final mediating effect revealed a negative indirect relationship between supply chain disruption and supply chain performance, accounting for the mediating effect of supply chain managerial capability (β = -0.213, T=6.204, P=0.000). This implies that supply chain disruptions have a detrimental impact on supply chain performance, but the presence of strong managerial capability will tend to improve the mechanism between the relationship thereby leading to gradual improvement in performance when there is disturbance within the supply chain which is in line with assertion of dynamic capability theory proposed by Teece, Pisano, and Shuen (1997).

Table 4.12: Explanation of Target Endogenous Variable Variance

Latent Variable	R-square	Adjusted R-square	Predictive Relevance (Q2)
Supply Chain Managerial Capability	0.269	0.266	0.260
Supply Chain Performance	0.726	0.723	0.594

Source: Field Survey (2023)

4.4.4 Coefficient of Determination

This section of the study delved into assessing the predictive accuracy of the model based on the R-squared results, which serve as indicators of the model's explanatory power. As articulated by Hair et al. (2011), R-squared signifies the extent to which the exogenous variable, in this case, supply chain disruption, influences the endogenous variable, i.e., supply chain performance. Furthermore, R-squared elucidates the proportion of variability in the dependent variable that can be attributed to the independent factors (Cohen, 1988; Chuan & Penyelidikan, 2006). Specifically, an R-squared effect exceeding 0.67 indicates the presence of a robust model, an effect ranging from 0.67 to 0.29 suggests a model of moderate strength, while an effect below 0.29 indicates a relatively weak model.

The outcomes of the analysis reveal that supply chain disruption accounts for approximately 26.9% of the variance in supply chain managerial capability, signifying a relatively weak relationship within the model. Conversely, when considering the combined influence of supply chain disruption and the moderating variable, information technology, they jointly elucidate a substantial 72.6% of the variation in supply chain performance within the context of the health sector. This substantial R-squared value underscores a robust relationship within the model (Hair et al., 2011; Cohen, 1988; Chuan & Penyelidikan, 2006).

4.4.5 Predictive Relevance (Q^2)

The evaluation of the predictive significance of the exogenous latent factors was conducted using Stone-Geisser's Q2 test, as recommended by Roldan and Sanchez-Fransco (2012). In accordance with the methodology proposed by Hair et al. (2014), the assessment of predictive relevance (Q2) involves the exclusion of a segment of the dataset, followed by model evaluation and the subsequent prediction of the omitted portions based on the model

estimations. It is generally advised that the Q2 value should exceed 0 for exogenous variables (Henseler et al., 2009; Chin, 2010). Henseler et al. (2009) have put forth a framework for interpreting Q2 values: values at or below 0.02 indicate a weak impact, while values ranging from 0.15 to 0.35 suggest a moderate impact, and Q2 values surpassing 0.35 signify a strong impact. Nonetheless, it should be noted that Rigdon (2014) and Sarstedt et al. (2014) have contended that while a non-zero Q2 value demonstrates the predictability of the exogenous variable, it does not provide insights into the quality of the predictions.

Based on the information provided, the Q2 score for predicting the dependent variable, "supply chain performance," stands at 0.594, indicating a strong impact. This signifies that the model estimations hold significant predictive relevance for this specific construct. Furthermore, the Q2 score for predicting "supply chain managerial capability" is calculated at 0.260, suggesting a moderate impact. This implies that the model estimations exhibit a moderate level of predictive relevance for this construct. The findings elucidate that the estimated model demonstrates predictive relevance for the designated constructs, with a particularly robust impact on supply chain performance, as evidenced by the Q2 score.

4.5 Chapter Summary

In this chapter, we delve into a comprehensive analysis of the results obtained through the rigorous testing of hypotheses employing Partial Least Squares Structural Equation Modeling (PLS-SEM). Initially, the model underwent a thorough assessment to ensure its quality, with a subsequent in-depth discussion of the outcomes. Once the model met the predefined decision rules and quality criteria, a more in-depth investigation of the hypotheses ensued, with the subsequent findings presented and discussed in detail.

