**KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI**

**The relationship between collaborative knowledge creation and supply chain**

**resilience, the mediating role of supply chain innovation**

By

**FRANCIS MATEY**

A Thesis submitted to the Department of Supply Chain and Information Systems, College of Social Sciences in partial fulfillment of the requirements for the degree of

**MASTER OF SCIENCE IN**

**LOGISTICS AND SUPPLY CHAIN MANAGEMENT**

**MAY, 2023**

# DECLARATION

I hereby declare that this submission is my work towards the Masters of Science in Logistics and Supply Chain Management and that, to the best of my knowledge, it contains no material previously published by another person nor material which has been accepted for the award of any other degree of the University, except where due acknowledgment has been made in the text.

FRANCIS MATEY        …………………        ………………..

**(PG9269821)**                     **Signature**           **Date**

**Certified by:**

**Prof. Kwame Owusu Kwateng**     ………………....      …….………….

**(Supervisor)**                    **Signature**          **Date**

**Prof. David Asamoah**         ………………..        ………………..

**(Head of Department, SCIS)**       **Signature**         **Date**

## DEDICATION

This thesis is wholeheartedly dedicated to my beloved wife, Cynthia Matey, who have been my source of inspiration and gave me strength when I thought of giving up, who continually provides her moral, spiritual, emotional, and financial support.

Also, to my late parents, who shared their words of encouragement to climb higher the academic ladder. You really meant a lot to me.

To my adorable children Anita, Julius and Nora who supported me throughout the study, and most especially Anita, helping to improve upon my Technology skills, I will forever be grateful to you.

And lastly, I dedicated this thesis to the Almighty God, thank you for the guidance, strength, power of mind, protection and skills and for giving me a healthy life. All of these, I offer to you.
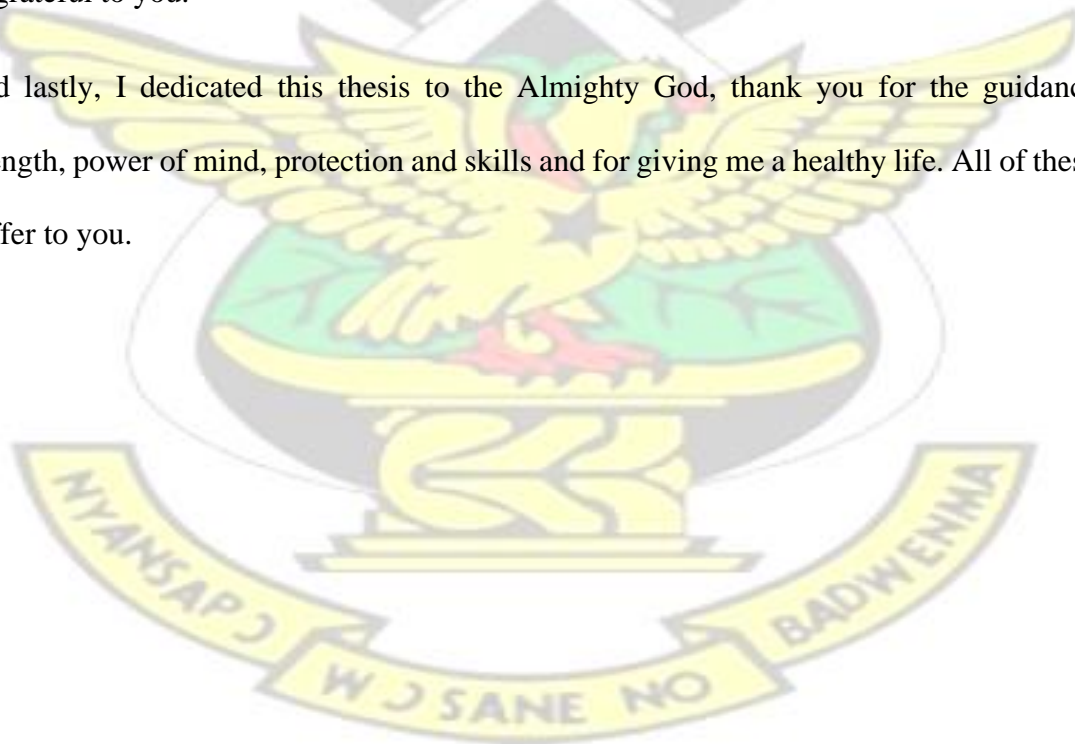
## ACKNOWLEDGMENT

I would like to acknowledge and give my warmest thanks to my supervisor Prof. Kwame Owusu Kwateng who made this work possible. His guidance and advice carried me through all the stages of writing my thesis.

I am also indebted to my Lecturers and all my course mates for letting my study be an enjoyable moment, and for your brilliant comments and suggestions, thanks to you.

I would also like to give a special thanks to my wife Cynthia Matey and my brothers Edmund and Eric for their continues support and understanding when undertaking my study. Your prayer for me was what sustained me this far.

A debt of gratitude is also owned to my good friends, Mr. Francis Kamewor who's had work made me completed this work on time and Madam Effah who always stood by me. Finally, I would like to thank God, for letting me through all the difficulties. I have experienced your guidance day by day. You are the one who let me finish my course. I will keep on trusting you for my future.
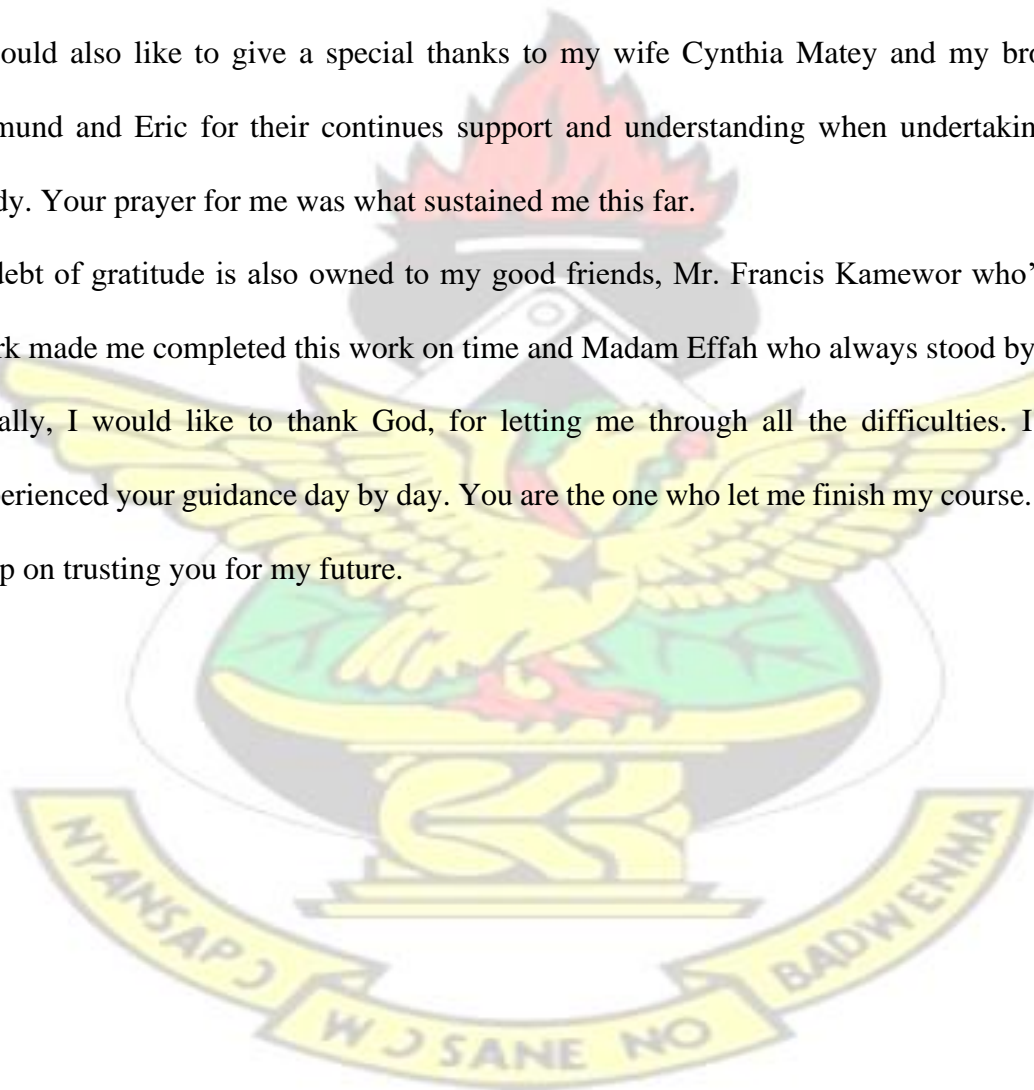
# ABSTRACT

The main objective of this study is to evaluate how collaborative knowledge creation may affect supply chain resilience as well as the mediating role of supply chain innovation. The study employed cross-sectional descriptive survey design. This survey was conducted using a quantitative approach. Convenience and purposive sampling technique were used to choose 176 participants from procurement, logistics, and top executive or managers of all the multinational companies in Ghana. A prepared questionnaire was the main tool used for data collection. Both SPSS v26 and SmartPls v4 were used for the statistical analysis. Both descriptive and inferential approaches were used to analyze the data. The findings indicated a significant positive direct influence on CK to SCRES and SCI. SCI had a significant direct influence on SCRES and also mediates CK-SCRES interactions. To improve SC resilience in the face of disruptions, the study suggests that management work with partners to use inductive and deductive reasoning to learn new things, to release and share ambitious and creative ideas and discussions, and to spend a lot of time reconfiguring information and sorting, integrating, and categorizing new knowledge.

.

.

# TABLE OF CONTENTS

# LIST OF TABLES

# LIST OF FIGURES

# CHAPTER ONE

## INTRODUCTION

### 1.1 Background of the Study

Given that developed as well as developing nations manufacturing sector accounts for the largest share of the industrial sector (Haraguchi, Cheng, and Smeets, 2017). The manufacturing industries refer to those industries which involve the manufacture and processing of articles and indulge in either creating new commodities or adding value (Pfeiffer, 2017). The indigenous manufacturing industry supports local businesses and employs a major section of the increasing workforce. Manufacturing, food processing, construction, a small glass industry, textiles and clothing, chemicals and pharmaceuticals, metal processing, furniture and wood products, and leather and footwear are among Ghana's most important manufacturing industries (Addo, 2017). Despite the contribution of the sector to national growth, the face multiple challenges. Among the issues that have plagued this industry is that most manufacturers have not kept up with the growing dynamism in the global supply chain. Firms now operate in a dynamic and unpredictable business environment. In today's unpredictable and turbulent environment, every enterprise in the supply chain is at risk of disruption ( Fiksel et al. 2015; Sima and Mahour, 2019). As a result, an understanding of how firms can manage supply chain disruptions has become an important subject for both academics and practitioners ( Parast and Shekarian 2019; Scholten et al., 2019; Al-Omoush et al., 2020; Medel et al., 2020; Sabahi and Parast, 2020; Nikookar and Yanadori, 2022).

The recent COVID-19 pandemic has been wreaking havoc worldwide, affecting several million firms and disrupting many supply chains. Firms develop supply chain resilience

"to be alert to, adapt to, and quickly respond to" such events (Ambulkar et al., 2015; Nikookar and Yanadori, 2022). Past research has suggested various organizational capabilities and resources as antecedents that enhance supply chain resilience. According to the Institute for Supply Management (ISM), at least 97% of supply chains were disrupted by the COVID-19 pandemic by the end of May 2020 (ISM, 2020). Large-scale supply chain disruptions triggered by the COVID-19 pandemic indicate that research insights into exploring supply chain resilience antecedents might not be sufficiently effective in dealing with the pandemic and future COVID-like events that occur (Rahman et al., 2021).

Recent discourse in the supply chain management (SCM) literature highlights the importance of further investigation of supply chain resilience antecedents at various levels of analysis (Azadegan and Dooley, 2021; Nikookar and Yanadori, 2022). Much is unknown beyond common organizational resilience antecedents (Nikookar et al., 2019). Nikookar and Yanadori (2022) argued that there were new avenues to enhance supply chain resilience by leveraging factors at levels other than the organization. This requires an organization to look into the whole supply network's capabilities to survive, adapt and grow when confronted with change and uncertainty (Knemeyer et al., 2009; Scholten and Sanne, 2015). Accordingly, the empirical and conceptual literature highlights the importance of collaborative knowledge creation for building a resilient supply chain (Pettit et al., 2013; Khaled et al., 2020) as the "glue that holds supply chain organizations together in a crisis" (Richey, 2009). However, while there is an agreement in the literature that collaborative knowledge creation is one of the formative elements of a resilient supply chain, to date, little is known on how exactly collaborative knowledge creation influences supply chain resilience. Drawing on the discussion above, it is unclear how collaborative

knowledge creation influences supply chain resilience. This study is therefore conducted to examine how collaborative knowledge creation may influence supply chain resilience

## 1.2 Statement of the Problem

In the face of complexity in today's' supply chain management collaboration is pivotal in creating new knowledge as a social process whereby knowledge is transferred and incorporated through social networks, providing businesses with social capital embedded in these networks (Chen et al., 2016; Tu, 2020). The outbreak of the pandemic and the recent Ukraine war has exposed how most business have become more vulnerable. The implications of these disruption did not just affect firms, but to the extent of halting many supply chains. In response, attention from both industry players and scholars has rising on the concept of supply chain resilience, as a strategic way of reducing the impact of disruptions through proactively searching for emerging that enables supply chains to react while bouncing back or performing much better a post disruption. Prior studies (Knemeyer et al., 2009; Scholten and Sanne, 2015) have indicated that it is essential for firms to consider the entire supply chain network capabilities in the face of uncertainty. Accordingly, prior studies have highlighted the importance of collaboration for building a resilient supply chain (Scholten and Schilder, 2015; Juan et al., 2021; Belhadi et al., 2021; Zhou et al., 2022) as the "glue that holds supply chain organizations together in a crisis. However, while there is an agreement in the literature that collaboration is one of the formative elements of a resilient supply chain, to date, little is known on how exactly collaborative knowledge creation influences supply chain resilience. Collaboration in a supply chain relates to the capability of two or more autonomous firms to work effectively together, planning and executing supply chain operations toward common goals (Cao et

al., 2010). Although collaboration between organizations is the core notion of supply chain risk management practices, the literature on supply chain resilience lacks empirical insights beyond the single company perspective. Although collaborative knowledge creation is accepted as contributing to sustaining a competitive advantage, there is limited empirical evidence how it contributes to building resilient supply chains, especially during pandemics such as COVID-19. Previous studies have largely ignored the impact of collaborative knowledge creation on supply chain resilience. Furthermore, while the strategic values of collaborative knowledge creation practices are clear, most firms are unable to comprehend how it could be useful in enhancing their pro-activeness in such crises.

Apart from the lack of clear understanding of regarding how collaborative knowledge creation may influence supply chain resilience, earlier studies are largely conducted in developed economies with different socio-cultural orientations. Again, drawing from the contingency perspective, achieving supply chain resilience may not just be developed via only collaborative knowledge creation. There may be other factors that may also trigger building resilient supply chains, one of which is supply chain innovation. Though the concepts of supply chain innovation and supply chain resilience have received wide recognition in risk management literature (Sabahi and Parast, 2020; Belhadi et al., 2021; Ivanov et al., 2021; Kwak et al., 2018), the role of supply chain innovation in driving supply chain resilience has been neglected (Sabahi and Mahour, 2020). This study therefore envisages that collaborative knowledge creation may translate into supply chain innovation which may play essential role in delivering superior supply chain resilience. This study closes the aforementioned gaps by examining the relationship between collaborative

knowledge creation and supply chain resilience as well as the mediating role of supply chain innovation. Being among few attempts to examine the phenomena, this study makes a twofold contribution to supply chain risk management literature. The direct relationship of how collaborative knowledge creation may affect supply chain resilience which has not been adequately validated is explored in this study and further expand the theoretical lens of supply chain literature on the mediating role of supply chain innovation.

## 1.3 Objective of the Study

The main objective of this study is to evaluate how collaborative knowledge creation may affect supply chain resilience as well as the mediating role of supply chain innovation. Based gaps identified and discussed in the problem statement three specific objectives were put forward. These objectives include

1. To examine how collaborative knowledge creation influence supply chain resilience.
2. To evaluate the relationship between supply chain innovation and supply chain resilience.
3. To investigate the mediating role of supply chain innovation on the relationship between collaborative knowledge creation and supply chain resilience.

## 1.4 Research Questions

1. How does collaborative knowledge creation influence supply chain resilience?
2. Does supply chain innovation impact on supply chain resilience?
3. What is the mediating role of supply chain innovation on the relationship between collaborative knowledge creation and supply chain resilience?

## 1.5 Significance of the Study

The study is conducted basically on the effect of collaborative knowledge creation on supply chain resilience in the context of multinational firms and the mediating role of supply chain innovation on the relationship between collaborative knowledge creation and supply chain resilience. The outcome of this study will make significant practical and theoretical contributions. The nature of the study is such that it is categorized into two folds with regards to its benefit to the supply chain risk management and its implementation in emerging economies. First and foremost, the nature of the study will benefit these organizations by contributing immensely towards how these organizations will come out with policies that will ensure that allows them to build resilient supply chains via collaboration. Again, this study will also contribute to firms with institutional frameworks that by far will ensure that relational issues relating to disruption management can be resolved in these frameworks.

The findings of the study expand perspectives on the variables used in the study. Such as supply chain innovation, collaborative knowledge creation and supply chain resilience. In as much as these variables has received much attention in research, it has been researched separately and in a different context. A combination of these factors in a single study, therefore, presents a unique contribution to the study. Therefore, this study may provide a better understanding to both practitioners and scholars in supply chain risk management. Theoretically the study will also add to literature in academia especially in Sub Sahara Africa by providing direction on supply chain resilience. This study is an attempt to fill the chasm. Resource Based View and Dynamic Capability theories will be employed to understand the phenomena in Ghanaian context.

## 1.6 Research Methodology

In examining the mediating role of supply chain innovation on the relationship between collaborative knowledge creation and supply chain resilience, the study employed positivist research approach which made use of a quantitative methodology. Again, the study also survey design to gather primary data from both service and manufacturing large scale organizations. The study population comprised all senior and middle level managers of multinational firm in Ghana. A sample of 100 firms were sampled in the study. After selecting the organization, the researcher will further have used purposive sampling method to select individuals that are directly involved in the subject under investigation. The study conducted extensive literature review to help to discover the academic writings supporting the relevant of topic and the research hypotheses. Again, the study used primary source of data to validate the results produced in literature through field survey using questionnaires adopted from previously validated instruments. After the data collection, the primary data that has been gathered from the field will be vetted for accuracy and reliability. The questionnaires that have been adequately filled will be coded into excel for analysis. This study will employ two data analysis approach i.e. descriptive and inferential analysis using multivariate data analyzes such as Structural Equation Modelling (SEM) and factor analyzes in order to fulfil set objectives in chapter one. Descriptive analysis will be based on information provided by respondents concerning their organization (demographical data), which include profile of the organization and the respondents. The essence of the descriptive analysis is to test for normality and this included frequencies, percentages, means, skewness and kurtosis statistics. The motive of this analysis is to ensure that data gathered are suitable for covariance based-SEM analysis. It is done to

check for missing data, outliers, and data distribution (Hair et al., 2017). Inferential analysis will be used to test the hypothesis in the study.

## 1.7 Scope of the Study

The scope sets the context and boundaries of the research. Contextually the study focused on multinational firms across the country. Though many factors may affect resilience issues of firms, this study focuses on investigate how CKC and SCI influence supply chain resilience in the context of large multinational firms in Ghana.

