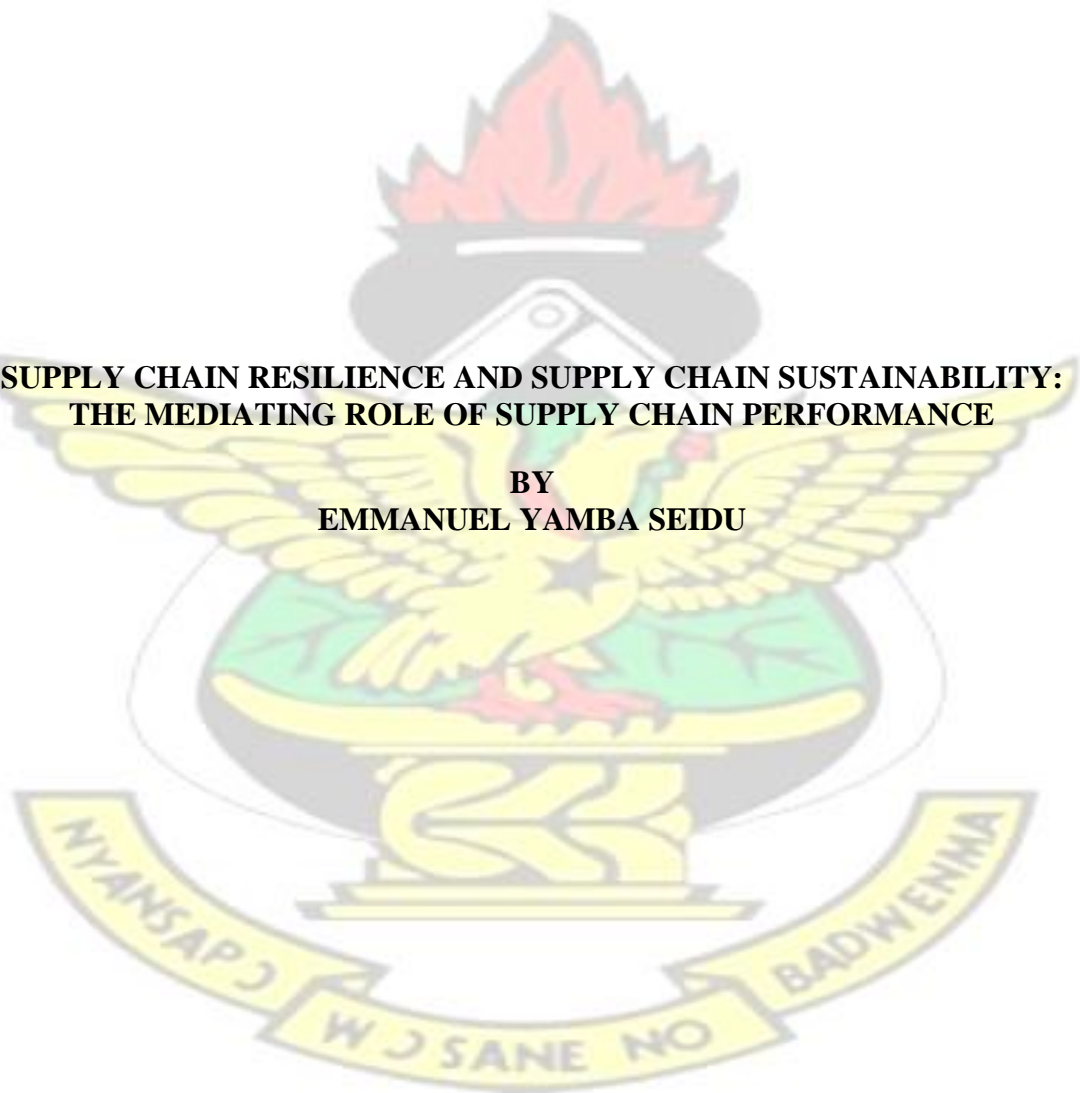**KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI**
INSTITUTE OF DISTANCE LEARNING

SUPPLY CHAIN RESILIENCE AND SUPPLY CHAIN SUSTAINABILITY: THE MEDIATING ROLE OF SUPPLY CHAIN PERFORMANCE

BY
EMMANUEL YAMBA SEIDU

MARCH, 2023

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BY
EMMANUEL YAMBA SEIDU
(BSc. Marketing)

A THESIS SUBMITTED TO THE DEPARTMENT OF SUPPLY CHAIN AND INFORMATION SYSTEMS, INSTITUTE OF DISTANCE LEARNING IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF THE DEGREE OF

MSC LOGISTICS AND SUPPLY CHAIN MANAGEMENT

MARCH, 2023

DECLARATION

I hereby declare that this thesis is the result of my original work for the MSc. in Logistics and Supply Chain Management, and that, to the best of my knowledge, it does not contain material published by another person or materials accepted for the award of any other University degree, except where appropriate acknowledgments have been made in the text.

Emmanuel Yamba Seidu   ……...........................   ……...........................
(PG 20189621)   Signature   Date

Certified by:

Dr. Dorcas Nuertey   ……...........................   ……...........................
(Supervisor)   Signature   Date

Certified by:

Prof. David Asamoah   ……...........................   ……...........................
(HOD, SCIS Department)   Signature   Date

DEDICATION

I devote this thesis to the glory of God, who enabled me to complete it via his unmerited favours and Grace. I also dedicate it to my wonderful wife for her constant encouragement and support throughout the preparation of this thesis. May God continue to bless and keep her in his care for me.

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My deepest thankfulness goes to the Almighty God for his strength and mercy throughout this work. Special thanks also go to my supervisor, Dr. Dorcas Nuertey, for her exceptional supervision, direction, and inspiration, which helped me complete this thesis successfully. May God continue to bless her and grant her every heart's desire. I'd want to express my gratitude to all of my lecturers and friends who have helped me complete this project in various ways. May God generously bless us all.

ABSTRACT

To ensure efficient, resilient, sustainable and competitive supply chain systems, supply chain managers and companies have drifted their attention and focus from being individuals and organizations to being supply chain. Supply chain managers now have the comprehensive responsibility of understanding and ensuring the complete performance of supply chain management systems to ensure the driven competitive advantage that organizations seek and to holistically improve the performance of the organizations whiles balancing the streamlined satisfaction of the consumers. A quantitative research design was employed for the study. The purpose of the study was to examine the role of supply chain performance on supply chain resilience and sustainability. A quantitative survey design was adopted by the study and a population of about 1,750 firms were used by the study. A total of 120 firms of the Accra Metropolitan area were sampled for the study and a questionnaire instrument was employed in gathering data from the top managers and staff of the sampled manufacturing firms accordingly. The study findings revealed that supply chain resilience positively and significant affects both sustainability performance and supply chain performance directly, whereas supply chain performance did not significantly affect sustainability performance. Also, supply chain performance did not significantly mediate the relationship between supply chain resilience and sustainability performance. The study therefore recommended that managers focus on developing their supply chain resilience capabilities to ensure that they are able to reap the positive benefits in both the short and long run, as it had significant ramifications for both supply chain and sustainability performance.
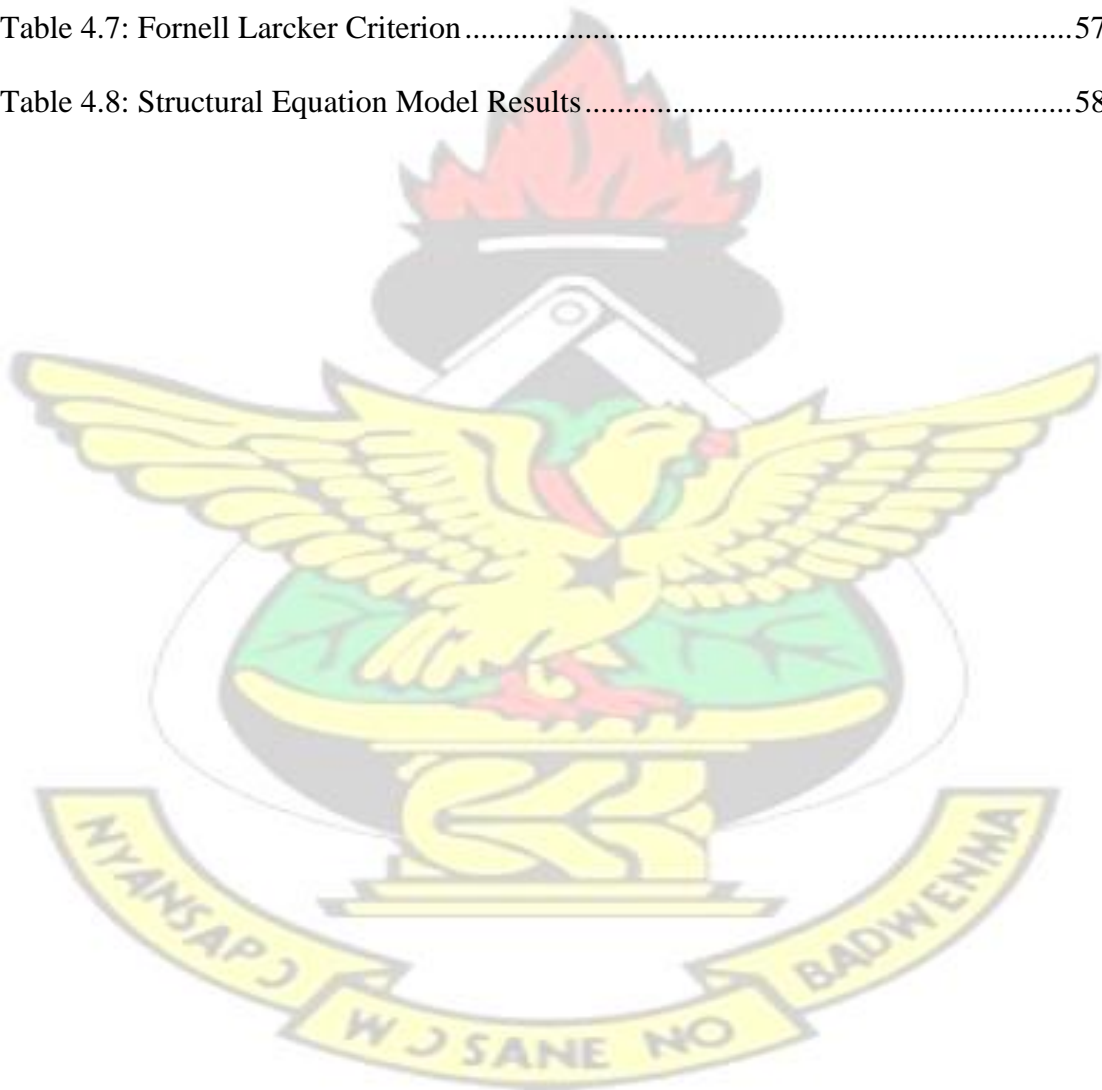
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LIST OF ABBREVIATIONS/ACRONYMS

B2B   Business to Business

B2C   Business to Consumers

CO2   Carbon Dioxide

HRO'S   High Reliability Organizations

ILO   International Labour Organization

IT   Information Technology

NGOS   Non-Governmental Organizations

OECD   Organization for Economic Cooperation Development

PLC's   Product Life Cycles

RBT   Resource Based Theory

SC   Supply Chain

SCM   Supply Chain Management

SCP   Supply Chain Performance

SCR   Supply Chain Resilience

SCR   Supply Chain Resilience

SP   Sustainability Performance

TCE   Tangible Common Equity

WIP   Work in progress

CHAPTER ONE

INTRODUCTION

1.1   Background to the Study

Organizational competitiveness has changed from a focus on internal skills to a focus on the entire supply chain in today's highly unstable and competitive marketplaces (Ketchen and Hult, 2007). Organizations realised the necessity to continually stay relevant and competitive in the midst of continue competition, enhancing internal efficacy was no longer efficient (Childhouse and Towil, 2003). Recently, they have come to light, and the focus has switched from supply chain management at the plant level to enterprise level (Gunasekaran et al., 2005). Enhancing productivity and making the entire supply chain competitive, supply chain coordination has grown strategically crucial (Puigjaner and Lainez, 2008). In the view of Moslem et al. (2013), ''understanding and implementing supply chain management (SCM) is prudently important for keeping competitiveness in the global market and boosting profitability''.

The complete procedure of controlling goods and services from its raw material stage to a finished product that consumers use is termed as supply chain. This movement includes not only material flow but also financial and information flow. Comparatively, (Christopher, 1998) opined that supply chain is ''the arrangement of higher and lower organizations involving in the different activities and strategies that yields results in the production of goods and services for the consuming customers''. ''Hence, the purpose of sustainability is to keep a perfect equilibrium between the three actors of development that together determine scope of human existence which includes social economic and environmental goals''. (OECD, 1997; DETR, 1999). There is currently a growing interest in sustainability performance as a term significantly in both the enclave of business and other aspects of society today (Carter and Easton, 2011). Hence, it is now and ardent issue of concern to manufacturers to impeccably consider economic, environmental and social attributes in the gaols, strategies, culture and decision making expediently (Blengini and Shields, 2010), as there is a growing pressure from customers, non-governmental organizations, government authorities and the employees themselves demanding of the organizations to address and manage the issues resulting on the society and environment as a consequence of their activities,

such issues have become crucial to managers today (Carter and Easton, 2011). In the affirmation that sustainability is inevitable concern for business executives in every nation," Porter and Kramer (2006) assert that ''having a capability in sustainability can give a firm a competitive edge if such expertise is relatively uncommon in the market'' (Mentzer et al., 1989). Carter and Easton, 2011 opined that '' strategically supply chain managers have been positioned purposefully to influence the environmental and social performance through supply chain activities such as supplier development and selection, modal and carrier selection, vehicle routing and scheduling, location decisions, and packaging options''. According to Winter and Knemeyer (2013), ''there exist an efficient relationship between supply chain management and sustainability which focuses on functional aspects that affect success as much as elements that affect people and the environment''. As a result, Markley and Davis, 2007 elucidates that many enterprises today comprehensively rely on the efficiency acquired through supply chain networks for a long-term success.

Globally, as supply chain becomes more vulnerable and disrupted, an efficient supply chain is needful for the network's long-term practicality (Christopher and Peck, 2004). Supply networks, in addition to financial hazards, raise ethical and environmental considerations (Foerstl et al, 2010). As indicated by (Perez-Sanchez, Barton, and Bower 2003; Nawrocka 2008) companies of the modern age are severely under increasing pressure from a wide scope of stakeholder groups to infuse sustainability into their supply chain management process. ''Given this background, it is relevantly important to have in place a strong supply chain to help fight against risks from all perceptions to help ensure the network's long-term viability'' (Christopher and Peck 2004; Ponomarov and Holcomb, 2009). To cope with the challenges posed by turbulent transformation and disruption, organizations must develop a proactive and resilient strategy (Jüttner and Maklan, 2011). Resilience is a business's ability to survive, adapt and grow in the face of adversity. A proactive and thorough approach like this is essential to ensure supply chain sustainability (Ponomarov and Holcomb, 2009). It is important to note that the level of vulnerability and situation affects resilience (Korhonen and Seager, 2008).

For this reason, companies consider it essential to identify and assess each customer's risks and vulnerabilities in order to build the necessary resilience in the event of a

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significant disruption (Zsidisin and Ellram, 2003; Wu et al., 2006). "Supply chain management is critical, especially as volatility and uncertainty persist." Therefore, supply chain management must take environmental concerns into account when making decisions regarding any element of planning, sourcing and sourcing, conversion or other logistics management tasks. For the supply chain to successfully create and distribute value in a volatile business environment, risk management is increasingly necessary. Faced with this problem, researchers such as Blos et al. (2009), Jüttner and Maklan (2011) and Pettit et al. (2013) theorize the evolution of risk management and resilience in supply chain management. To decrease vulnerabilities and accomplish supportability, concurring to Ponomarov and Holcomb (2009), "it is fundamental to construct strong capabilities". Comparable to this, inquiries have talked almost the moderating devices required to address supply chain vulnerabilities. For example, Haider (2007) "proposes improving household in reverse joins in arrange to abbreviate fabricating and dispersion times, upgrading social and natural compliance, and putting more accentuation on the expansion of item and showcase mix". Among others, Ahmed (2009), Nuruzzaman et al. (2010) "discuss the significance of forward and reverse linkages, item separation, different sources of supply, channel rerouting to anticipate late conveyance, keeping up save capacity, quality control and imperfection rate decrease, expertise and proficiency advancement, item and handle advancement, estimating and prescient examination to follow the vulnerabilities, client responsiveness, and compliance".