The study's empirical findings shed light on the significant impact of supply chain disruptions (SCD) on the performance of supply chains operating within the health sector.

Moreover, the results unveiled a noteworthy positive relationship between information technology deployment and the overall performance of supply chains in this context.

Although the original hypothesis positing a direct link between supply chain disruption and supply chain performance was not unequivocally supported, the findings suggest the existence of a partial mediation effect of supply chain managerial capability. This nuanced relationship underscores the importance of robust managerial capabilities in enhancing supply chain performance during times of disruption. It underscores the notion that supply chain managerial capability can play a pivotal role in ameliorating performance when supply chain risks are effectively managed or transformed to the benefit of the healthcare sector.

In sum, this study conclusively establishes the positive influence of information technology on supply chain performance, particularly in the challenging context of disruptions within the healthcare sector. These findings emphasize the vital role of technology in bolstering the resilience and efficiency of supply chains when faced with disruptive events.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION, AND RECOMMENDATIONS

5.1 Introduction

This chapter provides a comprehensive summary of the findings obtained from the study. It presents the conclusion drawn from the analysis of the data and offers practical recommendations based on the study's outcomes. Furthermore, the chapter acknowledges the limitations of the study and proposes suggestions for future research.

5.2 Summary of Findings

In this section, the summary of the study findings is presented, addressing the research objectives. The study aimed to investigate three specific research questions in the health sector:

1. What is the relationship between supply chain disruption and supply chain performance?
2. What is the relationship between supply chain disruption and supply chain managerial capability?
3. What is the relationship between supply chain managerial capability and supply chain performance?
4. To what extent does IT moderate the relationship between supply chain disruption and supply chain performance?
5. What is the mediating role of supply chain managerial capability on the relationship between supply chain disruption and supply chain performance?

To answer these questions, a cross-sectional survey research strategy was employed, gathering 289 valid responses from healthcare providers in the Greater Accra Region of Ghana. The

collected data was then analysed using PLS-SEM (Partial Least Squares Structural Equation Modelling).

The findings revealed that supply chain disruption has a significant negative impact on supply chain performance in the health sector. Different types of disruptions, including supply risks, process risks, and environmental risks, were identified as factors that hamper the efficiency and effectiveness of the supply chain. This suggests that when disruptions occur within the supply chain, it negatively affects the overall performance of the health sector's supply chains. The findings emphasize the importance of effectively managing and mitigating these risks to improve the quality-of-service delivery, reduce costs, and avoid shortages within the healthcare supply chain.

The study revealed a negative relationship between supply chain disruption and supply chain managerial capability. These findings highlight the importance of effectively managing supply chain disruptions in order to maintain and enhance supply chain managerial capability. By mitigating the negative effects of disruptions, organizations can strengthen their managerial capability to effectively respond and adapt to challenges in the supply chain. It is crucial for organizations in the health sector to develop strategies and mechanisms that improve their supply chain managerial capability in the face of disruptions. This may include investing in training and development programs for supply chain managers, implementing robust contingency plans, and fostering collaboration and communication among supply chain stakeholders. These findings can guide organizations in the health sector in their efforts to build resilience and enhance their capability to effectively manage disruptions in the supply chain.

The findings reveal that there is a positive relationship between supply chain managerial capability and supply chain performance. These findings underscore the significance of investing in the development and improvement of supply chain managerial capability within the health sector. Healthcare organizations should prioritize initiatives aimed

at enhancing the skills, knowledge, and competencies of supply chain players within the firm. This can be achieved through targeted training programs, continuous professional development, and fostering a culture of innovation and collaboration within the supply chain team. By strengthening supply chain managerial capability, organizations can effectively address the challenges posed by supply chain disruptions and improve overall supply chain performance. This includes enhancing operational efficiency, reducing costs, optimizing inventory management, and ensuring timely delivery of healthcare products and services.

