KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI.

COLLEGE OF HUMANITIES AND SOCIAL SCIENCE

KNUST SCHOOL OF BUSINESS, KUMASI

SUPPLY CHAIN AMBIDEXTERITY ON SUPPLY CHAIN PERFORMANCE IN THE OIL AND GAS SECTOR: THE MODERATING ROLES OF INNOVATION CAPABILITIES.

BY

CHARLES DONKOR

(BSc BUSINESS ADMINISTRATION)

A THESIS SUBMITTED TO THE DEPARTMENT OF SUPPLY CHAIN INFORMATION SYSTEMS, KNUST SCHOOL OF BUSINESS IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD DEGREE OF

MSC. SUPPLY CHAIN MANAGEMENT

NOVERMBER , 2023

DECLARATION

I hereby declare that except the references of people's work which I have duly acknowledged. This work is the result of my own original research and no part of it has been presented to any institution for award of certificate.

KNUST

Charles Donkor

(PG 9262921) …… ……

Signature Date

Certified by

…… ……

Dr. Matilda Kokui Owusu-Bio Signature

Date

(Supervisor)

Certified by

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

DEDICATION

I dedicate this work to my family, especially my Mum,Esther Atta-Duodu, My brother Seth Fiifi Donkor and my Dad, FK.

ACKNOWLEDGEMENT

Special thanks go to my supervisor Dr. Matilda Kokui Owusu-Bio for her for his quick response, fair critique, and display of extensive knowledge in the subject under study, which has made this thesis a success. To Miss Ethel Boadi, I am grateful for your assistance and support during the research period. Final acknowledgement goes to everyone who in various capacities contributed to completion of this thesis, particularly those who provided information for the study.

KNUST

ABSTRACT

Supply chain ambidexterity is a valuable strategy that can be adopted by organizations within the oil and gas industry. However, the adoption of a supply chain ambidexterity strategy also presents challenges related to balancing short-term and long-term objectives, managing complexity, and developing the right talent. The study investigated the impact of supply chain ambidexterity on supply chain performance in the oil and gas sector: the moderating roles of innovation capabilities. Quantitative research design was adopted. For data collection, the study used adapted questionnaire. Overall, a sample of 314 employees of oil and gas companies in Ghana were selected using the simple random sampling technique. Structural equation modelling was used as technique to analyse the relationship among the constructs. The results highlight that supply chain ambidexterity (SCA) has a significant positive impact on supply chain performance (SCP). Secondly, the study confirms the positive impact of innovation capabilities on supply chain performance. The study also explores the moderating role of innovation capabilities. The findings reveal a notably positive moderating effect of innovation capabilities on the relationship between supply chain ambidexterity and supply chain performance. Organizations, particularly those in the oil and gas sector, should embrace ambidextrous strategies that balance cost efficiency with adaptability. Policy initiatives should encourage the development of organizational structures

that support the simultaneous pursuit of exploration and exploitation goals.

Table of Contents

KNUST

KNUST

LIST OF TABLES

KNUST

LIST OF FIGURES

KNUST

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Supply chain ambidexterity is a valuable strategy that can be adopted by organizations within the oil and gas industry (Jermsittiparsert and Pithuk, 2019; Khan *et al.*, 2021). By balancing exploration and exploitation activities, organizations can become more flexible, innovative, and efficient (Aslam *et al.*, 2018; Jermsittiparsert and Pithuk, 2019). However, the adoption of a supply chain ambidexterity strategy also presents challenges related to balancing shortterm and long-term objectives, managing complexity, and developing the right talent (Jermsittiparsert and Pithuk, 2019; Partanen *et al.*, 2020; Khan *et al.*, 2021). To successfully adopt a supply chain ambidexterity strategy, organizations should establish clear goals and objectives, foster a culture of innovation, invest in talent development, and leverage technology.

Innovation capabilities play a crucial role in driving supply chain performance and enhancing organizational competitiveness in today's dynamic business environment. The ability to innovate and introduce new products, processes, and technologies allows companies to adapt to changing market demands, improve operational efficiency, and gain a competitive edge (Vu, 2020; Migdadi, 2021). Several studies have emphasized the positive relationship between innovation capabilities and supply chain performance (Aryanto, Fontana and Afiff, 2015; Rajapathirana and Hui, 2018a). Rajapathirana and Hui (2018) in their study confirmed that there is a strong significant relationship between innovation capabilities and firm performance. These capabilities enable organizations to quickly adapt to unexpected events, identify alternative sources of supply, and develop innovative solutions to overcome challenges. As a result, organizations with robust innovation capabilities are more resilient and better able to

recover from disruptions, ensuring continuity in the supply chain (Zimmermann, Ferreira and Moreira, 2020; Migdadi, 2021). Innovation capabilities significantly impact supply chain performance by enabling organizations to adapt to changing market demands, enhance collaboration and integration, and improve resilience. Emphasizing and investing in innovation capabilities can help companies stay ahead in today's competitive business landscape, drive supply chain excellence, and achieve firm performance (Rajapathirana and Hui, 2018b, 2018a; Odoom and Mensah, 2019).

Supply chain performance is a critical aspect of organizational success, encompassing various key indicators such as efficiency, cost-effectiveness, reliability, responsiveness, and customer satisfaction (Anand and Grover, 2015; Yusoff, Ashari and Salleh, 2016; Rombe and Hadi, 2022). Achieving and maintaining high levels of supply chain performance is vital for organizations to meet customer demands, optimize operational efficiency, and gain a competitive advantage in the marketplace (Yusoff, Ashari and Salleh, 2016; Ikatrinasari, Harianto and Yuslistyari, 2020; Saleheen and Habib, 2023).

Two of the most crucial raw commodities in the world are oil and gas (Al-Janabi, 2020; Ariweriokuma, 2021; Adadzi, Godson-Amamoo and Nunoo, 2022). Since the middle of the 1950s, it has been the primary energy source in the globe (Lisitsa, Levina and Lepekhin, 2019). The oil business, one of the most important sectors of the global economy, has a big impact on how other industries develop (Ariweriokuma, 2021; Adadzi, Godson-Amamoo and Nunoo, 2022). This energy source is employed for a variety of purposes, including driving cars, producing electricity to heat houses and water, powering contemporary technology, obtaining chemicals for domestic cleaning goods, and more. The oil and gas industry plays a key role in sustaining the world economy. The products that this company produces provide assistance to several other significant industries, including the industrial and automotive sectors. According to Lisitsa et al. (2019), changes in markets, customer expectations, and technological systems

have an influence on how competitively organizations may operate. As a result, the oil and gas sector must continually restructure its positioning strategy and tactics. Following the sharp rise in oil product prices in Ghana, it is critical to assess the supply chains of oil businesses so that the key players in the sector may make educated decisions (Amoako *et al.*, 2022).

Businesses are required to use existing efficiencies and spot market possibilities inside their operations as they compete in an increasingly uncertain and turbulent market (Jermsittiparsert and Pithuk, 2019; Aslam *et al.*, 2020; Khan *et al.*, 2021). Such inquiry entails learning how to be adaptable and creative as well as searching for new potential and opportunities. In the view of Handfield et al. (2015), creating an ambidexterity competence enables businesses to be both efficient and adaptable at the same time. An ambidextrous company is one that can manage the demands of the modern corporate environment while still being effective and aligned in doing so. It can also quickly adjust to changes in the environment in order to remain competitive (Handfield *et al.*, 2015; Jermsittiparsert and Pithuk, 2019). Supply chain ambidexterity refers to an organization's ability to effectively balance two seemingly contradictory objectives - exploitation and exploration - within its supply chain operations (Jermsittiparsert and Pithuk, 2019; Partanen *et al.*, 2020). In the context of the oil and gas sector, exploitation refers to the company's ability to effectively and efficiently extract and deliver the resources it has access to, while exploration refers to its ability to seek out new resources and adapt to changing market conditions.

In recent years, the oil and gas sector has experienced significant disruption due to factors such as increased competition, volatile oil prices, and shifting geopolitical landscapes (AlJanabi, 2020; Ariweriokuma, 2021; Adadzi, Godson-Amamoo and Nunoo, 2022). These challenges have highlighted the importance of developing supply chain strategies that are flexible, adaptable, and capable of responding to changing market conditions (Alhosani and Zabri, 2018; Lee, 2018; Archil Artmeladze, 2021).

One way that companies in the oil and gas sector can achieve this flexibility is by embracing supply chain ambidexterity (Aslam *et al.*, 2020; Khan *et al.*, 2021). By developing a supply chain that is capable of simultaneously exploiting existing resources while exploring new ones, companies can mitigate the risks associated with market disruptions and maintain a competitive edge (Jermsittiparsert and Pithuk, 2019; Aslam *et al.*, 2020; Partanen *et al.*, 2020).

Myriad extant literature has advanced the contribution of supply chain ambidexterity on supply chain performance (Jermsittiparsert and Pithuk, 2019; Aslam *et al.*, 2020; Partanen *et al.*, 2020). With specific reference to the oil and ga industry supply chain ambidexterity allows companies to better manage risk (Aslam *et al.*, 2020; Wang *et al.*, 2021). By maintaining a balance between exploitation and exploration, companies can reduce their reliance on any single resource or market, thereby reducing the impact of supply chain disruptions such as price fluctuations, political instability, and natural disasters. Gualandris et al. (2018) in their study provided an empirical support for the association between supply chain ambidexterity and firm performance. Simply therefore, supply chain ambidexterity can help companies to optimize their supply chain operations (Gualandris, Legenvre and Kalchschmidt, 2018; Wang *et al.*, 2021). By constantly exploring new resources and seeking out new suppliers, companies can identify opportunities to reduce costs, improve efficiency, and enhance their overall supply chain performance (Gualandris, Legenvre and Kalchschmidt, 2018; Wang *et al.*, 2021).

Supply chain ambidexterity can help companies to foster innovation within their supply chains (Gualandris, Legenvre and Kalchschmidt, 2018; Roldán Bravo, Ruiz-Moreno and Lloréns Montes, 2018). By encouraging exploration and experimentation, companies can identify new technologies, processes, and approaches that can drive continuous improvement and enhance their ability to respond to changing market conditions (Lee and Rha, 2016; Jermsittiparsert and Pithuk, 2019). Supply chain ambidexterity has emerged as a key strategy for companies in the oil and gas sector looking to maintain a competitive edge in an increasingly challenging

business environment. By embracing a supply chain strategy that balances exploitation and exploration, companies can effectively manage risk, optimize their operations, foster innovation, and build resilience within their supply chains, all of which can contribute to improved supply chain performance.

In this context, innovation capabilities can play a crucial role in moderating the relationship between supply chain ambidexterity and supply chain performance. Companies with strong innovation capabilities are better able to adapt to changing market conditions and technological advancements, allowing them to achieve higher levels of ambidexterity and ultimately improve their supply chain performance (Vu, 2020; Lam *et al.*, 2021; Migdadi, 2021).

Several studies have investigated the relationship between supply chain ambidexterity and supply chain performance, and the results have been mixed. Some studies have found a positive association between supply chain ambidexterity and supply chain performance, while others have found no significant relationship (Gualandris, Legenvre and Kalchschmidt, 2018; Roldán Bravo, Ruiz-Moreno and Lloréns Montes, 2018; Le and Lei, 2019). However, there is evidence to suggest that the relationship between supply chain ambidexterity and supply chain performance may be moderated by a firm's innovation capabilities.

The capacity to innovate has been viewed as a critical component of a company's competitive edge and long-term success (Akhavan and Mahdi Hosseini, 2015; Sulistyo and Siyamtinah, 2016; Vu, 2020). As a result, many businesses make an effort to establish relevant and successful paths to innovation, yet they are still copycats and find it difficult to innovate (Lam et al., 2021; Le & Lei, 2019).

Empirical evidence suggests that innovation capabilities, such as knowledge integration capabilities (Wang, Chen and Fang, 2018; Wichitsathian and Nakruang, 2019; Acharya *et al.*, 2022), can moderate the association between supply chain ambidexterity and supply chain performance. Firms with higher innovation capabilities are likely to experience greater benefits

from supply chain ambidexterity than firms with lower innovation capabilities (Sulistyo and Siyamtinah, 2016; Rajapathirana and Hui, 2018a). Therefore, firms should invest in developing their innovation capabilities in order to enhance the benefits of supply chain ambidexterity.

1.2 Problem statement

Currently, the oil and gas industry's key challenge are to reduce production costs and offer customers with completed goods (Asghar *et al.*, 2018; Amoako *et al.*, 2022). A petrochemical plant's supply chain as a whole may become more efficient and competitive with the help of effective supply chain management. However, becoming ambidextrous while relying on the supply chain has been eluding many businesses within developing countries due to lack of empirical studies and evidence to guide the adoption (Aslam *et al.*, 2018, 2020).

Many organizations within the oil and gas industry struggle with establishing clear objectives and metrics for balancing exploration and exploitation activities within their supply chains (Klass and Meinhardt, 2014; Ablo and Overå, 2015). This lack of clarity makes it difficult to measure progress and success in adopting a supply chain ambidexterity strategy.

Despite the abundance of studies of innovation, there are scanty of innovation capabilities in the context of small businesses within developing countries (Fernando, Chidambaram and Wahyuni-TD, 2018; Lutfiani and Nur, 2019; Zimmermann, Ferreira and Moreira, 2020). This assessment is necessary since innovation capability has been discovered to be a multifaceted construct that varies between small and large businesses (Le and Lei, 2019; Lam *et al.*, 2021).

Another problem with the adoption of supply chain ambidexterity is that many organizations within the oil and gas industry are resistant to change and innovation (Ardito *et al.*, 2020; Abdalla and Nakagawa, 2021). This resistance can manifest in a reluctance to invest in new technologies and processes or a preference for maintaining the status quo.

There have been myriad of challenges since the emergence of COVID-19 across the globe (Dewi and Adiarsi, 2020; Indupurnahayu *et al.*, 2021) and adopting supply chain ambidexterity

becomes a prudent strategy, but very confusing especially to oil and gas companies within developing countries. Demand and supply fluctuations as a result of the COVID-19 pandemic has placed intense pressure on supply chain within the oil and gas industry (Dewi and Adiarsi, 2020; Indupurnahayu *et al.*, 2021; Amoako *et al.*, 2022).

Assessment of supply chain performance within the oil and gas industry in developing countries has been few if not completely non-existent (Ibrahim and Daneshvar, 2017; Negi, 2021). Empirical study from Amponsah and Opei (2017) assessed some challenges and prospect that confronts the supply chain of Ghana's downstream petroleum sector, but no mention was made to how these companies within the sector could leverage supply chain ambidexterity to ensure increased performance. A recent study that assesses the role of business intelligence on operational performance found that supply chain ambidexterity played a mediating role (Mbima and Tetteh, 2023a). Even though this relationship has been established within the context of Ghana, the focus was on Small and Medium Enterprises (SMEs) with no specific mention of oil and gas industry players. It therefore appears that research on supply chain ambidexterity and innovation capabilities within the oil and gas industry is lacking. Against this background, this study seeks to assess the impact that supply chain ambidexterity has on supply chain performance, and additionally consider the moderating influence of innovation capabilities of the oil and gas companies within Ghana.

1.3 Research objectives

The study's primary goal is to evaluate the impact of innovation capabilities as moderators on supply chain performance in the oil and gas industry. The following precise goals must be met in order to accomplish the study's overall goal, which includes;

1. To examine the impact of supply chain ambidexterity on supply chain performance.

2. To determine the effect of innovation capabilities on supply chain performance.
3. To assess the moderating role of innovation capabilities on the relationship between supply chain ambidexterity and supply chain performance.