## 1.8 Limitations of the study

The study has some limitations. Though prior studies recommend the use of single respondent in a study of this nature, however, in practice no single person controls or manages the entire SC, this study therefore is limited by using single respondent. Additionally, including a mediator in the the relationship would be more robust and valid in contexts specific to service delivery or public sector. It would have been useful to employ a longitudinal research design in understanding the relationship. Though the study had no issues of common method bias despite using single respondent, it is important that future studies consider multiple respondents from each firm. Again, future researchers can also investigate the conceptual model using other sectors of the economy of Ghana such as service sector and non-profit organizations.

## 1.9 Organization of the Study

The study is structured into five chapters. The Chapter One introduces the background to the study, the research problem, research objectives, research questions, justification or significance of the study, scope of the study, limitations of the research and overview of the research methodology. The Chapter Two, reviews relevant literatures related to social capital theory, innovation and firm performance. The literature review encompasses both theoretical and empirical sections. The various concepts about the study will also be reviewed in the Chapter Two. The Chapter Three elaborates on the research methodology. The chapter discusses the study design, population of the study, sampling, data collection, data processing, data analysis and ethical consideration. The Chapter Four of the study present analyses the data and discuss the result. The Chapter Five summarizes the research result, make the necessary conclusions and recommend appropriate and feasible policy and managerial measures for improving procurement in Ghana.

## CHAPTER TWO

## LITERATURE REVIEW

### 2.1 Introduction

Chapter two of this thesis is organized into four main sub-headings. The chapter provides information organized under conceptual review, theoretical review, empirical review, and finally the research model and hypotheses development. The Conceptual review section provides definitions, operationalization, and how the constructs have been used in this study. The theoretical review section also provides the theoretical underpinnings of the study. The various prepositions proposed in this study were depicted using a conceptual framework and various relationships were well discussed. The Chapter ends with research gaps highlighted in the study.

### 2.2 Conceptual Review

This section provides definitions, operationalization, and how the constructs have been used in this study. The model has three main constructs (Supply chain innovation, supply chain resilience, and collaborative knowledge creation). These constructs have been operationalized in subsequent sections below (see 2.2.1-2.2.3).

### 2.2.1 Collaborative Knowledge Creation

Collaborative Knowledge Creation has placed enormous resource demands on universities to seek connections with businesses in order to remain at the cutting edge in all subject areas (Al-Omoush, Palacios-Marqués, and Ulrich, 2022). Moreover, the changing technology in the disruption era is making collaboration and building relationships between universities, government, and industry are now changing (Tan, Chan, Bielaczyc, Ma,

Scardamalia, and Bereiter, 2021). According to a prior study, there is increasing public pressure on universities to serve as catalysts for economic growth and to serve larger social needs by way of educational systems and how information becomes more accessible than they have in the past (Ren, van der Duim, and Jóhannesson, 2021). Furthermore, the notion of collaborative knowledge creation describes a situation in which two or more individuals get together and collaborate to produce new knowledge and information that will be used for innovation and knowledge growth inside organizations (Muukkonen, Lakkala, Ilomäki, and Toom, 2022). Moreover, the term "particular sort of learning, deliberate in nature, and geared toward creating a product (knowledge, service, or technology)" is used to describe collaborative knowledge creation. Although the process of developing information jointly is hindered by difficulties, collaborative knowledge creation promotes creativity (Chen, Tan, and Pi, 2021). In addition, a dialogue that involves brainstorming, considering all points of view, pressing perceptions, ensuring that all voices are heard, enticing participants, exhibiting the capacity to refrain from passing judgment, broadening one's own perspective to include other's perspectives, and sharing experiences over time is referred to as collaborative knowledge creation (Ahmad Qadri et al., 2021). Simply put, "collaborative knowledge generation" refers to the dissemination of individual researchers' information, amplifying it in social contexts, and wisely tying it to the organization's existing knowledge (Ayanbode, and Nwagwu, 2021). Alternatively, in order to improve organizational learning, collaborative knowledge creation refers to connecting the learning and knowledge processes. In addition, communication, idea exchange, and information transfer through in-person meetings, debates, faculty development initiatives, and industry-institute collaborations all contribute to the growth of knowledge (Bin, Zhang, Zhan, and

Ma, 2021). For the purpose of the study, the definition of collaborative knowledge creation by Muukkonen et al., (2022) will be employed in the study. It states that the notion of collaborative knowledge creation describes a situation in which two or more individuals get together and collaborate to produce new knowledge and information that will be used for innovation and knowledge growth inside organizations.

### 2.2.1 Supply Chain Resilience

The current responsibility of managers and supply chain (SC) professionals in this decade is sustainability and resilience (Shishodia, Sharma, Rajesh, and Munim, 2021). Moreover, Resilience acquires importance in SCs since generating sustained competitive advantages is the main goal. In addition, the capacity of supply chains (SCs) to recover to their pre-disruption state or an enhanced configuration is known as supply chain resilience (SCRES), and it is becoming more and more important in the modern environment (Novak, Wu and Dooley, 2021). Furthermore, that is very different from the current supply chain, which is essential to the smooth running, effectiveness, and long-term success of the company (Yanamandra, 2022). Furthermore, when seen in this context, any supply chain disruption compromises the effectiveness of the company. In addition, the answer is supply chain resilience (Grzybowska, and Stachowiak, 2022). Resilience in the supply chain, on the other hand, is described as "the adaptive capacity of the supply chain to anticipate unforeseen events, respond to disturbances, and recover from them by ensuring continuity of operations at the appropriate degree of connectivity and control over structure and function" (Hobbs, 2021). Supply chain resilience is the ability of a supply chain network to withstand disruption and minimize the effects on revenues, expenditures, and clients (Mubarik, Bontis, Mubarik, and Mahmood, 2021). Additionally, resilient supply chains

help firms achieve a competitive edge by helping them adjust quickly and effectively to sudden changes in the economy, technology, and market (Novak, and Dooley, 2021). A supply chain is also considered strong if it can resist attack and recover. This necessitates being able to stop or greatly minimize the impact of the majority of supply chain disruptions (Spieske, and Birkel, 2021). Additionally, operational risk and interruption may pose a hazard to a number of supply chain components. Additionally, as demonstrated by COVID-19, global disasters may have a major, pervasive impact on supply chain logistics, suppliers, and workforces (Ali et al., 2021). Unexpected competition, rapidly shifting market trends, and even abrupt changes in customer purchase patterns are further sources of supply chain disruptions (Wieland, and Durach, 2021). Additionally, supply chain resilience is becoming a competitive differentiator, but it necessitates a significant shift in the way we see cooperation (Bag, Rahman, Srivastava, Chan, and Bryde, 2022). As an alternative, partners must create an environment to encourage better communication, information sharing, and decision-making. True development and resilience require transparent supply networks (Iftikhar, Purvis, Giannoccaro, and Wang, 2022). The definition provided by Hobbs (2021) will be utilized for the study's objectives. It says that "the adaptive capacity of the supply chain to anticipate unforeseen events, respond to disturbances, and recover from them by ensuring continuity of operations at the appropriate degree of connectivity and control over structure and function." is what is meant by "resilience in the supply chain."

## 2.2.1.2 Supply Chain Innovation

For companies of all sizes, supply chain innovation is essential. It comprises analyzing how a company utilizes its resources, operational capabilities, and assets to develop unique

strategies for satisfying customer expectations (Hopkins, 2021). Additionally, firms should evaluate an innovation's value according to how well it meets customer needs (Zhang, He, and Tian, 2022). In addition, Supply chain innovation refers to customer-centric, preventative maintenance, automation, and visibility-focused initiatives (Zilberman, Reardon, Silver, Lu, and Heiman, 2022). Furthermore, businesses will be able to fulfill client demand and increase profitability by using these tactics (Afraz, Bhatti, Ferraris, and Couturier, 2021). In addition, a supply chain is the web of individuals, organizations, resources, jobs, and technical developments involved in the manufacture and delivery of an item (Krishnan, Yen, Agarwal, Arshinder, and Bajada, 2021). The transfer of raw materials from the supplier to the manufacturer and the ultimate delivery to the client are all included in the supply chain as well (Anwar, Wong, and Tseng, 2022). Instead, supply chain innovation requires cooperation and support from all levels of an organization and is a team effort (Abdalla, and Nakagawa, 2022). Furthermore, supply chain innovation is the cornerstone of a company since it is robust, flexible, and supports so many sectors of the business (Shen, Xu, Chan, and Choi, 2021). The definition of supply chain innovation provided by Zilberman et al. (2022) will be adopted for the study's purposes. According to this, supply chain innovation refers to projects that are customer-centric, maintenance-preventative, automated, and visibility-focused.

## 2.3 Theoretical Review

An abundance of knowledge and information in the scope of innovation makes the research process to become challenging, difficult, and lengthy (Soetanto, 2017). Thus, to focus the research direction, two underpinning theories were used as a research foundation in supporting and addressing the gap, and as a guide to align this research into an appropriate

14

direction. The researcher examines underlying ideas in this part, as well as the mediating function of supply chain innovation, as a foundation for investigating and studying the link between collaborative knowledge production and supply chain resilience. The Resource-Based View Theory (RBV) and its extension to the Knowledge-Based Theory serve as the foundational theories for this investigation. Theoretical frameworks provide a clear prism or context through which a subject is studied; it explains the context and the connections between the various factors and dimensions.

## 2.3.1 Resource-Based View Theory

The resource-based viewpoint theory holds that in order for enterprises to remain competitive, they must use all of their organizational, human, and physical resources, both tangible and intangible (Caseiro and Coelho, 2019). The most important sources of pro-activeness in a firm are seen to be intangible assets (Grimsdottir and Edvardsson, 2018; Vannoy andMedlin, 2012; Zhang, andWu, 2019). According to earlier research, businesspeople that actively look for possibilities are able to research new markets utilizing their knowledge base to foresee potential future business prospects. By Martello (1994), opportunity discovery is referred to as serendipitous future scanning, in which learned knowledge is essential. Knowledge, innovation, and entrepreneurship, in accordance with Pineiro-Chousa, López-Cabarcos, Romero-Castro, and Pérez-Pico (2020), are the cornerstones of economic growth and competitiveness. Social capital helps companies who are looking for new information discover problems with the way the market now operates and what could be done proactively to understand and fulfill customers' expectations and ambitions (Nafei, 2016). According to study, pro-activeness depends on collaboration between business partners and other members of corporate social networks (e.g., Chen,

15

Jiao, Zeng, and Wu, 2016). Cooperation is essential in the production of new information and provides businesses with access to the social capital that is present in these networks as a social mechanism for knowledge transfer and assimilation through social networks (Chen et al., 2016; Tu, 2020). Wang claims that social capital affects organizational performance by contributing to the production of shared knowledge (2016). The knowledge-based economy's rise and the enormous IT breakthroughs that have occurred since then in which investing in e-business is essential have confirmed the rising impact of intellectual capital assets. Businesses must assess their intellectual capital in order to effectively adapt to and exploit e-business, claim Jafaridehkordi et al. (2015). More specifically, the study (e.g., Hayton, 2005; Vannoy and Medlin, 2012; Liu, Ke, We, and Lu, 2016) demonstrates the vital significance of social capital in comprehending, implementing, and evaluating e-business models. A review of the literature indicates that the relationship between collaborative knowledge generation and supply chain resilience depends heavily on supply chain innovation. These perspectives cover those related to family companies, human resources, innovation, and entrepreneurship (Carnevale and Hatak, 2020; Chesbrough, 2020). (Kraus and others, 2020) Even now, research is used to conduct investigations. The study intends to advance current knowledge management (KM) literature by examining how these capabilities, particularly infrastructure and procedures, affect the resilience of supply chains that frequently experience natural catastrophes.

### 2.3.2 Knowledge-Based Theory

A company, in accordance with the knowledge-based theory, is an entity that possesses knowledge as well as the capacity to create and use knowledge, and that knowledge serves

as the foundation of its competitive advantage (Wang, Zhang, and Zhang 2020). Additionally, it implies that knowledge provides a competitive edge. The information that a company has access to, along with its ability for knowledge production and application, is the most important source of competitive advantage. In the knowledge economy, an organization's success is dependent on its knowledge and comprehension (Zhang, Jiang, and Zhang 2019; Zhang, Jiang, and Zhang 2021). A recent study on manufacturing companies found that organizational creativity is directly impacted by knowledge, and organizational learning and innovation are directly impacted by organizational performance (Zhang, Zhang, and Song 2015). The two primary knowledge processing stages of the knowledge life cycle, namely knowledge generation, and knowledge integration, also comprise a variety of knowledge-generating activities. Such as the description of the issue, individual and group learning, the development of knowledge claims, the gathering of information, and the evaluation of knowledge claims. Reflective feedback (knowledge claim evaluation) is used to constantly develop this knowledge in order to get it ready for integration. By integrating knowledge, corporate processes may be changed to reflect newly created or acquired information (Weichhart, Stary, and Vernadat 2018). In addition, current research demonstrates that organizations may gain competitive, financial, and innovative benefits through the creation, acquisition, use, and sharing of knowledge. Employees and managers in organizations should constantly learn new information and advance knowledge management in order to maintain ongoing organizational performance. Additionally, the level of individual knowledge management engagement is crucial for fostering knowledge workers' productivity as well as the efficacy and creativity of the knowledge management framework. In reality, individual knowledge

management engagement is crucial for enhancing knowledge organizations' capacity for innovation and knowledge workers' productivity (Butt et al. 2019). The two main methods of acquiring knowledge are through seeking it out externally and by producing it inside. When a company engages in knowledge searching, they go outside for knowledge resources that they do not already own. Companies might look for expertise in related or supplementary sectors. Organizations can improve their ability to handle novel situations and build organizational capacities by actively pursuing information. The majority of businesses do not fully understand the information that is available outside of them, therefore they need to interact with other individuals or organizations to get the information they need (Yan, Davison, and Mo 2013). It can strengthen the enterprise's competitive advantage whether the information is developed internally or acquired from the outside. As a result, knowledge generation is crucial to the growth of businesses.

## 2.4 Conceptual Framework

The theoretical model is supported by Resource-Based View Theory (RBV) and Knowledge-Based Theory as its two main foundations (see Figure 2.1). The benefit of supply chain collaboration in pursuing innovation is widely acknowledged in the literature on supply chain management (Cao and Zhang, 2011; Soosay et al., 2008; Soosay and Hyland, 2015; Zimmermann et al., 2016). However, it is not immediately clear what steps and activities are done in partnership with other supply chain firms to stimulate innovation. Independent (collaborative knowledge production), dependent (supply chain resilience), and mediating variables are all included in the overall idea (supply chain innovation). In this study, three types of variables were employed. It is anticipated that supply chain

innovation's function as a mediator in the interaction between supply chain resilience and cooperative knowledge generation.

**H₁**
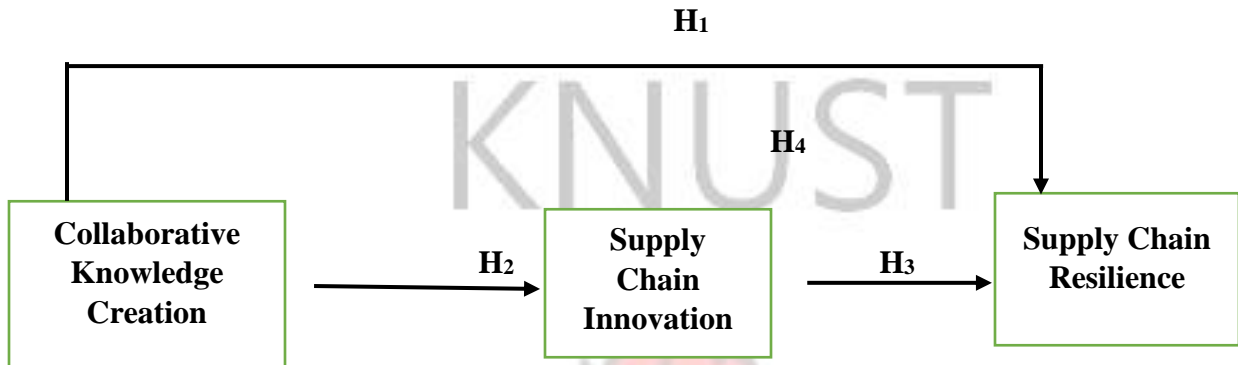


**Figure 2.1: Conceptual framework of the study**

### 2.4.1 Hypotheses Development

This segment discusses the five key hypotheses as shown in Figure 2.1 above. Subsections have been created and discussed for each of the hypotheses as illustrated by the research model.

### 2.4.2 Hypothesis 1: *Relationship between Collaborative Knowledge Creation and Supply Chain Resilience*

In today's market competition, where uncertainty is growing, cross-functional and cross-organizational supply chain collaboration will boost supply chain resilience and, as a consequence, increase supply chain competitiveness. Manthou et al., 2015 and Stank et al., 2014 believe that supply chain cooperation is a collaborative effort done by various firm players in the Supply Chain Resilience in order to execute resource sharing through internal and external business linkages. The concept of "collaborative knowledge creation" really developed via the combination of the concepts of "synergy" and "knowledge innovation"; it encourages improving organizational cooperation based on knowledge production and

information exchange. To put it another way, it aims to improve Supply Chain Resilience's overall competitive advantage while also bringing economic benefits to each company through the creation of new knowledge. A company's capacity to adapt to customer requests may improve with effective information flow, management, and innovation amongst firms. These characteristics may also help the organization in overcoming a range of unclear difficulties that may develop throughout production and operation. Therefore, collaborative innovation is the way to go if you want to enhance the economic, environmental, and social performance of your supply chain. In order to effectively manage substantial changes and uncertainties, member organizations can create new production, inventory, marketing, and other practices through the cooperative and collaborative operation of the Supply Chain Resilience. Hence, it is anticipated that a positive influence of Collaborative knowledge on Supply Chain Resilience:

*$H_1$. Collaborative knowledge creation positively influences Supply Chain Resilience and therefore there is a strong and significant relationship between the two variables.*

**2.4.3 Hypothesis 2: Collaborative Knowledge Creation on Supply Chain Innovation**

Companies engaged in supply chain collaborative innovation efforts seek out partners to explore new avenues and get new knowledge (Wang and Hu, 2020). However, control over collaborative knowledge creation is usually exercised by certain enterprises, making it challenging for supply chain partners to collaborate (Suh et al., 2019; Whitehead et al., 2019). The analysis of 104 UK manufacturing enterprises by Squire et al. (2009) found a favorable correlation between relationship traits and the dissemination of collaborative knowledge creation between the buyer and supplier. Higher relationship quality enables more information exchange between the buyer and the provider, according to Sjoerdsma

and van Weele's (2015) research. However, there are differences in how connection quality affects different types of information sharing. Cavusgil et al. (2013) show that maintaining close relationships with other businesses makes it easier for them to share tacit knowledge, while Feng et al. (2018) found that supply chain businesses are more likely to share explicit knowledge, based on data from the US manufacturing and services industries.