Organizational resilience was identified in a recent study by Lengnick Hall et al. (2011) as "a firm's ability to absorb and generate situationally specific responses to disruptive events." According to Mitroff and Alpasan (2003), resilient organizations "are proactive and recover faster in the face of adversity." They emphasize flexibility and the ability to adapt to the positive and negative effects of environmental uncertainty in addition to resilience. Hamel and Valikangas (2003) therefore emphasize that "resilience is based on flexibility and adaptive preparedness for disruptions rather than simple recovery". According to Ponomarov and Holcomb (2009), in the organizational perspective on resilience, the focus is on "critical characteristics, including adaptability, flexibility, sustainment, and recovery." Erol et al. (2010) emphasize flexibility, redundancy, adaptability, connectivity, and agility when characterizing resilient organizations. Because resilient supply chains rely on the characteristics of resilient

organizations, the characteristics of resilient organizations are comparable to the characteristics of resilient supply chains (Pettit et al. 2010).

Supply chain resilience (SCR) highlights the adaptability of systems to mitigate transient disruptive events (Briano, et al. 2009; Smith, 2004). According to Sheffi and Rice (2005), "supply chain resilience is developed to correspond to three distinct phases of disruptive events: "preparedness", "responsiveness" and "resilience". Furthermore, other studies have used system response and recovery times as a measure of resilience (Hamel and Välikangas, 2003; Mitroff and Alpaslan, 2003). The ideas of response and recovery can also be seen as related and incompatible. For example, a quick and effective recovery depends on a quick response. According to Falasca et al. (2008) and Craighead et al. (2007), "supply chain resilience is a characteristic of supply chain design". As a result, the properties of supply chain capability, supply chain design, and supply chain preparedness, reaction, and recovery may all be castoff to understand supply chain resilience. This study defines supply chain resilience as "the attribute of a supply chain to exhibit certain capabilities such as flexibility, redundancy, integration, efficiency, market and financial strength as well as ensuring quick readiness, response and recovery from crisis through a well-controlled and connected supply chain design for achieving long-term sustainability in the supply chain" based on the concept of supply chain resilience in previous studies.

1.2   Problem Statement

With research showing that supply chain disruption risk has a significant negative impact on a company's short-term performance (Tang 2006a, Shukla et al. 2010), executives and researchers have made significant efforts to create a new type of supply chain that is resilient to supply chain disruptions disorder and heals quickly afterward. This capacity is reflected in the idea of resilience, which refers to the ability to recover from failure and return to an original state (Christopher and Peck, 2004; Sheffi 2005). Research on supply chain risk management has attracted attention due to the relevance of supply chain resilience. However, in a more crowded marketplace, many companies have begun to understand that good supply chain management techniques are necessary to give their products and/or services a sustainable competitive advantage, while improving organizational and overall supply chain performance (Li et al., 2006).

According to Abbasi et al. (2010), "the growth and overall survival of businesses and organizations in today's global economic and competitive market depends gallantly on the special importance and dedication to supply chain management activities as well as strong integrated relationships between organizations and customers, so it is important that the customer is at the centre of all marketing efforts. Gilaninia et al. (2011) confirmed the previous view, according to Abbasi et al. (2010).

Despite the growing emphasis on supply chain management practices, the literature has not been able to provide much input to support the practical application of supply chain management practices to adapt to all relevant situations (Cigolini et al., 2004). This is attributed to a number of factors, such as the interdisciplinary origins of supply chain management, its conceptual ambiguity, the evolution of ideas, and the variety of environments in which supply chain companies operate. "There is much evidence to show how cultural, social, and economic aspects influence supply chain management processes, performance, and customer satisfaction" (Harland, 1997; Mentzer et al. events, 2001, and Kaufmann and Carter, 2006). Companies have reviewed and adjusted their strategies in many ways, and they have learned that customer satisfaction is essential to their survival. To manage the supply chain effectively, interactions between suppliers and customers must be fully coordinated and communicated. Fast information flow between network components helps build efficient supply chains (Shekari et al., 2006). This context inspired the researcher to conceive a study on how supply chain sustainability and resilience influence performance.

Operational efficiency is a source of competitive advantage that allows an organization to stand out from its competitors from the customer's standpoint by operating at flexible costs and thus achieving higher profits (Christopher, 1992). Price/cost ratio, quality, delivery, flexibility and time to market are calculated competitive criteria to measure performance. On the other hand, organizational performance is related to how well the organization achieves its financial and market-oriented goals (Yamin et al., 1999). The short-term goal of SCM is mainly to improve production performance, while the long-term goal is to increase the market share and profits of all members of the supply chain (Tan et al., 1998). According to Li et al. (2006), "any organizational initiative, including supply chain management, will ultimately contribute to improving organizational performance." The research gap of the study mainly lies in the fact that supply chain

management activities have not fully achieved the goals of supply chain operating organizations.

1.3 Research Objectives

 The main objective of the study is to examine the role of supply chain performance on supply chain resilience and sustainability

i. To examine the contribution of supply chain resilience to organizational performance?

 ii. To determine the relationship between supply chain sustainability and organizational performance?

iii, To determine the relationship between supply chain performance and organizational performance

1.4 Research Questions

What is the contribution of supply chain resilience to organizational performance?

. What is the relationship between supply chain sustainability and organizational performance?

What is the relationship between supply chain performance and organizational performance?

1.5 Justification of the Study

This research work (Thesis) contains empirical and research evidence of contributions. This work is important and useful to academicians, policy think tanks, industry players and decision-making bodies with comprehensive understanding and cohesive knowledge in the new paradigm shift (supply chain resilience) to help firms to recover from the shock (disruptions) they encounter in the economic, social and environmental aspects of their business operating space.

The information and knowledge gained from this research work will broaden the horizons of industry players and experts to effectively consider the role of supply chain

resilience in meeting the needs of the organizations to enhance their strategies to recover from the social, economic and environmental disruption risks. It is therefore an important area for research as by the extensive evidence, this study will add to the knowledge based that exist already for academicians to be able to refer from as a complete document. Again, further studies can be investigated following the findings from this study.

1.6 Research Methodology

Purposive and convenience sampling methods were employed to analyse and interpret the data using both structured questionnaires. The analysis included drawn conclusions from collected and processed data. firms in Accra business area were chosen to allow for easy accessibility and availability of respondents. The study was based on 120 sampled manufacturing firms.

1.7 Scope of the Study

The study is focused on manufacturing companies within the Accra business region. This research a holistic and in-depth analysis of the sampled manufacturing companies in Accra with detailed focus on the mediating role of supply chain performance.

1.8 Limitation of the study

The study was limited in scope as the focus was concentrated only to part of the Greater Accra region in Ghana, this will therefore affect the generalization to other major cities in the country. Time and cost were also another limitation that this study faced in obtaining information and the administration of the questionnaires to the sample respondents. This is because, the completion of the research work was based on a deadline which significantly needed to be met as a requirement of the study.

1.9 Organization of the Study

There are five chapters in this work. The study's history, the problem statement, the research objectives, the research questions, the justification for the investigation, a brief description of the methodology, the scope of the study, its constraints, and its organization are all covered in the first chapter's general introduction. The second

chapter is devoted to a study of the literature, which includes theoretical and conceptual frameworks, definitions, and justifications based on theoretical, empirical, and anecdotal data. The fundamental components of research design, methodology, and methodologies, study population, sampling strategies, sample size, data sources, instruments, methods of data collecting, and explanation for the choices made, analysis, research ethics, and conclusion make up Chapter 3 discussion of research methodology. While the final chapter provides the summary, conclusions, and suggestions, Chapter 4 is focused on the data gathering and representation.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter's primary focus is a review of pertinent literature that was used in the study. There are three major sections in this chapter two: The definition of the important variables required for the study is the focus of Section 2.1. The key theories supporting the study of SCRS are the focus of Section 2.2. Information on the empirical literature that has been undertaken is the focus of Section 2.3. The conceptual framework of the study is the focus of Section 2.4.

2.1 Conceptual Review

This section of the study presents the definitions of the various concepts such as Supply Chain Resilience (SCR), Sustainability Performance (SP) and Supply Chain Performance (SCP) etc. in the research and how it is defined by different scholars.

2.1.1 The Concept of Supply Chain Resilience

Significant evidence through research has shown that supply chain resilience risk has a revivified correlated negative effect on the company's short-term performance. Academicians, researchers and managers of organizations have collaboratively been working tirelessly to create a viable supply chain that can survive disruptions and convalesce immediately (Tang 2006a, Shukla et al., 2010). The effective character is constituted under the conceptualization of resilience, which pragmatically has the capability to recover from setbacks and return an organization to its initial performing standards (Christopher and Peck, 2004; Sheffi, 2005). The science of supply chain risk management has been revitalized by supply chain resilience. The idea of supply chain resilience is still debatable, and it's still not totally clear how to put it into practice. The concept of resilience has been studied by several scientific fields. According to Lighezzolo and De Tychey (2004), ''metallurgy's definition of resilience is the relationship between the kinetic energy needed to fracture a metal item and the surface area of the broken area''. Resilience has been defined by psychologists and sociologists as "a dynamic capability to adjust his or her model level of ego-control, in either direction, as a function of the demand features of the environmental context" (Tisseron,

2007; Block and Block, 1980). More of a personality attribute than a skill, resilience is valued. In crisis management and the concept of High-Reliability Organizations (HROs), such as nuclear power plants, nuclear aircraft carriers, and air traffic control, resilience emerged as a source of important lessons for how all businesses should reduce errors and handle peak demands (Weick and Sutcliffe, 2001). According to Kendra and Wachtendorf (2003), resilience in the management field is "a fundamental quality of individuals, groups, organizations, and systems as a whole to respond productively to significant change that disrupts the expected pattern of events." Resilience is linked to risk and vulnerability in the context of supply chains in the sense that not all risks can be totally avoided, managed, or eliminated (Christopher and Peck, 2004; Peck, 2006). The ability of a supply chain to recover from a disruption (Sheffi and Rice, 2005), to return to its pre-disruption or ideal state (Christopher and Peck, 2004), or to "maintain or regain a dynamically stable state, which allows it to continue operations after a major mishap and/or in the presence of a continuous stressor" are all examples of supply chain resilience. (Hollnagel and colleagues,2006). Sheffi (2005) ''offers an important move, noting that supply chain resilience now includes the potential of a supply chain to be better positioned than the competitors and even gain an advantage from interruptions''.

According to Ponomarov and Holcomb (2009), "supply chain resilience is an institutional measure of a supply chain's accepted ability to recognize unforeseen events, respond to disruptions, and overcome by maintaining operational continuance at the expected and connected level control of structure and function" According to Christopher and Peck (2004), the definition of supply chain resilience is "the ability of an organization to return to its original state or to move to a new, more necessary state after encountering difficulties." Sheffi (2005) makes the following assertions equally clearly: "The resilience of a material is its ability to return to its original shape after being deformed. In the business world, resilience refers to "the ability of a business to recover quickly from a significant setback (such as the time required to resume production, service, fulfilment, etc. normal order" exchange rate, etc.). Again, (Waters, 2011) explains that "resilience refers to the ability of a supply chain to quickly return to a previous state or switch to a preferred alternative product". the ability to recover from a disturbance to return to a steady state. This concept seems important when considering how flows continue after supply chains are disrupted. According to

Nikookar et al. (2021), "resilience is the ability of a business to continue operating normally for a certain period of time after market turmoil". Supply chain resilience is defined as "a business's ability to respond quickly and recover from unstable business circumstances." According to Barroso et al. (2011), supply chain resilience "is the ability to respond to the negative consequences of disruptions occurring at any given time in order to maintain supply chain objectives". The related concept of resilience, derived from these criteria, illustrates how quickly a supply chain can resume normal operations after being affected by a hazardous event. In fact, resilience is more proactive than that because it recognizes that the chain may not have been operating optimally before the event. Supply chain resilience is no longer determined solely by risk management capabilities. More importantly, "this capability allows a company to manage disruptions and even benefit from them better than its competitors" (Sheffi, 2005). "Improving the actors, interactions, operations and functions of the supply chain – made up of interrelated and interdependent business activities – is driven by developing resilience. feedback" (Peck, 2006). Various suppliers, safety inventory storage, responsive price strategy, delay strategy, integration, resource reconfiguration, refresh, and replication are some of the options suggested for developing this competence (Tang 2006a, Sheffi, 2007). Therefore, organizations can deploy or build specialized dynamic capabilities such as idea generation capabilities, market disruption capabilities, new product development capabilities, marketing capabilities or development capabilities new process development, such as these capabilities are well known (Esterby-Smith et al., 2009). Resilience appears to be part of the last set of competencies mentioned. Resilience must not only be defensive, absorbing the negative impact of recognizing risks or reacting to disruptions, but also proactive, anticipating risks based on experience of disruptions in the past. For example, Weick and Sutcliffe (2007) argue that "resilience has three dimensions:1) absorptive capacity, which allows the company to avoid sudden collapse or shock; 2) the ability to innovate, allowing the company to invent new futures; and 3) "mastery" capabilities, which allow the company to strengthen itself through its experience.

These talents are divided into three categories:

absorb the consequences of environmental changes, innovate and reconfigure resources, and integrate experiential knowledge into innovation. Absorptive capacity

attempts to absorb disruptions, survive the impact of the shock, and thereby maintain the robustness of the supply chain. Responsiveness focuses on the ability to respond fully and quickly to supply chain variables such as supply and demand. These first two qualities are often created through methods that emphasize agility, flexibility, and redundancy, such as secure inventory holding, flexible logistics networks, and multiple sourcing, among many other things. However, taking advantage of your abilities is more than just a learning process or achieving personal development goals. Concerns about learnability are often raised by the establishment of a complete quality system, such as applying processes, standard operating procedures, updating databases after interruptions. segment and ensure continuous improvement of the supply chain system. The five principles that guide resilience are: a) understand the supply chain network and apply re-engineering methods, b) use a supplier base collaboration strategy based on information sharing, c) create and maintain a supply chain network flexible sourcing capable of responding quickly to changing conditions, and e) introducing a culture of supply chain risk management. Sheffi (2005) identifies "three approaches to developing resilience: a) increase the level of redundancy, such as maintaining excess inventory, maintaining low-capacity utilization, using multiple sources of supply, etc. b) enhance flexibility, for example by using concurrent rather than sequential processes; and c) change corporate culture."

2.1.2 The Concept of Sustainability Performance

The Brundtland Commission defined sustainable development in 1987 as development that " the comprehensively meets the demands of the present age without compromising the needs of the future generations" (Brundtland, 1987). Since the inception, sustainability as a term has gained popularity globally. In the interest of academicians, the concept of sustainability has been explained more inclusively as a business-related concept through different and divergent views. Inversely, ardent economist of old have disputed on the variant view on the tenets that firms should be the carriage of the associated load of sustainable development. (Foerstl et al.,2010) the primary oriented goal of a firm is to significantly meet the demands and requirements of its stakeholders. (Friedman, 1970), whiles the responsibility of the state is particularly driven towards ensuring that the future generations will be capable to meeting their own needs without a compromise. (Brundtland, 1987) In view of this assertion, '' organizations should be

pertinent in working within their regulated framework and extensively must not go beyond what is required of them according to lawn''. Individuals are more likely to praise prosocial behaviours and stigmatize irresponsible ones, which may contribute to individual altruism, according to recent behavioural economists (Bénabou and Tirole, 2006).