1.4 Research questions

KNUST

With regard to achieving the specific objectives stated, the following questions would be answered:

1. How does supply chain ambidexterity impact supply chain performance?
2. What is the impact of innovation capabilities on supply chain performance?
3. How does innovation capabilities moderate the relationship between supply chain ambidexterity and supply chain performance?

1.5 Significance of the study

This research addresses the gap of lack of information and clarity in defining path or strategies in making supply chain ambidextrous from an empirical perspective. Thus, by supplying information on how firms could leverage supply chain ambidexterity within their operation would ensure firms attainment of innovations and increased performance. Again, at the national level, they would be a blueprint as to how the industry (that is, oil and gas industry) could use the supply chain ambidextrous practices to improve overall performance of the industry.

Managers of oil and gas companies would find the research useful when drafting their supply chain management policies. This would help managers in understanding the impact of their rules on the supply chain of oil and gas businesses and in developing policies that do not adversely affect the sector. The result of this study is valuable resource for other researchers or for more study in the same area. This study added to the current body of knowledge on oil and gas supply chain management. The study also served as a springboard for further investigation

into the difficulties in controlling the supply chain in Ghana's gas and oil industry. This study contributes to the body of knowledge currently known about supply chain management, notably in the oil and gas industry with a focus on the ambidexterity and innovation potential of the supply chain.

KNUST

1.6 Scope of the study

The study focused on Greater-Accra region as most of the oil and gas companies have their headquarters within the region. The study further focused on two of the major oil and gas companies that have presence within Accra and other regions: Tel Energy Limited and Engen Ghana Limited. Incorporated under Ghanaian legislation, Tel Energy is a local oil marketing firm that offers a wide range of downstream petroleum-related products and services. Engen Ghana Limited, experts in petroleum retail and supply, guarantees motorists and business clients in Ghana the finest customer service and high-quality goods from our renowned service stations. These companies were selected for this study because they have over 25 years of experience within the oil and gas industry in Ghana, and this is vital in understanding how their supply chain has been ambidextrous over the years. In terms of variables, the study is delimited to the supply chain practices, supply chain ambidexterity, supply chain performance, and innovation capabilities within the oil and gas industry.

Working definitions of variables:

Supply chain practices

"Supply chain practices encompass the deliberate and coordinated efforts of an organization to plan, execute, and control the various activities involved in the sourcing, procurement, production, and delivery of goods and services to customers. These practices aim to optimize the flow of materials, information, and resources across the supply chain network, enhance operational efficiency, reduce costs, minimize risks, and improve customer satisfaction."

Supply chain ambidexterity

The capacity of a business to concurrently carry out and excel in both efficiency and flexibility within its supply chain operations is referred to as supply chain ambidexterity. In order to adapt and respond to volatile market situations, it entails finding a balance between utilizing current skills and investigating new prospects. In the context of supply chain management, ambidexterity recognizes the need to achieve operational efficiency, cost reduction, and productivity gains while also maintaining the agility and responsiveness required to meet changing customer demands, market disruptions, and competitive pressures.

Supply chain performance

Supply chain performance is the measurement and analysis of the ability of a supply chain to achieve its desired outcomes and objectives. It involves evaluating the efficiency, effectiveness, and responsiveness of the supply chain in terms of meeting customer demands, reducing costs, optimizing inventory levels, minimizing lead times, enhancing service levels, and generating sustainable value for all stakeholders involved.

Innovation capabilities

Innovation capabilities are the collective knowledge, skills, resources, and organizational attributes that enable an organization to foster a culture of innovation, generate novel ideas, and effectively translate them into successful outcomes. It involves the capacity to identify emerging trends, technologies, and customer needs, promote creativity, experiment with new approaches, and successfully bring innovative products, services, or processes to market.

1.7 Brief Methodology

The research design, outline, population, sample, and sampling method are all described in this portion of the study along with research processes, data collection methods, and data analysis methods. Based on the nature of this study, both descriptive and explanatory research design was applied. In terms of approach, the quantitative approach was relied upon. The case study strategy was deployed in this study. The population for this study employees of oil and gas companies within Ghana. The target population is employees of both Tel Energy and Engen Ghana limited. The toral target population for this study is 1450 stuff for both companies. The estimated sample size using the Yamane function for the target population of 1450 and a margin of error of 5% is approximately 314. The 314 staff members were chosen using a simple random selection process. Structural equation modelling technique was used for the data analysis. Structural equation modelling technique provided the ground to examine the associations that exist among the constructs: supply chain ambidexterity, supply chain performance, and innovation capabilities of the oil and gas companies.

1.8 Limitation of the Study

The major limitation was the respondent's willingness to undertake and answer the survey questionnaire. Cost of administering materials, printing and internet reliability to access material from previous studies was some of the major challenges encountered. Other moderating factors also impact supply chain performance such as firm size and managers experience as well as commitment to the supply chain to become ambidextrous. However, this current study was not able to incorporate such moderating variables.

1.9 Organization of the study

Generally, the study was organized into five chapters. The introduction, or Chapter 1, includes the following subtopics: background, explanation of the problem, research aims, research questions, importance of the investigation, scope and limitation of the study, as well as structure

of the study. Chapter Two centred on Literature necessary for the study covering related studies on supply chain practices, supply chain ambidexterity, supply chain performance, and innovation capabilities of the oil and gas companies. Chapter three is the research methods. This chapter provided methodology which includes research design, the population, sampling and sampling procedure, research instrument, and data collection instrument and data analysis. Chapter four is the results and discussions. This chapter presented the analysis of the findings and interpretation of the data gathered. Chapter five provided the summary of the findings, conclusion, and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter provides a review of the literature that is relevant to the study's problem. This includes a theoretical analysis that clarifies commonly accepted principles, rules, and techniques for understanding and summarizing significant features of the study problem. It

goes a step further by providing both an empirical analysis of prior research that was pertinent to the subject and critique of the present literature.

2.1 Conceptual Review

A concept review is a discussion in which you assess various or competing concepts and choose which ones to support and carry out to the end. The conceptual review addresses key issues of importance in a study.

2.1.1 Supply Chain Ambidexterity

Supply chain ambidexterity is the ability of an organization to simultaneously manage and optimize its operations for efficiency while exploring and experimenting with new strategies to remain competitive in a dynamic business environment. Thus, SC-Ambidexterity could be understood to mean the capacity to alter supply chain architecture in order to respond to market changes while coordinating the motivations of supply chain partners (Liu, Liao and Li, 2018; Aslam *et al.*, 2020). Although the researchers are aware that maintaining alignment and flexibility at the same time is challenging, they contend that being able to do so results in a long-term performance (Aslam *et al.*, 2020).

Traditionally, supply chain management has focused on achieving operational efficiency through the use of best practices, process standardization, and cost reduction (Roldán Bravo, Ruiz-Moreno and Lloréns Montes, 2018; Jermsittiparsert and Pithuk, 2019; Aslam *et al.*, 2020). However, in today's dynamic business environment, organizations must also be able to respond quickly to changes in customer needs, market conditions, and emerging technologies (Khan *et al.*, 2021). Supply chain ambidexterity requires organizations to balance the need for operational efficiency with the need for agility and flexibility(Roldán Bravo, Ruiz-Moreno and Lloréns Montes, 2018; Wang *et al.*, 2021).

The concept of supply chain ambidexterity can be divided into two categories: exploitative and explorative (Kristal, Huang and Roth, 2010; Constant, Calvi and Johnsen, 2020). Exploitative activities focus on improving existing processes, reducing costs, and increasing efficiency. Explorative activities focus on experimentation, innovation, and adaptation to changing market conditions (Constant, Calvi and Johnsen, 2020; Gu, Yang and Huo, 2021). Organizations must balance these two activities to achieve supply chain ambidexterity.

The importance of supply chain ambidexterity is evident in the dynamic business environment of today. Organizations face increasing pressure to improve operational efficiency, reduce costs, and maintain quality while responding to changing market conditions and emerging technologies. Supply chain ambidexterity enables organizations to balance these conflicting priorities and remain competitive (Kristal, Huang and Roth, 2010; Constant, Calvi and Johnsen, 2020). In addition, supply chain ambidexterity enables organizations to anticipate and respond to disruptions in the supply chain (Ojha, Acharya and Cooper, 2018a; Wamba *et al.*, 2020). Disruptions can include natural disasters, political instability, and economic downturns. An ambidextrous supply chain can quickly adapt to these disruptions and maintain business continuity (Aoki and Wilhelm, 2017; Liu, Liao and Li, 2018).

Technology is essential for improving the ambidexterity of the supply chain (Pu, Wang and Chan, 2020; Gastaldi *et al.*, 2022). Digital transformation, including the adoption of technologies such as artificial intelligence (AI), the Internet of Things (IoT), and blockchain, can improve supply chain visibility, agility, and flexibility (Pu, Wang and Chan, 2020; Gastaldi *et al.*, 2022). AI can be used to analyse data and identify patterns and trends, enabling organizations to make informed decisions quickly (Aslam *et al.*, 2020; Abdalla and Nakagawa, 2021).. IoT sensors can be used to monitor supply chain activities in real-time, providing insights into the performance of the supply chain. Blockchain technology can create a secure

and transparent platform for transactions and data sharing, improving trust between stakeholders (Mavengere, 2013; Aslam *et al.*, 2020; Abdalla and Nakagawa, 2021).

Leadership and culture play a crucial role in fostering an ambidextrous supply chain (Rafailidis, Trivellas and Polychroniou, 2017; Ojha, Acharya and Cooper, 2018b). Leaders must communicate the importance of supply chain ambidexterity and provide the necessary resources, including funding, talent, and technology, to implement it successfully. In addition, leaders must encourage experimentation and risk-taking to foster an innovative and adaptable culture (Ojha, Acharya and Cooper, 2018b; Alamsjah and Yunus, 2022).

Organizational culture also plays a critical role in achieving supply chain ambidexterity (Altay *et al.*, 2018; Muhammad *et al.*, 2021). Organizations must create a culture that values both operational efficiency and agility and flexibility (Muhammad *et al.*, 2021). This culture must support experimentation, risk-taking, and innovation while maintaining a focus on quality and cost reduction (Altay *et al.*, 2018; Ojha, Acharya and Cooper, 2018b; Muhammad *et al.*, 2021). Achieving supply chain ambidexterity is critical to remaining competitive in today's dynamic business environment. Organizations must balance the need for operational efficiency with the need for responsiveness and flexibility to achieve supply.

2.1.2 Supply chain Performance

Supply chain performance refers to the measurement and evaluation of how effectively and efficiently a company's supply chain functions to achieve its objectives (Yusoff, Ashari and Salleh, 2016; Kwamega, Li and Abrokwah, 2018; Abdulameer, Yaacob and Ibrahim, 2020). It involves tracking key performance indicators (KPIs) across the entire supply chain, from the initial sourcing of raw materials to the delivery of finished goods to the end customer.

The oil and gas industry has a complex supply chain that spans across various stages, from exploration and production to transportation and distribution of products (Adam *et al.*, 2019;

Ghaithan, Attia and Duffuaa, 2021; Kannankutty and Menon, 2021). The performance of the supply chain in this industry is critical to ensuring efficient and effective operations and the success of the organization.

A corporation may determine if their supply chain has improved or declined using supply chain performance measurement (SCPM) (Agami, Saleh and Rasmy, 2012; Anand and Grover, 2015). Performance metrics that were both quantitative and qualitative were proposed. However, historically, businesses have only used financial accounting indicators to analyze and evaluate their performance (Anand and Grover, 2015; Abdulameer, Yaacob and Ibrahim, 2020).

Collaboration between stakeholders is crucial to enhancing supply chain performance in the oil and gas industry (Anand and Grover, 2015; Ho, Kumar and Shiwakoti, 2020). The industry is complex, and several stakeholders are involved, including producers, suppliers, distributors, and regulators. Collaboration can improve communication and coordination among stakeholders, leading to better supply chain visibility, reduced lead times, and improved customer service (Alhosani and Zabri, 2018; Adam *et al.*, 2019). One example of collaboration is the use of blockchain technology (Kim and Shin, 2019; Akhavan and Philsoophian, 2022). Blockchain technology can create a secure and transparent platform for transactions and data sharing between stakeholders. This can improve supply chain visibility, reduce transaction costs, and enhance trust between stakeholders. Additionally, using blockchain technology, items can be tracked from the moment of manufacturing to the point of consumption, guaranteeing that they are genuine and meet all legal criteria (Longo *et al.*, 2019; Akhavan and Philsoophian, 2022).

The performance of the supply chain is critical to the success of the oil and gas industry. The industry faces several challenges that affect supply chain performance, including price volatility, regulatory compliance, geopolitical risks, and environmental concerns (Alhosani and

Zabri, 2018; Adam *et al.*, 2019; Cognizant, 2022). Technology, such as big data analytics and the Internet of Things, can enhance supply chain performance by improving supply chain visibility, reducing lead times, optimizing inventory management, and enhancing customer service (Kim and Shin, 2019; Akhavan and Philsoophian, 2022). Collaboration between stakeholders is also crucial to enhancing supply chain performance, and the use of blockchain technology can facilitate collaboration and improve transparency and trust between stakeholders (Cao and Zhang, 2011; Ho, Kumar and Shiwakoti, 2020; Akhavan and Philsoophian, 2022). Overall, the oil and gas industry must continue to embrace technology and collaboration to improve supply chain performance and remain competitive in a rapidly changing global market.

2.1.3 Innovation Capabilities

Innovation capabilities refer to an organization's ability to develop and implement innovative ideas that create value for customers and improve the organization's performance (Zimmermann, Ferreira and Moreira, 2020; Migdadi, 2021). Innovation capabilities are critical for organizations to remain competitive and thrive in today's dynamic business environment (Vu, 2020; Zubizarreta *et al.*, 2021). Innovation capabilities could also be understood to mean an organization's ability to identify and develop innovative ideas, create new products and services, and improve existing products and services (Zimmermann, Ferreira and Moreira, 2020; Migdadi, 2021). Innovation capabilities include a wide range of activities, including research and development, idea generation, experimentation, prototyping, and commercialization (Rajapathirana and Hui, 2018a; Puspita, Christiananta and Ellitan, 2020).

Innovation capabilities are not just about developing new products and services. They also include improving existing products and services, finding new ways to deliver value to customers, and creating new business models (Puspita, Christiananta and Ellitan, 2020;

Stelmaszczyk, 2020; Lam *et al.*, 2021). Innovation capabilities require a deep understanding of customer needs, market trends, and emerging technologies (Migdadi, 2021).

Innovation capabilities are critical for organizations to remain competitive and thrive in today's dynamic business environment. Organizations that have strong innovation capabilities are better able to respond to changes in customer needs, market conditions, and emerging technologies (Lutfiani and Nur, 2019; Migdadi, 2021; Lianto, Dachyar and Soemardi, 2022). In addition, innovation capabilities can create value for customers and improve organizational performance (Lutfiani and Nur, 2019; Migdadi, 2021). Innovative products and services can increase revenue, reduce costs, and improve customer satisfaction. Innovation can also lead to improved operational efficiency, enhanced employee morale, and a positive impact on the environment and society (Puspita, Christiananta and Ellitan, 2020; Stelmaszczyk, 2020; Lam *et al.*, 2021).