Hence, it is anticipated that a positive influence of Collaborative Knowledge Creation on Supply Chain Innovation:

*H₂. Collaborative Knowledge Creation has a positive and significant effect on Supply Chain Innovation*

### 2.4.4 Hypothesis 3: Supply Chain Innovation on Supply Chain Resilience

Ponomarov and Holcomb (2009) urged for evaluation of additional company skills that lead to SCR in a previous research that conceptualizes the notion of SCR. In answer to this appeal, we draw on the research that has been reviewed and suggests a connection between company innovativeness and SCR. Prior research has connected firm innovation to openness to change and readiness to take on new challenges (Azadegan and Dooley, 2010). To thrive in dynamic and unpredictable situations, innovative businesses often steer clear of ordinary methods and aggressively seek out unique and novel concepts (Teece, 2007). As an illustration, DHL's investment in creative city logistics solutions is essentially a proactive response to possible interruptions that may arise in the urban distribution environment (DHL, 2011). "Putting any fresh, problem-solving concept into practice" is

another broad definition of innovation (Kanter, 1983, p. 20). As a result, a company's capacity to provide speedy solutions to problems may be essential while dealing with interruptions. It would enable businesses to manage interruptions even in the absence or insufficiency of contingency planning. The ability of a company to innovate is also positively correlated with how well it responds to abrupt market shifts (Mainela and Puhakka, 2008). According to Christensen et al. (1998), business innovativeness is one of the key factors in long-term survival. As a result, business innovation may be seen as a key factor in SCR, which measures the capacity to handle disturbances in the best possible way (Christopher and Peck, 2004). In conclusion, business innovation may be viewed as a crucial competitive advantage that may help SCR. As a result, the following theory is put forth:

*H3. Supply Chain Innovation has a positive and significant effect on Supply Chain Resilience*

*H4. Supply Chain Innovation mediates the relationship between Collaborative Knowledge Creation and Supply Chain Resilience*

## 2.5 Empirical Review

This section assessed the research on prior studies that addressed the study's objective. These include the connection between supply chain innovation and collaborative knowledge generation, as well as the connection between the two and supply chain resilience. Literature related to the study's goal the interaction between cooperative knowledge production and supply network resilience, as well as the function of supply chain innovation as a mediating factor in previous and ongoing research projects were evaluated.

Al-Omoush, Simón-Moya, and Sendra-Garca (2020) carried out research to find out how social capital and cooperative knowledge building may assist firms in taking a proactive approach to respond to the COVID-19 issue through e-business. The study's sample, which included 198 managers, was drawn from these Jordanian industrial companies. PLS is used for exploratory research, which is what this study was, whereas SEM was utilized to evaluate novel research models with many components and measurements. Data analysis was carried out using Smart-PLS 3.0. The study employed the Resource-Based view hypothesis. The findings show the importance of social capital and collaborative knowledge generation in developing e-business pro-activeness in responding to the pandemic. The author recommended that future studies be evaluated in additional research, focusing on bigger samples from other industries, nations, and areas to corroborate these findings in light of the study's limitations.

The research by Zhang, Zhang, and Zhou (2021) examines how information seeking and knowledge creation might promote green supply chain management. In the study, the knowledge-based theory was employed. Bartlett spherical and exploratory factor analysis were used in the analysis (EFA).477 businesses from central China were chosen for the study as the research items. These companies cater to eight main industries, including mining, manufacturing machines, clothing processing, mobile communications, transportation and logistics, biotechnology, and healthcare. The results show that green self-efficacy may serve as a link between these three ideas, and that information seeking and knowledge creating may motivate organizations to embrace green supply chain management (GSCM). Given the limitations of the study, the author advised that future

research focus on the impact of extra knowledge activities on green supply chain management.

Al-Omoush, Ribeiro-Navarrete, Lassala, and Skare (2022) conducted a study to look at how social capital supports organizational sustainability, knowledge generation, and creative collaboration during the historically momentous COVID-19 crisis. Data from a sample of 289 managers, directors, and department heads from Jordan's top 50 manufacturing enterprises were evaluated using Smart-PLS-SEM. Both resource-based theory and social networking theory were used in the study. The results demonstrate that social capital significantly influenced collaborative creativity, knowledge generation, and organizational sustainability during the COVID-19 crisis. It also shows that knowledge creation had a significant impact on both of these factors. Given the study's shortcomings, the author recommended that future research delve into how they are empowered by information technology sustaining organizational sustainability, and preserving competencies.

Abeysekara, Wang, and Kuruppuarachchi, (2019) carried out a study to determine the level of supply-chain resilience (SCR's) capabilities used by businesses in the Sri Lankan garment sector and to determine if these capabilities have an impact on the efficiency and competitiveness of those businesses. The study made use of a conceptual framework to assess SCR's capabilities and examine how they impact business performance and competitive advantage. Partially least squares structural equation modeling is used to statistically assess data from questionnaire responses from 89 Sri Lankan clothing manufacturers (PLS-SEM). The study used the Dynamic Capability Theory. The study finds that the SCR's abilities of re-engineering, agility, and cooperation are positively

impacted by the culture of supply-chain risk management. Agility has a major influence on both corporate performance and competitive advantage. In view of the limitations of the study, the author suggested that additional research should concentrate on small- and medium-sized enterprises in an economy other than large-scale businesses.

Wieland and Wallenburg (2013) did a study to examine the resilience domain which is important in the field of supply chain management. The study looked at how relational competencies impact resilience and how resilience affects the supply chain's customer value. The study is empirical in nature, using a confirmatory methodology, and survey data gathered from manufacturing companies in three different nations that is then used to assess structural equation modeling. The relational perspective is used as the fundamental theoretical underpinning. A Resource-Based View theory was used in the study. The research demonstrates that while integration does not positively affect resilience, cooperative and communicative interactions do. Additionally, it is shown that better resilience, which is accomplished by investing in agility and robustness, increases a supply chain's customer value. In light of the limitations of the study, the researcher suggested that future research may evaluate the impact of relational competences for various forms of supply chain hazards. Scholten, and Schilder, (2015) carried out a study that seeks to investigate how supply chain resilience is influenced by collaboration and investigated collaborative actions and the underlying mechanisms that affect visibility, velocity, and flexibility. In this study, 16 semi-structured interviews conducted between January 2013 and May 2014 served as the primary source of data. An experimental case study examined eight buyer-supplier relationships in the food processing industry. The supply chain resilience theory was applied in the study. Important findings show how specific

cooperative behaviors (information-sharing, cooperative communication, cooperatively created knowledge, and joint relationship-building activities) increase supply chain resilience through increased visibility, velocity, and flexibility. The supply chain network's interdependencies and underlying mechanisms for these components are mentioned. Given the limitations of the study, the author recommended that future research use quantitative data to experimentally evaluate our hypotheses in order to enhance the generalizability and validity of their findings.

In a research published in 2014, Brandon-Jones, Squire, Autry, and Petersen analyzed the knowledge creation process, governance frameworks, and the mediating function of technology in the growth of supply chain open innovation capabilities. Social exchange theory (SCT) and transaction cost theory (TCT) are both used in the study as the theoretical foundation for developing our solution model. 140 samples, drawn from 600 organizations, were analyzed using PLS; the response rate was 23.3%. The findings contribute to our understanding of how governance structures and technological advancements support the success of open innovation in the context of supply chains. In light of the limits of the study, the author suggested that future research broaden to diverse viewpoints, such as different organizational cultures and leadership styles, or the management of public and private units.

In order to enhance the knowledge management (KM) literature, Umar, Wilson, and Heyl (2021) looked at how these abilities impact the resilience of supply chains that regularly experience natural disasters, notably infrastructure and processes. Using a multiple case study approach, the role of KM in the food supply chains of two different South Asian regions has been examined. This area was chosen because it frequently experiences natural

disasters, and because food supply systems are essential to the relief effort. Supply chain resilience theory was employed in the study. According to the data, supply chain resilience may be raised when members collaborate to produce, share, and apply knowledge. These knowledge management processes benefit greatly from the capabilities of the KM infrastructure. IT innovations, a robust central hub network, and a collaborative culture enable information generation, knowledge exchange, and knowledge exploitation. Based on the limitations of the study, the author suggested that future research may focus on a more nuanced perspective of the complex interactions between the processes of KM acquisition, KS, and KU.

Based on a thorough evaluation of peer-reviewed publications published in 2020, Montoya-Torres, Muoz-Villamizar, and Mejia-(2021) Argueta's research makes an attempt to map the academic literature looking at problems related to the impact of the COVID-19 outbreak on supply chains. The research developed a framework for addressing significant disruptions that provide a challenge to SCM operations based on the most recent studies in the field, according to the criteria defined by the systematic method (Systematic review). Decision Theory and Organizational theory were adopted in the study and Bibliometric analysis was also conducted. The findings highlight a number of areas that require more research, including cooperation, the uptake of new technologies, the dissemination of knowledge, and measures to increase awareness among supply chain stakeholders. Given the constraints of the study, the researcher suggested that an in-depth comparison be undertaken soon to evaluate the advancement of supply chain management methods.

A research was conducted by Belhadi, Mani, Kamble, Khan, and Verma in 2021 to look at the direct and indirect implications of AI, SCR, and SCP in the context of the dynamism

and unpredictability of the supply chain. Based on the study's objective and the organizational information processing theory, the study anticipated using AI in the supply chain (OIPT). In order to evaluate the developed framework, a structural equation modeling (SEM) approach was employed. The poll gathered information from 279 firms across a variety of sizes, industries, and countries. According to research, while AI has a short-term direct impact on SCP, it is encouraged to use its information processing capabilities to build SCR for long-lasting SCP. The author encouraged future research to examine more correlations and phenomena using a combination of qualitative and quantitative approaches in order to gain deeper insights based on the study's limitations.

Research by Martins, Vils, Serra, da Silva Junior, and Napolitano (2022) suggests that the perception of crises might mediate the relationship between knowledge development and market orientation in South Carolina. Partial least square structural equation modeling was used to assess the hypotheses. The data collection consisted of 279 full replies from business-to-business companies in international SCs. The results demonstrate that, in contrast to what is already known in the literature, the perception of a crisis in an SC is not lessened by knowledge generation during a crisis. Additionally, research indicates that there are no discernible differences between industrial and service SCs when it comes to making sense of crises and that SC links decrease collaboration when it comes to knowledge development and sharing and increases focus on individual performance. Based on the study's findings, the author recommended that more research be done to determine whether crises initially encourage collaboration before cooperation breaks down.

Khraishi, Paulraj, Huq, and Seepana, (2022) conducted a study to better understand how formal knowledge procedures, internal knowledge-generating capacity, and absorptive

28

capacity interact to improve SME's OI performance. The study advances a number of hypotheses between the variables of interest, all of which are grounded on the knowledge-based perspective theory. The authors assess their hypothesis using survey data from 200 European SMEs that collaborate with foreign suppliers. The findings suggest that internal knowledge-generating capacity and absorptive capacity have a favorable association. Absorptive capacity is favorably correlated with OI performance outcomes in addition to positively moderating the influence of internal knowledge generation capability on OI performance. On the other hand, formal knowledge-sharing practices act as a negative mediating factor in the link between OI performance and absorptive ability. In view of the constraints of the study, the author suggested that future research may look at the underlying links between other KM activities, such as knowledge translation, application, and protection, to assess their complementary roles in resulting in OI benefits for SMEs.

### 2.5.1 Shareholder Orientation and Circular Procurement

Hayek (2015) performed research to assess the impact of audit committee compensation on non-audit service procurement. Data were acquired from publicly traded corporations in the United States from 2010 to 2012. To evaluate the hypotheses, the researchers employed multivariate regression methods. The data revealed that audit committee compensation has a considerable impact on non-audit service procurement. Because the study was confined to publicly listed corporations in the United States from public databases in the United States, the findings may not be generalizable to smaller public companies and private organizations in the United States, as well as firms domiciled in other countries.

Okotie and Tafamel (2021) looked at how the level of transparency affects the Nigerian Civil Service's public procurement processes. The research design used is one of a survey. 318 employees of the public procurement department/unit of the federal government ministries in Abuja who were chosen from various ministries provided the data. Simple linear regression was employed in the study to examine the data. The results showed a strong and favorable relationship between public procurement methods and transparency. To make the best use of the resources available, it was determined that impartiality and justice should be ingrained in Nigeria's public procurement system.

Vandapuye (2018) looked at the effects of supply chain and stakeholder orientation on the performance of oil marketing firms in Accra. The descriptive research approach was used. Data from 86 people were gathered. The data were analyzed using multiple regression. The results demonstrated that Stakeholder Orientation significantly improved the efficiency of the oil marketing firms in Accra Metropolis. Future research should take into account business size, the number of branches and other factors to see if they mediate or inhibit the link between supply chain orientation, stakeholder orientation, and performance.

Mohammed, (2020) investigated how market orientation affects business performance in the Ghanaian airline sector and identifies the moderating influence that safety and security measures have on this connection. A descriptive research methodology was used for this study. Using a convenient sample approach, data was gathered from market-oriented airline personnel. The hypotheses were tested using structural equation modeling. The results showed that, in the Ghanaian environment, there is a connection between market orientation and company performance. Future studies may take into account the usage of other aviation-related environmental elements as moderators or mediators in assessing the

impact and strength of the relationship between market orientation and business performance in a given environment.

Ngetich (2015) investigated the impact of strategic orientation on the performance of big retail outlets in Nairobi. The descriptive cross-sectional research design was used in this study. Data was gathered from 15 major retail outlets in Nairobi, Kenya. The data were analyzed using regression analysis. The data revealed that strategic orientation greatly improves the performance of Nairobi retail establishments. The study advised that future research look at the impact of interaction orientation on innovation success.
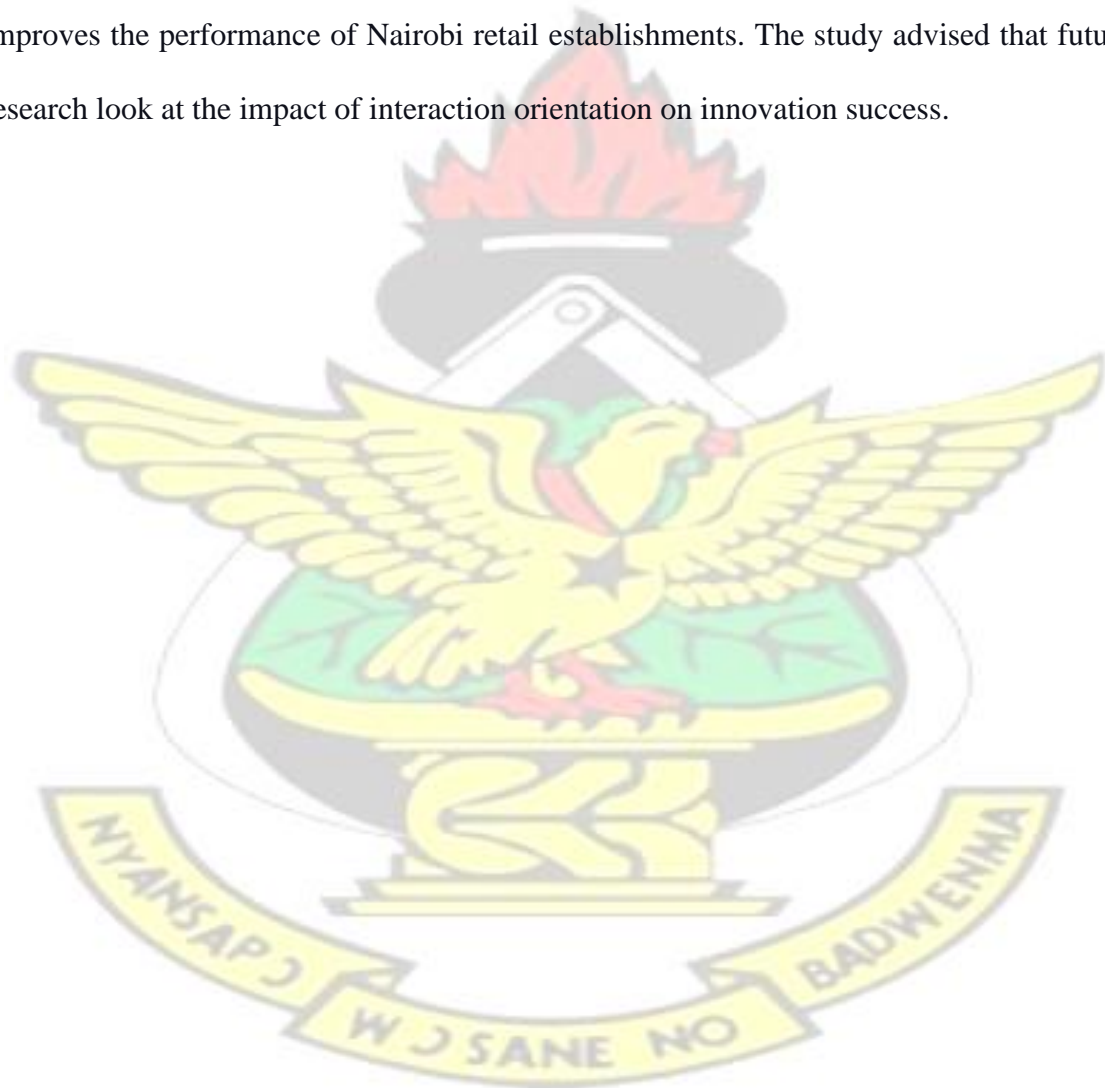
**Table 2.1: Summary of Literature Review**

| Author/Year | Country | Purpose | Theory | Method | Findings | Futre studies |
|---|---|---|---|---|---|---|
| Al-Omoush, Simón-Moya, and Sendra-García, (2020) | Spain | This study's goal is to investigate how social capital and cooperative knowledge development might help businesses be proactive in reacting to the COVID-19 situation through e-business. | Resource-Based View theory | Quantitative | The findings show the importance of social capital and collaborative knowledge generation in developing e-business proactiveness in responding to the pandemic. | The author recommended that future studies be evaluated in additional research, focusing on bigger samples from other industries, nations, and areas to corroborate these findings in light of the study's limitations. |
| Abeysekara, Wang, and Kuruppuarachchi, (2019) | Asia | The aim of the study is to determine the level of supply-chain resilience (SCRes) capabilities used by businesses in the Sri Lankan garment | Dynamic Capability Theory | Quantitative | The study found that the SCRes competencies of collaboration, agility, and re-engineering are positively impacted by the culture of | In view of the limitations of the study, the author suggested that additional research should concentrate on small- and medium-sized enterprises in an economy other than large-scale businesses. |

| | | sector and to determine if these capabilities have an impact on the efficiency and competitiveness of those businesses. | | | supply-chain risk management. | |
|---|---|---|---|---|---|---|
| Wieland, and Wallenburg, (2013) | Germany | The goal of this study is to look at how relational competencies affect resilience and how resilience affects the customer value of a supply chain. | Resource-Based View Theory | Quantitative | The research demonstrates that while integration does not positively affect resilience, cooperative and communicative interactions do | Given the limitations of the study, the researcher suggested that future research may evaluate the importance of relational competencies for different types of supply chain hazards. |
| Scholten, and Schilder, (2015) | Netherlands | The study looked at collaborative efforts to find out how supply chain | Supply chain resilience theory | Quantitative | Findings show how specific cooperative behaviors (information-sharing, cooperative | The author suggested that future research employ quantitative data to empirically assess our hypotheses in order to |

| | | | | | communication, cooperatively created knowledge, and joint relationship-building activities) increase supply chain resilience through increased visibility, velocity, and flexibility. | improve the generalizability and validity of their findings in light of the constraints of the study. |
| --- | --- | --- | --- | --- | --- | --- |
| Brandon-Jones, Squire, Autry, and Petersen, (2014) | Taiwan | The study's goal is to examine the processes of governance, the process of knowledge creation, and the mediating function of technology in the | Social exchange theory (SET) and transaction cost theory (TCT) | Quantitative | The findings contribute to our understanding of how governance structures and technological advancements support the success of open innovation | Given the constraints of the study, future research should expand to different perspectives, such as different organizational cultures and leadership styles, or the management of public and private units. |

| | | growth of supply chain open innovation capabilities. | | | in the context of supply chains. | |
|---|---|---|---|---|---|---|
| Zhang, Zhang, and Zhou, (2021) | China | The research will explore how knowledge creation and information gathering may promote green supply chain management. | Knowledge-based theory | Quantitative | The results show that gathering knowledge and seeking information can persuade companies to use green supply chain management (GSCM) | Given the limitations of the study, future research should focus on the impact of extra knowledge-related activities on green supply chain management. |
| Al-Omoush, Ribeiro-Navarrete, Lassala, and Skare, (2022) | Jordan | The paper explores the role of social capital in the historically momentous COVID-19 crisis in terms of collective intelligence, | Social networking theory and Resource-based theory | Quantitative | The results demonstrate that social capital significantly impacted collaborative creativity, knowledge | Future studies explore how information technology empowers them, maintaining organizational sustainability and conserving capabilities. |