Economically, ''sustainability is therefore considered a prudent and resourceful methodology that businesses may use to create competitive advantage over their counterparts and have the support of their stakeholders.'' (Cavaco and Crifo, 2009; Hull and Rothenberg, 2008; Surroca et al.2010; Waddock and Graves, 1997). Sustainability, according to sociological perspective, is an advanced procedure that businesses experiences not willingly but as an imposition on the business by stakeholders with an attached pressure to comprehend the legitimacy of the business. (Jüttner, U., and S. Maklan. 2011) Sustainability performance, as defined by the United Nations Global Compact (2015), '' is the careful management of environmental, social, and economic disruptions, as well as the motivation of good governance practices, across the lifespan of product and services''. The goal of long-term environmental, social, and economic value creation for all stakeholders engaged in bringing products and services to market is the goal of sustainable performance. Sustainability performance is also defined by Waddock et al. (1997) as the ''consequence of sustainability efforts, or the benefits stakeholders gain from sustainability actions''. In their view, Székely and Knirsch (2005), opined that sustainability performance primarily ''refers to the complete evaluation of economic, social, and environmental advancement with a long-term focus''. Hence, it is the established correlation of between the economic, social and environmental goals of the business put in their business plans, as well as the improvement of the balance between all three. The concept of sustainability primarily assists businesses in reducing risks, avoiding waste creation, increasing material and energy efficiency, developing innovative, environmentally friendly products and services, and obtaining operating permissions from local communities. Sustainability performance projects a business affirmation to the well-being of its partners. Sustainability performance has been defined once more as an ''organization's capacity to comprehend the demands and expedience of consumers and partners over a period of time, streamlined by efficient management and organizational worker awareness

through learning and the application of accurate improvements and innovations''. (Barroso et al., 2011)

In order to maximize value for the organization's business growth, sustainability performance is defined as the position of environmental and financial objectives in the execution of key business activities. Bennett and James (1997) opined that sustainability performance is ''the measurement and management of the relationship between business, society, and the environment''. The integration of a corporation with the economic, social, and environmental systems is stressed in this term. The effect of interactions on other systems must be measured. Between business and science, there is no common grounds of agreement on how sustainability performance should be evaluated. Roome (1998) elucidated that, sustainable performance refers to " organizational management that holistically understands its involvement in social, environmental, and economic systems which is driven towards management and relationships to meet the environmental, social, and economic requirements of various stakeholders in its networks." Stakeholders monitor and assess the sustainability performance of a focal firm. By aligning this firm's and its stakeholders' interests, Jones, 1995 in this assertive view opine that, sustainability performance significantly inspires stakeholder collaboration, which focuses on helping the firms to meeting their desirable and achievable goals in an oriented manner.

A highly sustainable organization has lower wages, a greater supply of qualified labor, and more inventive managers (Turban and Greening, 1997). (Porter and Kramer, 2007). It reduces the likelihood of government regulatory action and attracts socially concerned consumers (Hillman and Keim, 2001). With an intended sustainability focusing on productivity, a company is by margin able to reduce the procurement cost associated with the organization while proportionately managing the supply chain's environmental resources such as energy, water and the efficient use of natural and synthetic material. This efficiently leads to employee motivation, increased productivity and cost effectiveness and pragmatically reduces the risk associated with employee's health and safety. Again, it improves awareness of important supply chain operations such as natural resource management and extraction, logistics, and manufacturing, and enables improved resource management and stewardship. Organizations use supply chain sustainability as a measure of adaptation such that their

suppliers will as a requirement follow and adapt to the environmental regulations of the of the organization (e.g., hazardous substance restrictions regulations) and increase the law on product responsibility; hence avoiding possible future liability and creating a more enabled environment of operation. Therefore, in view of this, when an organization performs unsatisfactorily, it increases the risk of exposing its mistakes thereby losing the support of its partners. (Marcus and Goodman, 1991). Thus, firms that are constant but stable are better suited to limiting their disclosure. Low performing businesses have both positive and negative effects on sustainability and are always geared towards revealing it constantly. This seems to be more evident with businesses whose performance with sustainability is limited and poor. Low performers do well on at least some sustainability factors, such as the environment or governance, even though their sustainability performance is uneven. Example an oil operating organization may completely have a negative impact on the society and the environment in general but will comprehensively act towards its employees in a positive manner, whilst the partners will be expectant that such a corporation to be harmful to their well-being, yet the firm may be directed to show its good exemplary behaviours in order to appease stakeholders' complaints and meet the demands of legitimacy. (Bansal and Clelland, 2004).

Recognizing the variety of sustainability performance is critical. Stakeholders are diverse and diversified. These include governments, customers, competitors, employees etc groups that cannot be addressed by a single sustainable activity. Fair trade methods focus on the well-being of suppliers, the prevention of child labour, and the well-being of employees, while lowering CO2 emissions benefits the community as a whole. As a result, sustainability measures may result in varying levels of sustainability performance. Certain stakeholders may benefit from sustainability efforts while others do not. Similarly, they may help some stakeholders while harming others.

Organizations in developed countries ensures the safety of their employees whiles they comprehend child labour in the facilities outside their home countries. Organizations may follow suit in the pursuance of procedures their suppliers while causing damage to the environment, organizations are purely not good or bad; they are practically both good and evil at the same instance. (Strike et al., 2006).

2.1.3 The Concept of Supply Chain Performance

Performance cannot be only characterized by internal decisions and actions in the highly competitive global environment of today, as the involvement of all involved parties produces overall supply chain results (SC). Competition now exists across supply chains rather than between individual businesses. (Markley and others, 2007) It's crucial for businesses to comprehend how to implement supply chain management (SCM) when forming global relationships (Halldorsson et al., 2008). The Global Supply Chain Forum (1998) defined supply chain performance as the ''coordination of critical business activities from the customer to the original suppliers that result in goods, services, and knowledge that are valuable to the end user and other stakeholders''.

To (Saad and Patel, 2006), supply chain performance ''refers to the complete supply chain's activities in meeting the requirement needs of the customer such as product availability, timely delivery, and all necessary inventory and capacity in the supply chain to deliver that performance in a responsive manner''. In support of this, Bai et al., (2017) elucidated that, supply chain performance is ''the application of a set of tools and strategies for controlling and managing supply chain operations in order to improve supply chain performance''. In view of Shepherd and Günter (2006), Supply chain performance is defined as ''a set of methodologies used to collaborate suppliers, manufacturers, warehouses, and stores efficiently so that goods and service is produced and distributed in the right quantities, to the right locations, and at the right time, in order to minimize system wide costs while meeting service level requirements''.

Supply chain was described by Aitken et al. (2005) as ''a network of interconnected and dependent entities that cooperate to allow the transportation of products into markets''. According to Lambert et al. (1998), "supply chain performance" is "the integration of significant business processes from the original supplier to the end user that offers products, services, and information that add value for consumers and other stakeholders." Simchi-Levi et al. (2004) defined supply chain performance as ''a set of strategies for efficiently integrating suppliers, manufacturers, warehouses, and retail establishments so that goods are produced and distributed in the right quantities, to the right locations, and at the right times to lower system costs while meeting service-level requirements''. According to Stank et al., (2001), supply chain performance is defined

''as maximizing service to customers of choice at the lowest overall cost''. Cooper et al. (1997) describe supply chain performance as ''the integration of business processes from end user through original suppliers that offer products, services and information that generate value for consumers". Supply chain performance is defined by Mentzer et al., (2001) as ''the systemic, strategic coordination of traditional business functions and tactics across these business functions within a specific company and across businesses within the supply chain, with the goal of improving the long-term performance of the individual companies and the supply chain as a whole''.

The idea encompasses the wide range of operations required to design, implement, and control manufacturing and delivery processes from raw material origin to final consumption. Some of the advantages of supply chain performance include faster time to market, lower inventory, flexibility and response to changing market demand, and secure visibility to important information. The performance of the supply chain can reduce total costs while enhancing performance. It also entails integration, coordination, collaboration, and performance measurement across businesses and the supply chain. Finally, it is necessary to determine whether establishing measurement tools to assess supply chain performance is cost effective, particularly for small and medium-sized businesses.

2.2   Theoretical Review

This part of the literature review significantly touched on relevant theories underpinning the current study. These theories assist in throwing light on the relationship between supply chain resilience and supply chain sustainability. The reviewed theories include the resource-based theory and the transaction cost theory.

2.2.1   Resource Based Theory

Purchasing and supply chain management principles have long emphasized the pursuit of information technology (Pressutti, 2003). Resource-based theory (RBT), a promising new framework for examining sustainability has emerged in this field (Baily, 2008). According to RBT, measured by economic rents (Caridi et al., 2004). Such sustainability is only possible if the resources on which it is based are unique, rare, priceless and incomparable (Bales and Fearon, 2006). Furthermore, RBT is based on

the idea that the resources controlled by the firm are largely fixed and diverse (Pearcy and Guinipero, 2008). Some isolating mechanisms, such as asset co-specialization (Teo and Benbasat, 2003), specific historical circumstances (Berger and Calabrese, 2005), causal ambiguity (Liao et al., 2007), social complexity, tacit knowledge and skills, responsible for the imperfect mobility of resources (including inimitable and non-substitutable characteristics) (Puschmann and Alt, 2005). It makes sense to classify organizational learning as a strategic resource under the resource-based approach, since both organizational theory and resource-based learning aim to maintain profit and competitive advantage. sustainability is often created by businesses from resources (such as new capabilities and knowledge) created thanks to lessons learned from past mistakes and the passage of time. strategies developed from these resources may be sustainable because other companies' efforts to replicate them have failed due to lack of institutional knowledge, learning ability, and time to continue. It is believed that the sustainability of that advantage must be described in dynamic and time-sensitive terms due to the dynamic nature of supply chain. According to this study, resource-based theory is fundamental in maintaining companies' competitive advantage over fierce competitors.

2.2.2   Transaction Cost Theory

According to transaction cost economics, firms that trade with a small number of other firms face the problem of opportunism. Having multiple suppliers reduces this risk because buyers are less dependent on any one of them, giving the company the ability to negotiate better supply terms (Dedrick et al., 2008). According to Dedrick et al, fit, coordination costs, and risk opportunism are three fundamental transaction characteristics that must be perfectly balanced when choosing a company's suppliers. (2008). Technology has the potential to reduce coordination costs by reducing the costs of partnering with new suppliers through standardization and automation of procurement activities. This mainly benefits the purchasing organization when it comes to common items like copper pipes. Companies can now consolidate purchasing to take advantage of volume savings, use fewer suppliers, and focus on manufacturers of low-cost items using technology. (2008) (Dedrick). The use of technology helps reduce coordination costs. For example, it is now less expensive to search and find information about prices and products offered thanks to computerized electronic marketplaces

(Bakker et al., 2008). Collaboration simplifies information sharing by reducing transaction costs, as it allows companies to reduce contract costs by reducing supply chain uncertainty. If suppliers cannot accurately predict the costs of product components, they may be reluctant to sign contracts that tie the supplier to a fixed price over an extended period of time (Arrowsmith, 2002). Uncertainty in new product development, demand, technology and supply are factors that contribute to uncertainty in the supply chain and especially uncertainty in the manufacturing sector (Koufteros, 1999). Supply uncertainty is correlated with unpredictable events in the supply chain. Unpredictable supply is due to a number of factors, including delivery delays and raw material shortages. Supply chain uncertainty will certainly impact sales and could disrupt production, affecting distributors and retailers in the supply chain. Unexpected events in the downstream sector of the supply chain are a sign of demand uncertainty (Koufteros, 1999). Short product life cycles (PLCs), seasonality, volatility in fashion trends, and new product adoption can all contribute to demand fluctuations (or demand risk). (Johnston, 2005).

Another uncertainty in manufacturing is new product development, which results from unforeseen events during the product prototyping, product design, and market research stages. Technological uncertainty, last but not least, "refers to the ambiguity in choosing the appropriate technological platform" (Koufteros, 1999). An example of this is the trade-off between a future technology that offers better value for money but is of questionable feasibility and a perfect and perhaps outdated production system (Klein, 2007). In addition, political instability (such as oil crises), natural instability (such as fires and earthquakes), and social unrest (such as strikes) can all increase instability (Johnston, 2005). The concept of uncertainty is important to tangible common equity (TCE), which assumes that people behave opportunistically and have bounded rationality. In our original work on transaction costs, we did not distinguish between different types of uncertainty. In more recent research, the concept of uncertainty has been dissected (Melville et al., 2004). For example, Wendin (2001) distinguished between primary and secondary (behavioural) uncertainty and drew on Khalifa and Shen (2008). According to Sulek et al. (2006), "exogenous factors such as technology, uncertainty about natural disasters, consumer preferences, regulations, and uncertainty about natural disasters are the main sources of major uncertainties affecting the underlying transaction." Due to coordination issues, technological difficulties and

communication problems caused by initial uncertainty, transaction execution may be affected. However, secondary uncertainty refers to the risk of opportunism in business transactions using flawed contracts.

Sulek et al. (2006) did something similar by classifying uncertainty into three groups: primary, supplier, and competitive. Fundamental uncertainty, which is consistent with (Wendin, C. 2001; Sulek et al., 2006), ''refers to ignorance of natural rules and conditions of affairs. Strategic decisions made by actual competitors, potential competitors, or inadvertent actions lead to competitive uncertainty'' (McManus, 2002). Supplier uncertainty is fundamentally behavioural uncertainty and also relates to potential opportunism by upstream or downstream partners. According to Trent (2007), "uncertainty" in organizational theory refers to ''environmental uncertainty, which includes both primary and secondary uncertainty. ambiguity about suppliers' and rivals' behaviour, as well as ambiguity in technology and legislation, are a few examples of environmental uncertainty''. Because of fluctuating demand and absence of communication within the supply chain, the bullwhip effect – the amplification of fluctuations in demand as orders move higher up the chain – is a problem (Featherman and Pavlov , 2003). Johnson and Whang (2002) state that "data from the food industry support this conclusion," while Nagle et al. (2006) discuss the bullwhip effect on the auto industry. By reducing information asymmetry and uncertainty, sharing demand information throughout the supply chain can help reduce the bullwhip effect (Lee et al., 2003). As a result, when companies optimize capacity planning, production, and inventory, they minimize internal risk by reducing uncertainty through information sharing. Information sharing appears to have many benefits, but because a more open corporate policy encourages opportunistic behaviour, it can also increase transaction risk. However, ambiguity can influence a company's decision about whether to provide information or not. This is consistent with contingency theory, which posits that characteristics within organizations change depending on the level of environmental uncertainty and the rate of change (Larsson et al., 2008). Overall, transaction cost theory is mostly consistent with research; As stated, the application of technology throughout the entire supply chain process inherently helps reduce transaction costs that often occur when using traditional supply chain processes between commercial organizations, but in other words, On the other hand, when the entire supply chain process is carried out through technology, coordination costs are reduced and more

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practically, technology helps in finding information about products and services in the market. Electronic fields are less expensive. Effectively, the risks and uncertainties associated with the supply chain process are reduced by the presence of unified information technology in the supply chain process, uncertainties such as Delivery delays are eliminated through the effective use of information technology.

2.3 Empirical Literature

Recently, supply chain managers have turned more attention to supply chain risk, primarily because of the negative effects that supply chain disruptions can have on supply chain performance (Blackhurst et al., 2008). "To effectively minimize disruption, the supply network must have both tangible and intangible characteristics" (Christopher and Peck 2004; Pettit et al., 2010). Determining supply chain resilience requirements based on capacity and vulnerability is essential to combat supply chain challenges and disruptions (Sheffi and Rice, 2005). Therefore, companies must evaluate and decide on the level of resilience of their supply chains. There is still no model to quantify supply chain resilience (Ponomarov and Holcomb, 2009). Even empirical research in this area is rare. Based on analysis of previous studies, it is not possible to quantify supply chain resilience in a globally recognized way. Several SCR measurement coefficients have been used by researchers such as Petit et al. (2010), Christopher and Peck (2004), Sheffi and Rice (2005) and Erol et al. (2010), among others. These parameters include supply chain capacity and vulnerability. For example, much of the research has focused on some measure of resilience, although Sheffi and Rice (2005) and Ponomarov and Holcomb (2009) emphasize the importance of reaction time and recovery in determining resilience. Resilience was recently defined by Wieland and Wallenburg (2013) as "a proactive and reactive skill that emphasizes proactive preparation and anticipation of changes in the event of disruption as well as effort response and recovery in response to disturbances". A review of previous literature shows that supply chain resilience is a complex concept with many dimensions that can be measured in terms of capacity and vulnerability as well as from a response perspective. chain, supply and recovery times, and the architecture of the supply chain must be considered. (Craighead et al., 2007; Wieland and Wallenburg 2013; Falasca et al., 2008). The development of such a multidimensional model to assess resilience is noteworthy because no comprehensive model for measuring

resilience has been proposed by research (Ponomarov and Holcomb, 2009). Scholars often emphasize the value of resilience for sustainability in the literature. According to Folke (2002), resilience is "necessary for sustainability in ecological research". Reiterating the need for resilience to achieve sustainability, Derissen et al. While there are "many vulnerabilities that global supply chains regularly face (Fiksel, 2006; Korhonen and Seager, 2008; Leat and Revoredo Giha, 2013), "resilience is also important for sustainability. sustainability of the supply network". No empirical research has been conducted to examine the link between resilience and sustainability, despite the importance of resilience to supply chain sustainability. The lack of theoretical contributions on this topic has prompted calls for rigorous, empirical research to examine the links between supply chain resilience and multiple (social) dimensions. social, environmental and economic) of sustainability.