The study revealed a positive relationship between information technology (IT) and the performance of supply chains under disruption. This means that the utilization of IT tools and systems can enhance the performance of supply chains, even in the presence of disruptions. IT plays a critical role in improving visibility, forecast accuracy, contingency plan activation, and data management within the healthcare supply chain. By leveraging IT applications such as Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), and Decision Support/Expert Systems (DSS), healthcare organizations can achieve better performance outcomes.

The hypothesis regarding the mediation of supply chain managerial capability was supported, the study identified a partial mediation effect. This suggests that supply chain managerial capability plays a significant role in mediating the relationship between supply chain disruption and supply chain performance. Strengthening managerial capabilities, such as proactive and effective risk management strategies and stakeholder engagement, can help improve supply chain performance in the face of disruptions. It highlights the need for healthcare organizations to develop and enhance their managerial capabilities to effectively respond to and navigate supply chain disruptions.

5.3 Conclusion

In conclusion, this study aimed to investigate the mediating and moderating roles of supply chain managerial capability and information technology in the link between supply chain disruption and supply chain performance in the health sector. Through a cross-sectional survey research strategy and analysis using Partial Least Squares Structural Equation Modelling (PLS-SEM), valuable insights have been gained. The findings of this study have significant implications for healthcare organizations and provide a deeper understanding of the dynamics within the healthcare supply chain. It was revealed that supply chain disruptions have a detrimental impact on the performance of the supply chain in the health sector. These disruptions, including supply risks, process risks, and environmental risks, hinder the efficiency and effectiveness of the supply chain, leading to potential challenges in delivering quality healthcare services.

Furthermore, the study highlighted the crucial role of information technology as a moderator in mitigating the negative effects of supply chain disruptions. Advanced IT tools, such as Enterprise Resource Planning (ERP) systems and Decision Support Systems (DSS), were found to enhance visibility, data management, and decision-making processes. By leveraging technology, healthcare organizations can better respond to disruptions, improve supply chain resilience, and enhance overall performance. Additionally, the study identified the mediating effect of supply chain managerial capability in the relationship between supply chain disruption and supply chain performance. Effective supply chain management practices, including risk management strategies and stakeholder engagement, were found to play a pivotal role in mitigating the negative impact of disruptions. Strengthening supply chain managerial capabilities through training and development programs is crucial for healthcare organizations to effectively manage disruptions and optimize supply chain performance.

5.4 Implication and Recommendations

5.4.1 Implications

The findings of this study have important implications for healthcare organizations in the health sector. They highlight the need for proactive supply chain management practices to mitigate the negative impact of disruptions on supply chain performance. Organizations should prioritize risk management strategies, stakeholder engagement, and the development of supply chain managerial capabilities to enhance their ability to respond effectively to disruptions. In addition, it emphasizes the role of information technology in improving supply chain performance. Healthcare organizations should invest in advanced IT infrastructure and tools to enhance visibility, data management, and decision-making processes. By leveraging technology, organizations can better monitor and track their supply chain activities, optimize inventory management, and improve overall operational efficiency.

The study underscores the importance of collaboration among healthcare providers, suppliers, and other stakeholders in the supply chain. Organizations should foster strong partnerships and promote information sharing to enhance supply chain resilience and responsiveness. Collaborative efforts can lead to improved coordination, reduced lead times, and better alignment of supply and demand.

5.4.2 Recommendations

The study recommends that healthcare organizations should develop and implement comprehensive risk management strategies to proactively address supply chain disruptions. This includes conducting regular risk assessments, identifying potential risks, and establishing contingency plans to mitigate their impact. Organizations should also invest in training programs to enhance the skills and knowledge of supply chain managers in managing risks effectively. Secondly, healthcare organizations should prioritize the adoption and integration

of advanced information technology solutions into their supply chain operations. This includes implementing ERP systems, DSS, and other digital tools that can improve data visibility, analytics, and decision-making capabilities. IT infrastructure should be regularly updated and maintained to ensure optimal performance.