Three essential business operations factors interact throughout the firm's innovation activity. These include the company's assets, such as its knowledge (which could translate as expertise), procedures, and products, its connections with external social and economic developments, and the innovative ideas of its employees (Balan and Lindsay, 2010). The characteristics that a company requires to enable this innovation activity are described by IC. These qualities enable it to develop and offer new and improved goods, as well as swiftly and successfully embrace new processes and procedures, allowing it to compete more successfully in a fast changing environment (Balan and Lindsay, 2010; Sulistyo and Siyamtinah, 2016; Rajapathirana and Hui, 2018a). Since innovation is a complex activity in and of itself, IC has several dimensions or components and makes use of a variety of resources, tools, and competencies (Balan and Lindsay, 2010).

Innovation capabilities are critical for organizations to remain competitive and thrive in today's dynamic business environment. Developing and enhancing innovation capabilities requires a holistic approach that includes people, processes, and technology (Sulistyo and Siyamtinah, 2016; Rajapathirana and Hui, 2018a; Vu, 2020). Organizations must foster a culture of innovation, build cross-functional teams, invest in research and development, partner with external stakeholders, use technology to enhance innovation, and create a dedicated innovation team (Rajapathirana and Hui, 2018a; Puspita, Christiananta and Ellitan, 2020; Lam *et al.*, 2021). By implementing these strategies, organizations can create innovative products and services, improve customer satisfaction, and enhance organizational performance.

2.1.4 Ghana's Oil and Gas Industry Players and Supply Chain

The international procedures for petroleum product discovery, extraction, refinement, transportation, and marketing are all part of the supply chain for the Ghanaian oil and gas sector, just like they are for all other oil and gas industries (Ablo and Overå, 2015; Ackah and Mohammed, 2018). Upstream, midstream, and downstream make up the industry's three main divisions. The upstream sector, sometimes referred to as the exploration and production (E&P) sector, is responsible for discovering and producing natural gas and crude oil (Graham and Ovadia, 2019; Al-Janabi, 2020). The midstream acts as an essential conduit between the major population centers and the remote oil production regions. Crude oil, gas liquids (NGLs), natural gas, natural and sulfur are just a few of the commodities that are processed, stored, marketed, and transported by the midstream sector. Examples of downstream industrial activities include petrochemical plants, retail stores, retail businesses, and natural gas distribution companies (Lima, Relvas and Barbosa-Póvoa, 2016; Lisitsa, Levina and Lepekhin, 2019).

2.1.4.1 Upstream Sector (Operation and Extraction)

Major independent oil exploration and operational firms like Hess, Tullow, and Kosmos, as well as native Ghanaian institutions like the Ghana National Petroleum Corporation and service suppliers, make up the upstream industry (Anku-Tsede, 2016; Skaten, 2018; Adadzi, Godson-Amamoo and Nunoo, 2022). Tullow, however, was appointed the Jubilee Field Operator in October 2008 and started running with the partners and the Ghanaian government to build the field as a way to supply Ghana with its first large oil output (Skaten, 2018).

The Jubilee Field Phase 1 Development Plan and Unitization Agreement was formally approved by the Ghanaian Minister of Energy on behalf of the Ghanaian government in July 2009. Due to a successful development program that includes the building of a Floating Production Storage and Offloading facility, the Jubilee field produced its first oil in November 2010. The first discovery well had been drilled for almost 40 months, making this the quickest full-scale deep-water development ever (Tullow Oil 2017).

2.1.4.2 Away from (Refinery)

The only and best refinery in Ghana is the publicly owned Tema Oil Refinery (TOR) (Boakye *et al.*, 2022). The refinery was one of the first eight refineries in Africa when it was built in 1963. This share of the 65,000 bpsd national demand is satisfied by the state-owned refinery's Crude Distillation Unit, which can produce 45,000 bpsd. Tema Oil Refinery (TOR) Limited refines and distills a range of petroleum products, some of which products include liquefied petroleum gas (LPG), aviation turbine kerosene, and cracked fuels (Amponsah and Opei, 2017; Boakye *et al.*, 2022).

Tema Oil Refinery (TOR) has situated itself to update and extend its infrastructure as a result of the discovery of oil and gas in Ghana. In the Ghanaian market and the ECOWAS Subregion, this would guarantee the supply of petroleum products and the reliability of TOR as a

significant petroleum product producer. TOR aims to become the preferred option for companies that deal with ready-to-use petroleum products, especially Bulk Distribution Companies (BDCs). TOR improved its ability to make and store more petroleum stuff. The company can now store way more crude oil and finished petroleum products to about 1,000,000 metric tonnes. The company also upped its storage for LPG from 7,560 to 10,560 metric tonnes (Tema Oil Refinery, 2022).

The Bulk Oil Storage and Transport (BOST) which serves as both a petroleum storage facility and a gas distribution company in the nation, as well as oil marketing firms like SHELL Ghana, TOTAL, and GOIL are other participants in the downstream industry (MacCarthy *et al.*, 2019; Abudu and Sai, 2020).

2.1.5 SCM best practices in oil marketing firms

Due to security considerations, information technology is also crucial for oil marketing organizations (Olhager and Prajogo, 2011; Saad, Mohamed Udin and Hasnan, 2014; Aulakh, Settanni and Srai, 2022). Oil companies provide a variety of hazardous items, as well as other partners in the supply chain, so suppliers and consumers must always be informed of the location of each shipment destination (Prajogo and Olhager, 2012; Ahmad and Saifudin, 2014). Chemical businesses are thinking about using wireless technology to track deliveries.

Oil and petrochemical companies outsource their logistical activities to manage their supply chains and cut expenses. When a company outsources a task, it cedes control of the operation to a service provider who manages the supply chain for third-party logistics (Prajogo and Olhager, 2012; Ahmad and Saifudin, 2014; Aulakh, Settanni and Srai, 2022).

All the same, companies in the oil trade or industry have taken their understanding of outsourcing to the next level and discovered that a special kind of outsourcing or subcontracting

their logistical tasks is a collaboration and cooperative effort with their rivals (Cao and Zhang, 2011; Sarkar, Omair and Kim, 2020; Dominguez *et al.*, 2022).

Products are frequently a source of interest to the consumer in sectors like those that produce oil and gas derivatives' raw materials until the goods meet their criteria and the required supply is finished in the promised amount of time. As a result, competing oil and gas companies create SCM partnerships to supply products to consumers, enabling them to save transportation and inventory costs and enhance customer service (Thongrawd *et al.*, 2020; Tarigan, Siagian and Jie, 2021). Reduced transportation expenses are then shared among the participating businesses in the global supply chain (Diaz *et al.*, 2015; Jerbi *et al.*, 2022). Sending the exchange is the name given to this cooperative strategy. This kind of collaboration with rival businesses produces a worldwide remedy for the supply chain's general constraints and is anticipated to be new (Cao and Zhang, 2011; Dominguez *et al.*, 2022).

The ecosystems in which oil and gas firms operate are dynamic and complicated, and they frequently confront difficulties related to supply and demand in particular (Klass and Meinhardt, 2014; Al-Janabi, 2020; Ariweriokuma, 2021). With oil prices at historic lows and no chance of an immediate recovery, the time has come to evaluate supply chain and procurement procedures as well as expenses. Oil and gas companies need to focus on both the non-hydrocarbon supply chains that deal with the tools, materials, and services required to run their operations as well as the supply networks for their own products (MacCarthy *et al.*, 2019; Al-Janabi, 2020; Ariweriokuma, 2021). The non-hydrocarbon supply chain is essential for providing the equipment and services required to find, extract, process, and eventually market the oil and gas. Procurement and supply chain strategies are anticipated to be at the forefront of key problems facing oil and gas firms given the current downward spiral of oil prices (Klass and Meinhardt, 2014; Ariweriokuma, 2021). Oil and gas firms can consider the following

supply chain and procurement options to improve supply chain value in order to achieve a noticeable rise in the profit margin.

2.2 Theoretical Review

The major goal of a theoretical review is to accurately examine the body of information that has accrued in relation to a circumstance, idea, theory, or reality. The theoretical literature review helps in the formulation of new testable hypotheses by identifying what concepts currently exist, their linkages, the depth of their research, and more. The theoretical review is frequently employed to demonstrate the lack of sufficient theories or the inadequacy of the theories that are already in use to explain novel or developing areas of inquiry.

2.2.1 Resource-Based Theory

Resource-Based Theory was initially introduced by Edith Penrose in 1959, who suggested that the unique resources possessed by a firm are the primary source of competitive advantage (Penrose, 1996). However, it was not until the 1980s and 1990s that RBT gained widespread recognition and development, primarily through the works of scholars such as Jay Barney, Birger Wernerfelt, and Michael Porter (Barney, 2021; Barney, Ketchen and Wright, 2021). Resource-Based Theory (RBT) emphasizes the importance of a company's assets and capabilities in creating long-term competitive advantage (Barney, 2021; Barney, Ketchen and Wright, 2021). According to this theory, a firm's unique combination of resources, such as human capital, organizational culture, technology, and knowledge, can lead to superior performance and sustained competitive advantage over time (Barney, Ketchen and Wright, 2021; Freeman, Dmytriyev and Phillips, 2021).

Resource-Based Theory (RBT) is a management theory that focuses on the strategic management of a firm's resources and capabilities as a source of competitive advantage (Barney, Ketchen and Wright, 2021; Zahra, 2021). Resources are the physical and intellectual

assets, including financial capital, physical assets, intellectual property, human capital, and organizational expertise, that a company owns. Resources are the fundamental components that allow a business to carry out its operations and provide value (Nagano, 2020; Barney, Ketchen and Wright, 2021). Capabilities are the firm's capacity to deploy its resources effectively and efficiently to achieve desired outcomes. They encompass the skills, knowledge, routines, and processes that enable a firm to perform specific tasks or activities. Capabilities are often developed and accumulated over time, contributing to a firm's competitive advantage (Hitt, Xu and Carnes, 2016; Zahra, 2021).

According to the resource-based theory of the business, a corporation's resources are crucial to sustaining its competitive advantage and putting its corporate and marketing strategy into practice. A company must have resources that are valuable, uncommon, challenging for other businesses to duplicate, and also challenging to replace in order to be successful (Barney, 1991). Resources must be precious, uncommon, unique, and non-substitutable in order to create a sustained competitive advantage, according to one of the main tenets of resourcebased theory. Barney (1991) suggested that such resources are difficult for competitors to replicate, which leads to a sustained competitive advantage. Some of the criticisms advanced against the theory include the non-consideration of external environment and the role of luck, does not provide clear guidance on how to develop resources, and ignores the role of networks and relationships in creating competitive advantage.

Critics of RBT argue that the theory overlooks the importance of the external environment and the role of luck in shaping a firm's performance (Kozlenkova, Samaha and Palmatier, 2014). For example, firms may have valuable and rare resources, but changes in the external environment, such as regulatory changes, may render them non-valuable or obsolete. Another criticism of RBT is that it does not provide clear guidance on how to develop resources (Hitt,

Xu and Carnes, 2016; Kellermanns *et al.*, 2016). While the theory emphasizes the importance of valuable, rare, inimitable, and non-substitutable resources, it does not offer a clear roadmap on how firms can develop and acquire such resources. Some scholars argue that RBT overlooks the importance of networks and relationships in creating competitive advantage (Kozlenkova, Samaha and Palmatier, 2014; Hitt, Xu and Carnes, 2016; Kellermanns *et al.*, 2016). For example, firms may gain access to valuable resources and knowledge through relationships with suppliers, customers, and other stakeholders.

A useful framework for comprehending how a firm's resources and skills might result in enduring competitive advantage is provided by resource-based theory. While the theory has received significant attention and development over the years, it is not without its critiques and limitations. Nonetheless, RBT remains a valuable tool for managers and scholars seeking to understand the sources of competitive advantage (Hitt, Xu and Carnes, 2016; Kellermanns *et al.*, 2016).

The term "Supply Chain Ambidexterity" refers to a company's capacity to concurrently pursue both efficiency and flexibility in its supply chain operations. Resource-Based Theory (RBT) sheds light on this idea (Roldán Bravo, Ruiz-Moreno and Lloréns Montes, 2018; Zahra, 2021). RBT suggests that a firm's resources and capabilities play a crucial role in achieving ambidexterity. RBT argues that firms differ in the types, quality, and availability of their resources. This resource heterogeneity creates an opportunity for firms to develop unique capabilities that enable supply chain ambidexterity (Xiao *et al.*, 2012; Li *et al.*, 2022).

For example, a firm may possess resources such as advanced technologies, skilled workforce, or strong relationships with suppliers and customers, which can be leveraged to achieve both efficiency and flexibility in the supply chain.

RBT emphasizes the importance of resource complementarity, which refers to the synergy and compatibility among different resources and capabilities within a firm (Xiao *et al.*, 2012; Barney, Ketchen and Wright, 2021). To achieve supply chain ambidexterity, firms need to combine and integrate their resources and capabilities in a way that enables simultaneous pursuit of efficiency and flexibility. For instance, combining a robust inventory management system with flexible manufacturing processes can allow a firm to respond quickly to changing customer demands while maintaining cost-effective operations (Roldán Bravo, Ruiz-Moreno and Lloréns Montes, 2018; Aslam *et al.*, 2020).

According to the resource-based theory, IC may be defined as a unique asset of a company that enables it to successfully implement new procedures and techniques and create and launch new and enhanced goods to compete better in a fast-changing environment (Balan and Lindsay, 2010). Some of the key resources and capabilities that contribute to innovation capability include knowledge and skills of both employees and managers, the financial resources available (Rajapathirana and Hui, 2018a; Lam *et al.*, 2021). Innovation capability requires specialized knowledge and skills, including scientific and technical expertise, market knowledge, and the ability to identify and evaluate new opportunities. Innovation capability also requires access to the resources needed to develop and implement new ideas and products, including funding, physical infrastructure, and access to networks and partnerships (Lam *et al.*, 2021; Migdadi, 2021). Innovation capability is an important resource that can enable firms to generate new ideas and technologies, create new markets, and sustain competitive advantage over the long-term. As such, it is a critical component of resourcebased theory.

Under resource-based theory, innovation capability is considered to be a valuable and rare resource that can be difficult to imitate or substitute (Balan and Lindsay, 2010). Developing a strong innovation capability requires significant investments of time, money, and effort, and

the specific configuration of resources and capabilities that contribute to innovation capability may be unique to each organization. Therefore, organizations that develop a strong innovation capability are more likely to achieve sustained competitive advantage and superior performance (Balan and Lindsay, 2010; Akhavan and Mahdi Hosseini, 2015; Sulistyo and Siyamtinah, 2016).

KNUST

2.2.1 Dynamic Capability Theory

The Dynamic Capability Theory was first proposed by David Teece, Gary Pisano, and Amy Shuen in their 1997 paper, "Dynamic Capabilities and Strategic Management." Teece, Pisano, and Shuen are considered the major proponents of the theory and have made significant contributions to the field of strategic management (Faizal, Zaidi and Othman, 2012). Other scholars who have contributed to the development of Dynamic Capability Theory include Constance Helfat, Margaret Peteraf, and Giovanni Dosi, among others. These scholars have expanded upon the initial work of Teece, Pisano, and Shuen and have helped to further develop and refine the theory over time. The relevance of a firm's capacity to adjust and react to changes in the environment is emphasized by dynamic capability theory (Faizal, Zaidi and Othman, 2012). Dynamic capabilities are the organizational processes, routines, and capabilities that enable firms to adapt and innovate in response to changing market conditions, technology, and competition (Teece, 2018; Liu, An and Liu, 2022). In order to respond to shifting market conditions and capture new possibilities, a company must be able to dynamically refresh its resources and skills over time. It entails recognizing environmental changes, grabbing opportunities, and rearranging resources and competencies to line with the company's strategic objectives (Teece, 2018; Vu, 2020).