Supply Chain Resilience (SCR) As emphasized by Smith et al. (2021), SCR has potential impacts on various performance areas, including market, financial, and operational performance. The creation of a supply chain resilience may involve participation from manufacturing companies ranging from raw material suppliers to manufacturers and distributors. Despite the benefits of SCR, there are still challenges in establishing a resilient SC (Gunasekaran et al. 2019). SCA requires strong collaboration with SC partners in terms of information sharing (Fayezi and Zomorrodi 2015), rapid changes in delivery time, design, product enhancements, product introduction, and production capability to fulfil consumer demand as cost-effectively as feasible (Al-Shboul 2017) and real-time decision-making, tracking and tracing, and risk sharing. The agility of a firm's SC refers to its capacity to respond rapidly to consumer needs while also maintaining costs in check (Golgeci et al. 2019); these requirements can only be achieved using advanced digital technology. Panigrahi et al. (2022) examined the relationship between SCR and operational performance in India. A strong relationship between resilience in the SC and operational performance development has been improved. It is also possible to improve the SCR by integrating information systems which increases the role of digital technologies. The information systems and digital technologies enabled by resilience in the SC provide significant operational benefits, including improved working efficiency, improved information visibility, lower inventory levels, faster response times, and more accurate forecasts.

The study of Baqaee and Farhi (2020), for example modelled COVID-19 as a combination of exogenous shocks to the supply quantity, productivity of producers, and composition of the final demand. Ivanov and Dolgui (2020) proposed a model for an intertwined SHEN AND SUN supply network in which the supply chains in the market are entirely interconnected. They recommended that the impacts of COVID-19 be examined further from this novel perspective. Paul and Chowdhury (2020) proposed a mathematical production recovery plan for manufacturing supply chains during the COVID-19 pandemic. Although these studies provide relevant insights into supply chain management during a specific pandemic, these are highly impractical owing to the deficiency of real data. Their studies empirically estimated the impacts of the pandemic on supply chains. Most studies in this stream have focused on the supply chains of medical supplies and personal protective equipment (e.g., Armani et al., 2020; Gereffi, 2020; Ranney et al., 2020) and emphasized the importance of digital technology adoption (e.g., Armani et al., 2020) and government guidance (e.g., Ranney et al., 2020). Another focus has been on agricultural and food supply chains (e.g., Aday & Aday, 2020; Gray, 2020; Reardon et al., 2020; Richards & Rickard, 2020). For example, Hobbs (2020) discussed the shocks imposed by COVID-19 on the demand and supply sides and their corresponding effects on food supply chains in Canada. The above studies agree that agricultural and food supply chains are not experiencing severe disruptions and that their logistics services are still effective. However, the scenario for other supply chains is not as positive. Majumdar et al. (2020) studied the clothing supply chain operating in South Asian countries, based on interviews with experts, and found that the demand, supply, and manufacturing were completely disrupted and delinked in this supply chain. McMaster et al. (2020) examined global fashion supply chains and summarized the existing risks and mitigation methods. Different strategies have been recommended, such as sustainable sourcing models that incorporate disruption risk sharing (Majumdar et al., 2020), social distancing in factories (Bodenstein et al., 2020), increasing online presences and visual stores (McMaster et al., 2020), agile supply chains (McMaster et al., 2020), and resilient supply chains (Hobbs, 2020; Singh et al., 2020). The utilization of data-driven digital technologies, such as digital supply chain twins, has been emphasized (Ivanov & Dolgui, 2020). However, none of the previous studies can ensure that their recommendations will be productive as COVID-19 continues to expand worldwide.

In general, as realistic data are unavailable, simulations are frequently conducted to analyse the impact of disruptions. For example, Ivanov (2020) used a simulation-based methodology to examine and predict the impacts of COVID-19 on supply chain performance. He observed that the closing and opening times of facilities are expected to be significant factors. Ivanov and Das (2020) used a simulation method to analyse pandemic supply risk mitigation measures and potential recovery paths. Other studies were comparatively more specific and focused on certain measures or certain industries. For example, Guan et al. (2020) used a global trade-modelling framework to analyse the impacts of COVID-19 lockdowns on supply chains. They found that a longer lockdown that can eradicate the disease would cause a smaller loss than shorter ones. Singh et al. (2020) developed a simulation model for a public distribution system network to demonstrate COVID-19 disruptions in a food supply chain. Our study differs from previous ones in the following aspects. First, although simulations are commonly conducted to analyse the impact of COVID-19, we utilize the practical operational data of JD.com and reveal the difficulties throughout retail supply chains. Furthermore, unlike previous studies related to the COVID-19 outbreak, we advance beyond the analysis of the impact of a pandemic and consider supply chain resilience and the practical resilience strategies of firms. To our best knowledge, our study is the first one to focus on the practical resilience indicators and strategies of a specific firm during COVID-19, in addition to analysing the impact of COVID-19. Finally, considering the characteristics of this retail supply chain, we analyse and discuss different industries, whereas previous studies examined only specific industries, such as medicine supply chains (e.g., Gereffi, 2020) or food supply chains (e.g., Hobbs, 2020).

Over the past ten years, the clothing sector has grown by more than 15% per year. Export earnings of no more than $1 million came from the clothing sector in 1978, but this increased to $8 billion in 2006 and $19.90 billion in 2011, making the country an exporter. second largest clothing exporter in the world (BGMEA 2012). Bangladesh's garment industry is in crisis despite witnessing significant growth over the past few decades due to various issues including lack of backward linkages, potential trade differences from agreements different trade in the production of low-value products in the region, non-compliance with social and environmental concerns, infrastructure

limitations, political unrest, utility failures, and other operational disruptions (Nuruzzaman, 2009; Ahmed, 2009; Islam et al., 2012). Ahmed (2009) also points out that "the majority of Bangladesh's garment exports are created from imported fabrics. The growing demand for raw materials for the garment industry cannot be met by the domestic textile industry." Furthermore, only nine categories made up 60% of Bangladesh's garment exports, indicating that the country's apparel exports are disproportionately concentrated on a small number of products. Additionally, several studies (Islam and Deegan, 2008; Haider, 2007; Nuruzzaman et al.,2010) discuss "labour unrest due to human rights violations, low pay, dangerous working conditions, environmental pollution, political instability, interruptions in utility supply, particularly power shortages, ineffective customs and port management, exchange rate fluctuations, warehousing issues, disruptions in supply of fabrics and other accessories, increases in crime, and more., lack of backward linkages and other disruptions". Islam et al., (2012), as well as Uddin and Jahed, (2007), "list several operational disruptions in Bangladesh's apparel supply chain, including: a lack of raw materials, defective raw materials, equipment failure, absenteeism, machine malfunction, unexpected work in process (WIP), defective products, quick schedule changes, stalemate for labour strikes, production shutdown brought on by political action, and power supply issues". Rahman (2007), Nuruzzaman et al., (2013) note that "weak and insufficient infrastructures, such as subpar port facilities, port congestion, issues with land transportation, and ineffective customs documentation processes, frequently erect barriers in the way of the functions of the apparel supply chain". Due to the shorter lifespan of fashion products, these vulnerabilities are the main sources of lead-time variations. Delivery time is a decisive factor for success in the fashion industry. For Bangladesh, reducing delays is the most important consideration in this situation. For knitting companies, the average lead time is 60 to 80 days in Bangladesh, compared with 40 to 60 days in China and 50 to 70 days in India (Haider, 2007). In addition to longer delivery times, the current disruptions have a number of adverse impacts, including higher production costs, product quality issues and customer dissatisfaction (Islamet al., 2012; Rahman, 2007).

Violations of social and environmental standards constitute a particularly sensitive vulnerability. Consumers, non-governmental organizations (NGOs), governments, media and other stakeholders are frequently concerned about violations of social and environmental issues by clothing manufacturers. Bangladesh shirt. The Tazreen

Fashion Factory fire that claimed the lives of more than 112 workers and the Rana Plaza collapse that killed more than 1,100 people recently attracted international media attention (Fibre2fashion News Desk 2013). For example, the Washington Post previously described the event as "THE TRAGEDY: At least 112 people died in a textile factory fire in Bangladesh on Saturday (www.washingtonpost.com). According to Fibre2fashion, a world-famous fashion website, at least 117 people died in a transformer explosion at a garment factory in the Dhaka area two years ago, and more than 120 people died in a recent fire. at Tazreen Fashion. business. Furthermore, he stated that in the previous five to six years, more than 500 people had died in fires in various textile factories in Bangladesh (Fibre2fashion News Desk, 2013). Media and consumer protection organizations criticize multinational buyers (retail chains) for purchasing from substandard factories and sacrificing social and environmental quality to reduce costs. For example, following the death toll from building collapses and fire accidents, Wal-Mart came under scrutiny for purchasing from companies with low safety standards. As a result, Wal-Mart and Bangladesh's garment industry suffered serious reputational damage. One of the main causes of operational disruption is non-compliance with social and environmental issues. For example, in garment manufacturers in Bangladesh, the refusal to pay workers the legal minimum wage and provide them with benefits often leads to labour unrest, ultimately slowing production process; Such disruptions lengthen delivery times, ultimately affecting global buyers. in terms of the time, they need to advertise their products compared to their competitors.

Similarly, other studies have highlighted the need for mitigation measures to address hazards associated with the apparel supply chain. For example, Haider (2007) advises "strengthening internal upstream connectivity to accelerate production and distribution, improve social and environmental compliance, and pay more attention to product diversity and market components". "The importance of backward and forward linkages, product differentiation, multiple sources of supply, channel rerouting to avoid delivery delays, maintain spare capacity, control quality and reduce error rates, skills and efficiency development, product and process improvement, forecasting and forecasting Analytics to track uncertainties, customer responsiveness, etc. are also used by Ahmed et al., (2010)" as well as other authors mentioned in 2009. In addition, they promote aspects such as better internal and external integration, better internal and external management systems. external integration, collaboration, contact with customers and

suppliers, monitoring workers' rights in factories, etc. There is a lot of research on the sensitivity of the garment industry and potential solutions in the literature, but no studies support these findings. There is therefore an urgent need for research in this area to contribute to the body of knowledge and ensure the resilience and sustainability of the sector. It is important to emphasize that due to the enormous economic importance of the garment industry to the Bangladesh economy, the long-term sustainability of the textile supply chain is essential. Therefore, identifying supply chain weaknesses and developing corresponding resilience are approaches to making supply chains resilient and sustainable.

In a supply chain crisis, a strategic gap is the result of choosing the wrong strategy or delaying a strategic decision. For example, Ericsson suffered financial losses worth millions of dollars due to decision makers' failure to act strategically during a fire at a supplier's factory (Norrman, 2004). Strategic gaps can be caused by supply chain relationships, adoption of new techniques and systems, supplier decisions, technical choices, competition and any other any other related to strategic business (Blos et al., 2009). These defects slow down the production process and in the worst case can lead to the rejection of the entire production batch (Blos et al., 2009). It is important to be careful when dealing with these vulnerabilities. Corrective actions and refactoring decisions can reduce the severity of these vulnerabilities. According to Simons (1999), "an interactive control system that encourages managers to discuss strategic gaps will enhance collaboration, visibility, and awareness." Collaboration with other actors in the supply chain, better visibility and knowledge are all important factors in deciding the best course of action in the event of a supply chain disruption and minimizing potential impacts. strategic gap. "Supply chain cash flow is hindered by many financial complexities and disruptions. Some of the main causes of financial fragility include credit default or insolvency of supply chain members, fluctuations in commodity prices, exchange rates, market fluctuations finance, higher interest rates and economic crisis" (Blos et al., 2009; Pettit et al.., 2013).

A regular occurrence in international commerce is the fluctuation of raw material prices in both home and foreign markets, which has a significant impact on the cost of finished goods. Similar to how raw material prices and the price of finished goods are affected by exchange rate fluctuations. To reduce these kinds of vulnerabilities, it's crucial to

forecast changes in material market pricing, have a backup plan, work cooperatively with your supply chain partners, and share information with them (Kleindorfer and Saad, 2005). Good communication with supply chain partners, for instance, enables one to share the risk of loss resulting from raw material and exchange rate fluctuations. Operational vulnerability can take the shape of operator error, a lack of raw materials, a loss of key staff, employee turnover and absenteeism, a malfunctioning IT system, theft, a lack of experienced workers, an interruption in utility service, etc. (Blos et al., 2009; Pettit et al., 2010). Operational hiccups cost money and time. For instance, severe power outages in Bangladesh disrupt the manufacturing processes of businesses that produce clothing, causing the production led time to be longer than anticipated. Businesses must maintain backup generators to maintain production, but this raises manufacturing costs (Ahmed, 2009). If operational vulnerabilities are not addressed correctly and on time, they could result in a significant loss for a firm and its supply chain. Failing to do so could have serious effects on the supply chain, accelerating the rate of stockouts and increasing the cost of customer displeasure from longer wait times, among other things (Rice and Caniato, 2003). Because of the product's poor quality or the shipping delay, the customer can even claim not to have received the item (Blos et al., 2009). Hendricks and Singhal's research show that the revelation of supply chain disruptions such as operational problems or shipping delays results in a considerable decline in shareholder value. Consequently, supply chain researchers should pay attention to this topic given its importance, to mitigate the operational vulnerabilities, a number of strategies such as flexibility, quality control, skill development training, ensuring workers' satisfaction, back-up utility source and reserve capacity are useful (Pettit et al., 2010; Duclos et al.,2005; Suresh and Braunscheidel, 2009).

Disruptions in supply and demand are a frequent and important cause of supply chain vulnerabilities (Christopher and Peck, 2004; Pettit et al., 2010). These obstacles occur on both the supplier and customer side. Supply disruptions occur when delivery quantities and delivery times are unpredictable. These problems can be caused by raw material shortages, problems with the quality of donated materials, supplier opportunism, or delays (Wagner and Bode 2008; Pettit et al., 2010). These problems can also arise due to production problems, non-compliance with quality standards, production problems, forecasting errors or logistical failures (Walker and Weber, 1987). According to Svensson (2000), "Disruptions in supply can be caused by supplier

equipment failures, employee problems, adverse weather conditions," and so on. To maintain production efficiency and avoid impacts across the chain, supply must be provided. on time, completely and without errors. Supply chain managers also need to be aware of vulnerabilities caused by customer demand or disruptions. Uncertainty in demand results from its volatility and inaccurate forecasting (Bartezzaghi and Verganti, 1995; Enns, 2002). Because customer demand is random and uncertain, supply chains can be affected by the bullwhip effect if information flow is not optimized. Failure to manage unpredictable demand will result in excess inventory or bottlenecks, leading to customer dissatisfaction (Verbeke et al., 1998).

2.4   Conceptual Framework

''A conceptual framework is a network of interconnected concepts that, when combined, provide a thorough knowledge of an event'' (Jabareen, 2009). Mugenda (2008) defines conceptual framework as a short statement of the phenomenon under investigation supplemented with a graphical or visual representation of the study's primary factors. According to Young (2009), ''a conceptual framework is a diagrammatical representation that shows the link between dependent and independent variables''.