| | | collaborative innovation, and organizational sustainability. | | | generation, and organizational sustainability during the COVID-19 crisis. | |
|---|---|---|---|---|---|---|
| Umar, Wilson, and Heyl, (2021) | South Asian | The study intends to advance existing knowledge management (KM) literature by examining how these skills affect the resilience of supply chains that frequently face natural catastrophes, particularly infrastructure and processes. | Supply chain resilience thoery | Quantitative | The data demonstrate that supply chain resilience may be strengthened when members collaborate to produce, exchange and apply knowledge. | A more sophisticated understanding of the complex interactions between KM acquisition, KS, and KU processes should be the focus of future study. |

| Montoya-Torres, Muñoz-Villamizar, and Mejia-Argueta, (2021) | USA | The research attempts to map the scholarly literature looking at concerns linked to the impact of the COVID-19 epidemic on supply chains | Decision Theory and Organizational theory | Qualitave (Systematic review) | The findings highlight a number of areas that require more research, including cooperation, the uptake of new technologies, the dissemination of knowledge, and measures to increase awareness among supply chain stakeholders. | The researcher proposed that a more thorough comparison be conducted in the near future to assess the development of supply chain management techniques |
|---|---|---|---|---|---|---|
| Belhadi, Mani, Kamble, Khan, and Verma, (2021) | South Europe, Southern Asia, and North Africa | The dynamism and unpredictability of the supply chain are taken into account as the study looks at the direct and | organizational information processing theory | Quantitative | According to research, while AI has a short-term direct impact on SCP, it is encouraged to use its | Future research to examine more correlations and phenomena using a combination of qualitative and quantitative approaches |

| | | indirect implications of AI, SCRes, and SCP. | | | information processing capabilities to build SCRes for long-lasting SCP. | |
|---|---|---|---|---|---|---|
| Martins, Vils, Serra, da Silva Junior, and Napolitano, (2022) | Brazil | The study proposes a mediation effect between knowledge development and market orientation in SC through crisis perception in an effort to address the issue. | Cooperative game theory s | Quantitative | Findings show that knowledge creation during a crisis in an SC does not lessen crisis perception | The author recommended that more research be done to determine whether crises initially encourage collaboration before cooperation breaks down |
| Khraishi, Paulraj, Huq, and Seepana, (2022) | UK | Understanding how formal knowledge processes, internal knowledge-generating capacity, and absorptive | Knowledge-based theory | Quantitative | The findings show a positive correlation between internal knowledge generation and absorptive capacity. | In order to assess the complementary roles of other KM activities, such as knowledge translation, application, and protection, the author suggested that |

| | | capacity interact to enhance SME's OI performance is the main objective of the study. | | | future studies may look at the underlying linkages between these activities. |
| --- | --- | --- | --- | --- | --- |
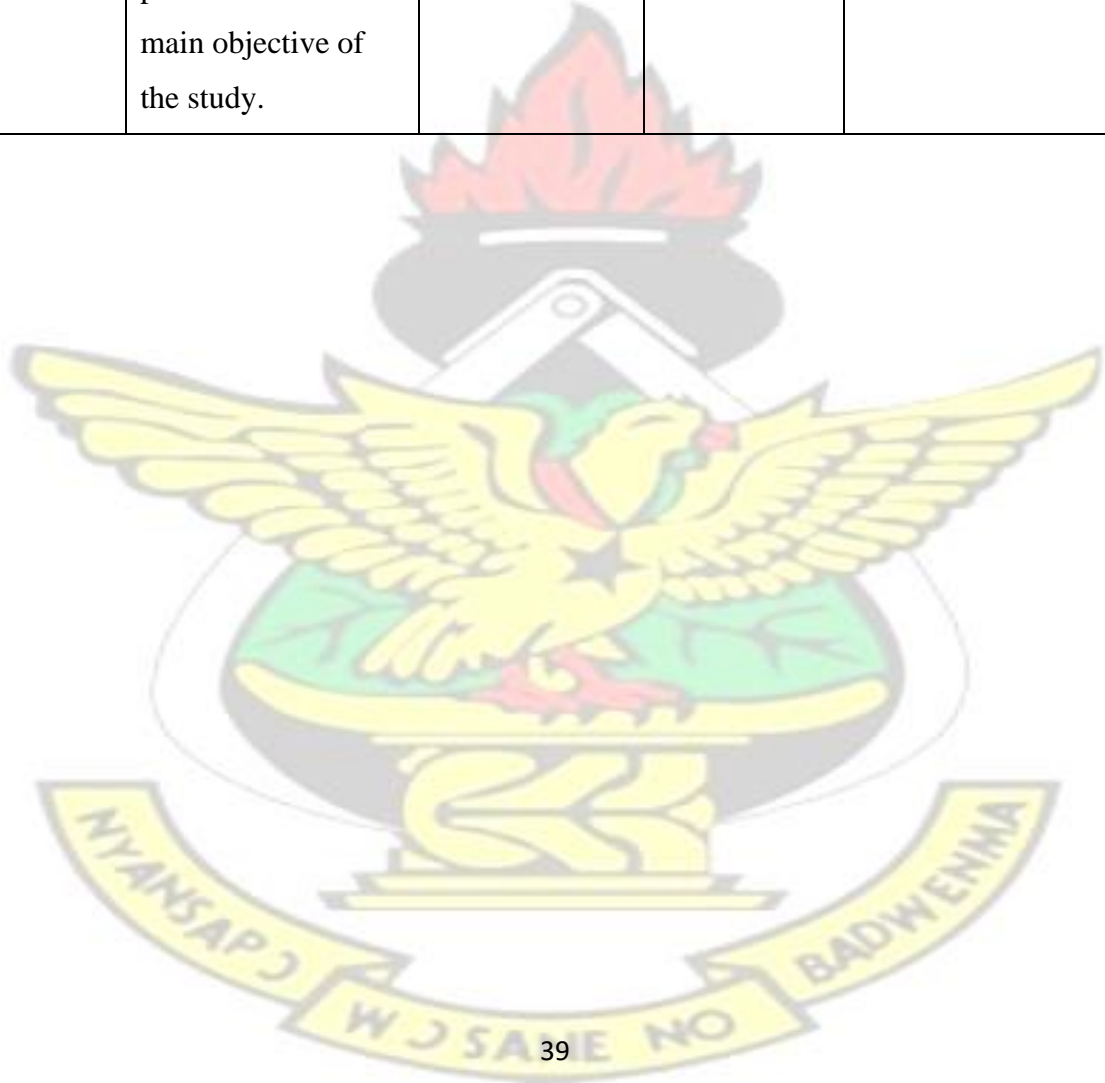
# CHAPTER THREE

## RESEARCH METHODOLOGY AND ORGANIZATIONAL PROFILE

### 3.1 Introduction

This chapter objectively presents the methodology of the research. The methods projected in this chapter, purpose to accomplish the study objectives and answer the research questions. The methodology chapter commenced by clearly explaining the research design, secondly, research sampling procedures, and then the research instrument. The final stage in this section addresses the explanation of the proposed data analysis.

### 3.2 Research Design

The positivism research philosophy which is the underpinning philosophy for quantitative research can be considered to fit well with the objectives of the research study based on the above approaches. Subsequently, the study employed quantitative methods of data collection in a single study according to the nature of the study. Its purpose is to assess theoretically formulated hypotheses regarding the impacts of a collection of study variable constructs, as well as to use reliability and validity to appraise the results and generalize them. Proceeding with this, the investigator will optimize the principles of positivism philosophy after the epistemological standpoint.

In terms of data collection, measurement, and analysis, the research design refers to how a study will be carried out. It establishes the conditions for data collection and analysis in such a way as to strike a balance between relevance to the study purpose e and organizational efficiency (Kothari, 2004). The creation of that kind of planning and evaluation is for the most efficient research possible, resulting in the greatest amount of information. The goal of research design,

to put it differently, is to collect as many available facts as feasible with minimum effort, time, and money (Cohen, Manion and Morrison, 2009).

The study employed the cross-sectional descriptive survey design where deductive reasoning is applied to the quantitative data (Cohen, Manion, and Morrison, 2013). Deductive reasoning is used to make logical conclusions after the analysis. The deductive approach is a method where the researcher uses theories as bases to conduct an investigation which would be used to determine the result of a theory (Pham, 2018). The deductive method is usually made of quantitative techniques. The quantitative technique uses a survey questionnaire where data are normally collected from respondents Researchers that utilize quantitative approaches collect and analyze numerical data in order to understand, forecast, and/or control occurrences. It provides an in-depth insight into the specific testable study and focuses on examining the relationship between variables (Eyisi, 2016).

The survey method is employed for the quantitative study because it examines a sample of the population to produce a quantitative or numeric depiction of attitudes, practices, and opinions. Through face-to-face questionnaire administration, primary data was acquired in the quantitative research design. Usage of the survey method was considered to be efficient and economical; it brings many advantages to the researcher; For instance, it is economical compared to interviewing, authorizes secrecy, and could produce additional truthful answers, besides it has the possibility of eliminating prejudice owing to wording questions differently with diverse respondents (Kothari, 2012; Durepos and Wiebe, 2019).

Subsequently, the use of the quantitative technique was employed to help in understanding the underlying reasons respondents to evaluate how collaborative knowledge creation may affect supply chain resilience as well as the mediating role of supply chain innovation.

### 3.3 Population of the Study

The population of interest refers to the target population constituting individuals or entities that the study seeks to treat (Majid et al., 2018). Lavrakas, et al., 2018) described the population of interest as the specific groups of individuals, businesses, or entities that the researcher seeks to treat and make generalizations based on the characteristics of those groups. For this study, the population of managers of multinational firms in Ghana. The population is also determined by the unit of analysis, thus if the researcher intends to conduct the study at the organizational level, then it is advisable to use a single response, however, if the study is an individual level. Then the focus could be on multiple respondents from a case study. This study is conducted at the organizational level; hence the target populations include all multinational firms and their outlets across Ghana. Data is gathered from procurement, logistics, and top executives or managers of all the multinational companies in Ghana.

### 3.4 Sample Size and Sampling Technique

The nature of the study and the research design, according to Kothari (2012), determine the number of study participants who should be included in the sample. In obtaining the sample size in a given population, three main methods for estimating a sample size can be identified. Firstly, the sample size can be calculated by using formulas (Israel, 1992). Secondly the use of a published statistical table to estimate the sample size, for instance, the published statistical table of Krejcie and Morgan (1970) and Cohen et al., (2013, 2009). Lastly, a researcher can decide to utilize census methods by collecting data from the entire population. In addition to that a rule of thumb that one can use to estimate the sample size for a study. For instance, Bosman (1998) recommend that a sample size of 400 can be used to collect data for a study. Likewise, Kolloway (1998) also suggested that a sample size of 200 can be used as a sample size for a study. However, to properly

situate the study, appropriate sample size must be employed. In this study, the sample size determination was established from Yamane's simplified formula (1967) to decide the sample size for the study. It is defined as:

$$n = \frac{N}{1+N\,(e)^2}$$

Where:

n = Expected Sample Size N =

Study Population

E = Margin of error and the confidence interval is 95%

Using the formula, the sample size is calculated below

$$n= 315/1+315(0.05)^2$$
$$= 315/\,1.7875$$
$$= 176.\,22$$
$$= 176$$

Based on the formula, one hundred and seventy-six (176) arrived as the sample size. After the determination of the sample size, the researcher must now determine the sampling technique for the study after determining sample size. Every researcher's dream would have been to collect data from every single person in a population. This scenario is only achievable when the researcher is working with small groups of people. When the population of interest is big, however, this census approach is not always viable. Accessing potential participants is also costly, time-consuming, and complicated. As a result of these issues, studies that use huge populations, such as this one, have depended on sampling procedures to pick a representative

sample from the population of interest (Malhotra, 2010).

There are two types of sampling techniques available for use by researchers. Depending on the objective of the study, a researcher may use the probabilistic sampling technique or the non-probabilistic sampling technique. A probabilistic sampling technique is a technique that ensures that every item in the given population has a chance of being selected for the sample (Ahmed, 2016). It is choosing samples randomly from a larger population based on probability. Some of the probabilistic samples include simple random, stratified sampling, cluster, systematic and multi-stage sampling. The non-probabilistic sampling techniques do not guarantee an equal chance of items being drawn into the sample (Ahmed, 2016). It is not based on probabilistic selection but on the researcher's judgment. Some non-probabilistic sampling techniques include convenience sampling, quota, snowball, and purposive or judgmental sampling.

This study used both the connivance and purposive sampling technique to draw teachers who were ready and available to participate in the study. The study employed convenience sampling to collect relevant information from employees who are well knowledgeable about the phenomena under enquiry. The type of data collected from respondents is discussed in the next section.

**3.5 Data Collection**

Two main sources of data exist in any research, this includes primary data and secondary data. While primary data refers to first-hand information gathered by the research for the purpose of the research, secondary data deals with already existing data gathered for a different purpose. The choice of the data source in any research is dependent on the nature of the objective of the

study. Considering the nature of this study, primary data is more suitable to be able to test the hypotheses proposed in Chapter two (2). The choice of primary data is justified by the quest to gather first-hand information on the views of managers in the agribusiness space on how industry 4.0, supply chain analytics, circular economy, and green mindfulness may be combined to drive innovation performance. Data used in this study will therefore be gathered using a well-structured questionnaire.

The study employed the five-point Likert scale, which is better since the point scale's position between positive, negative, and neutral options is properly balanced, reducing misunderstandings in participant's responses (Croasmun and Lee Ostrom, 2011; Sarstedt and Mooi, 2019). On a scale of 1 to 5, 1 means strongly disagree, 2 means disagree, 3 means neutral, 4 means agree, and 5 means strongly agree. The survey had two parts. Part one is for gathering background information from participants, while part two is divided into four sections for bringing together information focusing on the independent variables. Section A, B, C, and D of the second part was designed in gathering information on collaborative knowledge creation, supply chain resilience, and supply chain innovation correspondingly. Items used in the design of the questionnaire were sourced from the previously validated instruments (see Appendix 1).

## 3.6 Data Processing and Analysis

Data analysis is the process of using a systematic procedure to draw inferences from data gathered from the field as well as considering the various procedures that can be used to analyze the data (Churchill and Iacobucci, 2009). The researchers further suggest that the research design, the kind of data and assumptions made in the research, and concerns associated with the study will influence the suitability of a given technique. Data analysis may follow quantitative or qualitative procedures in scrutinizing the large volume of information

obtained from the field. In the quantitative context, the procedure includes the use of statistical techniques to describe and examine variation in the quantitative measures. The quantitative approach emphasizes the use of either inferential or descriptive statistics (statistical techniques), to understand and establish relationships between constructs.

In this study Statistical Package for Social Sciences (SPSS) version 23 and SmartPLS 3 software will be utilized to conduct descriptive statistics and inferential statistics respectively. The data collected will be coded, cleaned, and prepared for analysis. The data will first be coded in Microsoft excel. In excel the data will be thoroughly checked to avoid possible data entry errors.

After cleaning the data will then be exported to SPSS. The data checks in SPSS include missing values, reliability, descriptive statistics, and test of assumptions for multivariate analysis.

Subsequently, SmartPLS version 3 (Ringle et al., 2015) will be employed to conduct inferential statistics through multivariate data analysis

### 3.7 Reliability and Validity

Evaluating the measurement model is very important in quantitative research, it confirms the validation and the result of the research. It is however important for researchers to concentrate on improving the quality of their work (Heale and Twycross, 2015). Again, there are two vital features to deal with in assessing the measurement model, they include the reliability and validity of the study instrument to be used (Saunders, Lewis, and Thornhill, 2016). Khalid et al. (2012), defined reliability measurement as the degree to which the measurement is free from random error by giving a consistent result. Concurrently, it is known as internal consistency of measurement which mirrors the same underlying construct (Cooper and Schindler, 2003). To test for how reliable an instrument is, Hair et al. (2012), came up with two tests of reliability and they are internal consistency and indicator of reliability. For internal consistency reliability, the

researcher used Cronbach Alpha. According to Hair, Sarstedt, Ringle, and Mena (2012), the indicator reliability is used to measure the indicator's variance to explain the latent construct where every indicator's absolute standardized loading should be more than 0.7 (Hair, Ringle, and Sarstedt, 2011). The researchers claim that the indicator loading, between 0.4 to 0.7 should be removed from the scale if deleting the said indicator will increase the composite reliability above the accepted threshold value. However, if the indicator loading is equal to or less than 0.7, it should be removed at all times from the reflective scale. Zikmund (2000), defined validity to be the accuracy of the measurement device and denotes the ability of a scale to measure what is proposed to measure. For quantitative research, the researcher has to certify that the three traditional forms of validity exist in the measurement device and they include face validity, content validity, and construct validity (Heale and Twycross, 2015).

Content Validity: The common method among others is content validity however, it is very needful to be conducted. It tests whether the items would measure all the content which is made to measure in the study (Creswell, 2009; Heale and Twycross, 2015). The content validity is mostly done through reviewing related literature, in this research, the instruments used were validated from past studies. Yet to make sure that it captures all the content of the research, the researcher explored face validity by involving experts to evaluate to ensure that the instruments are suitable in terms of their relevance, appearance, and properly representing the elements (Richard G. Netemeyer, William O. Bearden, 2003)

## 3.8 Ethical Considerations/Issues

Ethics are the moral principles that a person must follow, irrespective of the place or time (Akaranga and Makau, 2016). Research ethics focus on the moral principles that researchers must follow in their respective fields of research (Fouka and Mantzorou, 2011). A consent form was presented to the authorities of all selected firms to inform them of all benefits and risks involved in the participation and further sought their consent for their inclusion in the study. Selected firms had the right to decline their participation in the study. The researcher indicated in the consent form that all forms of anonymity and confidentiality would be observed. Privacy of firms in terms of freedom to define the time, extent and the conditions of sharing information were also observed. The researcher avoided any form of actions in their relation with participants that amounts to deception. All forms of plagiarism and falsification of data were also avoided by the researcher

## *3.9* Profile of the Construction Industry

Given that developed as well as developing nations manufacturing sector accounts for the largest share of the industrial sector (Haraguchi, Cheng, and Smeets, 2017). The manufacturing industries refer to those industries which involve the manufacture and processing of articles and indulge in either creating new commodities or adding value (Pfeiffer, 2017). Dangelico and Vocalelli (2017) describe the term as a manufacturing and marketing segment focused on the manufacture, processing, or preparation of raw material and commodity products, the finished products could be used both as a finished good of production or for sale to customers (Xu, Serrano, and Lin, 2017). Whereas, as per Hitomi (2017), a manufacturing sector could be seen as an economic activity wherein, on a large scale, the material is converted into finished products

(Kayanula and Quartey 2000). Added to that, the National Manufacturing Association (USA) proposed the term as the firms engaged in manufacturing and processing of products.

In its industry report, the Ghana Statistical Service (GSS) proposed the term as a collection of activities associated with goods and services. The Ghana Enterprise Development Commission (GEDC) has described the manufacturing sector in aspects of their machinery and plants. However, Kayanula and Quartey (2000) brought up the underlying potential risk of prioritizing a fixed asset and the potential impact of inflation on valuation, in specific by adopting criteria for fixed assets. The indigenous manufacturing industry supports local businesses and employs a major section of the increasing workforce. Manufacturing, food processing, construction, a small glass industry, textiles and clothing, chemicals and pharmaceuticals, metal processing, furniture and wood products, and leather and footwear are among Ghana's most important manufacturing industries (Addo, 2017).

Among the issues that have plagued this industry is that most manufacturers have not kept up with technological advancements and have failed to invest in new and modernized equipment, resulting in higher electricity usage (Abor and Quartey, 2010). Inadequacies in terms of innovation, knowledge inadequacies, financial constraints and the quality of locally produced items, as well as operational inefficiencies, and insufficient knowledge are just a few of the identified constraints faced by small and medium scale enterprises (Abor, 2015; Oppong et al., 2014; Quartey et al., 2017; Sitharam and Hoque, 2016).