According to Dynamic Capability Theory, firms can achieve sustained competitive advantage by continuously developing and refining their capabilities and resources to meet changing

market demands (Teece, 2018; Liu, An and Liu, 2022). Firms must be able to sense changes in the environment and identify opportunities and threats that arise. This requires a deep understanding of the market, competition, and emerging technologies (Faizal, Zaidi and Othman, 2012). Firms must be able to quickly and effectively respond to new opportunities by developing new products, services, and processes that meet customer needs and preferences (Teece, 2018; Liu, An and Liu, 2022). Firms must be able to transform their internal processes, structures, and capabilities to support ongoing innovation and adaptation (Teece, 2018). This involves investing in research and development, training and development, and organizational learning.

Dynamic Capability Theory emphasizes the importance of continuous innovation and learning as key drivers of competitive advantage (Faizal, Zaidi and Othman, 2012; Teece, 2018). Businesses that can create and use dynamic capabilities are more likely to have longterm success in quickly evolving and fiercely competitive industries (Faizal, Zaidi and Othman, 2012).

Overall, Dynamic Capability Theory provides a framework for understanding how firms can develop and leverage their capabilities and resources to achieve sustained competitive advantage in dynamic and unpredictable environments (Faizal, Zaidi and Othman, 2012; Liu, An and Liu, 2022).

The management theory known as "dynamic capability theory" is concerned with a company's capacity to integrate, reconfigure, and adjust its resources and capabilities in response to changing and unpredictable situations (Lee and Rha, 2016). It plays a significant role in enhancing innovation capabilities and improving supply chain performance. In terms of innovation capabilities, Dynamic Capability Theory emphasizes the importance of sensing and seizing new opportunities, as well as transforming existing resources and capabilities to create

innovative solutions (Gupta, 2021; Liu, An and Liu, 2022). By continuously monitoring the external environment and internal resources, firms can identify emerging trends, customer needs, and technological advancements, enabling them to develop new products, services, and processes. Dynamic capabilities facilitate the exploration and experimentation required for innovation, allowing firms to adapt and align their resources and capabilities accordingly (El Gizawi, 2014; Yan *et al.*, 2022). This includes fostering a culture of creativity, encouraging knowledge sharing and collaboration, and investing in research and development activities (Yan *et al.*, 2022). By developing and leveraging innovation capabilities, firms can introduce novel and differentiated offerings, leading to competitive advantage and growth in the marketplace.

Regarding supply chain performance, Dynamic Capability Theory contributes by enabling firms to adapt and align their supply chain strategies, processes, and resources with changing market conditions (Kapoor and Aggarwal, 2020; Yan *et al.*, 2022). It recognizes the importance of flexibility, agility, and responsiveness in the supply chain to address uncertainties, disruptions, and evolving customer demands (Hong, Zhang and Ding, 2018; Teece, 2018; Yan *et al.*, 2022). Dynamic capabilities allow firms to quickly reconfigure their supply chain networks, adjust production and distribution processes, and collaborate with suppliers and partners to meet changing requirements (Hong, Zhang and Ding, 2018; Yan *et al.*, 2022).. This may involve implementing advanced technologies, improving information systems, and developing collaborative relationships. By effectively leveraging dynamic capabilities, firms can achieve better supply chain visibility, reduced lead times, improved coordination, and enhanced customer service (Beske, Land and Seuring, 2014; Isnaini,

Nurhaida and Pratama, 2020; Yan *et al.*, 2022). This, in turn, leads to increased operational efficiency, cost savings, risk mitigation, and customer satisfaction. Furthermore, the ability to align supply chain strategies with innovation initiatives enables firms to bring new products to

market faster and more efficiently, further enhancing their competitiveness and overall supply chain performance (Isnaini, Nurhaida and Pratama, 2020; Yan *et al.*, 2022).

2.3 Empirical Review

Recent research on ambidexterity in the context of big industrial companies and their supply networks is scarce (Aoki and Wilhelm, 2017; Partanen *et al.*, 2020). Nevertheless, such companies may gain from supply network exploration and exploitation as it permits efficient use of already-existing supply chains while taking advantage of untapped supply chain potential. More precisely, supply chain exploitation, which may be viewed as the conventional method of supply chain management, focuses on reliability, risk mitigation, and overall effectiveness of supply networks as well as well defined, short-term, quantifiable objectives (Partanen *et al.*, 2020). There are several empirical studies that support the positive association between supply chain ambidexterity and firm performance, including profitability.

Mbima and Tetteh (2023b) investigated the relationship between business intelligence, supply chain ambidexterity, and operational performance of firms. The interdependencies between variables were investigated in the study using the quantitative technique. A practical and purposeful sample technique was used to poll 216 senior and middle managers/owners of SMEs in Ghana. The research was carried out using SPSS version 23 and Smart PLS version 3. The study finds that supply chain ambidexterity positively affects a firm's operational performance, as it enables firms to simultaneously explore new opportunities and exploit existing capabilities. The study finds that supply chain ambidexterity mediates the relationship between business intelligence and operational performance. Specifically, the positive impact of business intelligence on operational performance is partially explained by the positive impact of business intelligence on supply chain ambidexterity.

One such study is "The Impact of Supply Chain Ambidexterity on Firm Performance: A Resource-based Perspective" by Shin and Colicchia (2017). The study examines the relationship between supply chain ambidexterity and firm performance in the context of the Italian manufacturing industry. The authors find that supply chain ambidexterity positively impacts firm performance, including profitability, as it enables firms to simultaneously explore new opportunities and exploit existing capabilities.

Another study that supports the association between supply chain ambidexterity and profitability is "Supply Chain Ambidexterity and Firm Performance: The Mediating Role of Innovation Capability" by Wong and Chin (2020). The study examines the mediating role of innovation capability in the relationship between supply chain ambidexterity and firm performance in the context of the Malaysian manufacturing industry. The authors find that supply chain ambidexterity positively impacts firm performance, including profitability, through the mediating role of innovation capability.

Partanen et al. (2020) focused their study on Supply chain ambidexterity of manufacturing SMEs and how it impacts on their performance. The moderating role of strategic information sharing and network capability were also examined. Overall, 200 manufacturing SMEs in Sweden were sampled for the study. The study finds that supply chain ambidexterity positively affects SME performance, as it enables firms to simultaneously exploit existing capabilities and explore new ones. The study suggests that supply chain ambidexterity is an important driver of SME performance and that network capability and strategic information flow play important moderating roles in this relationship. The findings suggest that SMEs should focus on developing their supply chain ambidexterity, while also improving their network capability and strategic information flow to maximize the positive impact on performance.

Nazari et al. (2022) on their part investigated the Impact of Supply Chain Ambidexterity on the Financial Performance In terms of its goal and character, the current research is applied and descriptive survey in nature. In the province of Kermanshah, 1000 employees of small and medium-sized businesses made up the statistical population of the study. 278 individuals were chosen as the sample size using Morgan's table. The questionnaire served as a research tool. The study finds that supply chain ambidexterity positively affects a firm's financial performance, as it enables firms to simultaneously exploit existing capabilities and explore new ones.

The influence of supply chain ambidexterity on supply chain performance (SCP) under uncertainty was examined by Alamsjah and Asrol in their study from 2022. In order to construct a study framework that suggests a supply chain strategy under uncertainties relevant to inter-island logistics in Indonesia, the dynamic capability theory of businesses was implemented in the supply chain. In order to identify the supply chain uncertainties, this study surveyed 140 large-scale businesses that ship goods around the Indonesian islands and used SmartPLS to analyze the data. Although agile supply chain (ASC) and lean supply chain (LSC) were shown to be able to associate the SAM and SCP indirectly, the supply chain ambidexterity (SAM) was found to demonstrate no direct association with SCP (Alamsjah and Asrol, 2022).

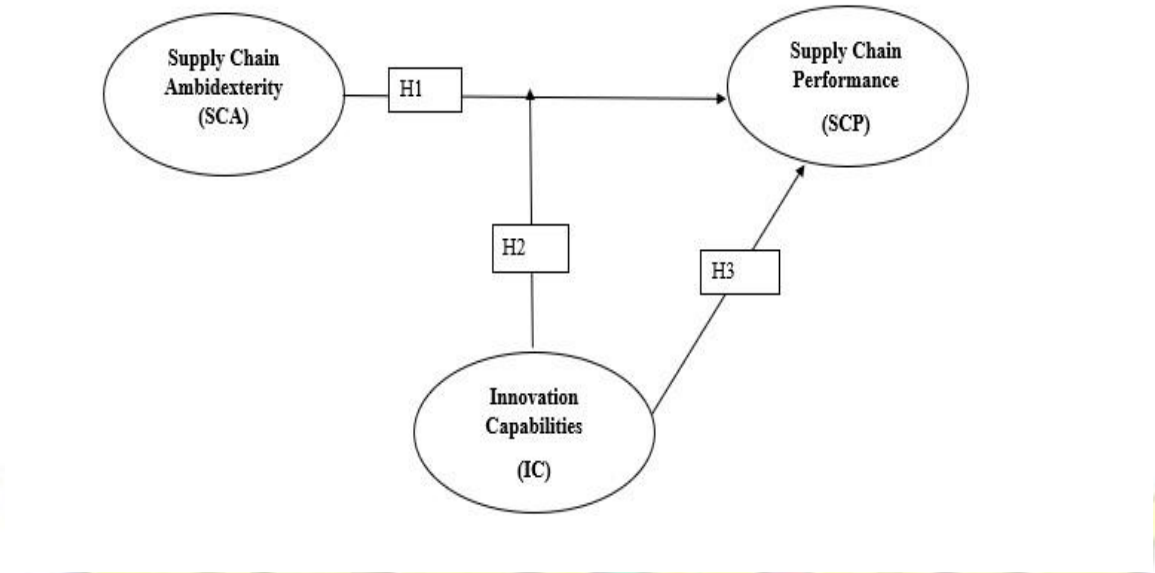
2.4 Conceptual Framework

Based on the extant empirical studies and hypotheses developed, this study conceptualizes a framework that will guide the study. Thus, the relationship among the various constructs is depicted in Figure 2.1 below.

From the framework, supply chain ambidexterity has a direct impact on how firms attain supply chain performance. This path diagram further has the H1 and H2 to depict the hypotheses conjectured. The central notion is that the direct association between supply chain

ambidexterity and supply chain performance is impacted by innovation capabilities of the firm. Thus, the magnitude and direction of the association between SCA and SCP is dependent on IC.

Figure 2. 1 Conceptual Framework



2.5 Hypotheses Development

Organizations that are able to balance exploration and exploitation activities in their supply chains are expected to achieve higher levels of supply chain performance compared to those that focus solely on one of these activities. Previous studies have shown a positive relationship between supply chain ambidexterity and supply chain performance (Partanen *et al.*, 2020; Alamsjah and Asrol, 2022; Mbima and Tetteh, 2023b). For example, Wu, Zhao, and Zhang (2019) found that supply chain ambidexterity positively influenced supply chain agility, which in turn positively influenced supply chain performance. Similarly, Chen, Yang, and Lei (2019) found that supply chain ambidexterity positively influenced supply chain resilience, which in turn positively influenced supply chain performance. Other studies have also highlighted the

importance of balancing exploration and exploitation activities in supply chain management. For example, Zhu, Sarkis, and Lai (2018) found that organizations that were able to balance exploration and exploitation activities in their supply chains were better able to respond to environmental uncertainties and achieve superior supply chain performance. Furthermore, previous studies have also highlighted the importance of agility and resilience in achieving superior supply chain performance (Christopher and Towill, 2001; Christopher and Peck, 2004). These studies suggest that organizations that are able to balance exploration and exploitation activities in their supply chains are better able to respond to environmental uncertainties and achieve superior supply chain performance. Organizations that are able to balance exploration and exploitation activities in their supply chains are expected to achieve higher levels of supply chain performance compared to those that focus solely on one of these activities. Further research is needed to empirically test this hypothesis and explore the underlying mechanisms that drive this association. Based on the previous studies, it is hypothesized that:

H1: There is a positive association between supply chain ambidexterity and supply chain performance.

In recent years, there has been growing interest in understanding the role of supply chain ambidexterity in enhancing supply chain performance. However, the relationship between supply chain ambidexterity and supply chain performance may be contingent on the level of innovation capacity within the organization. Yusr (2016) investigated the role that innovation capabilities play in the relationship between Total Quality Management (TQM) and innovation performance. Yusr found that innovation capability positively moderates the relationship between TQM practices and innovation performance. This suggests that organizations that have a strong innovation capability are more likely to benefit from implementing TQM practices to

enhance their innovation performance. The study also identifies three components of innovation capability, including technology management, human resource management, and external collaboration. The findings suggest that organizations should focus on building these components of innovation capability to enhance their ability to leverage TQM practices for innovation performance. Additionally, the study highlights the importance of a supportive organizational culture and leadership commitment in building innovation capability and leveraging TQM practices for innovation performance. Overall, the study provides insights into the importance of innovation capability in enhancing the effectiveness of TQM practices in driving innovation performance (Yusr, 2016).

The study by Rajapathirana and Hui, 2018) investigated the relationship between innovation capability, innovation type, and firm performance. The study finds that innovation capability positively influences firm performance and that this relationship is mediated by the type of innovation. The study identifies three types of innovation, including product innovation, process innovation, and organizational innovation, and finds that each type of innovation has a different effect on firm performance. Specifically, product innovation has the strongest positive effect on firm performance, followed by process innovation and organizational innovation. The study also finds that innovation capability has a stronger positive effect on product innovation and process innovation than on organizational innovation. These findings suggest that organizations with a strong innovation capability are more likely to engage in product and process innovation and are more likely to see a positive impact on firm performance as a result. In conclusion, empirical evidence suggests that innovation capacity plays a critical role in moderating the relationship between supply chain ambidexterity and supply chain performance. Thus, organizations seeking to enhance their supply chain performance through ambidexterity must also focus on building their innovation capacity to ensure the effectiveness of this strategy.

Based on the previous studies, it is hypothesized that:

H2: Innovation capabilities have a moderating impacting on the association between supply chain ambidexterity and supply chain performance.

Innovation capabilities have a significant impact on supply chain performance, leading to improved operational efficiency, customer satisfaction, and overall competitive advantage (Zimmermann, Ferreira and Moreira, 2020; Arsawan *et al.*, 2022). Firms with strong innovation capabilities are better equipped to introduce new products, services, and processes that address evolving customer needs and market trends (Rajapathirana and Hui, 2018a; Puspita, Christiananta and Ellitan, 2020). This enables them to differentiate themselves in the marketplace and gain a competitive edge. Additionally, innovation capabilities enable firms to develop and implement novel supply chain strategies and practices, such as agile and responsive supply chain models, collaborative partnerships, and advanced technologies (Mehralian, Zarenezhad and Ghatari, 2015; Chai, 2017). These innovations in the supply chain result in improved coordination, reduced lead times, enhanced visibility, and increased flexibility, all of which contribute to superior supply chain performance. Research supports this notion, as studies have found a positive relationship between innovation capabilities and supply chain performance metrics, such as on-time delivery, inventory turnover, and customer service levels (Rajapathirana and Hui, 2018a; Gupta, 2021). Therefore, nurturing and leveraging innovation capabilities within the context of the supply chain is crucial for firms aiming to achieve sustainable competitive advantage and operational excellence. It is posited that:

H3: Innovation capabilities have a significant positive impact on supply chain performance.