Figure 2.1 Conceptual Framework
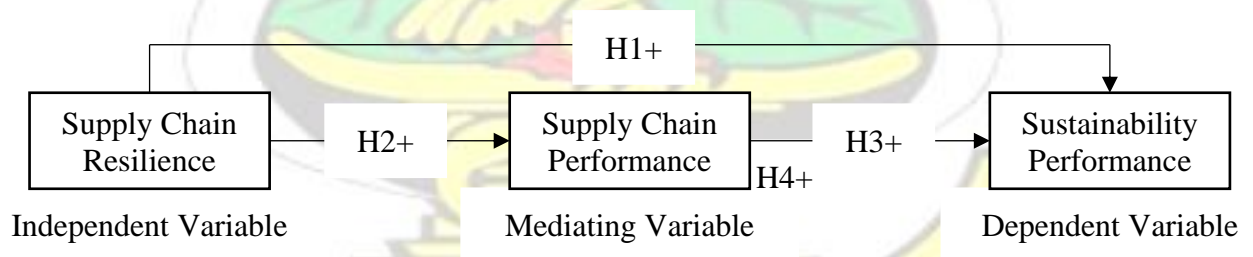
Source: Author's Construct (2022)

2.4.1   Supply Chain Resilience and Sustainability Performance

Due of the many uncertainties in a changing environment, risks can emerge and have unforeseen impacts, especially in the case of rare but severe extreme events such as fires. fires, earthquakes and terrorism (Zsidisin et al., 2000, 2004, Hasuser, 2003).

Research shows that failing to adequately describe low-probability, high-consequence situations is the most important mistake made in day-to-day risk management (Chopra and Sodhi, 2004; Sheffi and Rice, 2005; Kunreuther, 2006). Due to these supply, demand or logistics events, supply chains are frequently disrupted. Supply chain fragility, a symptom of underlying system weakness, exposes this activity to greater risk (Haimes, 2006). Because external risks and innate vulnerabilities can lead to supply chain disruptions, businesses are encouraged to seek solutions to anticipate, withstand and ultimately overcome these challenges. This is how the concept of resilience is developed, which refers to a company's ability to cope with the unexpected (Sheffi, 2005). Supply chains must continue to operate with a risk-tolerant mentality while maintaining customer satisfaction by limiting damage when hazards are identified (Gaonkar and Viswanadham, 2004; Tang 2006a). For this reason, resilient supply chains have been presented as an important additional dimension in high reliability theory, focusing on the activities that organizations can take to ensure the continued reliability of the organization and minimize, or even completely eliminate, the possibility of accidents. For some risky supply chains, it is intended to provide a high level of reliability to the organization (Roberts, 1990a; Perrow, 1994). According to Waters (2008), "a strong supply chain is less susceptible to attack risks". Furthermore, a company's resilience puts it in a stronger position than its competitors, giving it a competitive advantage in the face of shocks (Sheffi, 2005). Companies that practice sustainable development adopt behaviours that benefit all stakeholders (Marquis et al., 2007). Sustainability measures involve efforts to improve overall social well-being, including conserving natural resources, alleviating poverty, and improving education, as opposed to other corporate-focused expenditures. focused on enhancing shareholder wealth. (Barnett, 2007). Businesses operate with varying degrees of consistency and sustained performance. These two factors impact how they decide to communicate more or less frequently with stakeholders and how much information to provide them. We further argue that when firms decide whether to disclose information, they do not evaluate performance and consistency in isolation but in relation to one another. Specifically, inconsistent companies are less likely to disclose publicly if they also demonstrate high levels of sustainability performance. In other words, corporate sustainability performance moderates the relationship between the lack of consistency in corporate sustainability performance and the level of corporate sustainability information disclosure.

Businesses are inconsistently motivated to demonstrate their level of sustainability and operate with both positive and negative connotations of sustainability. This seems even more achievable for companies that perform poorly on sustainability. Although their performance is uneven, countries that perform poorly on sustainability score well on at least some sustainability factors, such as governance or the environment. Even if an oil company has an overall negative impact on society and the environment, it can still take positive steps to ensure the safety of its employees. Although stakeholders may expect such an undertaking to harm their welfare, the company may be tempted to reveal some of its beneficial actions to placate critics and regain its credibility (Bansal and Clelland, 2004).

As a result, depending on its sustainability performance, an inconsistent company will be more or less likely to disclose its information comprehensively. Impression management tactics that emphasize minimizing negative cues perform better than tactics that prioritize enhancing positive cues (Mishina et al., 2012). Stakeholders can check and respect some of the positive behaviors of low-performing sustainable companies, but they can also check and punish some of the bad behaviors of high-performing sustainable companies. High performance. While a company with variable sustainability performance may have an incentive to communicate less frequently, as a company's sustainability performance improves, so does the risk that stakeholders will take a closer look. The incidence of rare corporate misconduct will increase. By definition, a firm's ability to operate sustainably is difficult to observe (King and Toffel, 2007; King et al., 2005; Ruihua et al., 2003). In such a situation, stakeholders form expectations based on existing knowledge about the company's commitment to sustainability. Many stakeholders have formed opinions about corporate social responsibility even before seeing any evidence of sustainability (Brammer et al., 2009). Researchers have found that in cases where information is limited and results are difficult to track, prior signals, including a company's past reputation, function as filters to create expectations (Akerlof, 1970; Fombrun and Shanley, 1990; Spence, 1973; Weigelt and Camerer, 1988). We hypothesize that when companies change their sustainability disclosure, they will evaluate the extent to which they meet stakeholder expectations as well as what they need to disclose (sustainability performance). solidity and gaps). Therefore, we believe that an organization's past reputation will influence the amount of sustainability information disclosed.

2.4.2 Mediating Role of Supply Chain Performance

Businesses around the world use supply chain performance for the benefits it brings, such as faster delivery times, better financial results, effective customer satisfaction, and increased customer satisfaction. Supplier reliability increases. Effective supply chain performance (SCP) has emerged as a potential approach to maintain viable advantage and drive organizational performance, as competition becomes more prevalent among supplier networks. supply compared to between companies (Suhong et al., 2006). This involves sending the right quantity of product to the right place at the right time while reducing the associated costs for all parties involved (Saad et al., 2002). Supply chain management, according to Chopra and Meindl (2015), is "competing on value and working with customers and suppliers to establish a strong market position based on end-user value". Strong supply chain partnerships enable companies to leverage their market orientation by providing access to the rapid changes in customer value and competitive dynamics that are essential. necessary to achieve outstanding business performance. (2003) Martin and Grbac

The goal of supply chain performance is to connect each stage of the manufacturing and supply process, from the procurement of raw materials to the processing of items to the delivery of products to the end user. It focuses on how companies leverage supplier capabilities, processes and technologies to gain competitive advantage. By managing the entire supply chain rather than individual organizational elements, supply chain performance seeks to promote competitiveness (Stadler and Kilger, 2008). This concept emphasizes the idea that a customer focus on meeting needs and providing timely service is an important driver of effective supply chain performance, because meeting customer needs is a top priority for every organization (Doyle and Stern, 2006). It seeks to improve performance by more effectively leveraging internal and external resources to create a seamlessly connected supply chain, elevating competition between companies to competition between supply chains. (Lummus et al. 2003).

2.5 Hypothesis

HO: There is no significant relationship between supply chain resilience and supply chain performance.

H1: There is a significant relationship between supply chain resilience and supply chain performance.

HO: There is no significant relationship between supply chain sustainability and supply chain performance

H1: Supply chain sustainability will have a direct and significant relationship with supply chain performance.

CHAPTER THREE

RESEARCH METHODOLOGY AND PROFILE OF STUDY AREA

3.0 Introduction

This chapter presents the methods used in carrying out the study. It covers the design, population, sampling techniques and the sample size. The chapter also considers the usefulness of a chosen approach, and it entails for the purpose of meeting the objectives. The chapter also presents sources of data, methods for data collection, data management and analysis as well as ethical considerations.

3.1 Research Strategy

According to Creswell (2012), a research strategy is "a step-by-step plan of action that guides your ideas and efforts while allowing you to carry out research effectively and on time to produce reaching results. world size. The main objective of the strategy is to present the main elements of the research, including the topic, main areas, main objectives, research design and research methods. Quantitative research strategy and qualitative research strategy are two main research methods used in research. Non-numerical data and information mining is a strategy used in qualitative research to understand people's underlying motivations or opinions about events or an issue; it sheds light on the research topic and also helps in achieving the objective of the research. On the other hand, quantitative research focuses on collecting primary or secondary data in digital form. This method focuses on what, when, where, and how often a particular phenomenon occurs. The concept of objectivity is also the foundation of quantitative strategy (Johnson and Christensen, 2012).

Quantitative research, according to Borga et al. (2009), "is essential for determining opinions, attitudes, and behaviours as well as determining what the public thinks about a topic." Understanding that the conduct and conclusions of research are accurate when using quantitative methods, the researcher must set aside personal experiences, opinions, and biases (Fraenkel and Wallen, 2006). Quantitative research, according to Muijis (2017), "provides data from a large number of units, allowing generalization of results". A quantitative approach was useful in this investigation because the sample is very large. Again, the benefits of providing objective, reliable, and generalizable results contributed to the decision to use quantitative research for the study.

3.2 Research Design

According to Creswell (2014), research design refers to "several styles of inquiry used in qualitative, quantitative, and mixed methods and provides specific direction for the stages of the research." This design, which some researchers call the inquiry strategy, contains a clear explanation of the research question as well as plans for collecting, analysing, and interpreting results to answer the question or target. The current study adopted a quantitative survey method. In quantitative research, numerical data must be collected, analysed, and statistical text must be used. By examining interactions between variables, this is a technique for testing unbiased theories. Graphs are often used to show relationships between quantitative variables. In quantitative research, researchers use correlational statistics to verify and evaluate the strength of relationships between quantitative variables or sets of scores. As a result, the variables used can be measured by the device and the numbered data generated can be statistically analysed. Quantitative data often includes closed responses (Creswell, 2012; Creswell, 2014).

3.3 Population of the Study

According to Mugenda and Mugenda (2003), a population is "the entire set of people, events or objects that exhibit certain observable characteristics". A population is a set of individuals or objects that have at least one similar attribute. Peil (1995) states that "the constituent elements of a population must be similar, whether coexisting in a particular geographical area or having the same origin". About 1,750 manufacturing companies in the Accra business district were the study population.

3.4 Sample Size and Sampling Technique

Best (1980) asserted that "the fundamental goal of research is to find universally applicable principles." By carefully observing the variables in a small sample of the population, sampling techniques help to create differences or generalizations. According to Kumar (2005), "a sample is a portion of a population selected to reflect the whole". Therefore, the sample must be representative and allow the researcher to make accurate estimates of the attitudes and actions of the entire population. Singleton (2010) defines a sample as "the component of a design that details how cases are selected for observation. » There are probability and non-probability sampling designs. Although probability sampling is considered more scientific, it is not always practical or affordable. Instead, what makes it different is that each case in the population is selected at random and has a known probability of being included in the sample. Because the examples are not randomly selected, there is uncertainty about the chances of choosing a particular event in an unlikely setting. Purposive sampling and convenience sampling are two non-probability sampling techniques used in research. First of all, only senior managers with deep expertise and a high level of skills were chosen to answer the questions in the created questionnaire, since they have a lot of information about the scope of their activities in company. As noted earlier, convenience sampling is popular because of its ease of use and affordability, while purposive sampling is more time- and cost-effective than other sampling techniques. To provide a representative sample for data collection purposes, a sample of 120 manufacturing companies, equivalent to 7% of the total population, was selected for the study. This is based on Fraenkel and Wallen's (2000) assertion that the sample should be large enough that the researcher can obtain it with a reasonable investment of time and effort. 7% was selected due to the limited time to complete the study
.

3.5 Types and Sources of Data

According to the Merriam-Webster Dictionary, data is ''true information that serves as the basis for computations, conversations, or measurements (like measurements or statistics)''. Primary data were used in this study for its objectives. The sampled participants' answers to a questionnaire provided to gather the primary data.

3.6 Data Collection Method

According to Cohen et al., questionnaires are a popular and effective technique for collecting survey data because they provide organized data, often numerical, presented without the presence of researcher and is usually quite easy to analyze. (2011). According to Siniscalco and Ariat (2005), "a questionnaire is a survey instrument used to collect information from people about themselves or a social unit". It is accepted as a legitimate and reliable technique for collecting accurate data from participants. This is consistent with Acharya's (2010) assertion that "surveys are designed to elicit responses based on respondents' information or opinions on arbitrary or even objective topics." According to Ross (2005), "facts, opinions, activities, knowledge, expectations, attitudes and perceptions are some types of information that can be collected using questionnaires". Objective data, facts, opinions and expectations have all been collected for the present investigation. But as Bird (2009) notes, question wording must be precise and clear to provide a reliable and valid questionnaire. The supervisor carefully reviewed the language of the questionnaire to ensure its validity for the current study. The main advantage of using questionnaires is that it collects high-quality data, is easy to read, and leads to high-quality conclusions (Cohen et al., 2011). Participants in the current study were asked to provide high-quality data to increase reliability. All surveys, according to Mathers et al. (2007), it must be considered that respondents will complete them themselves. According to Edwards (2010): Graham et al. (2006), Jenkins and Dillman (1995) and Dillman (1991), "questionnaires may be sent in person, by mail or by email. The current study used self-administered questionnaires delivered in person. The questionnaire had four sections, section A dealt with general information, section B dealt with supply chain resilience, section C dealt with sustainability performance and section D dealt with supply chain performance. The questionnaire was given to the sampling organization.

3.7 Construct Measurement and Sources

SUPPLY CHAIN RESILIENCE(SR)		
SR12	We have enough flexibility in production	**Construct sources**
SR13	We accomplish the service quality according to customers' requirement more quickly than our competitors.	Mohammad Mirabi, Asieh Sadat Hatami & Somayeh Karamad, (2018) International Journal of Engineering and Technology (IJET)
SR14	We have standardized training and monitoring system to overcome disruptions	
SR15	Raw materials price fluctuation does not impact our supply chain negatively	
SR16	We control disruptions in utility supply on our supply chain better than its competitors	
SR17	Economic recession on our supply chain is managed well than our competitors	

SECTION C: SUSTAINAIBILITY PERFORMANCE

	SUSTAINAIBILITY PERFORMANCE (SP)							Construct Sources
SS18	We monitor the social compliance issues of our suppliers							
SS19	We evaluate and monitor the environmental performance of our suppliers							NafyadTolaAbebe, LemaTeshomeBeyecha & AdenechMengistuGemeda (2020) International Journal of Business and Management Invention (IJBMI)
SS20	We take adequate measures for safety and security of employees							
SS21	We take adequate precautions for hazards and safety of employees							
SS22	We use efficient and updated machinery and technology in production							
SS23	We are able to meet the lead time set by our consumers							
SS24	We take adequate measures for the health and sanitation of our employees							

SECTION D: SUPPLY CHAIN PERFORMANCE

SUPPLY CHAIN PERFORMANCE (SP)										Construct Sources
SP25	We produce at less cost relative to that of our competitors									*Jane Pauline Muthoni & Dr. Thomas Mose, (2020)* International Academic Journal of Procurement and Supply Chain
SP26	We are always readily available to meet our targets in the year									
SP27	We are well noted for the production of high-quality product									
SP28	Our process and production are noted for their environmental friendliness									
SP29	We provide reliable, consistent and quality service to our consumers.									
SP30	There is always a higher preference for our products than our competitors									

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3.8 Data Analysis Method

According to Shamoo and Resnik (2003), ''data analysis is the systematic application of statistical and/or logical methods to describe and display, summarize, and analyse and evaluate data''. In the study, descriptive statistics expressed as percentages were employed. The data were analysed using the social science statistics software. To make data easier to read, it was turned into percentages. Each questionnaire item was calculated to see whether it had a favourable or unfavourable impact on supply chain sustainability and resilience. The hypotheses were tested using partial least square – structural equation modelling. This was performed with the aid of SmartPLS.