# CHAPTER FOUR

# DATA ANALYSIS, PRESENTATION AND DISCUSSION OF RESULT

## 4.1 Introduction

The fourth chapter provides a statistical breakdown of the information outlined in chapter three. This chapter is divided into four parts. The first chapter presents preliminary data analysis, while subsequent chapters focus on more in-depth demographic profiles. Analyses of the study variables were both descriptive and correlational in this part. The model fit index and confirmatory factor analysis are discussed in the last section. The hypotheses of the investigation are then tested using the structural model. The most important findings are discussed in the end.

## 4.2 Exploratory Factor Analysis

Initially, the study performed an exploratory study of the data. As a first step in determining the reliability of the data, an exploratory factor analysis was performed. In this case, SPSS was used. Response rate, non-response bias, and common method bias or variance are all discussed here. The tests and interpretation that went into this preliminary analysis of data quality are outlined in Sections 4.1.1, 4.1.2, and 4.1.3.

## 4.2.1 Response Rate

The percentage of those who answered the survey is often reported. The percentage is calculated by dividing the total number of surveys sent out by the total number of answers. It is unusual for surveys to get a response rate of 50% or higher. Information was gathered from November 4, 2022, through December 22, 2022. Study participants were limited to 176, although 200 surveys were sent out to ensure a response. Previous studies (Sun et al., 2022; López, 2022; Lavidas, et

al., 2022) indicate that a response rate of 100.0% is satisfactory for analysis from a total of 176

questionnaires that were deemed relevant after review.

**Table 4.1: Responses Rate**

| Distributed | Collected | Percentage of Usable |
|---|---|---|
| Response | 176 | 100.0 |
| Non-Response | 0 | 0.0 |
| Total | 176 | 100.0 |

### 4.2.1 Test for Common Method Bias and Sampling Adequacy

Due to the high degree of dependency on a single respondent, problems with CMB might impact

or distort the findings of the connection between the predictors and the dependent variable in

survey research (Podsakoff and Organ, 1986; Bahrami et al., 2022). As a result, incorrect

inferences are made. CMB emerged from the concept of regularity or social acceptability, said

by Podsakoff et al. (2003). CMB may harm any data, although it can be mitigated in a number

of ways. Analysis using an exploratory factor technique confirmed that Harman's suggested

single-factor explanation accounted for variation below the 50% cutoff, providing support for

the approach. Using PCA, the study determined that the variables accounted for 46.6% of the

total variance.

**Table 4.2: Common Method Bias**

| Component | Initial Eigenvalues | | | Extraction Sum of Squared Loadings | | |
|---|---|---|---|---|---|---|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 8.851 | 46.582 | 46.582 | 8.851 | 46.582 | 46.582 |
| 2 | 2.118 | 11.147 | 57.729 | 2.118 | 11.147 | 57.729 |
| 3 | 1.602 | 8.432 | 66.161 | 1.602 | 8.432 | 66.161 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 4 | 0.955 | 5.025 | 71.186 | | | |
| 5 | 0.834 | 4.391 | 75.577 | | | |
| 6 | 0.581 | 3.059 | 78.636 | | | |
| 7 | 0.508 | 2.676 | 81.311 | | | |
| 8 | 0.495 | 2.604 | 83.915 | | | |
| 9 | 0.446 | 2.349 | 86.264 | | | |
| 10 | 0.393 | 2.069 | 88.333 | | | |
| 11 | 0.349 | 1.836 | 90.169 | | | |
| 12 | 0.326 | 1.717 | 91.886 | | | |
| 13 | 0.309 | 1.625 | 93.512 | | | |
| 14 | 0.252 | 1.329 | 94.84 | | | |
| 15 | 0.239 | 1.257 | 96.097 | | | |
| 16 | 0.222 | 1.169 | 97.266 | | | |
| 17 | 0.193 | 1.017 | 98.284 | | | |
| 18 | 0.172 | 0.903 | 99.187 | | | |
| 19 | 0.155 | 0.813 | 100 | | | |
| Extraction Method: Principal Component Analysis. | | | | | | |

The sphericity of the samples was determined using the Bartlett test and the Kaiser-Meyer-Olkin (KMO) test. Table 4.3 shows that the level of Kaiser-Meyer-Olkin sampling accuracy is 94.9%, and that the results of the Bartlett's test imply statistical significance (Approx. Chi-Square = 4593.873, df: 171, Sig. = 0.000). The results prove that the samples were collected correctly.

**Table 4.3: KMO and Bartlett's Test**

| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | |
|---|---|---|
| Bartlett's Test of Sphericity | | 0.924 |
| | Approx. Chi-Square | 7356.685 |
| | df | 276.000 |
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | Sig. | 0.000 |

## 4.2.2 Non-response Bias

The problem of non-response bias was studied. When there are less survey respondents than there are in the population, this phenomenon is known as non-response bias. Non-response bias, which is caused by low survey response rates, may reduce the confidence in survey results and the scope of an investigation's applicability. As a means of minimizing the effects of non-response bias, this research contrasted responses from early and late respondents. Participants that filled out the survey early did so before the first half of the month was through, while those who filled it out later did so thereafter. It was recommended by Oppenheim (2001) that neither group change any of the model's input variables. This proves there is no issue with non-response bias and that the samples are generalizable to the population at large. 88 responses came in on time, while the remaining 88 were late. Non-response bias was examined using T-tests. According to the t-test, there was no significant difference (see Table 4.4). According to the results, there is no difference between the first half and final months' construct data.

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

|  | Group | Mean | Levene's Test for Equality of Variances | Sig. | T |
|---|---|---|---|---|---|
|  |  |  | F |  |  |
| CK | 1 | 31.02 | 0.027 | 0.871 | 0.106 |
|  | 2 | 31.13 |  |  |  |
| SCRES | 1 | 14.22 | 0.038 | 0.159 | 1.11 |
|  | 2 | 14.39 |  |  |  |
| SCI | 1 | 26.35 | 0.356 | 0.076 | 0.576 |
|  | 2 | 26.95 |  |  |  |
|  |  |  | Levene's Test for Equality of Variances | 0.822 | 0.982 |
|  | Group | Mean | F |  |  |

## 4.3 Demographic Information

In order to provide context for the study, this section presents demographic data about the persons and organizations that were surveyed. Key information collected from respondents includes: gender, age, education, department, position, firm age, number of employees, and ownership structure.

**Table 4.5: Demographic Information**

| Variables | Categories | Frequency | Percent |
|---|---|---|---|
| Gender | Female | 72 | 40.9 |
| | Male | 104 | 59.1 |
| Age | 18-30 years | 25 | 14.2 |
| | 31-40 years | 104 | 59.1 |
| | 41-50 years | 36 | 20.5 |
| | Above 50 years | 11 | 6.3 |
| Level of Education | Bachelor Degree | 92 | 52.3 |
| | Diploma | 28 | 15.9 |
| | Graduate Studies (Master / Ph.D.) | 56 | 31.8 |
| Your Position in the Firm | Business Owner | 38 | 21.6 |
| | Business Owner & Manager | 92 | 52.3 |
| | Manager | 32 | 18.2 |
| | Production Manager | 14 | 8.0 |
| How many years have your firm been in operation? | 1 - 5 years | 31 | 17.6 |
| | 11 – 15 years | 41 | 23.3 |
| | 16 years and above | 14 | 8.0 |
| | 6 - 10 years | 90 | 51.1 |
| How many employees are in the firm? | 30 – 99 employees | 58 | 33.0 |
| | 5 – 29 employees | 24 | 13.6 |
| | More than 100 | 94 | 53.4 |
| Type of ownership | Fully locally owned | 87 | 49.4 |
| | Fully foreign owned | 59 | 33.5 |
| | Jointly Ghanaian & foreign owned | 30 | 17.0 |
| | Total | 176 | 100.0 |

| Variables | Categories | Frequency | Percent |
|---|---|---|---|
| Gender | Female | 72 | 40.9 |
| | Male | 104 | 59.1 |
| Age | 18-30 years | 25 | 14.2 |
| | 31-40 years | 104 | 59.1 |
| | 41-50 years | 36 | 20.5 |
| | Above 50 years | 11 | 6.3 |
| Level of Education | Bachelor Degree | 92 | 52.3 |

## 4.4 Model Fit Summary

Valid values and ranges may be found for the Fitness of Extracted-Index, SRMR, Root Mean
Square of Approximation, and Chi-Square (Table 4.9). Both the extracted and unusual indices
are under 0.9, the threshold for approval. The presence of a square root or common root in a
residual indicates that it is not infinitely small. As a result, future research must take into
account all relevant factors and points of view.

**Table 4.6: Reliability and Validity**

| Constructs | Items | Loadings | CA | CR | AVE | VIF |
|---|---|---|---|---|---|---|
| Adaptive Capability | AC1 | 0.859 | 0.889 | 0.919 | 0.693 | 2.894 |
| | AC2 | 0.858 | | | | 2.909 |
| | AC3 | 0.811 | | | | 2.089 |
| | AC4 | 0.814 | | | | 2.364 |
| | AC5 | 0.820 | | | | 2.368 |
| Big Data Analytics Capability | BDAC1 | 0.753 | 0.906 | 0.925 | 0.638 | 2.192 |
| | BDAC2 | 0.807 | | | | 2.527 |
| | BDAC3 | 0.820 | | | | 2.363 |
| | BDAC4 | 0.828 | | | | 2.588 |
| | BDAC5 | 0.815 | | | | 2.357 |
| | BDAC6 | 0.781 | | | | 2.379 |
| | BDAC7 | 0.785 | | | | 2.512 |
| Creativity | C1 | 0.795 | 0.878 | 0.912 | 0.677 | 2.187 |
| | C2 | 0.866 | | | | 3.286 |
| | C3 | 0.868 | | | | 2.826 |
| | C4 | 0.884 | | | | 3.268 |

Females made up 40.9% of the 176 replies, while males made up 59.1. Males outnumbered females in the research. 14.2% were 18–30, 59.1% were 31–40, 20.5% were 41–50, and 6.3% were above 50. Most participants were 31–40 years old. Table 4.5 showed that 52.3% had a bachelor's degree, 15.9% had a diploma, and 31.8% had done advanced studies (Master's or Ph.D.). Most participants had bachelor's degrees. 21.6% were business owners, 52.3% were business owners and managers, 18.2% were managers, and 8.0% were production managers. Results showed most participants were company owners and managers. 17.6% of the 176 businesses have been in operation for 1–5 years, 23.3 percent for 11–15 years, 8.0 percent for more than 16 years, and 51.1 percent for 6–10 years. The data suggest that most firms are 6–10 years old. Also, 33.0 percent of the 176 chosen firms had 30–99 staffs, 13.6% had 5–29 staffs, and 53.4 percent had more than 100 staffs. Most firms have above 100 staffs. Finally, 49.4% stated the firm was owned solely by Ghanaians, 33.5% by foreigners, and 17.0% by both. Most of the owned firms were local.

**Discriminant Validity**

The research also investigated the divergences between the different constructs (Hair et al., 2010; Henseler et al., 2016b). When testing for discriminant validity, it is essential that the square root of the AVE (diagonal value) of each latent variable be greater than the greatest correlation of the construct. Thus, Table 4.8 provides evidence of discriminant validity. The outcome once again demonstrates that multicollinearity is not present (Byrne, 2013). Table 4.8 shows that Collaborative knowledge creation has a 0.897 connection with itself, whereas it has 0.906 and 0.854 correlations with SC innovation and SC resilience, respectively. SC innovation and SC resilience had a 0.855 correlation, whereas SC innovation had a 0.888 correlation with itself. Among SC resilience, there was a correlation of 0.921.

### 4.4.1 Descriptive Statistics

The correlation coefficients between CK and SCI (r=0.906, P<0.05), CK and SCRES (r=0.854, P<0.05), and SCI and SCRES (r=0.855, P<0.05) are all very high in Table 4.6. Further, a correlation score between 0 and 0.30 indicates a little association, between 0.30 and 0.70 a moderate correlation, and between 0.70 and 1.0 a substantial correlation. The results indicate a strong connection between the variables.

**Table 4.7: Descriptive Statistics**

| Construct | 1 | 2 |
|---|---|---|
| Collaborative Knowledge Creation | 1.000 | |
| Supply Chain Innovation | 0.906 | 1.000 |
| Supply Chain Resilience | 0.854 | 0.855 |
| Construct | 1 | 2 |

### 4.4.2 Fornell-Larcker test

The research also investigated the divergences between the different constructs (Hair et al., 2010; Henseler et al., 2016b). When testing for discriminant validity, it is essential that the square root of the AVE (diagonal value) of each latent variable be greater than the greatest correlation of the construct. Thus, Table 4.8 provides evidence of discriminant validity. The outcome once again demonstrates that multicollinearity is not present (Byrne, 2013). Table 4.8 shows that Collaborative knowledge creation has a 0.897 connection with itself, whereas it has 0.906 and 0.854 correlations with SC innovation and SC resilience, respectively. SC innovation and SC resilience had a 0.855 correlation, whereas SC innovation had a 0.888 correlation with itself. Among SC resilience, there was a correlation of 0.921.

**Table 4.8: Fornell-Larcker criterion**

| Construct | Collaborative Knowledge Creation | Supply Chain Innovation | Supply Chain Resilience |
|---|---|---|---|
| Collaborative Knowledge Creation | 0.897 | | |
| Supply Chain Innovation | 0.906 | 0.888 | |
| Supply Chain Resilience | 0.854 | 0.855 | 0.921 |

**Correlation Analysis**

The correlation coefficients between CK and SCI (r=0.906, P<0.05), CK and SCRES (r=0.854, P<0.05), and SCI and SCRES (r=0.855, P<0.05) are all very high in Table 4.6. Further, a correlation score between 0 and 0.30 indicates a little association, between 0.30 and 0.70 a moderate correlation, and between 0.70 and 1.0 a substantial correlation. The results indicate a strong connection between the variables.

**Table 4.9: Descriptive and Correlation Analysis**

| Construct | 1 | 2 | 3 |
|---|---|---|---|
| Collaborative Knowledge Creation | 1.000 | | |
| Supply Chain Innovation | 0.906 | 1.000 | |
| Supply Chain Resilience | 0.854 | 0.855 | 1.000 |

**Source: Field Data, 2023**

**4.4.3 Confirmatory Factor Analysis**

The process of checking the validity of research models is essential. Cronbach's alpha and the Composite reliability test were used in this research to assess the robustness of the model. AVE, and indicator loadings were used to evaluate the model's validity. For this study, the study used a Cronbach alpha of 0.7 and a composite reliability index to analyze the internal consistency of

the constructs. Cronbach's alpha and the composite reliability index both exceed.80, as seen in Table 4.7. (Hair et al., 2016). This finding lends credence to the features of the measurement model. The indicator loadings were all more than 0.7. There is a convergent validity. When the AVE values were more than 0.5, convergent validity was shown. (Check out Table 4.10) All of the variables (T test) were significant at the 1.96 level, as shown in Table 4.7. Descriptive data may be found in Table 4.10. (Mean and Standard deviation). As can be seen in the table, the mean varies from 3.420 to 4.011. Std. Dev from the mean was between 1.014 and 1.400.

**Table 4.10: Confirmatory Factor Analysis**

| Scale | Code | Outer loadings | T statistics (|O/STDEV|) | Mean | Std. Dev | Skewness |
|---|---|---|---|---|---|---|
| Collaborative Knowledge Creation (CA = 0.965; CR = 0.966; AVE =0.804) | CK1 | 0.851 | 43.649 | 3.835 | 1.173 | -0.932 |
| | CK2 | 0.905 | 47.849 | 4.011 | 1.108 | -0.857 |
| | CK3 | 0.919 | 32.231 | 3.892 | 1.014 | -0.639 |
| | CK4 | 0.912 | 34.076 | 3.847 | 1.213 | -0.627 |
| | CK5 | 0.917 | 33.511 | 3.949 | 1.119 | -0.879 |
| | CK6 | 0.889 | 29.370 | 3.847 | 1.14 | -0.53 |
| | CK7 | 0.897 | 30.808 | 3.864 | 1.089 | -0.604 |
| | CK8 | 0.882 | 34.376 | 3.83 | 1.17 | -0.78 |
| Supply Chain Innovation (CA = 0.955; CR = 0.957; AVE = 0.789) | SCIN1 | 0.871 | 44.692 | 3.79 | 1.19 | -0.749 |
| | SCIN2 | 0.919 | 34.567 | 3.705 | 1.24 | -0.432 |
| | SCIN3 | 0.927 | 41.789 | 3.869 | 1.113 | -0.512 |
| | SCIN4 | 0.907 | 44.119 | 3.727 | 1.218 | -0.568 |
| | SCIN5 | 0.884 | 29.857 | 3.903 | 1.137 | -0.792 |
| | SCIN6 | 0.873 | 30.434 | 3.858 | 1.096 | -0.759 |
| | SCIN7 | 0.836 | 22.657 | 3.801 | 1.187 | -0.78 |
| Supply Chain Resilience (CA = 0.940; CR = 0.949; AVE = 0.847) | SCRES1 | 0.918 | 42.105 | 3.42 | 1.4 | -0.268 |
| | SCRES2 | 0.941 | 43.847 | 3.46 | 1.36 | -0.305 |
| | SCRES3 | 0.957 | 52.051 | 3.483 | 1.382 | -0.421 |

| | SCRES4 | 0.864 | 27.150 | 3.938 | 1.319 | -1.187 |
|---|---|---|---|---|---|---|

**Source: Field Data, 2023**

### 4.5 Model Fit Indices

The values for the Extracted-Index Fitness, SRMR, Root Mean Square of Approximation, and Chi-Square are all appropriate (Table 4.9). Both the rare and extracted indices are much lower than 0.9, the threshold for acceptability. Considering that the square of the residual is not close to zero, the root demonstrates that the residual is unsatisfactory. The Root Mean Square Approximation and the Total Residual Value are both unacceptable. These numbers are much larger than 0.1 and 3. This suggests that all relevant factors need to be taken into account in future research. A SRMR of 0.055 was found in Table 4.9, which is within the range of values considered acceptable in this research. Chi-square = 880.900, and the normed fit index was 0.816.

**Table 4.11: Fit Summary**

| Indices | Estimated model | Indices |
|---|---|---|
| SRMR | 0.055 | SRMR |
| d_ULS | 0.584 | d_ULS |
| d_G | 0.997 | d_G |
| Chi-square | 880.900 | Chi-square |
| NFI | 0.816 | NFI |

### 4.6 Coefficient of Determination (R2)

As shown by coefficient of determination analyses, the independent factors do account for part of the variance in the dependent variable (R2). Calculating R2 indicates how well the result was predicted by the independent variables. Predictive significance was defined as an R2 of 0.10 or

above by Falk and Miller (1992). Table 4.12 shows that both SC innovation and SC resilience have high levels of predictive accuracy (adjusted R2).

**Table 4.12: Coefficient of Determination**

| Construct | R-square | R-square adjusted |
|---|---|---|
| Supply Chain Innovation | 0.821 | 0.820 |
| Supply Chain Resilience | 0.766 | 0.763 |

Q2 is another way to check PLS model correctness (Hair et al., 2020). Deleting a data point at random, assigning missing values, and calculating the model's phase creates this statistic (Zhang, 2022). Q2 uses predicted sample data and model explanatory power (Hair et al., 2020). This approximation helps the blindfold approach interpret output data. Accuracy rises when Q2 results exceed expectations and projections are close to baseline (Zhang, 2022). Valid design estimates need Q2 to be non-zero for endogenous. The PLS path model predicts low, medium, and low when Q2 is larger than 0, 0.25, and 0.50. (Zhang, 2022). SC innovation scored 0.818 and SC resilience 0.726 in Q2 (Table 4.13). All Q-square values above 0.5, suggesting an excellent model fit and high predictive value.