KNUST

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter's main focus is a discussion of the study's methodology. Specific topics discussed include the research design chosen, the study's population, the sample size and sampling method used, the data gathering process, data processing, and ethical consideration.

3.2 Research Design, Approach, and Strategy

The research design serves as a road map for the study technique, connecting all pertinent study components in a logical and thorough manner in order to accomplish the investigation's goals (Tobi and Kampen, 2018; Farrall, 2021). The study topic's more unique qualities, such as the methods used for data collection and analysis, are the main focus. A research design could, in

general, be either quantitative or qualitative (Tobi and Kampen, 2018; Jilcha Sileyew, 2020). A quantitative research design is employed when data is gathered and then used to explain an interesting phenomenon. On the other hand, the qualitative research design is used when the framework, data collecting, and analysis are done utilizing text and descriptions (Tobi and Kampen, 2018; Pawar, 2020). The quantitative method is more objective in evaluating phenomena since it analyses numerical data from databases and surveys (Creswell and Creswell, 2018). To better understand how supply chain ambidexterity influence supply chain performance, this study uses a quantitative research design.

Research approach could be inductive approach, deductive approach, and abductive approach (Bryman and Bell, 2015; Saunders, Lewis and Thornhill, 2019). The key distinction between deductive and inductive approaches is how important the hypothesis is to the inquiry. While the inductive method encourages the creation of fresh notions and generalizations, the deductive method examines the veracity of the underlying assumptions (Bryman and Bell, 2015). A deductive approach is used when there is the need to test raised hypotheses of a study. But the creation of hypotheses is not a part of the inductive approach. The research questions and the objectives and goals that must be met throughout the course of the study come first. In an abductive approach, researchers begin by observing a phenomenon or a set of data and then generate possible explanations or hypotheses that could account for those observations (Bryman and Bell, 2015; Hair and Brunsveld, 2019). These hypotheses are then tested through further observation or experimentation. The goal is to arrive at the most likely explanation or hypothesis that can account for the observed data. Since this study begins by conjecturing hypothesis and essentially adopting analysis technique to test for its confirmation or rejection, a deductive approach was adopted. Again, the deductive approach aids in the generalization of the hypothesis.

Depending on the specifics of their study issue and the data they must gather, researchers might employ a variety of research methodologies. Some of these techniques include grounded theory, action research, case studies, surveying, experimental, and meta-analysis techniques. Experimental strategy involves manipulating one or more variables to measure their effect on an outcome. It is often used in laboratory settings to test cause-and-effect relationships. Survey strategy involves collecting data through questionnaires or interviews. Online, over the phone, or in person, surveys can be used to collect information on a variety of subjects. Case study strategy involves in-depth examination of a specific case or group of cases. Case studies can be used to gain insights into complex phenomena and to test theoretical frameworks. Collaboration between academics and practitioners is a key component of the action research method for identifying and resolving practical issues. It can be used to improve organizational practices or to address social issues. This study uses the case study strategy since the study wants to gain in-depth information on how Tel Energy and Engen Ghana limited leverage supply chain ambidexterity to trigger supply chain performance within the oil and gas sector.

3.3 Population

All entities, that is units, people, groups, and nations that at the time the study is conducted share a particular trait are referred to as the research populations (Sparks and Joyner, 2019; Casteel and Bridier, 2021). The population for this study is employees of companies operating within the oil and gas sector in Ghana. The target population of this study were employees working for Tel Energy and Engen Ghana limited. Thus, the total target

population for this study is 1450 staff for both companies.

3.4 Sample Size and Sampling Techniques

The researcher used a simple random sampling procedure in the selection of individuals. As part of this probability sampling strategy, participants were chosen for the research with an

equal chance of success (Etikan, 2016; Lohr, 2019). The simple random sampling technique was adopted because it has the potential to eliminate selection bias and provide an objective basis for selecting sample for a study (Adam, 2020; Casteel and Bridier, 2021). Based on the target population of 1450, this study used Yamane (1967). The Yamane formula is commonly used to calculate the sample size required for a survey to achieve a desired level of precision. The formula is:

$$n = N / (1 + N(e^2))$$

Where:

n = sample size N

= population size e

= margin of error

Assuming a margin of error of 5% (0.05), we can calculate the sample size required using the Yamane formula:

$$n = 1450 / (1 + 1450(0.05^2))$$

$$n = 1450 / (1 + 1450(0.0025)) \quad n = 1450 / (1 + 3.625) \quad n = 1450 / 4.625 \quad n \approx 314$$

Therefore, the estimated sample size using the Yamane function for a population of 1450 and a margin of error of 5% is approximately 314.

3.5 Data Collection Method

The practice of obtaining information or data from numerous sources is known as data collection. There are several methods for collecting data. It could be focus group discussion, observation, use of questionnaire, experimentation among others (Abawi, 2013; pouline, habimana, 2013). Under the case study research strategy, data collection could be done using interviews, questionnaires, observations, and document analysis. It allows for a comprehensive understanding of specific phenomena, processes, or strategies within the organizations. This study used a questionnaire to collect data. The constructs and or variables of interest for this study are captured in the questionnaire and a sample of the measures and sources of these constructs is presented in Table 3.1 below.

Table 3. 1 Constructs Measurement and Sources

Construct	Measures/items	Sources
Supply chain ambidexterity	8	(Partanen *et al.*, 2020) (Mbima and Tetteh, 2023b)
Supply Chain Performance (SCP)	6	(Alamsjah and Asrol, 2022)
Innovation capabilities	5	(Odoom and Mensah, 2019)

3.6 Sources of Data

Sources of data can be classified into two main categories: primary sources of data and secondary sources of data (Novikov and Novikov, 2019; Sian and Singh2, 2019; Flick, 2020). Data that is acquired by the researcher specifically for their study endeavour is referred to as primary data. Examples of primary sources of data include surveys, interviews, observation, focus group discussions, and experiment. Secondary sources of data are data that has been collected by someone else and is available for the researcher to use. Examples of secondary

sources of data include government reports, academic journals, books, databases, and websites. This study used the primary sources of data. Thus, questionnaire aided in collecting data.

3.7 Data Analysis

Due to the quantitative nature of the research methodology, this study used the quantitative analysis approach. To measure supply chain ambidexterity, supply chain performance, and innovation capabilities, Likert scale was used. specifically, a seven-point Likert scale shall be used. Structural Equation Modeling (SEM) was used to assess the relationship among the variables. SEM is a statistical method used to examine relationships between latent and observed variables (Ahmad, Zulkurnain and Khairushalimi, 2016; Hair *et al.*, 2017).

3.8 Data Validity and Reliability

In SEM, it is important to assess the validity and reliability of data to ensure that the model accurately reflects the underlying theoretical constructs. The study used Cronbach's alpha to determine the reliability of the test data. For validity, average variance extracted and Heterotrait-monotrait ratio (HTMT) was used. In structural equation modeling, the heterotrait-monotrait ratio (HTMT) is a metric used to evaluate discriminant validity. It is used to evaluate whether the correlations between two constructs are significantly higher than the correlations between each construct and its respective measurement items. HTMT is a more conservative measure of discriminant validity than other commonly used measures such as the Fornell-Larcker criterion or the cross-loadings approach (Ab Hamid, Sami and Mohmad Sidek, 2017; Roemer, Schuberth and Henseler, 2021).

3.9 Ethical Considerations

Since the companies have unique goodwill and reputation within the oil and gas industry, it is prudent that this research does not in any way tarnish their image with the outcome of this

study. Therefore, using pseudonyms for these companies shall be done in this study when the final report is presented (Schamp, Heitmann and Katzenstein, 2019; Liebe and Hunter, 2021). The dignity and privacy were all maintained during the course of this study. The workers essentially consented to sharing their information for the study by signing a permission form.

3.10 Profile of Oil and Gas Industry in Ghana

Oil and Gas Reserves: Ghana is one of the relatively new entrants in the global oil and gas industry. The country's offshore areas, especially the Tano Basin and the Jubilee Field, have been significant sources of oil and gas reserves. The discovery of oil in commercial quantities was made in 2007, and production began in 2010.

Major Fields:

- **Jubilee Field:** Discovered in 2007, it is one of Ghana's largest offshore oil fields and has been a significant contributor to the country's oil production.
- **TEN (Tweneboa, Enyenra, Ntomme) Fields:** These fields, located in the same vicinity as the Jubilee Field, started production a few years after Jubilee and have added to Ghana's oil output.

Major Companies

Tema Oil Refinery (TOR). Allied Ghana, Ebony Oil & Gas Limited, Ghana National Gas Company Limited, Engen Ghana Ltd, Ghana National Petroleum Corporation, GOIL PLC, Ghana Petroleum Mooring Systems Ltd (GPMS), PETROSOL GHANA, ZEN Petroleum, etc.

KNUST

CHAPTER FOUR

FINDINGS AND DISCUSSION

4.1 Introduction

The study's fourth chapter presented findings based on the information gathered and presented in accordance with the study's research objectives. The study's initial part gives descriptive details on the institutions and key factors.

4.2 Findings

4.2.1 Respondents Background Information

The demographic data of interest is summarized in Table 4.1 below.

Table 4. 1 Demographic Information of Respondents

		Frequency	% of Total	Cumulative %
Gender	Female	69	22.0 %	22.0 %
	Male	245	78.0 %	100.0 %

Age Limit	18-24 years old	7	2.2 %	2.2 %
	25-34 years old	139	44.3 %	46.5 %
	35-44 years old	140	44.6 %	91.1 %
	45-54 years old	28	8.9 %	100.0 %
Role/Position	Logistics Manager	196	62.4 %	62.4 %
	Marketing Manager	14	4.5 %	66.9 %
	Others	35	11.1 %	78.0 %
	Purchasing Manager	55	17.5 %	95.5 %
	Warehouse Manager	14	4.5 %	100.0 %
Experience	Mean	10.2		
	Median	10		
	Standard deviation	5.38		
	N	314		

Source: Field Data (2023)

Males (245, 78%) dominated this study. Probably, due to the hard manual and laboring nature of the work within oil and gas industry, it is typical to find more male workers responding to the questionnaire circulated. The age distribution is largely represented by those within the ages of 24 to 44 years. The combined representation of these age distribution is 88.9%. This representation is typical of the active labour force of Ghana. Majority of the respondents are Logistics Managers (196, 62.4%). The mean years of experience working within the oil and gas industry for the sampled employees was 10 years. Thus, it can be inferred that these sampled workers have high degree of work experience within the oil and gas industry.

4.2.2 Variables Descriptive Information

This study focused on the following variables: Innovation Capabilities (IC), supply chain performance (SCP), and Supply Chain Ambidexterity (SCA). To examine the association

among these variables within a structural equation model (SEM) framework, it is prudent to provide information on the various assumptions: test of normality, reliability and validity test, and model fit.

4.2.2.1 Normality Test

To ensure that the data were selected from the normal distribution, a normality test was undertaken. The summary of the result is presented in Table 4.2 below.

Table 4. 2 Normality Test

Indicators	N	Mean	Median	Standard deviation	Min	Max	Skewness	Kurtosis
IC1	314	4.54	4	1.80	1	7	-0.142	-1.140
IC2	314	4.78	5	1.84	1	7	-0.261	-1.290
IC3	314	4.76	5	1.88	1	7	-0.462	-1.090
IC4	314	4.85	6	1.86	1	7	-0.382	-1.250
IC5	314	4.59	5	1.87	1	7	-0.222	-1.380
SCP1	314	4.43	5	1.88	1	7	-0.348	-1.070
SCP2	314	4.68	5	1.97	1	7	-0.204	-1.320
SCP3	314	4.34	4	2.05	1	7	-0.259	-1.260
SCP4	314	4.40	4	1.70	1	7	-0.234	-0.891
SCP5	314	4.65	5	1.78	1	7	-0.385	-1.110
SCP6	314	4.75	5	1.92	1	7	-0.369	-1.060
SCP7	314	4.87	5	1.79	1	7	-0.467	-0.998
SCP8	314	4.45	4	1.69	1	7	-0.160	-1.210
SCA1	314	4.78	5	1.88	1	7	-0.372	-1.100
SCA2	314	4.58	5	1.78	1	7	-0.458	-0.829
SCA3	314	4.83	5	1.76	1	7	-0.404	-1.050
SCA4	314	4.81	5	1.71	1	7	-0.555	-0.574
SCA5	314	4.32	4	1.83	1	7	-0.098	-1.040
SCA6	314	4.31	5	1.80	1	7	-0.221	-1.110
SCA7	314	3.82	4	0.95	2	5	-0.362	-0.803
SCA8	314	3.44	4	1.07	1	5	-0.269	-0.686
SCA9	314	3.54	4	1.04	1	5	-0.307	-0.398

Source: Field Data (2023)

Using skewness and kurtosis, the normal distribution of the data can be checked. The standard rule for skewness is that the coefficient should be within the range -2 to 2 for the data to assume normality. In terms of kurtosis, the standard rule is that the estimated coefficient for the data should be within the range of -7 to 7 (Matore and Khairani, 2020; Bayoud, 2021;

Jammalamadaka, Taufer and Terdik, 2021). Checking from Table 4.2, the both the kurtosis and skewness were within range for data normality.

4.2.2.2 Reliability and Validity Test

One common method to assess reliability is through internal consistency, which measures how well the items (indicators) of a latent variable correlate with each other. The most commonly used statistic for internal consistency is Cronbach's alpha (α). The acceptable α value for is 0.7 (Bonett and Wright, 2015; Taber, 2018). Composite reliability is an alternative to Cronbach's alpha and is particularly useful in SEM when dealing with latent constructs with multiple indicators. It takes into account the factor loadings, measurement error, and correlations between indicators. For composite reliability, values above 0.7 are generally considered acceptable.

In SEM, discriminant validity and convergent validity are the two main forms of validity that are frequently estimated (Hair *et al.*, 2017, 2021). Convergent validity demonstrates that different indicators (observed variables) of the same latent construct are highly correlated with each other. This is assessed by examining the factor loadings of the indicators on their respective latent constructs. High factor loadings indicate strong relationships and support for convergent validity. Discriminant validity demonstrates that the indicators of different constructs are less correlated with each other than they are with their own latent constructs. This helps to distinguish between different constructs in your model. You can assess this by comparing the correlations between latent constructs and examining whether they are significantly higher than the correlations between constructs.

Table 4. 3 Reliability and Validity Test

Indicators	Factor Loading (λ)	Cronbach's Alpha (α)	Number of items	CR	AVE
IC3	0.88	0.945	3	0.946	0.742

IC4	0.89				
IC5	0.92				
SCP1	0.81	0.92	5	0.927	0.799
SCP2	0.88				
SCP3	0.9				
SCP7	0.8				
SCP8	0.89				
SCA4	0.82	0.924	3	0.916	0.799
SCA5	0.89				
SCA6	0.97				

Source: Field Data (2023)

Based on the standard rule for Factor Loading (λ), indicators IC1 and IC2 were dropped since they had lower than 0.7 loading. With regards to SCP, indicators SCP4, SCP5, and SCP6 were dropped for having lower loadings. The construct SCA also had SCA1, SCA2, SCA3, SCA7, SCA8, and SCA9 being dropped. Cronbach's Alpha (α) estimated for the constructs were all greater than the required minimum threshold of 0.7 for attaining data reliability.