3.9   Validity and Reliability Test

Reliability and validity are critical elements in research. These two elements were observed in this study. The measure of a construct's reliability is often defined as the degree of reliability and consistency of the measure. Reliability, as defined by Leedy and Ormrod (2005), is "the consistency with which a measurement instrument produces specified results when the thing being measured remains unchanged". To ensure the consistency of the measurement items, the study employed Cronbach's alpha, rho_a, and rho_c. Validity is the ability of a researcher to draw relevant conclusions about a sample or population from scores (Creswell, 2005). According to Joppe (2000), "validity evaluates the accuracy of the research results as well as whether the research actually measures the variables it was intended to achieve." To establish validity, the study also employed factor loadings, and average variance extracted (AVE).

3.10   Research Ethics

The goal of research ethics is to determine some norms and standards of behaviour that researchers are required to adhere to. In order to protect the subjects and the researcher, the researcher followed ethical rules while conducting this research. The following ethical concerns were raised:

According to Taylor et al. (2012), "informed consent is the decision to participate in research after learning about the potential risks and benefits of the research." This suggests that participants need to be informed about the aims of the research and the benefits that their participation will bring them. Companies have time to weigh the pros and cons of participating in this research before deciding whether to do so. The benefits of the study were also explained to the participants. On behalf of their employees, companies completed consent forms and the researcher received management approval. The basic goals of the study as well as associated risks or side effects were explained to the participants.

According to Cohen et al. (2011), "confidentiality is not disclosing any information about a participant that could be used to locate or identify that person." The researcher used masking features of specific cases, organizations or environments that could make them distinct even without names, as well as encoding the extracted data with identifiers. unique names instead of names to identify them (WHO, 2013). The researcher came up with a way to protect information from unwanted users. Data stored on electronic copies is also secured with a password.

In research, anonymity is often expanded to include withholding information about any individual or research location that would enable others to identify them (Walford, 2005). Anonymity is defined as not being able to identify the individual or study site involved. In the current study, survey questions used numbers instead of names of people or companies. The researcher and company officials agreed to release the information if the participant requested it.

3.11   Profile of the Manufacturing sector in Ghana:

The manufacturing sector is a subsector of industry. It covers 16 of the 33 sub-sectors in the international standard classification of industries. Manufacturing value added was 5.6313% of GDP in 2016. In 2003 the last time an industrial census was conducted in Ghana, there were about 26,000 manufacturing establishments employing about 243,500 persons. About 55% of the establishment were micro-business, employing less than 4 persons, 40% were small businesses employing between 5 and 19 persons; 5% were medium employing 20-99 persons and only 1% were large diagnostic study of light. Most of the establishment were located in Greater Accra and Ashanti regions; Greater Accra had 25.7% of establishment and 27.9% of employees whiles Ashanti had 24.7% of establishment and 24.3% of employees.

According to the 2003 industrial census almost 50% of the employees were apprentices or unskilled workers. About 5% were professionals and managerial staff and 40% were skilled workers. The manufacturing sector comprises primarily of heavy manufacturing with sub sectors such as metal production, chemicals and construction whiles that of the light manufacturing sub-sectors includes the pharmaceuticals, wood processing and the textiles. Comprehensively, the heavy manufacturing is seen to immensely contributes to the growth of the economy as they primarily tend to sell their products to other industries than end users and consumers. Accordingly, when an economy begins to recover, heavy industry is often first to show signs of improvement; this therefore makes the sector a leading economic indicator. In Ghana, manufacturing is nevertheless an important contributor to the country's GDP.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS, AND DISCUSSION

4.0 Introduction

The study's conclusion and provide answers to the research questions, data was primarily collected from the field. The data analysis and study results are presented in this chapter. Four sections make up the presentation. The demographics of the respondents and firm profile are covered in the first part. The respondent rate is presented in the second section and the research constructs' descriptive statistics are presented in the third portion.

4.1 Demographic Characteristics of Respondents

The demographic characteristics of the 120 respondents were analysed on the parameters of gender, age, educational background, department of the respondent, area of expertise of the respondent, position, number of employees, type of ownership, type of business and the annual revenue of the firm

Table 4.1: Profile of Respondents

	Variable	Frequency (120)	Percentage (100%)
Gender	Male	80	66.67%
	Female	40	33.33%
Age	26 - 30 years	49	40.83%
	31 - 35 years	18	15.00%
	36 - 40 years	22	18.33%
	41 years and above	31	25.83%
Educational Background	Bachelor's Degree	97	80.83%
	Master's Degree	23	19.17%
Department of Respondents	Procurement	20	16.67%
	Marketing	11	9.17%
	HRM	5	4.17%
	Supply Chain	58	48.33%
	Operation	16	13.33%
	Accounting and Finance	5	4.17%
	Others	5	4.17%
Expertise of Respondents	Logistics and Supply Chain Management	60	50.00%
	Procurement Management	20	16.67%
	Operation Management	16	13.33%
	Human Resources Management	5	4.17%
	Head of Accounting and Finance	6	5.00%

	Marketing Management	9	7.50%
	Others	4	3.33%
Position of Respondents	Procurement Manager	20	16.67%
	Supply Chain Manager	60	50.00%
	Head of Accounting and Finance	5	4.17%
	Operation Manager	15	12.50%
	Marketing Manager	10	8.33%
	Human Resources Manager	5	4.17%
	Others	5	4.17%
	Total	**120**	

Source: Field Study (2022)

The above table, suitable for analysing data related to the characteristics of respondents, shows that there are 120 respondents, of which 80 are men, accounting for 66.67% of the total number and the relative difference ratio lower is 40 of whom are women, representing (33.33%). This convergence is positively consistent with the finding that Ghana's manufacturing sector is male-dominated. This is therefore consistent with the established view of (ILO, 2005) that men's participation in work activities is significantly higher than that of women in general. Furthermore, the view of the Ghana Statistical Service, 2014 is also in line with the findings of the study, as they believe that the occupational structure of Ghanaians in terms of employment to population ratio shows that there are more men than women gender in the country's workforce. According to the table above, 40.83% of respondents are between 26 and 30 years old; 15.0% are between the ages of 31 and 35; 18.33 is from 36 to 40 years old; and 25.83% were aged 41 or older. We can reasonably infer that the responses came from a variety of age groups, as there was sufficient representation across a variety of age groups. Respondent age results showed that no minors participated in the survey. The table below that 80.83% of employees have a bachelor's degree, while 19.17% have a master's degree. This correspondingly confirms that the respondents actually participating in the study have the necessary and desired knowledge, which effectively influences their contribution to the study. This simply means that they have a thorough understanding of the topic being researched and provide accurate and relevant information for the study.

The table also shows that 48.33% of the respondents were from the supply chain department, followed by 16.67% from the purchasing department and the remaining

respondents were from the finance, operations and accounting departments. Human resources and marketing with a corresponding ratio of 4.17. %, 13.33%, 4.17% and 9.17%. The remaining 4.17 respondents were from other departments. This has implications for the research in that it is careful to include the perspectives of multiple sectors that can provide a realistic assessment of the research question. The survey tested respondents' knowledge in addition to their employment department.

The table above shows that the majority of respondents, including 50%, are people with expertise in the field of logistics and supply chain management. Accordingly, 16.67% of respondents are purchasing management experts. The remaining respondents were professionals from the financial accounting, operations, human resources, and marketing departments accounting for 5%, 13.33%, 7.50%, and 7.50% of the total population, respectively. reply. Finally, 3.33% of respondents are experts in other fields. This implies that research can inculcate the views of experts from multiple fields, thereby measuring concepts as accurately as possible. Respondent location was the final demographic factor assessed. The majority of respondents in the study, 50%, were supply chain managers, followed by purchasing managers, accounting for 16.67% of respondents. The remaining respondents were financial and accounting managers, operations managers, human resource managers and marketing managers accounting for 4.17%, 12.50%, 4.17% and 8.33% respectively. number of asked. 4.17% of participants ultimately held other positions. This demographic information demonstrates that respondents come from diverse departments and areas of expertise, providing a comprehensive representation of research concepts.

Table 4.2: Profile of Firms

	Variable	Frequency (120)	Percentage (100%)
	Less than 5 years	10	8.33%
	6 - 10 years	25	20.83%
Firm Age	11 - 15 years	45	37.50%
	16 - 20 years	26	21.67%
	21 - 25 years	14	11.67%
	6 - 9 employees	17	14.17%
Firm Size	10 - 29 employees	49	40.83%
	30 - 50 employees	40	33.33%
	More than 50 employees	14	11.67%
Ownership Type	State Owned	41	34.17%
	Individual Owned	56	46.67%

	Group Owned	23	19.17%
Industry	Food Processing industry	82	68.33%
	Service	21	17.50%
	E-commerce	17	14.17%
Firm Revenue	Less than GH¢500,000	47	39.17%
	GH¢500,000 - GH¢1,000,000	43	35.83%
	Above GH¢1,000,000	30	25.00%

Source: Field Study (2022)

According to the above table, 10 companies or 8.33% have been around five years or less, 25 companies or 20.83% have been found around for between six to ten years; 45 companies or 37.50% have been around for between eleven and twenty years; and finally, 14 companies or 11.6% have been around for between twenty-one and twenty-five years. The data thus shows that although the subject firms under study had varying levels of industry experience, they were all sufficiently seasoned to give accurate answers to the questionnaire items. Secondly, 17 of the firms representing 14.17% of the total employee size; 49 firms represented 40.83% of the total employees' size; 40 firms represented 33.33% of the total employee size and 14 firms represented 11.67% of the total employee size. Less than fifty employees are employed by the vast majority of companies. The structure of the company that offers logistic services, which characterized by a greater emphasis on capital investment than on labour investment, may be the cause of this, additionally, it shows that majority of the participating businesses were SMES, proving that the study's criteria were met

The table also shows that among the firms that took part in the study, 41 represent 34.17% of the total number of firms that are state-owned, 56 represent 46.67% of the total number of firms that are individually owned, and 23 represent 19.17% of the total number of firms that are group-owned. This demonstrates that the study took into account the effects of various ownership kinds. Following that, it was revealed that, of the firms that took part in the study, 82 firms, or 68.33% of the total, are in the food processing industry, 21 firms, or 17.50% of the total, are in the service sector, and 17 firms, or 14.17% of the total, are in the e-commerce sector. This demonstrates that food processing is a big business for Ghana's logistic companies. Additionally, information gleaned from this sector will be used in the study to explain the research concept. The firm's revenue was the final profile of the company to be measured. In accordance with

the aforementioned table, the majority of the firms representing 39.17% have annual revenues of less than 500,000 Ghana cedis, followed by 43 firms representing 35.83% with revenues of between 500,000 and 1,000,000 cedis, and finally 30 firms representing 25% with revenues of over 1,000,000 cedis. These demonstrate that the study covered a range of firm sizes and that the conclusions consequently represent a wide range of perspectives.

Descriptive Statistics

The score of each individual variable used to measure the three primary study constructs is reported using descriptive statistics. In order to describe how frequently the indicators of the variables occur in the logistics service-providing industry, the score is compared against the Likert scale, which measures the degree of agreement on a scale from 1 to 7. The ratings ranged from 1 to 7, with 1 denoting "strongly disagree" to "strongly agree," "disagree," "somewhat disagree," "neutral," and "agree." 1.00 - 2.99 = very minimal/less occurrence of the phenomena, 3.00 - 4.99 = minimal/less occurrence of the phenomenon, are the analysis criteria for the descriptive results. A reasonable occurrence of the phenomena is between 5 and 5.99, and a frequent occurrence is between 6 and 7.00. This is the benchmark used to assess how frequently the measures occur in the sector that offers logistical services. Each construct is thoroughly described in the sections that follow:

Table 4.3: Descriptive Statistics for Supply Chain Resilience

Items	Mean	Std. Dev.
Supply Chain Resilience	**4.76**	**1.57**
We have enough flexibility in production	5.62	1.39
We accomplish the service quality according to customers' requirement more quickly than our competitors	5.47	1.47
We have standardized training and monitoring system to overcome disruptions	5.18	1.56
Raw materials price fluctuation does not impact our supply chain negatively	2.66	1.87
We control disruptions in utility supply on our supply chain better than its competitors	4.60	1.52
Economic recession on our supply chain is managed well than our competitors	5.01	1.63

Because risks and operational disruptions can put many components of the supply chain at risk, respondents were asked about "supply chain resilience" in this section to determine whether their company has ability to largely mitigate supply chain disruptions and significantly reduce the impact of those disruptions. it happens. The results show that, with an average score of 2.66, the question "Commodity price fluctuations do not have an adverse effect on our supply chain" is one of the top issues leading to disruptions in the supply chain. This implies that manufacturing companies frequently use price fluctuations to drive high demand, which is considered the main driver of the Bullwhip Effect. Most inventory models assume that unit production costs or purchase prices remain constant throughout the planning period, even when price fluctuations occur, and on a scale that cannot be ignored because it would cause Serious errors in judgment. According to Seung-Kuk et al. (2010), "Material demand planning or transportation economics requires businesses to place orders at certain periods of time. » This "pendulum" grouping causes demand growth in different periods to be zero or increase very little. However, price fluctuations due to "discounts or promotions" during trade promotions will further complicate matters by distorting purchasing habits and creating significant changes in demand and demand is uneven.

The item "We control utility supply disruptions on our supply chain better than its competitors" is one of the actions performed by firms in Ghana to have a sufficient supply chain process, as evidenced by the mean score of 4.60. This means that managers today are aware of how critical it is to protect their supply chains from significant and expensive disruptions, but that efforts to increase supply chain cost efficiency are undermined by the most straightforward solutions, such as increasing inventory, adding capacity at various locations, and using multiple suppliers. With a mean score of 5.01, 5.18, 5.47, and 5.62, the factors "Economic recession on our supply chain is managed well than our competitors; We have standardized training and monitoring system to overcome disruptions, we accomplish the service quality according to customers' requirements more quickly than our competitors, and We have enough flexibility in production" are among those that assist firms in overcoming or minimizing the level of most supply chain disruption. According to this, supply chain resilience refers to a network's capacity to withstand disruption and lessen its consequences on revenues,

expenses, and customers. Resilient supply chains can help firms obtain a competitive edge as well as adjust swiftly and effectively to significant economic, technological, and market changes.

Table 4.4: Descriptive Statistics for Sustainability Performance

Items	Mean	Std. Dev.
Sustainability Performance	**5.24**	**1.31**
We monitor the social compliance issues of our suppliers	5.88	0.82
We evaluate and monitor the environmental performance of our suppliers	5.52	1.38
We take adequate measures for safety and security of employees	5.57	0.88
We take adequate precautions for hazards and safety of employees	5.10	1.43
We use efficient and updated machinery and technology in production	4.64	1.45
We are able to meet the lead time set by our consumers	5.01	1.63
We take adequate measures for the health and sanitation of our employees	4.95	1.61

Source: Field Study (2022)

Given their respective mean scores of 4.64 and 4.95, the results show that the items "We use efficient and updated machinery and technology in production" and "We take adequate measures for the health and sanitation of our employees" are ways for firms in Ghana to maintain a sustainable supply chain performance. This suggests that the environment surrounding the supply chain has grown more complicated, leading to more uncertainty. Operations in the supply chain are negatively impacted by these disruptions or risks. Some nations or non-governmental organizations have set up emergency services in response to disruptions to handle crises and guarantee the viability of production and life. The key challenge, though, is figuring out how to create long-term supply chains. Existing research suggests that resilience can increase sustainability under unforeseen conditions. The application of supply chain resilience to the issue of supply chain management is advantageous for enhancing supply chain resilience and encouraging continuous operation. Additionally, as the environment changes, less resources are accessible, which drives up the cost of running supply chains continuously. Utilizing new technologies is essential to support the growth of supply chains across a range of industries and, as a result, to make the transition from resource-

pulling to technology-driving. People play a key role in this process because they are the carriers of technology; as a result, supply chain operations will also be somewhat impacted by people-oriented thinking.