**Table 4.13: Predictive Power of the PLs Model**

| Construct | Q²predict |
|---|---|
| Supply Chain Innovation | 0.818 |
| Supply Chain Resilience | 0.726 |
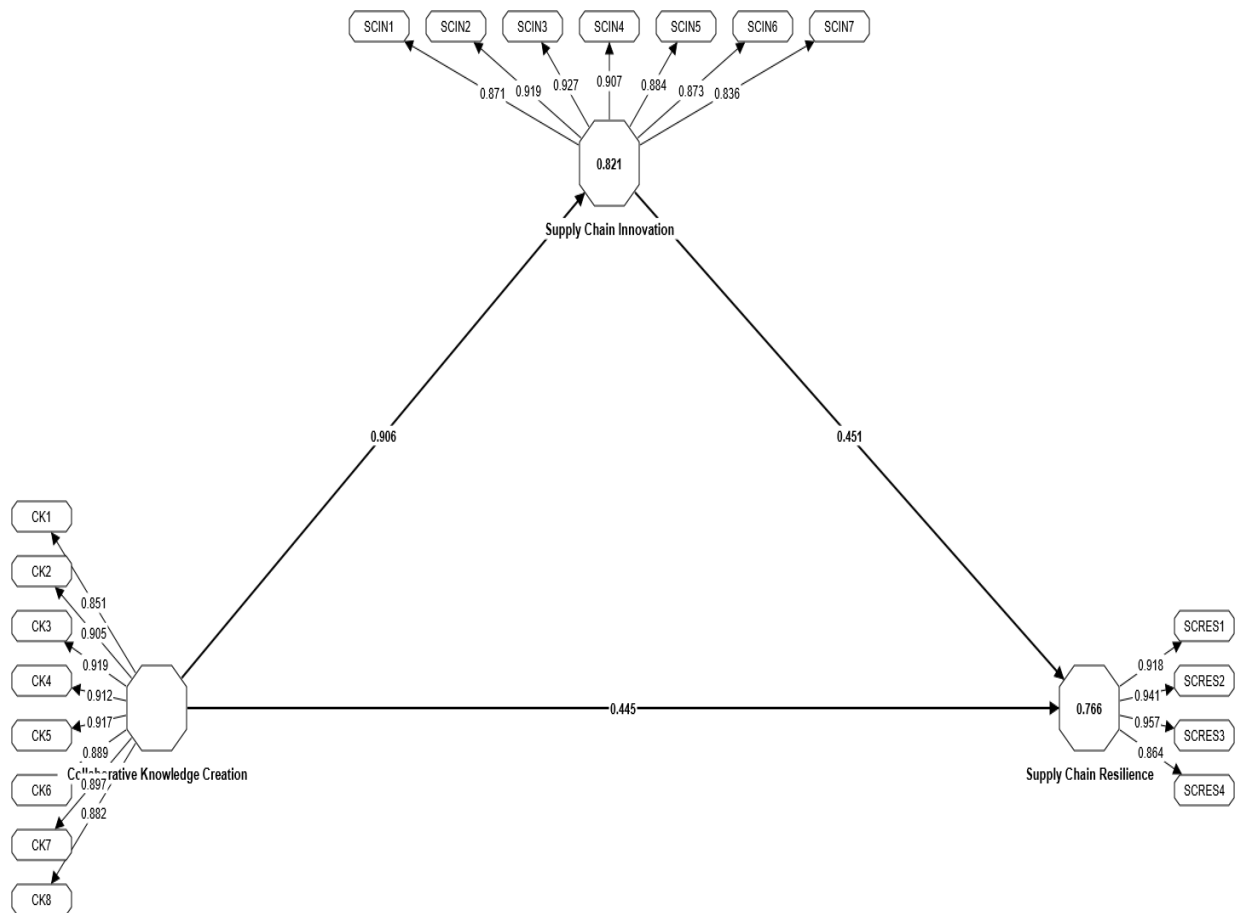
**Figure 4.1: Measurement Model Assessment**

## 4.7 Hypotheses for Direct and Indirect Relationship

The research hypotheses are investigated using SmartPLS 4. Table 4.14 displays the findings. Bootstrapping is then used to examine the mediation and moderation models in this study 5,000 times, with replacement, and the standard error will be computed in accordance with the confidence level of the evaluative model (Hair, Sarstedt, Hopkins & Kuppelwieser, 2014). This study analyses the impact of collaborative knowledge creation (CK) on supply chain resilience (SCRES) through the mediation effect of supply chain innovation (SCI).

**Table 4.14: Hypotheses for Direct Relationship**

| Path | Path Coefficient | T statistics (\|O/STDEV\|) | P values | Hypoyheses Validation |
|---|---|---|---|---|
| Collaborative Knowledge Creation -> Supply Chain Innovation | 0.906 | 59.873 | 0.000 | Accepted |
| Collaborative Knowledge Creation -> Supply Chain Resilience | 0.445 | 3.994 | 0.000 | Accepted |
| Supply Chain Innovation -> Supply Chain Resilience | 0.451 | 4.004 | 0.000 | Accepted |
| Collaborative Knowledge Creation -> Supply Chain Innovation -> Supply Chain Resilience | 0.409 | 4.014 | 0.000 | Accepted |

CK directly influences SCI with B=0.906, t=59.873, P=0.000, and Sig<0.05 in Table 4.12. The path coefficient was positive and the p-value for H1 was less than 0.05, indicating that CK directly influenced SCI. CK enhances SCI with a positive path coefficient. CK increases SCI by 90.6%.

CK directly affects SCRES (B=0.445; t=3.994; P=0.000; Sig<0.05). The path coefficient was positive and the p-value for H2 was less than 0.05, indicating a significant positive direct influence on CK to SCRES. CK enhances SCRES because the path coefficient is positive. CK accounts for 44.5% of SCRES.

SCI directly affected SCRES (B=0.451; t=4.004; P=0.000; Sig<0.05). Since the p-value was less than 0.05 and the path coefficient was positive, SCI had a significant direct influence on SCRES, validating the third hypothesis (H3). The positive path coefficient indicates that SCRES will improve with SCI. SCI boosts SCRES by 45.1%.

SCI indirectly affected CK and SCRES (B=0.409; t=4.014; P=0.000; Sig<0.05). SCI mediates

CK and SCRES positively since the p value for H4 was less than 0.05 and the path coefficient

was positive. The positive path coefficient indicates that SCI positively mediates CK-

SCRES interactions. This also means that SCI mediates 40.9% of the CK-SCI connection.
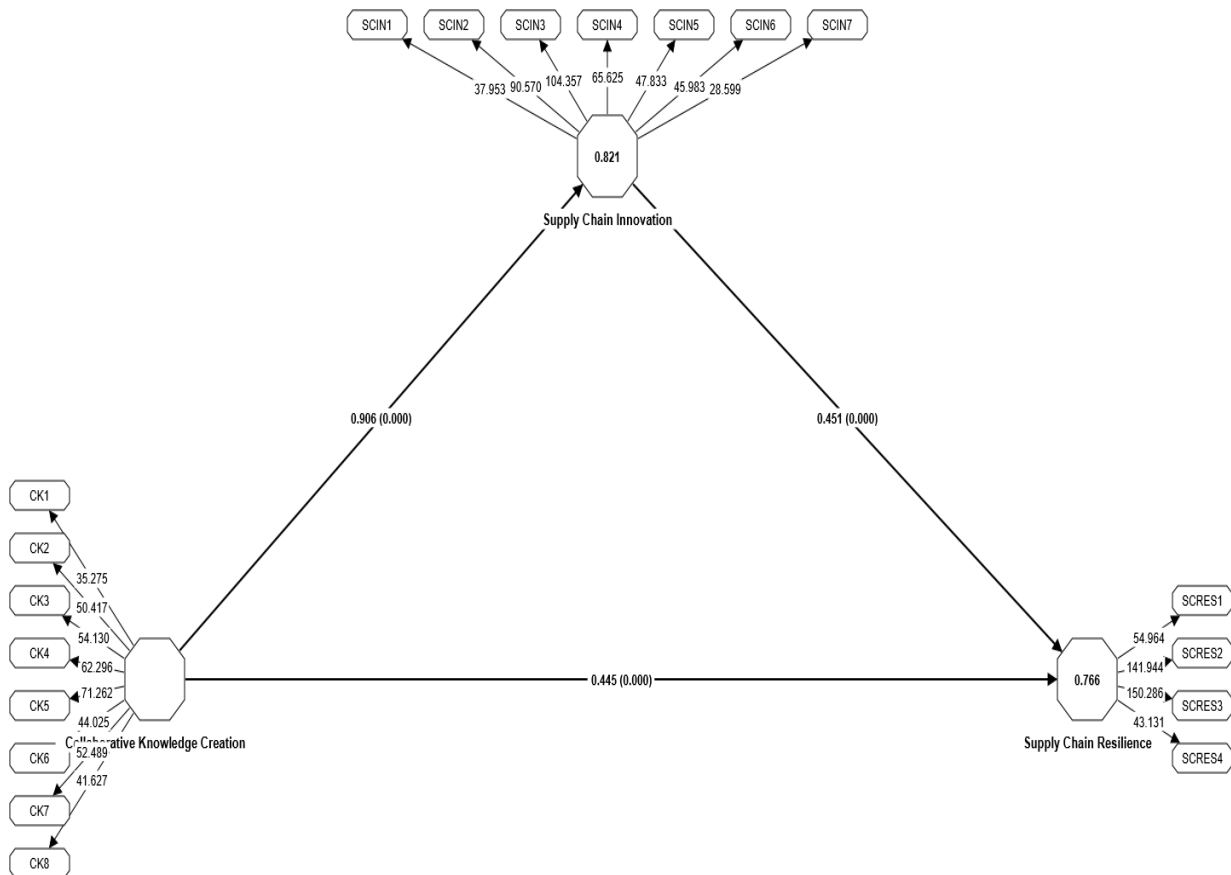


**Figure 4.2 Structure Model Evaluation**

**4.8 Discussion of Findings**

The results of the study are discussed in light of the previous research in this section. In

particular, it discusses how the relationship between collaborative knowledge creation (CK) and

supply chain resilience (SCRES) may be explained by the mediating function of SC innovation (SCI). Objectives on the relationship between the variables are then investigated further.

**4.8.1 Effect of Collaborative Knowledge Creation on SC Resilience**

The initial objective examines how collaborative knowledge creation influence supply chain resilience. The finding indicates a significant positive direct influence on CK to SCRES. CK enhances SCRES because the path coefficient is positive. CK accounts for 44.5% of SCRES. To improve SC resilience and respond swiftly to disruptions, management must work with partners to acquire new information via inductive and deductive reasoning, launch and share ambitious and innovative ideas and conversations, and devote significant effort to reconfiguring information and sorting, integrating, and classifying new knowledge. It was the goal of the study by Al-Omoush, Simón-Moya, and Sendra-Garca (2020) to determine whether or not social capital and cooperative knowledge building may aid businesses in developing preventative measures to address the COVID-19 problem through electronic commerce. They arrived to the conclusion that improving the responsiveness of e-businesses to the pandemic requires the cultivation of collaborative knowledge production. Zhang, Zhang, and Zhou (2021) investigate the potential of knowledge creation and sharing to improve environmentally friendly supply chain management. Ultimately, the research found that green supply chain management was adopted by more companies when employees worked together to share information (GSCM). In the wake of the historically significant COVID-19 crisis, Al-Omoush, Ribeiro-Navarrete, Lassala, and Skare (2022) investigated the role of social capital in promoting organizational resilience, knowledge creation, and collaborative problem solving. All the factors were shown to be significantly affected by the process of knowledge generation.

**4.8.2 Effect of Collaborative Knowledge Creation on SC Innovation**

The following objective evaluate the relationship between collaborative knowledge creation and supply chain innovation. The finding reveals that CK had a significant positive direct influence on SCI. CK improves SCI when the path coefficient is positive. Thus, CK boosts SCI by 90.6%. This means that management should work with partners using inductive and deductive methods to learn new things, launching and exchanging bold and inventive ideas and dialogues, and spending a great deal of time realigning information and sorting, combining, and categorizing new knowledge to boost SC innovation by assisting organizations in coming up with novel methods for carrying out business along the supply chain, and inspiring SC members to offer up their own ideas and suggestions. These results are consistent with those of other research (Gowthorpe, 2009; Cegarra-Navarro and MartNez-Conesa, 2007; Scholten and Schilder, 2015) that have proven the favourable influence of organizational learning and producing new knowledge on successful e-business innovation. According to Scholten and Schilder (2015), a company's ability to share information with its e-business partners is a crucial competitive advantage. Cegarra-Navarro and MartNez-Conesa (2007) argue that the prosperity of e-businesses is influenced strongly by the proliferation of information because of the intelligence and creativity it fosters. To boost their innovation potential, businesses need to expand their efforts of collaborative knowledge creation and innovation in order to create new goods, services, or methods (Purvis et al., 2016; Grimsdottir and Edvardsson, 2018a, 2018b; Faccin and Balestrin, 2018).

**4.8.3 Mediating Role of SC Innovation**

The final aim investigates the mediating role of supply chain innovation on the relationship between collaborative knowledge creation and supply chain resilience. The finding reveals that

SCI had a significant direct influence on SCRES. The positive path coefficient indicates that SCRES will improve with SCI. SCI boosts SCRES by 45.1%. This means that in order to increase SC resilience in the face of disruptions in the organization, management must think outside the box when it comes to how the supply chain is run, encourage its members to offer forth new ideas, and promote constant innovation in its fundamental procedures. The finding also indicates that SCI mediates CK and SCRES positively. The positive path coefficient indicates that SCI positively mediates CK-SCRES interactions. This also means that SCI mediates 40.9% of the CK-SCI connection. This means that management ought to be more creative in the ways in which the supply chain is run, encourage supply chain members to make suggestions, and pursue continuous innovation in core processes to encourage the organization to collaborate with partners by using inductive and deductive reasoning to learn something new, launching and exchanging ambitious and creative ideas and dialogues with partners, and spending a great deal of time with partners reconfiguring information and so on. The results of this study are consistent with those of Ambulkar et al. (2015), Mafabi et al. (2015), Moore and Westley, (2011), and Sabahi, Parast, and Kamalahmadi (2019), all of whom found that innovation increases businesses' resilience in the face of disruptions. Therefore, the company's continued success and survival in today's competitive, fast-paced business contexts depends critically on its ability to maintain its dynamic skills, such as innovation (Helfat and Winter, 2011). As a result, originality is crucial for SCR. Sabahi and Parast (2020) conducted a comprehensive literature study and discovered that innovation may have a direct effect on the dynamic capacities of organizations', such as information exchange, agility, and flexibility, which in turn considerably increases their resilience. Klibi et al. (2010) came to a similar

67

conclusion, arguing that organizations must handle frequent knowledge creation by strengthening their SC's ability to withstand disruptions.

# CHAPTER FIVE

# SUMMARY, CONCLUSION AND RECOMMENDATIONS FOR FUTURE RESEARCH

## 5.1 Introduction

The main objective of this study is to evaluate how collaborative knowledge creation may affect supply chain resilience as well as the mediating role of supply chain innovation. In the first portion of the chapter, the study's results and conclusion are summarized and briefly addressed. The chapter concludes with suggestions for further study.

## 5.2 Summary

### 5.2.1 Effect of Collaborative Knowledge Creation on SC Resilience

The initial objective examines how collaborative knowledge creation influence supply chain resilience. The finding indicates a significant positive direct influence on CK to SCRES. CK enhances SCRES because the path coefficient is positive. CK accounts for 44.5% of SCRES. This means that to improve SC resilience in the face of disruptions, management should work with partners to use inductive and deductive reasoning to learn new things, to open and share ambitious and creative ideas and dialogues, and to spend a lot of time reconfiguring information and sorting, integrating, and categorizing new knowledge.

### 5.2.2 Effect of Collaborative Knowledge Creation on SC Innovation

The following objective evaluate the relationship between collaborative knowledge creation and supply chain innovation. The finding reveals that CK had a significant positive direct influence on SCI. CK improves SCI when the path coefficient is positive. Thus, CK boosts SCI by 90.6%. To improve SC innovation, management should spend a great deal of time with partners

reconfiguring information and sorting, integrating, and categorizing new knowledge to aid organizations in coming up with novel approaches to supply chain management and operations, and to encourage SC members to offer their own ideas and suggestions.

### 5.2.3 Mediating Role of SC Innovation

The final aim investigates the mediating role of supply chain innovation on the relationship between collaborative knowledge creation and supply chain resilience. The finding reveals that SCI had a significant direct influence on SCRES. The positive path coefficient indicates that SCRES will improve with SCI. SCI boosts SCRES by 45.1%. This means that in order to increase SC resilience in the face of disruptions in the organization, management must think outside the box when it comes to how the supply chain is run, encourage its members to offer forth new ideas, and promote constant innovation in its fundamental procedures. The finding also indicates that SCI mediates CK and SCRES positively. The positive path coefficient indicates that SCI positively mediates CK-SCRES interactions. This also means that SCI mediates 40.9% of the CK-SCI connection. This means that management ought to be more imaginative in the ways that the supply chain is run, that they should encourage SC partners to make suggestions, and that they should seek innovative thinking in core processes to encourage the organization to team up with partners by using inductive and deductive reasoning to learn something new, by launching and exchanging ambitious and creative ideas and discussions with partners, and by spending a lot of time with partners reconfiguring information and so on

### 5.3 Conclusion

The main objective of this study is to evaluate how collaborative knowledge creation may affect supply chain resilience as well as the mediating role of supply chain innovation. The study

employed cross-sectional descriptive survey design. This survey was conducted using a quantitative approach. Convenience and purposive sampling technique were used to choose 176 participants from procurement, logistics, and top executive or managers of all the multinational companies in Ghana. A prepared questionnaire was the main tool used for data collection. Both SPSS v26 and SmartPls v4 were used for the statistical analysis. Both descriptive and inferential approaches were used to analyze the data. The findings indicated a significant positive direct influence on CK to SCRES and SCI. SCI had a significant direct influence on SCRES and also mediates CK-SCRES interactions. To improve SC resilience in the face of disruptions, the study suggests that management work with partners to use inductive and deductive reasoning to learn new things, to release and share ambitious and creative ideas and discussions, and to spend a lot of time reconfiguring information and sorting, integrating, and categorizing new knowledge.

## 5.4 Recommendations

From the study's results, this section offers advice to different stakeholders. Management and researchers are encouraged to consider these suggestions.

### 5.4.1 Recommendations for Management

The finding indicates a significant positive direct influence on CK to SCRES. To improve SC resilience in the face of disruptions, the study suggests that management work with partners to use inductive and deductive reasoning to learn new things, to release and share ambitious and creative ideas and discussions, and to spend a lot of time reconfiguring information and sorting, integrating, and categorizing new knowledge.

The finding reveals that CK had a significant positive direct influence on SCI. The study suggested that management work with partners to gain new knowledge through deductive and

inductive approach, to launch and share ambitious and creative ideas and discussions, and to spend a great deal of time with partners reconfiguring information and sorting, integrating, and categorizing new knowledge to improve SC innovation by assisting organizations in coming up with novel approaches to their supply chain's day-to-day activities.

The finding reveals that SCI had a significant direct influence on SCRES. Findings suggested that supply chain management may improve its resistance to disruptions by encouraging its members to think outside the box, embracing a culture of continuous improvement, and introducing novel techniques.

The finding also indicates that SCI mediates CK and SCRES positively. The research concluded that management should be more innovative in the ways the supply chain is run, encourage SC partners to offer new ideas, and pursue continuous innovation in core processes to encourage the organization to team up with partners through the use of inductive and deductive reasoning to acquire new knowledge, the introduction and share of novel ideas and meetings with partners, and the investment of substantial time in the process of information reconfiguration in combination with the partners.