For estimated both convergent and discriminant validity, average variance extracted (AVE) and Heterotrait-monotrait (HTMT) were used respectively. Extant literature has advanced that AVE should be greater than 0.5 for the data to have convergent validity (Valentini and Damásio, 2016; dos Santos and Cirillo, 2021). For Heterotrait-monotrait (HTMT) which measure discriminant validity, the rule of thumb is that if HTMT < 0.85, there is evidence of discriminant validity between the two constructs. This suggests that the constructs are distinct and do not share too much common variance. On the contrary, if HTMT ≥ 0.85, there might be an issue with discriminant validity between the two constructs. It could indicate that the constructs share a significant amount of common variance, potentially leading to measurement overlap.

Table 4. 4 Heterotrait-monotrait (HTMT) ratio of correlations

	SCA	IC	SCP
SCA	1.000		
IC	0.669	1.000	
SCP	0.674	0.74	1.000

Source: Field Data (2023)

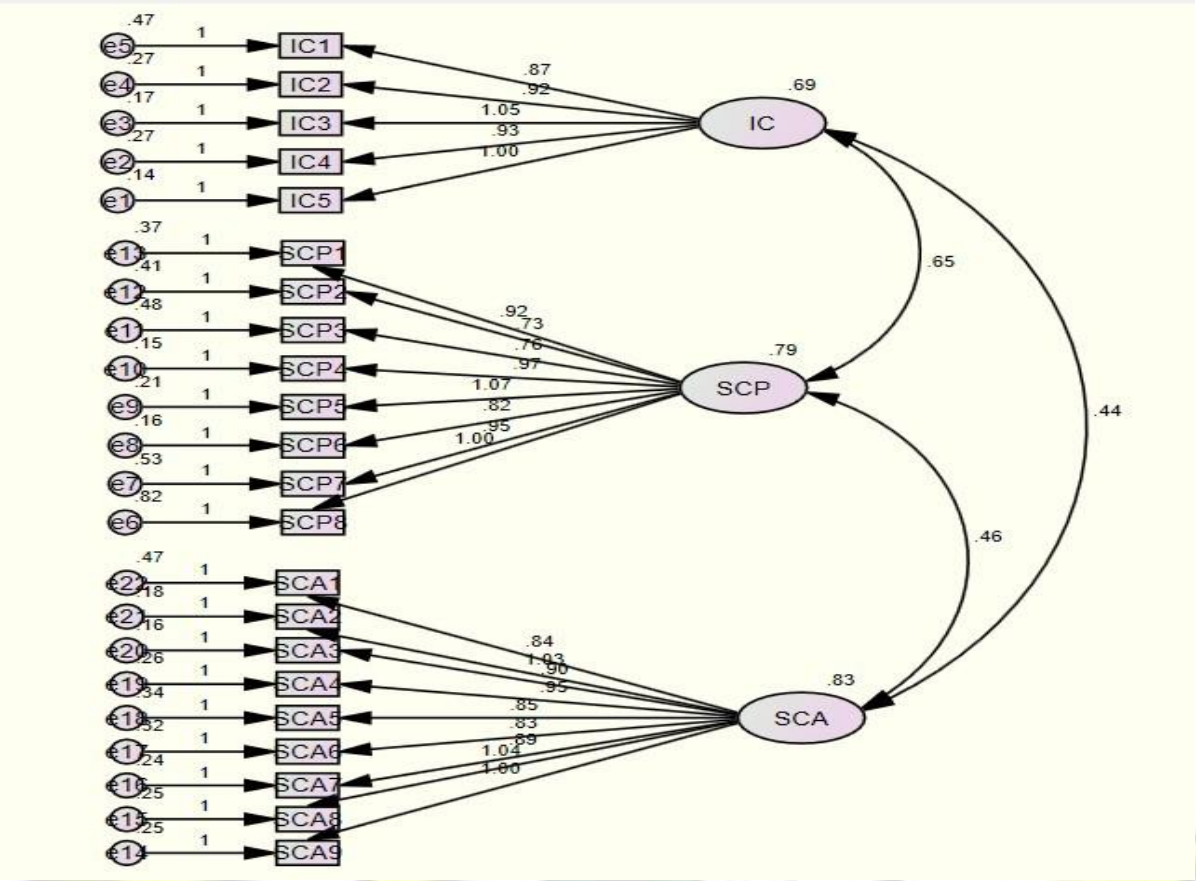
Clearly from Table 4.3 and Table 4.4 both convergent and discriminant validities are respectively established.

KNUST

4.2.2.3 Confirmatory Factor Analysis

CFA is commonly used to validate the measurement properties of a set of observed variables or items. Researchers often want to confirm that the items they are using to measure a particular construct are valid and accurately reflect that construct (Snowden *et al.*, 2015; John, 2019). Again, CFA allows researchers to test a specific theoretical model or hypothesis about how the observed variables are related to underlying latent constructs or factors. Researchers can confirm whether the hypothesized model fits the data well (Mohamad *et al.*, 2014; Snowden *et al.*, 2015). This study therefore estimated the CFA and presented in Figure 4.1 below.

Figure 4. 1 Confirmatory Factor Analysis



Model fit assessment is a critical step in SEM to determine how well the hypothesized model fits the observed data. Model fit indices provide a quantitative assessment of how closely the relationships and patterns specified in the model match the actual data collected. Evaluating model fit helps to determine whether the model adequately represents the underlying relationships among variables and whether any modifications are needed.

Table 4. 5 Model Fit

Fit indices	**Good fit**	**Acceptable Fit**	**Indices obtained**
X^2/df	$0 \leq X^2/df \leq 2$	$2 \leq X^2/df \leq 5$	0.012
RMSEA	0≤RMSEA≤0.05	0.05≤RMSEA≤0.08	0.040
NFI	0.95≤NFI≤1	0.90≤NFI≤0.95	0.991
TLI	0.95≤TLI≤1	0.90≤TLI≤0.95	0.996
SRMR	0.00≤SRMR≤0.05	0.05≤SRMR≤0.08	0.072

Source: Field Data (2023)

The conjectured model in this study was deemed to be good fitted as the estimated RMSEA stood at 0.04 less than the acceptable threshold of <0.05. Again, another measure of model fit is the TLI was anticipated to be greater than 0.95 was found to be 0.996 in this study. Simply, the entire model specified had a good fit.

4.2.3 Objective One: Impact of Supply Chain Ambidexterity on Supply Chain Performance

To provide answer to objective one of this study, a summary of the structural model is presented in Table 4.6 below.

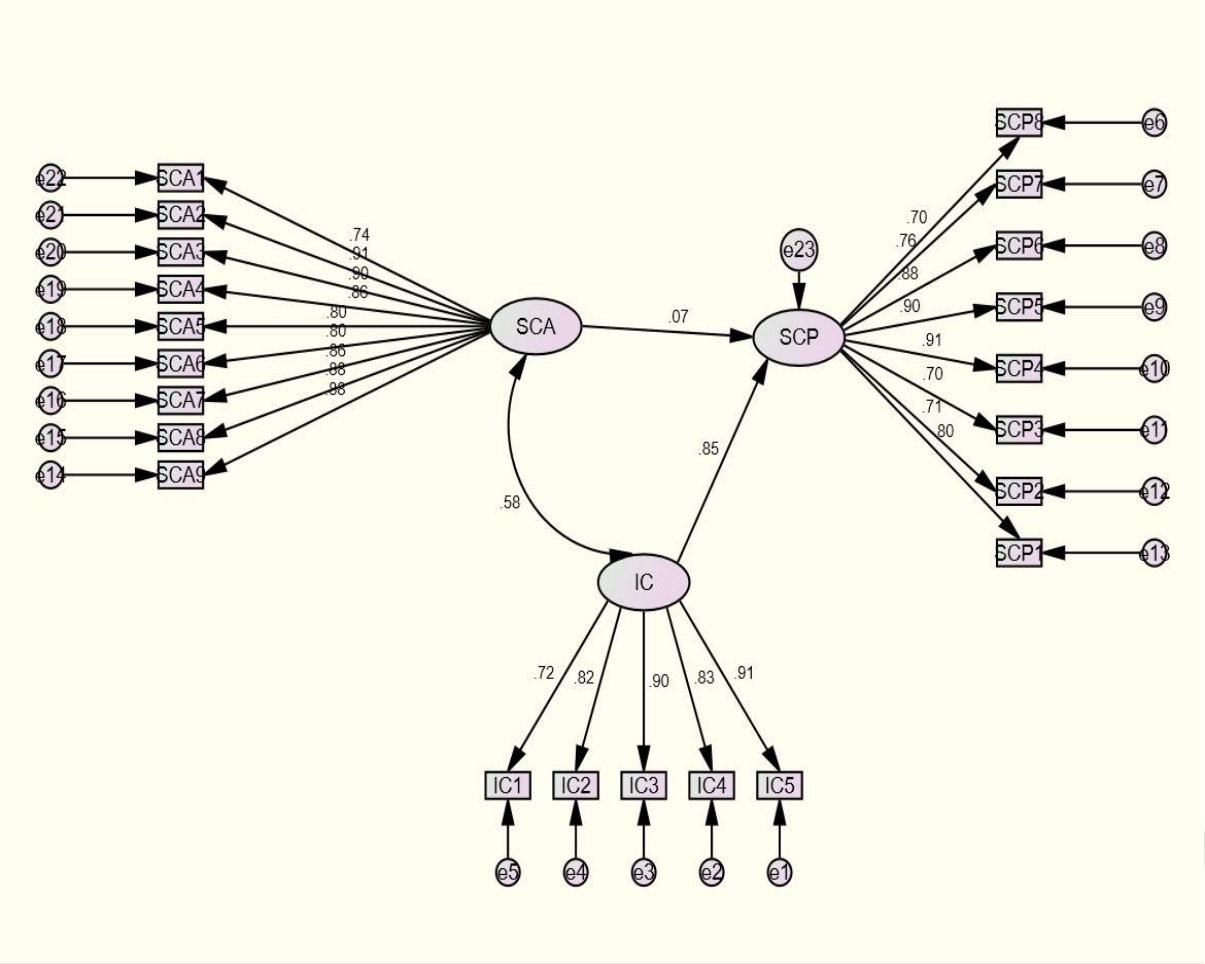
Table 4. 6 Structural Model Summary

Dep	Pred	Estimate	SE	z	p	Hypothesis	Decision
SCP	IC	0.8493	0.083	10.23253	< .001	H2	Supported
SCP	SCA	0.0700	0.014	5.00000	< .001	H1	Supported
SCP	SCA*IC	0.8081	0.0167	48.38922	< .001	H3	Supported

Source: Field Data (2023)

It is determined from the estimations in Table 4.6 that Supply Chain Ambidexterity (SCA) significantly improves supply chain performance (SCP) [β= 0.07, p<0.001]. Thus, H1 is supported in this study. This finding confirms earlier empirical studies by (Lee and Rha, 2016) and (Rojo, Llorens-Montes and Perez-Arostegui, 2016). However, this study contradicts earlier empirical study by Partanen et al. (2020) where performance rather decreased as firms deploy supply chain ambidexterity. The pictorial impact of the relationship between the dependent variable and independent variable variables is further provided in the path model below (that is Figure 4.2). Thus, the weight of impact for Supply Chain Ambidexterity (SCA) on supply chain performance (SCP) is covered as 0.07 as at significant level of p<0.001.

Figure 4. 2 Structural Path Model



4.2.4 Objective Two: Impact of Innovation Capabilities on Supply Chain Performance

Innovation Capabilities had a positive significant impact on supply chain performance [β= 0.8493, p<0.001]. The study by (Rajapathirana and Hui (2018) is thus confirmed by this current study with a significant positive association between innovation capabilities and supply chain performance.

4.2.5 Objective Three: Moderating Role of Innovation Capabilities

The association between supply chain ambidexterity (SCA) and supply chain performance (SCP) was shown to be strongly moderated by innovation capabilities [β=0.8081, p<0.001]. Overall, the magnitude of the moderating impact was greater than the direct association between Supply Chain Ambidexterity (SCA) and supply chain performance (SCP).

4.3 Discussion

The structural model summary in Table 4.6 reveals key findings that contribute to the understanding of the relationships under investigation. Firstly, it is evident that supply chain ambidexterity (SCA) has a positive impact on supply chain performance (SCP), as evidenced by the significant positive coefficient ($\beta = 0.07$, $p<0.001$). This result supports the study's hypothesis (H1) and aligns with previous research by Lee and Rha (2016) and Rojo et al. (2016), who also found a positive association between supply chain ambidexterity and performance. Interestingly, this finding contradicts the work of Partanen et al. (2020), where supply chain ambidexterity led to decreased performance, highlighting the complexity of these relationships. Nevertheless, the intriguing contradiction with the research conducted by Partanen et al. (2020) cannot be ignored. Partanen et al.'s findings suggest that supply chain ambidexterity may lead to decreased performance, emphasizing the intricate and contextdependent nature of these relationships. This inconsistency underscores the importance of considering various factors such as industry context, organizational characteristics, and the specific dimensions of supply chain ambidexterity in future studies. In conclusion, this structural model summary offers valuable insights into the intricate relationship between supply chain ambidexterity and supply chain performance. While it affirms the generally positive impact of SCA, it also highlights the need for a nuanced understanding of these dynamics, acknowledging that the effects can vary significantly depending on the specific circumstances and variables at play in different organizational contexts. Further research is necessary to unpack the underlying mechanisms and conditions that determine the nature of these relationships.

Secondly, the study establishes that innovation capabilities have a significant positive impact on supply chain performance ($\beta = 0.8493$, $p<0.001$). This outcome aligns with the research by

Rajapathirana and Hui (2018) and reinforces the importance of fostering innovation capabilities to enhance supply chain performance. This result underscores the vital role played by innovation capabilities in driving supply chain effectiveness and efficiency (van de Wetering, Mikalef and Helms, 2017; Vu, 2020; Migdadi, 2021). Organizations that prioritize and invest in cultivating a culture of innovation tend to outperform their peers in the supply chain arena. This alignment with existing research provides further validation of the importance of fostering innovation as a strategic imperative within supply chain management. In a world marked by rapid technological advancements and ever-evolving customer expectations, the ability to innovate within the supply chain has become a key differentiator (van de Wetering, Mikalef and Helms, 2017; Falahat *et al.*, 2020). It enables organizations to adapt to changing market conditions, seize new opportunities, and address emerging challenges effectively. This finding not only bolsters the theoretical foundation of the study but also underscores its practical relevance. Consequently, it emphasizes the significance of strategic efforts aimed at nurturing and harnessing innovation capabilities within supply chain management practices.