In addition, the items "We are able to meet the lead time set by our consumers, We take adequate precautions for hazards and employee safety, We take adequate measures for employee safety and security, We evaluate and monitor the environmental performance of our suppliers, and We monitor the social compliance issues of our suppliers" are additional factors that support businesses in maintaining an excellent supply chain sustainability performance, with mean scores of 5.01, 5.10, and 5.57 respectively. This shows that as economic globalization advanced, competition among supply chains eventually replaced competitiveness among businesses. To offset the negative effects on the economy, environment, and society, industrial structures have changed from resource-intensive to technology-intensive. As a result, the idea of sustainable development can no longer be upheld by solely chasing economic benefits. Elkington argues that companies ought to fulfil their social, environmental, and economic commitments. According to Subhabrata, (2006) the aim of enterprise sustainability is to develop more adaptable businesses by continual integration of the economic, environmental, and social systems. In the context of a sustainable environment, it is more advantageous to effectively manage supply chain products or services, meet the needs of relevant interest groups in supply chains, and increase the competitiveness and resilience of the supply chain by taking into account environmental and social objectives while meeting economic objectives.

Table 4.5: Descriptive Statistics for Supply Chain Performance

Items	Mean	Std. Dev.
Supply Chain Performance	**5.11**	**1.38**
We produce at less cost relative to that of our competitors	4.89	1.86
We are always readily available to meet our targets in the year	5.34	1.38
We are well noted for the production of high-quality product	5.53	.88
Our process and production are noted for their environmental friendliness	4.61	1.55
We provide reliable, consistent and quality service to our consumers	4.76	1.30
There is always a higher preference for our products than our competitors	5.50	1.28

Source: Field Study (2022)

The focus of this section will be on the significance of understanding the concept of supply chain performance and the elements that go into good supply chain performance. Understanding this idea is crucial since supply chain success affects more than just your organization's internal operations; it also has an impact on your company's sales, accounting, and employee and customer satisfaction. The items "We provide reliable, consistent, and quality service to our consumers, our process and production are noted for their environmental friendliness, and We produce at a lower cost relative to that of our competitors" are fairly considered as factors that contribute to the supply chain performance of firms in Ghana with a mean score of 4.76, 4.61, and 4.89. This shows that the supply chain is engaged and committed to shared objectives like increased customer satisfaction and competitiveness along the whole supply chain. Supply chain performance is centred on a group of approaches used to effectively integrate suppliers so that goods are produced and transported in the right quantities, to the right places, and at the right times, minimizing system-wide costs while achieving service level standards. The expression alludes to the diverse set of activities necessary to effectively plan, carry out, and manage the manufacturing and distribution processes that take place between the location of raw material origin and the point of consumption. A shorter time to market for a product, less inventory, more responsiveness to changing market demand, and secured visibility to crucial information are a few benefits.

Additionally, with a mean score of 5.50, 5.53, and 5.34 respectively, the items "There is always a higher preference for our products than our competitors, we are well noted for the production of high-quality product, and We are always readily available to meet our targets in the year" are the actual supply chain management factors to improve the supply chain performance. This suggests that the term "supply chain management" refers to a set of tactics used to integrate suppliers, producers, warehouses, and retail establishments in a way that ensures goods are produced and distributed in the right quantities, at the right times, to the right locations, and at the right times in order to lower system costs while maintaining service level requirements. In order to successfully plan, carry out, and manage the production and distribution processes that take place between the point of origin of the raw materials and the point of consumption, a wide range of tasks must be done. This is what the term "production and distribution processes" refers to. A shorter time to market, reduced inventory levels, greater flexibility and responsiveness to changing market demand, and protected visibility to

crucial information are just a few benefits that supply chain management may offer. Management of the supply chain has the potential to reduce overall costs while simultaneously improving performance. In addition to this, it often entails integration, coordination, cooperation, and performance assessment throughout the whole of the supply chain as well as inside individual enterprises.

4.2   Validity and Reliability Test

This section details the validity and reliability tests conducted to ensure that the items measured the underlying construct, and were consistent in measuring the underlying construct. Both convergent and discriminant validity tests were conducted. The results are given in the subsequent sections below.

4.3.1   Convergent Validity

Convergent validity describes how closely and consistently multiple approaches, measurements, or tools created to evaluate the same underlying construct or concept perform. Factor loadings, AVE, Cronbach's alpha, and composite reliability (Rho_A and Rho_C) were used in the study to establish convergent validity. According to Hair et al. (2014), the AVE must be at least 0.5 and the factor loadings of each item relative to its associated construct must be 0.7 in order to prove convergent validity. The Cronbach's Alpha and composite reliability scores must also be at least 0.7 in order to guarantee the dependability of the constructions. Table 4.6 below therefore presents the confirmatory factor analysis for supply chain resilience, sustainability performance, and supply chain performance.

Table 4.6: Confirmatory Factor Analysis

Items		Factor Loadings	AVE	Cronbach's Alpha	Rho_A	Rho_C
Supply Chain Resilience	SR12	0.955	0.870	0.969	0.975	0.975
	SR13	0.961				
	SR14	0.958				
	SR15	0.757				
	SR16	0.971				
	SR17	0.973				
Sustainability Performance	SP18	0.933	0.898	0.977	0.979	0.981
	SP19	0.948				

	SP20	0.884				
	SP22	0.961				
	SP23	0.981				
	SP24	0.976				
	SCP25	0.954				
	SCP26	0.976				
Supply Chain Performance	SCP27	0.946	0.862	0.967	0.974	0.974
	SCP28	0.815				
	SCP29	0.955				
	SCP30	0.916				

Source: Field Study (2022)

Table 4.6 shows that the six items used to quantify supply chain resilience had factor loadings ranging from 0.757 to 0.973. All of the factor loadings were higher than the required cutoff of 0.7, indicating the items used to measure supply chain resilience have a high level of validity. Similar to the AVE of 0.870, the 6 elements on average captured 87% of the overall variation in supply chain resilience. This suggests that the items accurately examined supply chain resilience, and it also suggests strong validity. At 0.969, 0.975, and 0.975 respectively, the Cronbach's Alpha, Rho_A, and Rho_C all had scores far above 0.7. These results show that the six factors used to measure supply chain resilience are highly consistent. As a result, the study was able to demonstrate the validity and reliability of the items used to measure supply chain resilience.

Seven items made up the sustainability performance measurement. One of the seven things had trouble loading, therefore it was removed. The loadings of the remaining 6 items ranged from 0.884 to 0.981. Additionally, an AVE of 0.898 was discovered. The six items' factor loadings and AVE both showed strong validity, proving that they did, in fact, evaluate sustainability performance. The Cronbach's Alpha, Rho_A, and Rho_C values of 0.977, 0.979, and 0.981 respectively further supported the validity of the items. These data demonstrated that the performance of the items in measuring sustainability was consistent. As a result, the study could conclusively say that the items were valid and reliable for assessing sustainability performance.

Last but not least, 6 items with factor loadings ranging from 0.815 to 0.976 and an AVE of 0.862 were used to quantify supply chain performance. The fact that all of the factor loadings were higher than 0.7 and the AVE was higher than 0.5 suggests that the items accurately and validly measured the underlying construct. The Cronbach's Alpha,

Rho_A, and Rho_C values of 0.967, 0.974, and 0.974, respectively, were all above 0.7, indicating the reliability of the items. This demonstrated that the metrics used to gauge supply chain performance were reliable. All things considered, the study was able to demonstrate that supply chain resilience, sustainability performance, and supply chain performance all complied with the requirements for convergent validity and were validly and consistently measured.

4.3.2 Discriminant Validity

Discriminant validity is the degree to which measures or instruments designed to assess distinct constructs or concepts produce results that are different from one another. This concept ensures that researchers can effectively separate and identify unique traits or phenomena in their studies. Discriminant validity was thus ensured in this study using the Fornell Larcker Criterion. The Fornell Larcker Criterion ensures discriminant validity by comparing the square roots of the AVE for each construct to the correlations between constructs. According to the Fornell Larcker Criterion, the square root of the AVE for a construct should be greater than the correlation between that construct and any other construct in order to establish good discriminant validity, as this suggests that the construct captures more variance from its indicators than it shares with other constructs.

Table 4.7: Fornell Larcker Criterion

Variables	1	2	3
. Supply Chain Resilience	**0.932**		
. Sustainability Performance	0.291*	**0.948**	
. Supply Chain Performance	0.327**	0.119	**0.928**
Note(s): *p < 0.05; **p < 0.01; ***p < 0.001			

Source: Field Study (2022)

The Fornell Larcker Criteria are shown in Table 4.7 above. The table shows that the connection between supply chain resilience and supply chain performance is 0.291 and 0.324, respectively. At the p 0.05 and p 0.01 significance levels, respectively, both relationships are significant. This demonstrates a 29.1% positive and substantial relationship between supply chain resilience and sustainability performance. The data also reveals a 32.7% positive and substantial correlation between supply chain

performance and resilience. There was an 11.9% correlation between supply chain performance and sustainability performance, however it was not significant since $p > 0.05$. In order to determine whether these correlation values matched the criteria for discriminant validity, they were compared to the AVE of each component. As a result, the AVE for supply chain resilience, sustainability performance, and supply chain performance, respectively, were 0.932, 0.948, and 0.928, and they were all higher than the correlations determined during the study. As a result, it was inferred that the study satisfied the criteria for discriminant validity.

4.3   Structural Equation Modelling

After establishing convergent and discriminant validity, the study proceeded to conduct the structural equation model in order to confirm, or deny the hypothesis formulated about the study variables. Accordingly, the results are presented in the table below.

Table 4.8: Structural Equation Model Results

| Relationships	Path Coefficients	P Values	Hypotheses	Results
Direct Effect				
Supply Chain Resilience --> Sustainability Performance	0.892***	0.000	H1	Supported
Supply Chain Resilience --> Supply Chain Performance	0.977***	0.000	H2	Supported
Supply Chain Performance --> Sustainability Performance	0.099	0.075	H3	Not Supported
Mediating Effect				
Supply Chain Resilience --> Supply Chain Performance --> Sustainability Performance	0.096	0.074	H4	Not Supported
Note(s): *p < 0.05; **p < 0.01; ***p < 0.001				

Source: Field Study (2022)

Table 4.8 above presents the structural equation model results. The table presents the results for the direct effect first. According to the table, supply chain resilience has a positive and significant effect on sustainability performance ($\beta = 0.892$; $p < 0.001$). In other words, by holding all other variables in the model constant, and increasing supply

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chain resilience by 1 unit, it results in a 0.892 standard deviation increase in sustainability performance. As a result, H1 was therefore supported. The table also showed that supply chain resilience has a positive and significant effect on supply chain performance ($\beta = 0.977$; $p < 0.001$). Based on the results, by increasing supply chain resilience by 1 unit, while holding all other variables in the model constant, there is a 0.977 standard deviation unit increase in supply chain performance. Again, the study was therefore able to confirm H2. The last direct relationship assessed was the effect of supply chain performance on sustainability performance. According to the results, supply chain performance does not have a significant effect on sustainability performance ($\beta = 0.099$; $p = 0.075$). The results were insignificant as $p > 0.05$. The results therefore showed that H3 was not supported.

Lastly, the study tested the mediating effect of supply chain performance in the relationship between supply chain resilience and sustainability performance. According to the results, supply chain performance does not significantly mediate the relationship between supply chain resilience and sustainability performance ($\beta = 0.096$; $p = 0.074$), as $p > 0.05$. Again, the findings therefore showed that H4 was not supported. The results of the structural equation model are also presented in Figure 4.1 below.

Figure 4.1: Structural Equation Model
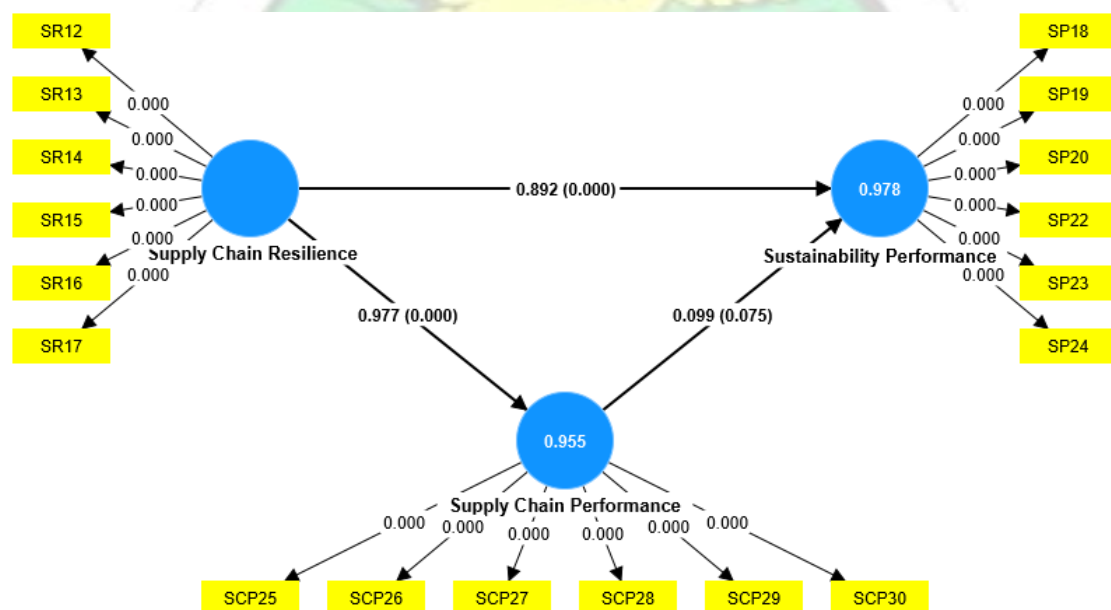
Source: Field Study (2022)

4.4   Discussion of Results

This section discusses the findings from this chapter in line with the research objectives. The discussion is done in the sections that follow below.

4.4.1   Supply Chain Resilience and Sustainability Performance

The main objective of the study is to determine how supply chain resilience affects sustainability performance. According to the research of Chopra and Sodhi (2004) and Sheffi and Rice (2005), supply chain resilience has a positive and significant impact on sustainable performance, according to the supply chain hypothesis. This theory was then supported or refuted in subsequent chapters. According to the correlation analysis presented in this chapter, supply chain resilience and sustainability performance are positively and significantly correlated at 29.1%. However, the correlation does not reflect how supply chain resilience affects sustainability performance; it simply represents the direction of the association between two variables. Structural equation modeling then demonstrated that supply chain resilience has a positive and significant impact on sustainability performance (= 0.892; p 0.001). According to the beta value, increasing supply chain resilience by one unit while holding all other variables in the model constant leads to an increase in sustainability performance with a standard deviation of 0.892. As indicated by p 0.001, there is less than a 0.1% chance that the effect of supply chain resilience found in this study is the result of chance. The investigation was able to confirm the relevance of the conclusions. Therefore, the study can support H1 and achieve the original research objective. This result is also consistent with the results of studies such as Chopra and Sodhi (2004) and Sheffi and Rice (2005), which argue that the biggest oversight in day-to-day risk management is not providing resilience for Chain. capacity. amount of attention.

Supply Chain Resilience and Supply Chain Performance

The next goal of the study is to determine how supply chain resilience affects its performance. Based on studies such as Gaonkar and Viswanadham (2004) and Tang (2006), the study developed hypotheses about the impact of supply chain resilience on supply chain performance, similar to the first objective. Fairy, these investigations lead to the hypothesis that supply chain resilience significantly and beneficially influences

supply chain performance. The study then tested the hypothesis and correlation analysis revealed a positive and significant relationship at 32.7% between supply chain resilience and its performance. It is important to conduct additional research to verify the impact of supply chain resilience on supply chain performance, because correlation does not imply causation. Supply chain performance is positively and strongly influenced by supply chain resilience, according to the structural model (r=0.977; p=0.001). The results show that building supply chain resilience within an organization increases supply chain performance by 0.977 standard deviations. This effect is found to be significant at the p0.001 level, indicating that there is less than a 0.1% probability that the relationship between resilience and supply chain performance is random. As a result, the study can support H2 as the results are consistent with both the stated hypothesis and previous research by authors such as Gaonkar and Viswanadham (2204) and Tang (2006), which stated that the series -elastic people. Thus, the second goal of the study has been achieved.