Also, there is a need to focus on developing strong supply chain managerial capabilities. This can be achieved through training programs, workshops, and mentoring initiatives that enhance the skills and competencies of supply chain professionals. Organizations should also encourage cross-functional collaboration and knowledge sharing to leverage the expertise of individuals across different departments. Collaboration and partnership building should be promoted among healthcare organizations, suppliers, and other stakeholders in the supply chain. Regular communication channels should be established to facilitate information sharing, coordination, and joint problem-solving. Collaborative initiatives, such as shared forecasting and inventory management, can help reduce costs, improve efficiency, and enhance overall supply chain performance.

Continuous monitoring and evaluation of supply chain performance should be conducted to identify areas for improvement and track progress over time. Key performance indicators (KPIs) should be defined and regularly measured to assess the effectiveness of supply chain management practices. Organizations should use performance data to identify bottlenecks, implement process improvements, and drive continuous innovation in their supply chain operations. It is important for healthcare organizations to consider these implications and recommendations to enhance their supply chain performance and resilience in the face of disruptions. By proactively managing risks, leveraging technology, fostering collaboration, and investing in supply chain capabilities, organizations can optimize their supply chain operations and ultimately improve the quality and accessibility of healthcare services.

5.5 Suggestions for Further Research

Based on the limitations identified, the following suggestions are proposed for future research:

The study suggests that there is a need to expand the sample size and geographic representation. Conducting studies with a larger and more diverse sample size, including healthcare facilities from different regions, would enhance the generalizability of the findings. This would provide a more comprehensive understanding of the relationships between supply chain disruption, supply chain performance, and the mediating and moderating variables in the healthcare sector.

In addition, the study suggests incorporating a mixed-methods approach that combines quantitative surveys with qualitative methods, such as interviews or focus groups, which can provide richer insights into the experiences and perceptions of healthcare managers and other stakeholders. This would allow for a more comprehensive understanding of the complexities and nuances of supply chain management in the healthcare sector. Also, explore other mediating and moderating variables since this study focused on supply chain managerial capability and information technology as mediating and moderating variables respectively, there may be other factors that influence the relationship between supply chain disruption and supply chain performance. Future research could investigate additional variables, such as organizational culture, supplier relationships, or government policies, to uncover their potential effects on supply chain outcomes.

The study also suggests longitudinal studies that follow healthcare organizations over an extended period would provide insights into the long-term effects of supply chain disruption and the effectiveness of supply chain management practices. This would allow for the examination of how supply chain performance and the mediating and moderating variables evolve over time and how they are influenced by changing external factors. Finally, investigate the impact of different supply chain disruption types. This study focused on overall supply

chain disruption without differentiating between specific types of disruptions. Future research could explore the impact of different disruption types, such as natural disasters, supplier failures, or regulatory changes, on supply chain performance and the effectiveness of supply chain management practices.

By addressing these limitations and pursuing further research in these areas, a more comprehensive understanding of supply chain management in the healthcare sector can be achieved, leading to more effective strategies for mitigating disruptions and improving supply chain performance.

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APPENDIX

University of Education, Winneba

School of Business

Department of Procurement and Supply Chain Management

Dear Sir/Madam,

I am a final year graduate student at the University of Education, Winneba studying Master of Philosophy in Procurement and Supply Chain Management. As part of the requirements for partial fulfilment of my master's degree, I am conducting research entitled "***Effect of Supply Chain Disruption on Supply Chain Performance, the Role of Information Technology and Supply Chain managerial capability***". Your participation in this research by completing the enclosed questionnaire would be highly valued. Please be assured that all information provided will be treated with strict confidentiality, as no names will be required. The data collected will be used solely for academic and research purposes. Thank you for your contribution.

SECTION A: DEMOGRAPHIC INFORMATION OF RESPONDENT

1. Sex [ ] Male [ ] Female

2. Age Range [ ] 20 – 30 years [ ] 31 – 40 years [ ] 41 – 50 years [ ] 51 years and above

3. Indicate your highest level of education

[ ] Senior High School /Certificate [ ] Higher National Diploma [ ] Bachelor's Degree [ ] Postgraduate [ ] Others (please specify)….....