The research also looks at how innovative capabilities might act as a moderator. The findings show that innovation skills have a moderating influence on the connection between supply chain ambidexterity and performance ($\beta=0.8081$, $p<0.001$). This suggests that innovation capabilities play a pivotal role in strengthening the positive impact of supply chain ambidexterity on performance. Notably, this moderating effect is even more pronounced than the direct association between supply chain ambidexterity and performance. What's particularly striking is the magnitude of this moderating effect, which surpasses the direct association between supply chain ambidexterity and performance. This outcome underscores the critical role that innovation capabilities play in shaping the relationship between ambidextrous supply chain strategies and performance outcomes as advanced in various extant empirical studies

(Jakhar *et al.*, 2019; Zimmermann, Ferreira and Moreira, 2020; Arsawan *et al.*, 2022). It suggests that organizations not only benefit from pursuing supply chain ambidexterity but also gain even greater advantages when they possess strong innovation capabilities to complement this strategic approach (Ramanathan, Ramanathan and Bentley, 2018; Odoom and Mensah, 2019). In essence, this finding highlights the dynamic and synergistic nature of these two critical factors: supply chain ambidexterity and innovation capabilities. Organizations aspiring to excel in their supply chain performance should not only seek to balance exploration and exploitation within their supply chains but also invest in nurturing a culture of innovation that empowers them to harness the full potential of ambidextrous strategies. This insight offers a valuable strategic perspective for businesses seeking to optimize their supply chain operations in a rapidly changing and competitive landscape.

In conclusion, the findings of this study underscore the crucial roles of supply chain ambidexterity and innovation capabilities in influencing supply chain performance. Moreover, the significant moderating effect of innovation capabilities highlights their amplifying impact on the relationship between supply chain ambidexterity and performance. These findings contribute to the broader body of knowledge in supply chain management and have practical implications for organizations seeking to enhance their supply chain performance through strategic ambidexterity and innovation initiatives. However, it's important to acknowledge the dynamic and context-dependent nature of these relationships, warranting further research for a comprehensive understanding.

CHAPTER FIVE

SUMMARY, CONCLUSION, AND RECOMMENDATION

5.1 Introduction

The study's last chapter includes a summary of the key results, inferences drawn from the data and existing literature, and suggestions for business, government officials, as well as academia.

5.2 Summary of Findings

The study aimed to investigate the impact of supply chain ambidexterity and innovation capabilities on supply chain performance, as well as the moderating role of innovation capabilities in this relationship.

First, the findings demonstrate that supply chain ambidexterity (SCA) significantly improves supply chain performance (SCP), which is in line with Hypothesis 1. Secondly, the study confirms the positive impact of innovation capabilities on supply chain performance. This highlights how important it is to foster innovative capabilities in order to improve supply chain performance.

The moderating effect of innovative capacities is also explored in the study. The results show that innovation skills have a noticeably beneficial moderating influence on the association between supply chain ambidexterity and performance. This suggests that innovation capabilities play a pivotal role in amplifying the positive impact of supply chain ambidexterity on performance. Notably, this moderating effect surpasses the direct association between supply chain ambidexterity and performance.

In conclusion, the study's outcomes underscore the pivotal roles of supply chain ambidexterity and innovation capabilities in influencing supply chain performance. Furthermore, the

substantial moderating effect of innovation capabilities accentuates their ability to strengthen the connection between supply chain ambidexterity and performance. These findings contribute to the broader supply chain management knowledge and offer practical implications for organizations striving to enhance performance through strategic ambidexterity and innovation endeavours. However, recognizing the dynamic and contextspecific nature of these relationships, further research is warranted for a comprehensive grasp of the mechanisms at play.

5.3 Conclusion

Supply chain ambidexterity holds significant importance for oil and gas companies due to the unique challenges and dynamic nature of the industry. In an environment characterized by volatile oil prices, geopolitical shifts, and evolving market demands, the ability to simultaneously optimize conflicting objectives becomes crucial. Supply chain ambidexterity enables these companies to navigate the challenges of balancing cost efficiency with flexibility. This is particularly pertinent in an industry where operational resilience is paramount. The ever-present volatility in oil prices requires companies to adapt swiftly to changing circumstances. Moreover, with the diversification of portfolios to include renewable energy sources, managing distinct value chains is essential. Ambidexterity aids in addressing the inherent dilemma between investing in exploration for future reserves and maximizing the production of existing assets. As oil and gas companies integrate technological advancements and respond to regulatory pressures for sustainability, the need for ambidexterity becomes even more pronounced. It empowers companies to innovate strategically, collaborate effectively with partners, and explore new markets while maintaining operational efficiency.

In a sector where global supply chain complexities are the norm, and the pursuit of economic and environmental goals is intertwined, supply chain ambidexterity emerges as a critical strategic approach for achieving long-term success and resilience.

5.4 Recommendation

Based on the findings presented, several recommendations can be made for both policy and theory in the context of supply chain management and innovation capabilities:

Policy Recommendations:

1. **Promote Ambidextrous Strategies:** Organizations, particularly those in the oil and gas sector, should embrace ambidextrous strategies that balance cost efficiency with adaptability. Policy initiatives should encourage the development of organizational structures that support the simultaneous pursuit of exploration and exploitation goals.
2. **Invest in Innovation:** Governments and industry regulators should encourage oil and gas companies to invest in building innovation capabilities. Supportive policies could include incentives for research and development, technology adoption, and collaboration with academic and research institutions.
3. **Sustainability Integration:** Policymakers should emphasize the integration of sustainability considerations within the framework of supply chain ambidexterity. This entails aligning environmental and social objectives with the pursuit of operational excellence.

Theory Development:

1. **Dynamic Capabilities and Ambidexterity:** Future research could explore the role of dynamic capabilities in facilitating supply chain ambidexterity. Investigate how firms

with strong dynamic capabilities effectively manage the tensions between exploration and exploitation within their supply chain activities.

2. **Contextual Factors:** Further investigation is needed into the contextual factors that influence the effectiveness of supply chain ambidexterity. These factors might include firm size, industry maturity, technological complexity, and geographic location.
3. **Longitudinal Studies:** Longitudinal studies could provide insights into the sustainability and long-term effects of supply chain ambidexterity and innovation capabilities. Understanding how these practices evolve and impact performance over time can enrich the knowledge base.

In conclusion, the study's findings emphasize the significance of supply chain ambidexterity and innovation capabilities for enhancing supply chain performance. Policymakers should consider these insights when designing strategies to support industries, such as oil and gas, in their pursuit of competitiveness and resilience. On the theoretical front, further exploration into dynamic capabilities, contextual factors, and longitudinal effects can advance our understanding of the complexities surrounding supply chain management and innovation.

Reference

Ab Hamid, M.R., Sami, W. and Mohmad Sidek, M.H. (2017) 'Discriminant Validity Assessment: Use of Fornell & Larcker criterion versus HTMT Criterion', in *Journal of Physics: Conference Series*. Institute of Physics Publishing, p. 12163.

Abawi, K. (2013) *Data Collection Instruments (Questionnaire & Interview)*, *Training in Sexual and Reproductive Health Research Geneva*.

Abdalla, S. and Nakagawa, K. (2021) 'The interplay of digital transformation and collaborative innovation on supply chain ambidexterity', *Technology Innovation Management Review*, 11(3).

Abdulameer, S.S., Yaacob, N.A. and Ibrahim, Y.M. (2020) 'Measuring Leagile Supply Chain, Information Sharing, and Supply Chain Performance: Pre-Test and Pilot Test', *International Journal of Technology*, 11(4).

Ablo, A.D. and Overå, R. (2015) 'Networks, trust and capital mobilisation: Challenges of embedded local entrepreneurial strategies in Ghana's oil and gas industry', *Journal of Modern African Studies*. Cambridge University Press, pp. 391–413.

Abudu, H. and Sai, R. (2020) 'Examining prospects and challenges of Ghana's petroleum industry: A systematic review', *Energy Reports*. Elsevier Ltd, pp. 841–858.

Acharya, C., Ojha, D., Gokhale, R. and Patel, P.C. (2022). Managing information for innovation using knowledge integration capability: The role of boundary spanning objects. *International Journal of Information Management*, *62*, p.102438.

Ackah, C. and Mohammed, A.S. (2018) *Local content law and practice: The case of the oil and gas industry in Ghana*. UNU-WIDER (WIDER Working Paper).

Adadzi, F.D., Godson-Amamoo, N.S. and Nunoo, J. (2022) 'The Ghanaian State and Governance of the Upstream Oil and Gas Industry', in *Petroleum Resource Management in Africa*. Springer International Publishing, pp. 349–402.

Adam, A., Zakuan, N., Bichi, S.A.U.A.A., Shettima, U., Ali, M. and Almasradi, R.B. (2019). 'Supply chain sustainability practices of oil servicing firms in the downstream sector of Nigeria's oil and gas industry'. *Journal of Economic Info*, *6*(4), pp.11-14.

Adam, A.M. (2020) 'Sample Size Determination in Survey Research', *Journal of Scientific Research and Reports* [Preprint].

Agami, N., Saleh, M. and Rasmy, M. (2012) 'Supply Chain Performance Measurement Approaches: Review and Classification', *The Journal of Organizational Management Studies* [Preprint].

Ahmad, N. and Saifudin, A.M. (2014) 'Supply Chain Management in Telecommunication Industry : The Mediating Role of Logistics Integration', *ICTOM 04 – 4th International Conference on Technology and Operations Management Supply* [Preprint], (August).

Ahmad, S., Zulkurnain, N. and Khairushalimi, F. (2016) 'Assessing the Validity and Reliability of a Measurement Model in Structural Equation Modeling (SEM)', *British Journal of Mathematics & Computer Science*, 15(3), pp. 1–8.

Akhavan, P. and Mahdi Hosseini, S. (2015) 'Social capital, knowledge sharing, and innovation capability: an empirical study of R&D teams in Iran,

Akhavan, P. and Philsoophian, M. (2022) 'Improving of Supply Chain Collaboration and Performance by Using Block Chain Technology as a Mediating Role and Resilience as a Moderating Variable', *Journal of the Knowledge Economy* [Preprint].

Alamsjah, F. and Asrol, M. (2022) 'Supply chain ambidexterity and performance under uncertainty: The case of inter-island logistics in Indonesia', *Uncertain Supply Chain Management*, 10(3).

Alamsjah, F. and Yunus, E.N. (2022) 'Achieving Supply Chain 4.0 and the Importance of Agility, Ambidexterity, and Organizational Culture: A Case of Indonesia', *Journal of Open Innovation: Technology, Market, and Complexity*, 8(2).

Alhosani, A. and Zabri, S.M. (2018) 'A uniform supply chain management framework for oil and gas sector: A preliminary review', *Journal of environmental management.* [Preprint].

Al-Janabi, Y.T. (2020) 'An Overview of Corrosion in Oil and Gas Industry', in *Corrosion Inhibitors in the Oil and Gas Industry*. Wiley, pp. 1–39.

Altay, N., Gunasekaran, A., Dubey, R. and Childe, S.J. (2018). 'Agility and resilience as antecedents of supply chain performance under moderating effects of organizational culture within the humanitarian setting: a dynamic capability view'. *Production Planning & Control*, *29*(14), pp.1158-1174.

Amoako, F.O.B., Donkor, H., Kwarteng, E. and Fordjour, E. (2022). 'Economic Impact of the COVID-19 Pandemic on the Oil and Gas Sector in Ghana'. In *SPE Nigeria Annual International Conference and Exhibition*. OnePetro.

Amponsah, R. and Opei, F.K. (2017) 'Ghana's downstream petroleum sector: An assessment of key supply chain challenges and prospects for growth'. *International Journal of Management and Business Studies*.

Anand, N. and Grover, N. (2015) 'Measuring retail supply chain performance: Theoretical model using key performance indicators (KPIs)', *Benchmarking*, 22(1), pp. 135–166.

Anku-Tsede, O. (2016) 'Occupational health and safety practices and the regulatory regime: Evidence from the infantile oil fields of Ghana', in *Advances in Intelligent Systems and Computing*. Springer Verlag, pp. 75–88.

Aoki, K. and Wilhelm, M. (2017) 'The role of ambidexterity in managing buyer-supplier relationships: The Toyota case', *Organization Science*, 28(6).

Archil Artmeladze (2021) 'Improving the Management of Logistic Operations in the Georgian Oil and Gas Industry', *Science Review* [Preprint], (1(36)).

Ardito, L., Petruzzelli, A.M., Dezi, L. and Castellano, S. (2020). 'The influence of inbound open innovation on ambidexterity performance: does it pay to source knowledge from supply chain stakeholders?'. *Journal of Business Research*, *119*, pp.321-329.

Ariweriokuma, S. (2021) 'Oil and gas in Africa', in *The Political Economy of Oil and Gas in Africa*.

Aryanto, R., Fontana, A. and Afiff, A.Z. (2015) 'Strategic Human Resource Management, Innovation Capability and Performance: An Empirical Study in Indonesia Software Industry', *Procedia - Social and Behavioral Sciences*, 211.

Aslam, H., Blome, C., Roscoe, S. and Azhar, T.M. (2018). 'Dynamic supply chain capabilities: How market sensing, supply chain agility and adaptability affect supply chain ambidexterity'. *International Journal of Operations & Production Management*, *38*(12), pp.2266-2285.

Aslam, H., Khan, A.Q., Rashid, K. and Rehman, S.U. (2020). 'Achieving supply chain resilience: the role of supply chain ambidexterity and supply chain agility'. *Journal of Manufacturing Technology Management*, *31*(6), pp.1185-1204.

Aulakh, P.K., Settanni, E. and Srai, J.S. (2022) 'Continuous manufacturing technologies in upstream pharmaceutical supply chains: Combining engineering and managerial criteria', *Journal of Multi-Criteria Decision Analysis*, 29(3–4), pp. 298–312.

Balan, P. and Lindsay, N. (2010) 'Innovation capability: Exploring the factors that make up this construct in the services sector', *AGSE International Entrepreneurship Research Exchange (7th : 2010 : Sunshine Coast, Australia)* [Preprint], (Ic).

Barney, J.B. (1991) 'Firm Resources and Sustained Competitive Advantage', *Journal of Management*, 17(1), pp. 99–120.

Barney, J.B. (2021) 'The Emergence of Resource-Based Theory: A Personal Journey', *Journal of Management*, 47(7).

Barney, J.B., Ketchen, D.J. and Wright, M. (2021) 'Resource-Based Theory and the Value Creation Framework', *Journal of Management*, 47(7).

Bayoud, H.A. (2021) 'Tests of normality: new test and comparative study', *Communications in Statistics: Simulation and Computation*, 50(12).

Beske, P., Land, A. and Seuring, S. (2014) 'Sustainable supply chain management practices and dynamic capabilities in the food industry: A critical analysis of the literature', *International Journal of Production Economics*, 152.

Boakye, B., Owusu-kumih, E. and Yaotse, K. (2022). 'Redeeming An Oil Refinery in An African Rentier Economy: A Perspective on Salvaging Ghana'S Tema Oil Refinery'. *Available at SSRN 4053857*.

Bonett, D.G. and Wright, T.A. (2015) 'Cronbach's alpha reliability: Interval estimation, hypothesis testing, and sample size planning', *Journal of Organizational Behavior*, 36(1), pp. 3–15.

Bryman, A. and Bell, E. (2015) 'Business research methods: Oxford University Press', *American journal of sociology* [Preprint].

Cao, M. and Zhang, Q. (2011) 'Supply chain collaboration: Impact on collaborative advantage and firm performance', *Journal of Operations Management*, 29(3).

Casteel, A. and Bridier, N.L. (2021) 'Describing populations and samples in doctoral student research', *International Journal of Doctoral Studies*, 16.

Chai, M.J. (2017) 'Product regulatory compliance in an agile supply chain', in *Society of Petroleum Engineers - SPE Asia Pacific Health, Safety, Security, Environment and Social Responsibility Conference 2017*.