Supply Chain Performance and Sustainability Performance

The study completed the prior target and then went to the next one. Assessing the impact of supply chain performance on sustainability performance was the next goal. The study hypothesis – which was based on through evaluation of the literature was that supply chain performance has a positive and significant impact on sustainability performance. The following step in the research process involved gathering and analysing data in order to validate or refute the formulated hypothesis. This procedure thus showed that although there 11.9% association between supply chain performance and sustainability performance, the effect was negligible. This was the case because p>0.05 indicated that there was a more than 5% possibility that the positive correlation between supply chain performance and sustainability performance was the result of chance. Nevertheless, the study went on to investigate the actual relationship between supply chain performance and sustainability performance and thus findings were consistent with those of the correlation analysis. Although supply chain performance was found to have a favourable impact on sustainability performance, this impact was not found to be statistically significant (=0.099; p=0.075), according to this result. In other words, the study's findings that supply chain performance influences sustainability performance favourably were not strong enough to be taken seriously as

correctly representing the population. The results so refuted the first hypothesis put forward. Therefore, the studies that served as the foundation for theory, namely Suhong et al., (2006) and Meindl (2005), were refuted. Regardless of outcomes, the goal of the study was accomplished

Mediating Role of Supply Chain Performance in the Relationship Between Supply Chain Resilience and Sustainability Performance

Determining the mediating function of supply chain performance in the relationship between supply chain resilience and sustainability performance was the study's final goal. In the light of this, the study anticipated that supply chain performance significantly and favourably mediates the relationship between supply chain resilience and sustainability performance (Stadtler and Kilger, 2008; Doyle and Stern, 2006). Although the results indicated a positive and significant mediating effect of supply cahin performance in the relationship between supply chain resilience and sustainability performance, the effect was non-significant (= 0.096; p=0.074), according to the results of structural equation modelling. As a result, the research hypothesis was in contrast with findings of the literature that had already been published (Stadtler and Kilger, 2008; Doyle and Stern, 2006). Nevertheless, the study was successful in achieving its final scientific goal

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION, AND RECOMMENDATIONS

5.0   Introduction

This chapter summarizes the previous chapters' findings as well as the inferences that may be taken from the research findings. Furthermore, this component of the study includes recommendations to businesses and policy makers, as well as research directions.

5.1   Summary of Findings

The purpose of this study was to explore the relationship between organizational performance and sustainable supply chain resilience and sustainability, as well as the mediating role of supply chain performance. As a result, the findings from the literature research and the information gathered during the study are summarized in this section. Based on the study's goals, the findings are presented below under subheadings.

5.1.1   Supply Chain Resilience and Sustainability Performance

The study started out by seeking to assess the effect of supply chain resilience on sustainability performance. Accordingly, the study performed a literature review based on which the study hypothesized that supply chain resilience positively and significantly affects sustainability performance. Following this hypothesis, the study continued to collect data, and either to confirm or deny the hypothesis. The data analysis showed that supply chain resilience and sustainability performance are positively and significantly related. Hence, the study continued with the structural equation model, which showed that supply chain resilience positively and significantly affects sustainability performance. These results therefore confirmed the initial hypothesis formulated about the relationship between supply chain resilience and sustainability performance.

5.1.2 Supply Chain Resilience and Supply Chain Performance

After fulfilling the first objective, the study proceeded to assess the effect of supply chain resilience on supply chain performance. Again, based on this objective, the study combed through literature and hypothesized based on the literature that supply chain resilience positively and significantly affects supply chain performance. The next step was to test the hypothesis by collecting and analyzing data. The collected data revealed that supply chain resilience and supply chain performance are positively and significantly related. Further analysis of the data revealed that supply chain resilience positively and significantly affects supply chain performance. This finding again confirmed the formulated hypothesis about the relationship between supply chain resilience and supply chain performance, confirming that indeed supply chain resilience positively and significantly affects supply chain performance

5.1.3 Supply Chain Performance and Sustainability Performance

The next objective was to assess the effect of supply chain performance on the sustainability performance. Similar to the previous research objectives, it was necessary to perform an extensive literature and formulate a hypothesis. The study therefore formulated a hypothesis that supply chain performance positively and significantly affects sustainability performance. After collecting data and subjecting it to various data analysis, the correlation analysis revealed that supply chain performance and sustainability performance are positively but insignificantly related. Further analysis also revealed that supply chain performance has a positive but insignificant effect on sustainability performance. This finding therefore diverged from the findings of external literature and thus meant the formulated hypothesis was denied

5.1.4 Mediating Role of Supply Chain Performance in the Relationship Between Supply Chain Resilience and Sustainability Performance

The last research objective was to determine the mediating role of the supply chain performance in the relationship between supply chain resilience and sustainability performance. Accordingly, once again, the study performed a through literature review based on which it was hypothesized that supply chain performance plays a positive and significant mediating role in the relationship between supply chain resilience and

sustainability performance. Similar to the previous objective, the study thus collected and analysed data in order to confirm or deny they study hypothesis. The data revealed that supply chain performance plays a positive but insignificant role in the relationship between supply chain resilience and sustainability performance. Accordingly, the study denied the formulated hypothesis, showing instead that supply chain resilience and sustainability performance

5.2   Conclusion

Supply chain resilience and sustainability has become essential in today's global competitive market and has been significantly identified as the growing means of ensuring healthy competition between organizations and their respective supply chain systems. A study looking at the effect of supply chain resilience and sustainability performance and the mediating role of supply chain performance therefore holds significant value for diverse bodies. The study therefore set out to conduct such research and formulated various hypothesis about the particular relationships between the study variables. Accordingly, after formulating the study hypothesis, it was necessary to collect data and subject it to various data analysis tools in order to confirm or deny the research hypothesis. According to the data analysis, the study found that supply chain resilience positively and significantly affects both supply chain performance and sustainability performance. However, supply chain performance was found to not significantly affect sustainability performance, nor significantly mediate the relationship between supply chain resilience and sustainability performance. Based on the finding, the study therefore concluded that supply chain performance positively affects supply chain performance and supply chain sustainability directly but not indirectly

5.3   Recommendations

This section makes recommendation for various stakeholders based on the findings from the study. The recommendations are made for management and future studies.

5.3.1 Recommendation for Management

First, the study found that supply chain resilience positively and significantly affects both supply chain performance and supply chain sustainability. This shows that supply chain resilience is of outmost importance not just for performing well within the short run, but also in the long run. As a result, this study suggests to management that they pay attention to supply chain resilience principles by being flexible in their production process and controlling disruptions within the supply chain as much as they can in order to record both short- and long-term performance goals. The study also showed that sustainability is not significantly affected by supply chain performance. This result implies that in management's effort to improve sustainability performance, they should not rely on only supply chain performance. Instead, management should focus on other aspects such as supply chain resilience. However, although supply chain performance does not significantly affect sustainability performance, it does not negatively affect it either. Thus, firms should still focus on improving their supply chain performance.

Lastly, the study also revealed that supply chain performance does not significantly mediate the relationship between supply chain resilience and sustainability performance. This implies that in the quest to improve sustainability performance, supply chain performance does not play an indirect role between supply chain resilience and sustainability performance. Firms should thus focus on the more direct means such as supply chain resilience in improving sustainability performance.

5.3.2 Recommendation for Future Studies

The study looked at the supply chain resilience and supply chain sustainability: the mediating role of supply chain performance. However, the study was limited to the manufacturing industry in Ghana. As a result, it is difficult to generalize the findings to other industries. The study therefore recommends that future studies look at the supply chain resilience and supply chain sustainability: the mediating role of supply chain performance in other industries as well. Also, the study was conducted within the Ghanaian context, future studies should therefore be done in other countries so that a more accurate view of the findings can be derived.

Furthermore, the insignificant effect of supply chain performance on sustainability performance and the insignificant effect of supply chain performance in the relationship between supply chain resilience and sustainability performance could be due to a relatively small sample size. Thus, future studies should be conducted with a larger sample size to determine if needed the effects do not exit or exist but could not be found due to the small sample size used in this study.

The study also recommends to future researchers that the findings be confirmed by conducting the study in a longitudinal setting in order to infer causality. Lastly, the model used in the study was a basic model, and thus helped explain the relationship within the model without complicating the results. However, future studies should endeavour to include more variables in the model, as the predictor of supply chain performance and sustainability performance are not so simple in real life. In this manner, the study would therefore have more practical implications

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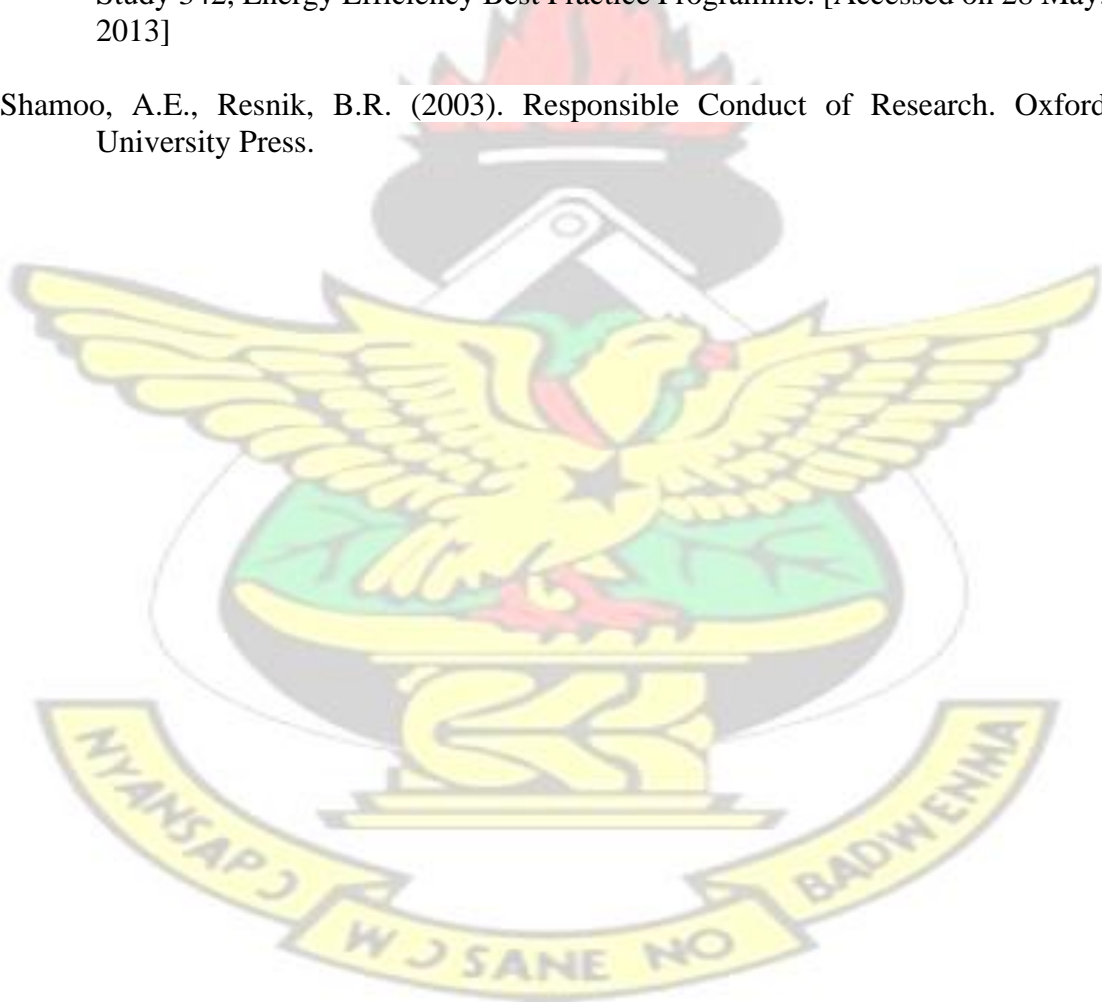
SURVEY QUESTIONNAIRE

My name is EMMANUEL SEIDU, a postgraduate student at the Kwame Nkrumah University of Science and Technology, Kumasi, Department of Supply Chain and Information Systems. This survey instrument has been designed to enable me carry out research on the topic: **"SUPPLY CHAIN RESILIENCE AND SUSTAINABILITY PERFORMANCE: THE MEDIATING ROLE OF SUPPLY CHAIN PERFORMANCE"**. Any information provided will be used for academic purposes ONLY. There are no risks associated with your participation, and your responses will remain confidential and anonymous.

SECTION A: RESPONDENT'S BIOGRAPHY AND COMPANY PROFILE

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

1. Gender: [ ] Male [ ] Female

2. Age: [ ] 25 years and below [ ] 26–30 years [ ] 31–35 years
   [ ] 36–40 years [ ] 41 years and above

3. Educational Background:
   [ ] No formal education [ ] Basic/Primary [ ] Secondary
   [ ] Bachelor's Degree [ ] Master's Degree [ ] Ph.D./Doctorate

4. Please, indicate the department you belong (e.g., Procurement, Marketing, HRM, Management, etc.) _____

5. Please, indicate your area of expertise (e.g., logistics and supply chain management, procurement management, operations management, etc.) _____

6. Please indicate your position in the firm (e.g. Supply Chain Manager, Operations Manager, etc.). _____

7. Number of years the firm has been in operation:
   [ ] Less than 5 year [ ] 6-10 years [ ] 11-15 years
   [ ] 16-20 years [ ] 21-25 years [ ] 25 years & above

8. Number of employees in the firm:
   [ ] Less than 6 employees [ ] 6-9 employees [ ] 10-29 employees
   [ ] 30-50 employees [ ] More than 50 employees

9. Type of ownership:
   [ ] State Owned [ ] Individual Owned [ ] Group Owned

10. Please, indicate the industry your firm belongs (e.g., food processing industry, service and commerce etc.) _____

11. Firm's annual revenue (in Ghana Cedis)?
    [ ] Less than 500,000 [ ] 500,000 – 1,000,000 [ ] Above 1,000,000

SECTION B: SUPPLY CHAIN RESILIENCE

Indicate the extent to which you agree or disagree with each statement by checking the appropriate number from 1 to 7, using the following scale:

1 = Strongly Disagree		*2 = Disagree*		*3 = Somewhat Disagree*		
4 = Indifferent/Not Sure		*5 = Somewhat Agree*		*6 = Agree*		
7 = Strongly Agree						

Item	Statement	1	2	3	4	5	6	7
SUPPLY CHAIN RESILIENCE (SR)								
SR12	We have enough flexibility in production							
SR13	We accomplish the service quality according to customers' requirement more quickly than our competitors.							
SR14	We have standardized training and monitoring system to overcome disruptions							
SR15	Raw materials price fluctuation does not impact our supply chain negatively							
SR16	We control disruptions in utility supply on our supply chain better than its competitors							
SR17	Economic recession on our supply chain is managed well than our competitors							

SECTION C: SUSTAINAIBILITY PERFORMANCE

Indicate the extent to which you agree or disagree with each statement by checking the appropriate number from 1 to 7, using the following scale:

1 = Strongly Disagree	*2 = Disagree*	*3 = Somewhat Disagree*
4 = Indifferent/Not Sure	*5 = Somewhat Agree*	*6 = Agree*
7 = Strongly Agree		

Item	Statement	1	2	3	4	5	6	7
SUSTAINAIBILITY PERFORMANCE (SP)								
SS18	We monitor the social compliance issues of our suppliers							
SS19	We evaluate and monitor the environmental performance of our suppliers							
SS20	We take adequate measures for safety and security of employees							
SS21	We take adequate precautions for hazards and safety of employees							
SS22	We use efficient and updated machinery and technology in production							
SS23	We are able to meet the lead time set by our consumers							
SS24	We take adequate measures for the health and sanitation of our employees							

SECTION D: SUPPLY CHAIN PERFORMANCE

Indicate the extent to which you agree or disagree with each statement by checking the appropriate number from 1 to 7, using the following scale:

1 = Strongly Disagree	2 = Disagree	3 = Somewhat Disagree
4 = Indifferent/Not Sure	5 = Somewhat Agree	6 = Agree
7 = Strongly Agree		

Item	Statement	1	2	3	4	5	6	7
SUPPLY CHAIN PERFORMANCE (SP)								
SP25	We produce at less cost relative to that of our competitors							
SP26	We are always readily available to meet our targets in the year							
SP27	We are well noted for the production of high-quality product							
SP28	Our process and production are noted for their environmental friendliness							
SP29	We provide reliable, consistent and quality service to our consumers.							
SP30	There is always a higher preference for our products than our competitors							