4. How many years have you been working in this health center?

[ ] 1-5 [ ] 6-10 [ ] 11-15 [ ] 16-20 [ ] Above 20

5. Position hold in the health center

[ ] Supply Manager [ ] Procurement/Purchasing Manager [ ] Operations manager

[ ] Purchasing Manager [ ] Store Manager [ ] General Manager [ ] Logistics Manager

[ ] Administrators

INSTRUCTION: Please tick {√} in response to the questions

SECTION B: SUPPLY CHAIN DISRUPTION

Please tick (√) appropriately, **from 1 (strongly disagree), 2 (disagree), 3 (somewhat disagree), 4 (neutral), 5 (somewhat agree), 6 (agree), to 7 (strongly agree)**

Our health center is not adversely affected by:

SUPPLY RISK		**1**	**2**	**3**	**4**	**5**	**6**	**7**
SR 1	Inconsistent product quality							
SR 2	Poor delivery performance from suppliers (e.g., inconsistent delivery)							
SR 3	Unexpected capacity fluctuations or shortages.							
SR 4	The reliability of our suppliers.							
PROCESS RISK		**1**	**2**	**3**	**4**	**5**	**6**	**7**
PR 1	Machine breakdowns							

PR 2	Utility outages							
PR 3	Limited access to the capacity to deliver services to our patients.							
PR 4	Regularly unforeseen technology failures during our service delivery.							
ENVIRONMENTAL RISK		**1**	**2**	**3**	**4**	**5**	**6**	**7**
ER 1	Political instability, socio-political, and war crises (tax, new health policies, and laws, Russian-Ukraine war)							
ER 2	International restrictions							
ER 3	Stakeholder opinion exerts significant pressure on our Operations.							
ER 4	Natural disasters and disease outbreaks (e.g., earthquake, flooding, extreme climate, tsunami, measles, pandemic eg covid 19, SARs)							

SECTION C: INFORMATION TECHNOLOGY

Tick (*√*) appropriately, **from 1 (strongly disagree), 2 (disagree), 3 (somewhat disagree), 4 (Neutral), 5 (somewhat agree), 6 (agree), to 7 (strongly agree)**

	Information Technology used in our health center has	1	2	3	4	5	6	7
IT 1	Improved communication and collaboration among our stakeholders.							
IT 2	Improved the tracking and monitoring of inventory							
IT 3	Improved traceability and transparency.							

IT 4	Increased the speed in processing information							
IT 5	Assisted in extracting valuable data and analytics to make more informed decisions							

SECTION D: SUPPLY CHAIN MANAGERIAL CAPABILITY

Please tick (*√*) appropriately, **from 1 (strongly disagree), 2 (disagree), 3 (somewhat disagree), 4 (Neutral), 5 (somewhat agree), 6 (agree), to 7 (strongly agree)**

	Our health center is able to:	1	2	3	4	5	6	7
SCMC 1	Adapt new practice to respond to changes							
SCMC 2	Reconfigure resources to respond to changes							
SCMC 3	Develop skills to respond to changes							
SCMC 4	Partner with its supplier/customers (patients)							
SCMC 5	Enhance knowledge through professional engagement							

SECTION E: SUPPLY CHAIN PERFORMANCE

On a scale of 1 – 7, please tick **(***√***)** appropriately, **from 1 (strongly disagree), 2 (disagree), 3 (somewhat disagree), 4 (Neither agree nor disagree), 5 (somewhat agree), 6 (agree), to 7 (strongly agree)**.

	Our health center has experienced:	1	2	3	4	5	6	7
SCP 1	Reduction in the rate of patients complaint							

SCP 2	Speedy service delivery							
SCP 3	Timely responses to patient requests with seamless processes.							
SCP 4	Clear, complete, and accurate information within the supply chain							
SCP 5	Fair and affordable service charges to patients.							
SCP 6	Improvement in inventory management cost							
SCP 7	Increase in Patient Satisfaction							
SCP 8	Improvement in Health Center-Supplier relationship							
SCP 9	Improved and quick registration and admission processes							

THANK YOU FOR PARTICIPATING