### 5.4.2 Recommendation for Future Studies

Many potential paths for further investigation are closed by this study's limitations. To begin with, the sample for the research consisted only of managers from the examined business. Therefore, a comparable research focusing on workers could provide more generalizable findings. It is also challenging to demonstrate causation using just cross-sectional descriptive design. With longitudinal and panel data, future studies may be able to empirically analyze the direction of causation. The research, which relied on quantitative approaches, looked at the connections between collaborative knowledge creation, SC resilience, and SC innovation. This

suggests that qualitative research techniques may be necessary for similar investigations in the future. Findings from this study also imply that different statistical analytic approaches might be helpful in future research. In order to determine the validity and generalizability of these findings, future research may seek to repeat this study in other countries.

# REFERENCES

Abdalla, S.S. and Nakagawa, K., 2022, March. Entrepreneurial Leadership, Supply Chain Innovation, and Adaptability: A Cross-national Investigation. In Operations Research Forum (Vol. 3, No. 1, pp. 1-21). Springer International Publishing.

Abeysekara, N., Wang, H. and Kuruppuarachchi, D., 2019. Effect of supply-chain resilience on firm performance and competitive advantage: A study of the Sri Lankan apparel industry. Business Process Management Journal.

Afraz, M.F., Bhatti, S.H., Ferraris, A. and Couturier, J., 2021. The impact of supply chain innovation on competitive advantage in the construction industry: Evidence from a moderated multi-mediation model. Technological Forecasting and Social Change, 162, p.120370.

Afum, E., Issau, K., Agyabeng-Mensah, Y., Baah, C., Dacosta, E., Essandoh, E. and Boateng, E.A., 2021. The missing links of sustainable supply chain management and green radical product innovation between sustainable entrepreneurship orientation and sustainability performance. Journal of Engineering, Design and Technology.

Ahmad Qadri, U., Ghani, M.B.A., Parveen, T., Lodhi, F.A.K., Khan, M.W.J. and Gillani, S.F., 2021. How to improve organizational performance during Coronavirus: A serial mediation analysis of organizational learning culture with knowledge creation. Knowledge and Process Management, 28(2), pp.141-152.

Ahmed, U., Umrani, W.A., Yousaf, A., Siddiqui, M.A. and Pahi, M.H., 2021. Developing faithful stewardship for environment through green HRM. International Journal of Contemporary Hospitality Management.

Ali, M.H., Suleiman, N., Khalid, N., Tan, K.H., Tseng, M.L. and Kumar, M., 2021. Supply chain resilience reactive strategies for food SMEs in coping to COVID-19 crisis. Trends in food science and technology, 109, pp.94-102.

Al-Omoush, K.S., Palacios-Marqués, D. and Ulrich, K., 2022. The impact of intellectual capital on supply chain agility and collaborative knowledge creation in responding to unprecedented pandemic crises. Technological Forecasting and Social Change, 178, p.121603.

Al-Omoush, K.S., Ribeiro-Navarrete, S., Lassala, C. and Skare, M., 2022. Networking and knowledge creation: Social capital and collaborative innovation in responding to the COVID-19 crisis. Journal of Innovation and Knowledge, 7(2), p.100181.

Al-Omoush, K.S., Simón-Moya, V. and Sendra-García, J., 2020. The impact of social capital and collaborative knowledge creation on e-business proactiveness and organizational agility in responding to the COVID-19 crisis. *Journal of Innovation and Knowledge*, *5*(4), pp.279-288.

Ambulkar, S., Blackhurst, J. and Grawe, S., 2015. Firm's resilience to supply chain disruptions: Scale development and empirical examination. *Journal of operations management*, *33*, pp.111-122.

Ameer, F. and Khan, N.R., 2022. Green entrepreneurial orientation and corporate environmental performance: A systematic literature review. European Management Journal.

Anwar, M.F., Wong, W.P. and Tseng, M.L., 2022. Examining Voluntary Engagement Barriers in Knowledge Sharing Practices for Supply Chain Innovation. International Journal of Knowledge Management (IJKM), 18(1), pp.1-23.

Archer, M., 2022. How to govern a sustainable supply chain: Standards, standardizers, and the political ecology of (in) advertence. Environment and Planning E: Nature and Space, 5(2), pp.881-900.

Arici, H.E. and Uysal, M., 2022. Leadership, green innovation, and green creativity: A systematic review. The Service Industries Journal, 42(5-6), pp.280-320.

Asadi, Shahla, Seyedeh OmSalameh Pourhashemi, Mehrbakhsh Nilashi, Rusli Abdullah, Sarminah Samad, Elaheh Yadegaridehkordi,Nahla Aljojo, and Nor Shahidayah Razali. 2020. Investigating Influence of Green Innovation on Sustainability Performance: A Case on Malaysian Hotel Industry. Journal of Cleaner Production 258: 120860.

Ayanbode, O.F. and Nwagwu, W.E., 2021. Collaborative technologies and knowledge management in psychiatric hospitals in South West Nigeria. Information Development, 37(1), pp.136-157.

Azadegan, A. and Dooley, K.J., 2010. Supplier innovativeness, organizational learning styles and manufacturer performance: An empirical assessment. *Journal of operations management*, *28*(6), pp.488-505.

Bag, S., Rahman, M.S., Srivastava, G., Chan, H.L. and Bryde, D.J., 2022. The role of big data and predictive analytics in developing a resilient supply chain network in the South African mining industry against extreme weather events. International Journal of Production Economics, 251, p.108541.

Bartlett, D. and Trifilova, A., 2010. Green technology and eco-innovation: Seven case-studies from a Russian manufacturing context. Journal of Manufacturing Technology Management.

Belhadi, A., Mani, V., Kamble, S.S., Khan, S.A.R. and Verma, S., 2021. Artificial intelligence-driven innovation for enhancing supply chain resilience and performance under the effect of supply chain dynamism: an empirical investigation. Annals of Operations Research, pp.1-26.

Bin, H., Zhang, Y., Zhan, Y. and Ma, J., 2021, December. Influence of Learners' Online Interaction Characteristics on Collaborative Knowledge Building in a Knowledge Forum. In 2021 Tenth International Conference of Educational Innovation through Technology (EITT) (pp. 251-256). IEEE.

Borsatto, J.M.L.S. and Bazani, C.L., 2021. Green innovation and environmental regulations: A systematic review of international academic works. Environmental Science and Pollution Research, 28(45), pp.63751-63768.

Brandon-Jones, E., Squire, B., Autry, C.W. and Petersen, K.J., 2014. A contingent resource-based perspective of supply chain resilience and robustness. Journal of Supply Chain Management, 50(3), pp.55-73.

Butt, A.S., Shah, H.H. and Ahmad, A.B., 2021. Exploring the potential challenges of belt and road initiative for sustainable supply chains: South Asian perspective. *Transportation Journal*, *60*(3), pp.307-338.

Butt, N., Lambrick, F., Menton, M. and Renwick, A., 2019. The supply chain of violence. *Nature Sustainability*, *2*(8), pp.742-747.

Cao, L., 2022. How green finance reduces $CO_2$ emissions for green economic recovery: Empirical evidence from E7 economies. Environmental Science and Pollution Research, pp.1-14.

Carnevale, J.B. and Hatak, I., 2020. Employee adjustment and well-being in the era of COVID-19: Implications for human resource management. *Journal of business research*, *116*, pp.183-187.

Caseiro, N. and Coelho, A., 2019. The influence of Business Intelligence capacity, network learning and innovativeness on startups performance. *Journal of Innovation and Knowledge*, *4*(3), pp.139-145.

Cegarra-Navarro, J.G., Jiménez, D.J. and Martínez-Conesa, E.Á., 2007. Implementing e-business through organizational learning: An empirical investigation in SMEs. *International Journal of Information Management*, *27*(3), pp.173-186.

Chatterjee, S. and Chaudhuri, R., 2021. Supply chain sustainability during turbulent environment: Examining the role of firm capabilities and government regulation. Operations Management Research, pp.1-15.

Chen, J., Zhou, J., Wei, S., Xie, Z., Wen, C. and Xu, G., 2016. Effect of a traditional Chinese medicine prescription Quzhuotongbi decoction on hyperuricemia model rats studied by using serum metabolomics based on gas chromatography–mass spectrometry. *Journal of Chromatography B*, *1026*, pp.272-278.

Chen, J.M. and Chang, C.I., 2013. Dynamic pricing for new and remanufactured products in a closed-loop supply chain. International Journal of Production Economics, 146(1), pp.153-160.

Chen, W., Tan, J.S. and Pi, Z., 2021. The spiral model of collaborative knowledge improvement: an exploratory study of a networked collaborative classroom. International Journal of Computer-Supported Collaborative Learning, 16(1), pp.7-35.

Chesbrough, H., 2020. To recover faster from Covid-19, open up: Managerial implications from an open innovation perspective. *Industrial Marketing Management*, *88*, pp.410-413.

Cui, L., Wu, H. and Dai, J., 2021. Modelling flexible decisions about sustainable supplier selection in multitier sustainable supply chain management. International Journal of Production Research, pp.1-22.

Dai, J., Xie, L. and Chu, Z., 2021. Developing sustainable supply chain management: The interplay of institutional pressures and sustainability capabilities. Sustainable Production and Consumption, 28, pp.254-268.

Das, M., Rangarajan, K. and Dutta, G., 2020. Corporate sustainability in SMEs: an Asian perspective. Journal of Asia Business Studies.

De Giovanni, P. and Vinzi, V.E., 2012. Covariance versus component-based estimations of performance in green supply chain management. International Journal of Production Economics, 135(2), pp.907-916.

DHL., 2011). "DHL launches open innovation for city logistics", www.cargobusinessnews.com/news/techwire/ news1.html (accessed October 20, 2011).

Dias, G.C., de Oliveira, U.R., Lima, G.B.A. and Fernandes, V.A., 2021. Risk management in the import/export process of an automobile company: A contribution for supply chain sustainability. Sustainability, 13(11), p.6049.

Effendi, M.I., Widjanarko, H. And Sugandini, D., 2021. Green supply chain integration and technology innovation performance in SMEs: a case study in Indonesia. The Journal of Asian Finance, Economics and Business, 8(4), pp.909-916.

Faccin, K. and Balestrin, A., 2018. The dynamics of collaborative practices for knowledge creation in joint R&D projects. *Journal of Engineering and Technology Management*, *48*, pp.28-43.

Falk, R.F. and Miller, N.B., 1992. *A primer for soft modeling*. University of Akron Press.

Farrell, A.M., 2010. Insufficient discriminant validity: A comment on Bove, Pervan, Beatty, and Shiu (2009). *Journal of business research*, *63*(3), pp.324-327.

Feng, M., Yu, W., Wang, X., Wong, C.Y., Xu, M. and Xiao, Z., 2018. Green supply chain management and financial performance: The mediating roles of operational and environmental performance. *Business strategy and the Environment*, *27*(7), pp.811-824.

Fornell, C. and Larcker, D.F., 1981. Structural equation models with unobservable variables and measurement error: Algebra and statistics.

Gowthorpe, C., 2009. Wider still and wider? A critical discussion of intellectual capital recognition, measurement and control in a boundary theoretical context. *Critical perspectives on accounting*, *20*(7), pp.823-834.

Grimsdottir, E., and Edvardsson, I. R., 2018. Knowledge Management, Knowledge Creation, and Open Innovation in Icelandic SMEs. SAGE Open, 8(4). https://doi.org/10.1177/2158244018807320

Grimsdottir, E. and Edvardsson, I.R., 2018a. Knowledge creation and open innovation in high-technology SMEs. In *Open innovation and knowledge management in small and medium enterprises* (pp. 87-116).

Grimsdottir, E. and Edvardsson, I.R., 2018b. Knowledge management, knowledge creation, and open innovation in Icelandic SMEs. *Sage Open*, *8*(4), p.2158244018807320.

Grzybowska, K. and Stachowiak, A., 2022. Global Changes and Disruptions in Supply Chains—Preliminary Research to Sustainable Resilience of Supply Chains. Energies, 15(13), p.4579.

Guo, J., Yu, H. and Gen, M., 2020. Research on green closed-loop supply chain with the consideration of double subsidy in e-commerce environment. Computers and Industrial Engineering, 149, p.106779.

Habib, M.A., Bao, Y., Nabi, N., Dulal, M., Asha, A.A. and Islam, M., 2021. Impact of strategic orientations on the implementation of green supply chain management practices and sustainable firm performance. Sustainability, 13(1), p.340.

Hair Jr, J.F., Howard, M.C. and Nitzl, C., 2020. Assessing measurement model quality in PLS-SEM using confirmatory composite analysis. *Journal of Business Research*, *109*, pp.101-110.

Hair Jr, J.F., Sarstedt, M., Hopkins, L. and Kuppelwieser, V.G., 2014. Partial least squares structural equation modeling (PLS-SEM): An emerging tool in business research. *European business review*.

Haldorai, K., Kim, W.G. and Garcia, R.F., 2022. Top management green commitment and green intellectual capital as enablers of hotel environmental performance: The mediating role of green human resource management. Tourism Management, 88, p.104431.

Hayton, J.C., 2005. Competing in the new economy: the effect of intellectual capital on corporate entrepreneurship in high-technology new ventures. *RandD Management*, *35*(2), pp.137-155.

Helfat, C.E. and Winter, S.G., 2011. Untangling dynamic and operational capabilities: Strategy for the (N) ever-changing world. *Strategic management journal*, *32*(11), pp.1243-1250.

Henseler, J., Ringle, C.M. and Sarstedt, M., 2015. A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the academy of marketing science*, *43*(1), pp.115-135.

Hobbs, J.E., 2021. Food supply chain resilience and the COVID-19 pandemic: What have we learned?. Canadian Journal of Agricultural Economics/Revue canadienne d'agroeconomie, 69(2), pp.189-196.

Hopkins, J.L., 2021. An investigation into emerging industry 4.0 technologies as drivers of supply chain innovation in Australia. Computers in Industry, 125, p.103323.

Hsu, C.C., Tan, K.C., Zailani, S.H.M. and Jayaraman, V., 2013. Supply chain drivers that foster the development of green initiatives in an emerging economy. International Journal of Operations and Production Management.

Iftikhar, A., Purvis, L., Giannoccaro, I. and Wang, Y., 2022. The impact of supply chain complexities on supply chain resilience: the mediating effect of big data analytics. Production Planning and Control, pp.1-21.

Jafaridehkordi, H., Chaleshtori, M.M. and Aminiandehkordi, P., 2015. The mediating effect of profitability in the relationship between Intellectual Capital and Market value. *Journal of Management and Accounting Studies*, *3*(03), pp.117-127.

Jalalian, L.R., Bavarsad, B. and Alizadeh, S., 2021. Investigating The Relationship Between Green Management And Economic Performance,(Environmental Performance And Social Performance): A Study Of Active Companies In Petrochemical Industries.

Jiang, W., Chai, H., Shao, J., and Feng, T., 2018. Green entrepreneurial ori-entation for enhancing firm performance: A dynamic capability per-spective.Journal of Cleaner Production,198, 1311–1323.

Karmaker, C.L., Ahmed, T., Ahmed, S., Ali, S.M., Moktadir, M.A. and Kabir, G., 2021. Improving supply chain sustainability in the context of COVID-19 pandemic in an emerging economy: Exploring drivers using an integrated model. Sustainable production and consumption, 26, pp.411-427.

Kemp, R. and Foxon, T., 2007. Typology of eco-innovation. Project Paper: Measuring Eco-Innovation, 5(1), pp.10-23.

Kemp, R. and Pearson, P., 2007. Final report MEI project about measuring eco-innovation. UM Merit, Maastricht, 10(2), pp.1-120.

Khan, M.A., Zubair, S.S., Rathore, K., Ijaz, M., Khalil, S. and Khalil, M., 2021. Impact of entrepreneurial orientation dimensions on performance of small enterprises: do

entrepreneurial competencies matter? Cogent Business and Management, 8(1), p.1943241.

Khan, S.A.R., Mathew, M., Dominic, P.D.D. and Umar, M., 2022. Evaluation and selection strategy for green supply chain using interval-valued q-rung orthopair fuzzy combinative distance-based assessment. Environment, Development and Sustainability, 24(9), pp.10633-10665.

Khan, S.A.R., Yu, Z., Umar, M. and Tanveer, M., 2022. Green capabilities and green purchasing practices: A strategy striving towards sustainable operations. Business Strategy and the Environment.

Khraishi, A., Paulraj, A., Huq, F. and Seepana, C., 2022. Knowledge management in offshoring innovation by SMEs: role of internal knowledge creation capability, absorptive capacity and formal knowledge-sharing routines. Supply Chain Management: An International Journal.

Kim, D., Cavusgil, S.T. and Calantone, R.J., 2006. Information system innovations and supply chain management: channel relationships and firm performance. *Journal of the academy of marketing science*, *34*(1), pp.40-54.

Klibi, W., Martel, A. and Guitouni, A., 2010. The design of robust value-creating supply chain networks: a critical review. *European Journal of Operational Research*, *203*(2), pp.283-293.

Kock, N., 2015. Common method bias in PLS-SEM: A full collinearity assessment approach. *International Journal of e-Collaboration (ijec)*, *11*(4), pp.1-10.

Kraus, S., Filser, M., Puumalainen, K., Kailer, N. and Thurner, S., 2020. Business model innovation: A systematic literature review. *International Journal of Innovation and Technology Management*, *17*(06), p.2050043.

Krishnan, R., Yen, P., Agarwal, R., Arshinder, K. and Bajada, C., 2021. Collaborative innovation and sustainability in the food supply chain-evidence from farmer producer organisations. Resources, Conservation and Recycling, 168, p.105253.

Lavidas, K., Petropoulou, A., Papadakis, S., Apostolou, Z., Komis, V., Jimoyiannis, A. and Gialamas, V., 2022. Factors affecting response rates of the Web survey with teachers. *Computers*, *11*(9), p.127.

López, M., 2022. The effect of sampling mode on response rate and bias in elite surveys. *Quality & Quantity*, pp.1-17.

Lumpkin, G.T. and Dess, G.G., 1996. Clarifying the entrepreneurial orientation construct and linking it to performance. *Academy of management Review*, *21*(1), pp.135-172.

Luu, T.T., 2021. Green creative behavior in the tourism industry: the role of green entrepreneurial orientation and a dual-mediation mechanism. Journal of Sustainable Tourism, 29(8), pp.1290-1318.

Mafabi, S., Munene, J.C. and Ahiauzu, A., 2015. Creative climate and organisational resilience: the mediating role of innovation. *International Journal of Organizational Analysis*, *23*(4), pp.564-587.

Makhloufi, L., Meirun, T., Belaid, F. and Yaacob, N.A., 2021. Impact of Green Entrepreneurship Orientation on Environmental Performance: The Natural Resource-Based View Perspective.

Manuj, I., Esper, T.L. and Stank, T.P., 2014. Supply chain risk management approaches under different conditions of risk. *Journal of Business Logistics*, *35*(3), pp.241-258.

Mao, H., Liu, S., Zhang, J. and Deng, Z., 2016. Information technology resource, knowledge management capability, and competitive advantage: The moderating role of resource commitment. *International Journal of Information Management*, *36*(6), pp.1062-1074.

Martello, W.E., 1994. Developing creative business insights: Serendipity and its potential in entrepreneurship. *Entrepreneurship and Regional Development*, *6*(3), pp.239-258.

Martins, F.S., Vils, L., Serra, F.A.R., da Silva Junior, W. and Napolitano, D.M.M.R., 2022. Knowledge generation and market orientation during global crises in supply chains. European Business Review.

Matopoulos, A., Vlachopoulou, M., Manthou, V. and Manos, B., 2007. A conceptual framework for supply chain collaboration: empirical evidence from the agri-food industry. *Supply Chain Management: an international journal*.

Menon, R.R. and Ravi, V., 2021. Analysis of barriers of sustainable supply chain management in electronics industry: an interpretive structural modelling approach. Cleaner and Responsible Consumption, 3, p.100026.

Montoya-Torres, J.R., Muñoz-Villamizar, A. and Mejia-Argueta, C., 2021. Mapping research in logistics and supply chain management during COVID-19 pandemic. International Journal of Logistics Research and Applications, pp.1-21.

Moore, M.L. and Westley, F., 2011. Surmountable chasms: networks and social innovation for resilient systems. *Ecology and society*, *16*(1).

Muangmee, C., Dacko-Pikiewicz, Z., Meekaewkunchorn, N., Kassakorn, N. and Khalid, B., 2021. Green entrepreneurial orientation and green innovation in small and medium-sized enterprises (SMEs). Social Sciences, 10(4), p.136.

Mubarik, M.S., Bontis, N., Mubarik, M. and Mahmood, T., 2021. Intellectual capital and supply chain resilience. Journal of Intellectual Capital.

Muukkonen, H., Lakkala, M., Ilomäki, L. and Toom, A., 2022. Juxtaposing generic skills development in collaborative knowledge work competences and related pedagogical practices in higher education. In Frontiers in education (p. 524). Frontiers.

Nafei, W.A., 2016. Organizational agility: The key to organizational success. *International Journal of Business and Management*, *11*(5), pp.296-309.

Najib, M., Fahma, F., Abror, A. and Suhartanto, D., 2022. Organizational Capability, Market Perspective, and Green Innovation Adoption: Insight From Indonesian Food Processing Small and Medium-Sized Enterprises. Journal of Small Business Strategy, 32(2), pp.51-66.

Najib, M., Fahma, F., Abror, A. and Suhartanto, D., 2022. Organizational Capability, Market Perspective, and Green Innovation Adoption: Insight From Indonesian Food Processing Small and Medium-Sized Enterprises. Journal of Small Business Strategy, 32(2), pp.51-66.

Nezhad, F.J., Taghizadeh-Yazdi, M., Dahooie, J.H., Babgohari, A.Z. and Sajadi, S.M., 2021. Designing a new mathematical model for optimising a multi-product RFID-based closed-loop food supply chain with a green entrepreneurial orientation. British Food Journal.

Novak, D.C., Wu, Z. and Dooley, K.J., 2021. Whose resilience matters? Addressing issues of scale in supply chain resilience. Journal of Business Logistics, 42(3), pp.323-335.

Novak, D.C., Wu, Z. and Dooley, K.J., 2021. Whose resilience matters? Addressing issues of scale in supply chain resilience. Journal of Business Logistics, 42(3), pp.323-335.

Parast, M.M., Sabahi, S. and Kamalahmadi, M., 2019. The relationship between firm resilience to supply chain disruptions and firm innovation. In *Revisiting supply chain risk* (pp. 279-298). Springer, Cham.

Park, A. and Li, H., 2021. The effect of blockchain technology on supply chain sustainability performances. Sustainability, 13(4), p.1726.

Paul, A., Shukla, N., Paul, S.K. and Trianni, A., 2021. Sustainable supply chain management and multi-criteria decision-making methods: A systematic review. Sustainability, 13(13), p.7104.

Pereira, M.M.O., Silva, M.E. and Hendry, L.C., 2021. Supply chain sustainability learning: the COVID-19 impact on emerging economy suppliers. Supply Chain Management: An International Journal.

Piñeiro-Chousa, J., López-Cabarcos, M.Á., Romero-Castro, N.M. and Pérez-Pico, A.M., 2020. Innovation, entrepreneurship and knowledge in the business scientific field: Mapping the research front. *Journal of Business Research*, *115*, pp.475-485.

Podsakoff, P.M. and Organ, D.W., 1986. Self-reports in organizational research: Problems and prospects. *Journal of management*, *12*(4), pp.531-544.

Podsakoff, P.M., MacKenzie, S.B., Lee, J.Y. and Podsakoff, N.P., 2003. Common method biases in behavioral research: a critical review of the literature and recommended remedies. *Journal of applied psychology*, *88*(5), p.879.

Ponomarov, S.Y. and Holcomb, M.C., 2009. Understanding the concept of supply chain resilience. *The international journal of logistics management*.

Purvis, L., Spall, S., Naim, M. and Spiegler, V., 2016. Developing a resilient supply chain strategy during 'boom' and 'bust'. *Production Planning & Control*, *27*(7-8), pp.579-590.

Rajak, S., Mathiyazhagan, K., Agarwal, V., Sivakumar, K., Kumar, V. and Appolloni, A., 2022. Issues and analysis of critical success factors for the sustainable initiatives in the supply chain during COVID-19 pandemic outbreak in India: A case study. Research in Transportation Economics, 93, p.101114.

Rehman, S.U., Kraus, S., Shah, S.A., Khanin, D. and Mahto, R.V., 2021. Analyzing the relationship between green innovation and environmental performance in large manufacturing firms. Technological Forecasting and Social Change, 163, p.120481.

Ren, C., van der Duim, R. and Jóhannesson, G.T., 2021. Messy realities and collaborative knowledge production in tourism. Tourist Studies, 21(2), pp.143-155.

Sabahi, S. and Parast, M.M., 2020. Firm innovation and supply chain resilience: a dynamic capability perspective. *International Journal of Logistics Research and Applications*, *23*(3), pp.254-269.

Saha, S., Moorthi, S., Wu, X., Wang, J., Nadiga, S., Tripp, P., Behringer, D., Hou, Y.T., Chuang, H.Y., Iredell, M. and Ek, M., 2014. The NCEP climate forecast system version 2. Journal of climate, 27(6), pp.2185-2208.

San, O.T., Latif, B. and Di Vaio, A., 2022. GEO and sustainable performance: The moderating role of GTD and environmental consciousness. Journal of Intellectual Capital, 23(7), pp.38-67.

Scholten, K. and Schilder, S., 2015. The role of collaboration in supply chain resilience. *Supply Chain Management: An International Journal*.

Scholten, K. and Schilder, S., 2015. The role of collaboration in supply chain resilience. Supply Chain Management: An International Journal.

Sharma, M., Kamble, S., Mani, V., Sehrawat, R., Belhadi, A. and Sharma, V., 2021. Industry 4.0 adoption for sustainability in multi-tier manufacturing supply chain in emerging economies. Journal of cleaner production, 281, p.125013.

Shen, B., Xu, X., Chan, H.L. and Choi, T.M., 2021. Collaborative innovation in supply chain systems: Value creation and leadership structure. International Journal of Production Economics, 235, p.108068.

Shishodia, A., Sharma, R., Rajesh, R. and Munim, Z.H., 2021. Supply chain resilience: A review, conceptual framework and future research. The International Journal of Logistics Management.

Silva, G.M., Gomes, P.J., Carvalho, H. and Geraldes, V., 2021. Sustainable development in small and medium enterprises: The role of entrepreneurial orientation in supply chain management. Business Strategy and the Environment, 30(8), pp.3804-3820.

Sjoerdsma, M. and van Weele, A.J., 2015. Managing supplier relationships in a new product development context. *Journal of Purchasing and Supply Management*, *21*(3), pp.192-203.

Spieske, A. and Birkel, H., 2021. Improving supply chain resilience through industry 4.0: A systematic literature review under the impressions of the COVID-19 pandemic. Computers and Industrial Engineering, 158, p.107452.

Su, Z., Zhang, M. and Wu, W., 2021. Visualizing sustainable supply chain management: A systematic scientometric review. Sustainability, 13(8), p.4409.

Sun, Z., Wu, L.Z., Ye, Y. and Kwan, H.K., 2022. The impact of exploitative leadership on hospitality employees' proactive customer service performance: A self-determination perspective. *International Journal of Contemporary Hospitality Management*, (ahead-of-print).

Tan, S.C., Chan, C., Bielaczyc, K., Ma, L., Scardamalia, M. and Bereiter, C., 2021. Knowledge building: aligning education with needs for knowledge creation in the digital age. Educational Technology Research and Development, 69(4), pp.2243-2266.

Teece, D.J., 2007. "Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance", Strategic Management Journal, Vol. 28 No. 13, pp. 1319-1350.

Umar, M., Wilson, M. and Heyl, J., 2021. The structure of knowledge management in inter-organisational exchanges for resilient supply chains. Journal of Knowledge Management.

Vannoy, S.A. and Medlin, B.D., 2012, January. Investigating social computing in competitive dynamics. In *2012 45th Hawaii International Conference on System Sciences* (pp. 5112-5121). IEEE.

Vannoy, S.A., and Medlin, B.D., 2012. Investigating Social Computing in Competitive Dynamics. 2012 45th Hawaii International Conference on System Sciences, 5112-5121.

Wang, B., Luo, W., Zhang, A., Tian, Z. and Li, Z., 2020. Blockchain-enabled circular supply chain management: A system architecture for fast fashion. *Computers in Industry*, *123*, p.103324.

Wang, M., Li, Y., Li, J. and Wang, Z., 2021. Green process innovation, green product innovation and its economic performance improvement paths: A survey and structural model. Journal of Environmental Management, 297, p.113282.

Wang, W., Zhang, Y., Zhang, K., Bai, T. and Shang, J., 2015. Reward–penalty mechanism for closed-loop supply chains under responsibility-sharing and different power structures. *International Journal of Production Economics*, *170*, pp.178-190.

Wang, Z., Wang, T., Hu, H., Gong, J., Ren, X. and Xiao, Q., 2020. Blockchain-based framework for improving supply chain traceability and information sharing in precast construction. *Automation in construction*, *111*, p.103063.

Weichhart, G., Stary, C. and Vernadat, F., 2018. Enterprise modelling for interoperable and knowledge-based enterprises. *International Journal of Production Research*, *56*(8), pp.2818-2840.

Whitehead, K., Zacharia, Z. and Prater, E., 2018. Investigating the role of knowledge transfer in supply chain collaboration. *The International Journal of Logistics Management*.

Wieland, A. and Durach, C.F., 2021. Two perspectives on supply chain resilience. Journal of Business Logistics, 42(3), pp.315-322.

Wieland, A. and Wallenburg, C.M., 2013. The influence of relational competencies on supply chain resilience: a relational view. International journal of physical distribution and logistics management.

Xie, X., Yang, Y., Gu, J. and Zhou, Z., 2020. Research on the contagion effect of associated credit risk in supply chain based on dual-channel financing mechanism. Environmental research, 184, p.109356.

Yan, Y., Davison, R. M., and Mo, C., 2013. Employee creativity formation: The roles of knowledge seeking, knowledge contributing and flow experience in Web 2.0 virtual communities. Computers in Human Behavior, 29(5), 1923-1932.

Yanamandra, R., 2022. Building Competitive Supply Chains: A Way through Supply Chain Resilience. In Emerging Trends in Decision Sciences and Business Operations (pp. 1-23). Routledge India.

Yang, S. and Tu, C., 2020. Capital and new product quality in high-tech startups-an examination in two environmental contexts. *Innovation*, *22*(1), pp.39-55.

Zhang, Q., Nakatani, J., Shan, Y. and Moriguchi, Y., 2019. Inter-regional spillover of China's sulfur dioxide (SO2) pollution across the supply chains. *Journal of Cleaner Production*, *207*, pp.418-431.

Zhang, T., Li, J. and JIANG, X., 2021. Analysis of supply chain finance based on blockchain. *Procedia Computer Science*, *187*, pp.1-6.

Zhang, W., Zhang, X. and Zhou, Q., 2021. How does knowledge seeking and knowledge generation promote green supply chain management? An empirical study from China. International Journal of Logistics Research and Applications, pp.1-21.

Zhang, X., He, J. and Tian, W., 2022. Bayesian Estimation of Supply Chain Innovation Path. Computational Intelligence and Neuroscience, 2022.

Zheng, J., Wu, G., Xie, H., and Li, H., 2019. Leadership, organizational culture, and innovative behavior in construction projects. International Journal of Managing Projects in Business.

Zilberman, D., Reardon, T., Silver, J., Lu, L. and Heiman, A., 2022. From the laboratory to the consumer: Innovation, supply chain, and adoption with applications to natural resources. Proceedings of the National Academy of Sciences, 119(23), p.e2115880119.
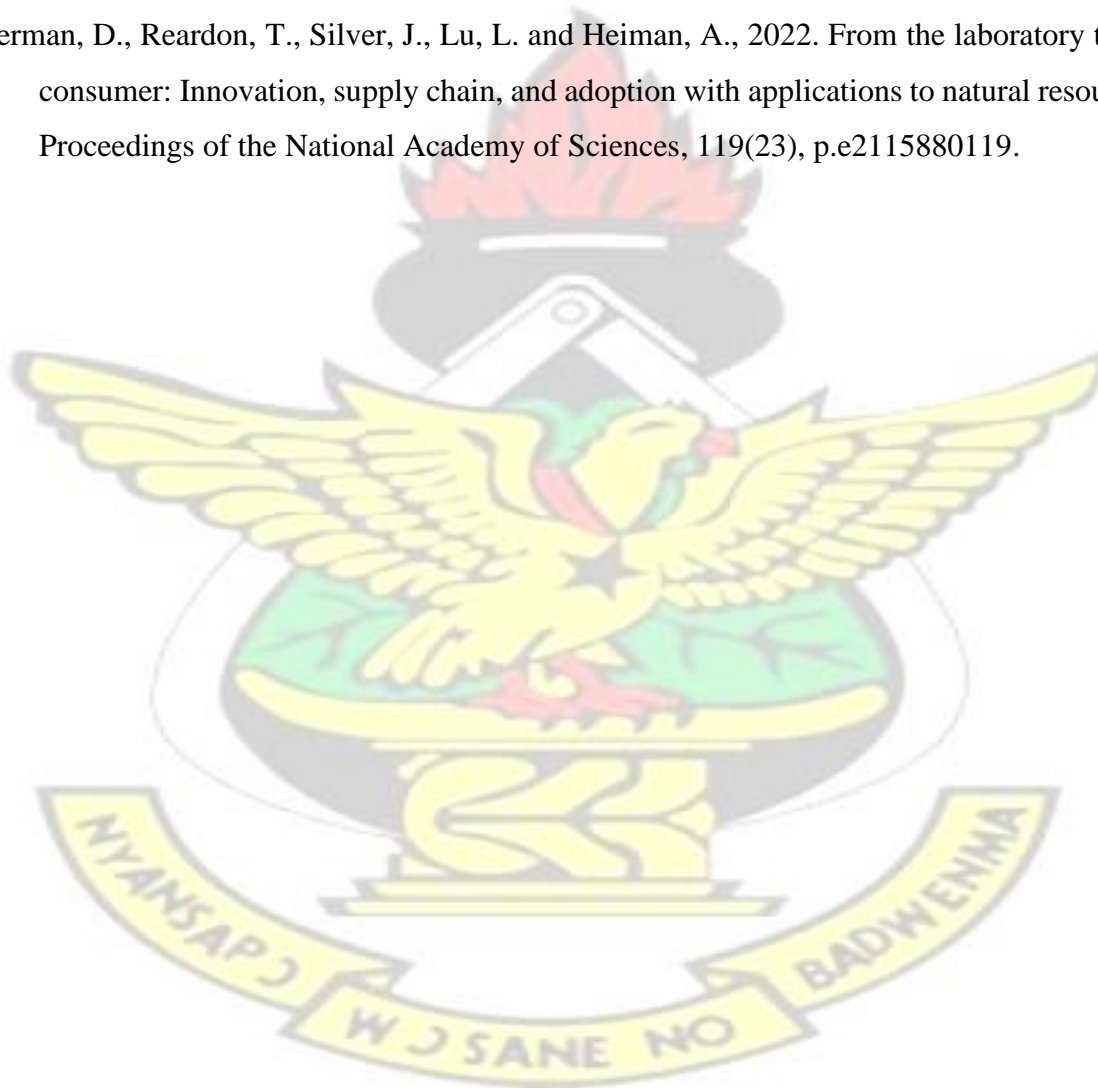
**SURVEY QUESTIONNAIRE**

Dear Sir/ Madam,


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

**SECTION A: RESPONDENT'S BIOGRAPHY AND COMPANY PROFILE**

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

Please answer the following questions:

1. *Gender*: Male ☐ Female ☐
2. *Age*
    18-30 years ☐ 31-40 year's ☐ 41-50 years ☐ Above 50 years ☐
3. *Level of Education*
    Junior High School ☐ Senior High School ☐ Diploma ☐ Bachelor Degree ☐ Graduate Studies (Master / Ph.D.) ☐ Others ☐ For Others, Please specify:……………………
4. *Your Position in the Firm*
    Business Owner ☐ Business Owner & Manager ☐ Manager ☐ Production Manager ☐ Others ☐…………………………………………………………………

5. *How many years have your firm been in operation?*
    1 - 5 years ☐ 6 - 10 years ☐ 11 – 15 years ☐ 16 years and above ☐

6. *How many employees are in the firm?*
    Less than 5 employees ☐ 5 – 29 employees ☐ 30 – 99 employees ☐ More than 100 ☐
7. Type of ownership:
    [ ] Fully locally owned    [ ] Fully foreign owned    [ ] Jointly Ghanaian & foreign owned

## SECTION B: COLLABORATIVE KNOWLEDGE CREATION (Al-Omoush et al., 2020)

To what extent do the following statements apply to your company by checking the appropriate number from 1 to 5, using the following scale:

| Item | Statement | 1 | 2 | 3 | 4 | 5 |
|------|-----------|---|---|---|---|---|
| CK1 | Getting novel ideas and technologies from social networks and interactions with suppliers, customers, associations, and other actors in the business environment. | | | | | |
| CK2 | Collaborating with partners using both inductive and deductive thinking to gain new knowledge | | | | | |
| CK3 | Launching and exchanging ambitious and creative ideas and dialogues with partners. | | | | | |
| CK4 | Using and sharing repositories of knowledge, lessons learned, and best practices with partners. | | | | | |
| CK5 | Spending a lot of time with partners reconfiguring information and sorting, integrating, and categorizing new knowledge. | | | | | |
| CK6 | Engaging in active liaising activities and sharing new values and thoughts with its functional departments and external partners. | | | | | |
| CK7 | Spending a lot of time in conducting collaborative learning experiments and sharing results with entire departments and external partners. | | | | | |
| CK8 | Strengthening knowledge and experience transfer channels through face-to-face meetings and web-based discussion groups | | | | | |

## SECTION C: RESILIENCE (Brandon-Jones et al., 2014)

Indicate the extent to which you agree or disagree that your firm attach importance to these activities by checking the appropriate number from 1 to 5 using the following scale:

| Item | | 1 | 2 | 3 | 4 | 5 |
|------|--|---|---|---|---|---|
| SCRES1 | Material flow would be quickly restored | | | | | |
| SCRES | It would not take long to recover normal operating performance | | | | | |
| SCRES3 | The supply chain would easily recover to its original state | | | | | |
| SCRES4 | Disruptions would be dealt with quickly | | | | | |

## SECTION D: SUPPLY CHAIN INNOVATION  (Panayides and Lun, 2009)

Indicate the extent to which you agree or disagree with each statement by checking the appropriate number from 1 to 5 using the following scale:

| Item | Statement | 1 | 2 | 3 | 4 | 5 |
|------|-----------|---|---|---|---|---|
| SCIN1 | We frequently try out new ideas in the supply chain context. | | | | | |
| SCIN2 | We seek out new ways to do things in our supply chain | | | | | |

| | | | | | | |
|------|---------------------------------------------------------------|--|--|--|--|--|
| SCIN3 | We are creative in the methods of operation in the supply chain. | | | | | |
| SCIN4 | We often introduce new ways of servicing the supply chain | | | | | |
| SCIN5 | We motivate supply chain members to suggest new ideas | | | | | |
| SCIN6 | We pursue continuous innovation in core processes | | | | | |
| SCIN7 | We pursue new technological innovation | | | | | |

*Thank you for participating in the survey.*