Christopher, M. and Peck, H. (2004) 'Building the Resilient Supply Chain', *The International Journal of Logistics Management*, 15(2), pp. 1–14.

Christopher, M. and Towill, D. (2001) 'An integrated model for the design of agile supply chains', *International Journal of Physical Distribution & Logistics Management*, 31(4), pp. 235–246.

Cognizant (2022) *What is oil and gas supply chain? | Cognizant*.

Constant, F., Calvi, R. and Johnsen, T.E. (2020) 'Managing tensions between exploitative and exploratory innovation through purchasing function ambidexterity', *Journal of Purchasing and Supply Management*, 26(4), p. 100645.

Creswell, John.W. and Creswell, J.D. (2018) 'The Selection of a Research Approach The Three Approaches to Research', in *Research design: Qualitative, quantitative and mixed methods approaches*.

Dewi, I. and Adiarsi, G.R. (2020) 'Leveraging the Covid-19 Crisis in Making Work-FromHome a Mainstream Practice in the Oil and Gas Industry', *International Journal of Multicultural and Multireligious Understanding*, 7(6), p. 305.

Díaz, J.T., Rojas, M.M., Contreras, A.T.V., Bolivar, H., Cubillos, J.D.V. and González, J.F.P. (2015). 'Methodology for decisions making in transportation logistics function'. In *2015 International Conference on Industrial Engineering and Operations Management (IEOM)* (pp. 1-8). IEEE.

Dominguez, R., Cannella, S., Ponte, B. and Framinan, J.M. (2021). 'Information sharing in decentralised supply chains with partial collaboration'. *Flexible services and manufacturing journal*, pp.1-30.

Etikan, I. (2016) 'Comparison of Convenience Sampling and Purposive Sampling', *American Journal of Theoretical and Applied Statistics*, 5(1).

Faizal, M., Zaidi, A. and Othman, S.N. (2012) 'Understanding the Concept of Dynamic Capabilities by Dismantling Teece, Pisano, and Shuen (1997)'s Definition', *International Journal of Academic Research in Business and Social Sciences*, 2(8).

Falahat, M., Ramayah, T., Soto-Acosta, P. and Lee, Y.Y. (2020). 'SMEs internationalization: The role of product innovation, market intelligence, pricing and marketing communication capabilities as drivers of SMEs' international performance'. *Technological forecasting and social change*, *152*, p.119908.

Farrall, S. (2021) 'Research Designs and Research Methods', in *Critical Criminological Perspectives*.

Fernando, Y., Chidambaram, R.R.M. and Wahyuni-TD, I.S. (2018) 'The impact of Big Data analytics and data security practices on service supply chain performance', *Benchmarking*, 25(9).

Flick, U. (2020) *Introducing Research Methodology: Thinking Your Way Through Your Research Project*.

Freeman, R.E., Dmytriyev, S.D. and Phillips, R.A. (2021) 'Stakeholder Theory and the Resource-Based View of the Firm', *Journal of Management*, 47(7).

Gastaldi, L., Lessanibahri, S., Tedaldi, G. and Miragliotta, G. (2022). 'Companies' adoption of Smart Technologies to achieve structural ambidexterity: an analysis with SEM'. *Technological Forecasting and Social Change*, *174*, p.121187.

Ghaithan, A.M., Attia, A.M. and Duffuaa, S.O. (2021) 'A multi-objective model for an integrated oil and natural gas supply chain under uncertainty', *RAIRO - Operations Research*, 55(6).

El Gizawi, N. (2014) 'The dynamic capabilities theory: assessment and evaluation as a contributing theory for supply chain management', *3rd IBA Bachelor Thesis Conference* [Preprint].

Graham, E. and Ovadia, J.S. (2019) 'Oil exploration and production in Sub-Saharan Africa, 1990-present: Trends and developments', *Extractive Industries and Society*. Elsevier Ltd, pp. 593–609.

Gu, M., Yang, L. and Huo, B. (2021) 'The impact of information technology usage on supply chain resilience and performance: An ambidexterous view', *International Journal of Production Economics*, 232.

Gualandris, J., Legenvre, H. and Kalchschmidt, M. (2018) 'Exploration and exploitation within supply networks: Examining purchasing ambidexterity and its multiple performance implications', *International Journal of Operations and Production Management*, 38(3).

Gupta, A.K. (2021) 'Innovation dimensions and firm performance synergy in the emerging market: A perspective from Dynamic Capability Theory & Signaling Theory', *Technology in Society*, 64, p. 101512.

Hair Jr, J.F., Hult, G.T.M., Ringle, C.M., Sarstedt, M., Danks, N.P. and Ray, S. (2021). *Partial least squares structural equation modeling (PLS-SEM) using R: A workbook* (p. 197). Springer Nature.

Hair Jr, J.F., Hult, G.T.M., Ringle, C.M., Sarstedt, M., Danks, N.P., Ray, S., Hair, J.F., Hult, G.T.M., Ringle, C.M., Sarstedt, M. and Danks, N.P. (2021). 'An introduction to structural equation modeling'. *Partial least squares structural equation modeling (PLS-SEM) using R: a workbook*, pp.1-29.

Hair, J.F. and Brunsveld, N. (2019) *Essentials of business research methods*, *Essentials of Business Research Methods*. Taylor and Francis.

Handfield, R.B., Cousins, P.D., Lawson, B. and Petersen, K.J. (2015). 'How can supply management really improve performance? A knowledge‐based model of alignment capabilities'. *Journal of Supply Chain Management*, *51*(3), pp.3-17.

Hitt, M.A., Xu, K. and Carnes, C.M. (2016) 'Resource based theory in operations management research', *Journal of Operations Management*, 41, pp. 77–94.

Ho, T., Kumar, A. and Shiwakoti, N. (2020) 'Supply chain collaboration and performance: an empirical study of maturity model', *SN Applied Sciences*, 2(4), pp. 1–16.

Hong, J., Zhang, Y. and Ding, M. (2018) 'Sustainable supply chain management practices, supply chain dynamic capabilities, and enterprise performance', *Journal of Cleaner Production*, 172, pp. 3508–3519.

Ibrahim, M.D. and Daneshvar, S. (2017) 'Supply chain pessimistic efficiency evaluation using a modified data envelopment analysis model', *International Journal of Supply Chain Management*, 6(3).

Ikatrinasari, Z.F., Harianto, N. and Yuslistyari, E.I. (2020) 'Improvement of supply chain performance of printing services company based on supply chain operation references (Scor) model', *Uncertain Supply Chain Management*, 8(4).

Isnaini, D.B.Y., Nurhaida, T. and Pratama, I. (2020) 'Moderating effect of supply chain dynamic capabilities on the relationship of sustainable supply chain management practices and organizational sustainable performance: A study on the restaurant industry in Indonesia', *International Journal of Supply Chain Management*, 9(1).

Jakhar, S.K., Mangla, S.K., Luthra, S. and Kusi-Sarpong, S. (2019). 'When stakeholder pressure drives the circular economy: Measuring the mediating role of innovation capabilities'. *Management Decision*, *57*(4), pp.904-920.

Jammalamadaka, S.R., Taufer, E. and Terdik, G.H. (2021) 'On multivariate skewness and kurtosis', *Sankhya: The Indian Journal of Statistics*, 83(2).

Jerbi, A., Jribi, H., Aljuaid, A.M., Hachicha, W. and Masmoudi, F. (2022). 'Design of supply chain transportation pooling strategy for reducing CO2 emissions using a simulation-based methodology: a case study'. *Sustainability*, *14*(4), p.2331.

Jermsittiparsert, K. and Pithuk, L. (2019) 'Exploring the nexus between supply chain ambidexterity, supply chain agility, supply chain adaptability and the marketing sensing of manufacturing firms in indonesia', *Humanities and Social Sciences Reviews*, 7(2).

Jilcha Sileyew, K. (2020) 'Research Design and Methodology', in *Cyberspace*. IntechOpen.

John, W. (2019) 'Scale Development and Construct Validity of Organizational Capital in Customer Relationship Management Context: A Confirmatory Factor Analysis Approach', *Business Perspectives and Research*, 7(1).

Kannankutty, M. and Menon, A.M. (2021) 'Implementing Cognitive Procurement and its Influence on Supply Chain During the Era of Digital Transformation in Oil and Gas Industry 4.0', in *Society of Petroleum Engineers - Abu Dhabi International Petroleum Exhibition and Conference, ADIP 2021*.

Kapoor, M. and Aggarwal, V. (2020) 'Tracing the economics behind dynamic capabilities theory', *International Journal of Innovation Science*, 12(2).

Kellermanns, F., Walter, J., Crook, T.R., Kemmerer, B. and Narayanan, V. (2016). 'The resource‐based view in entrepreneurship: A content‐analytical comparison of researchers' and entrepreneurs' views'. *Journal of Small Business Management*, *54*(1), pp.26-48.

Khan, A., Chen, C.C., Lu, K.H., Wibowo, A., Chen, S.C. and Ruangkanjanases, A. (2021). 'Supply chain ambidexterity and green SCM: moderating role of network capabilities'. *Sustainability*, *13*(11), p.5974.

Kim, J.S. and Shin, N. (2019) 'The impact of blockchain technology application on supply chain partnership and performance', *Sustainability (Switzerland)*, 11(21).

Klass, A.B. and Meinhardt, D. (2014) 'Transporting Oil and Gas: U.S. Infrastructure Challenges', *Iowa Law Review*, 100.

Kozlenkova, I. V., Samaha, S.A. and Palmatier, R.W. (2014) 'Resource-based theory in marketing', *Journal of the Academy of Marketing Science*, 42(1), pp. 1–21.

Kristal, M.M., Huang, X. and Roth, A. V. (2010) 'The effect of an ambidextrous supply chain strategy on combinative competitive capabilities and business performance', *Journal of Operations Management*, 28(5), pp. 415–429.

Kwamega, M., Li, D. and Abrokwah, E. (2018) 'Supply chain management practices and agribusiness firms' performance: Mediating role of supply chain integration', *South African Journal of Business Management*, 49(1).

Lam, L., Nguyen, P., Le, N. and Tran, K. (2021). 'The relation among organizational culture, knowledge management, and innovation capability: Its implication for open innovation'. *Journal of Open Innovation: Technology, Market, and Complexity*, *7*(1), p.66.

Le, P.B. and Lei, H. (2019) 'Determinants of innovation capability: the roles of transformational leadership, knowledge sharing and perceived organizational support', *Journal of Knowledge Management*, 23(3).

Lee, H. (2018) 'Research on Improving Logistics Efficiency in the Iraqi Oil and Gas Industry', *Journal of Management and Training for Industries*, 5(1).

Lee, S.M. and Rha, J.S. (2016) 'Ambidextrous supply chain as a dynamic capability: building a resilient supply chain', *Management Decision*, 54(1), pp. 2–23.

Li, L., Shan, S., Shou, Y., Kang, M. and Park, Y.W. (2023). 'Sustainable sourcing and agility performance: The moderating effects of organizational ambidexterity and supply chain disruption'. *Australian Journal of Management*, *48*(2), pp.262-283.

Lianto, B., Dachyar, M. and Soemardi, T.P. (2022) 'Modelling the continuous innovation capability enablers in Indonesia's manufacturing industry', *Journal of Modelling in Management*, 17(1).

Liebe, H. and Hunter, C.J. (2021) 'Ethical considerations of academic surgical research', *Seminars in Pediatric Surgery* [Preprint].

Lima, C., Relvas, S. and Barbosa-Póvoa, A.P.F.D. (2016) 'Downstream oil supply chain management: A critical review and future directions', *Computers and Chemical Engineering*. Elsevier Ltd, pp. 78–92.

Lisitsa, S., Levina, A. and Lepekhin, A. (2019) 'Supply-chain management in the oil industry', *E3S Web of Conferences*. Edited by O. Kalinina, 110, p. 02061.

Liu, L., An, S. and Liu, X. (2022) 'Enterprise digital transformation and customer concentration: An examination based on dynamic capability theory', *Frontiers in Psychology*, 13.

Liu, Y., Liao, Y. and Li, Y. (2018) 'Capability configuration, ambidexterity and performance: Evidence from service outsourcing sector', *International Journal of Production Economics*, 200. Lohr, S.L. (2019) *Sampling*. Chapman and Hall/CRC.

Longo, F., Nicoletti, L., Padovano, A., d'Atri, G. and Forte, M. (2019). 'Blockchain-enabled supply chain: An experimental study'. *Computers & Industrial Engineering*, *136*, pp.57-69.

Lutfiani, D.S. and Nur, S.A. (2019) 'Innovation Capability and Supply Chain Integration in MSMEs Performance', *The International Journal of Business & Management*, 7(12).

MacCarthy, G.A.K., Asamoah, C.N., Ephraim, B.A., Alekhin, V.N. and Poluyan, L.V. (2019). 'Analyzing Domino Effects Occurring on Gasoline Storage Tanks at the Bulk Oil Storage and Transportation (BOST) Depot'. *Russian Journal of Construction Science and Technology*, *5*(2).

Matore, E.M. and Khairani, A.Z. (2020) 'The Pattern of Skewness and Kurtosis Using Mean Score And Logit In Measuring Adversity Quotient (AQ) For Normality Testing', *International Journal of Future Generation Communication and Networking*, 13(1).

Mavengere, N.B. (2013) 'Information technology role in supply chain's strategic agility', *International Journal of Agile Systems and Management*, 6(1), pp. 7–24.

Mbima, D. and Tetteh, F.K. (2023a) 'Effect of business intelligence on operational performance: the mediating role of supply chain ambidexterity', *Modern Supply Chain Research and Applications*, 5(1), pp. 28–49.

Mbima, D. and Tetteh, F.K. (2023b) 'Effect of business intelligence on operational performance: the mediating role of supply chain ambidexterity', *Modern Supply Chain Research and Applications*, 5(1), pp. 28–49.

Mehralian, G., Zarenezhad, F. and Ghatari, A.R. (2015) 'Developing a model for an agile supply chain in pharmaceutical industry', *International Journal of Pharmaceutical and Healthcare Marketing*, 9(1).

Migdadi, M.M. (2021) 'Knowledge management, customer relationship management and innovation capabilities', *Journal of Business and Industrial Marketing*, 36(1).

Afthanorhan, W.M.A.B.W., Ahmad, S. and Mamat, I. (2014). 'Pooled Confirmatory Factor Analysis (PCFA) using structural equation modeling on volunteerism program: A step by step approach'. *International Journal of Asian Social Science*, *4*(5), pp.642-653.

Mojarad, A.A.S., Atashbari, V. and Tantau, A. (2018). 'Challenges for sustainable development strategies in oil and gas industries'. In *Proceedings of the International Conference on Business Excellence* (Vol. 12, No. 1, pp. 626-638).

Muhammad, F., Ikram, A., Jafri, S.K. and Naveed, K. (2020). 'Product innovations through ambidextrous organizational culture with mediating effect of contextual ambidexterity: An empirical study of it and telecom firms'. *Journal of Open Innovation: Technology, Market, and Complexity*, *7*(1), p.9.

Nagano, H. (2020) 'The growth of knowledge through the resource-based view', *Management Decision*, 58(1), pp. 98–111.

Nazari, K., Akbari, P., Mahdikhani, R. and Elyasi, E. (2023). 'Analyzing the Impact of Supply Chain Ambidexterity on the Financial Performance with Emphasis on the Moderating Role of Network Capability and Strategic Information Flow'. *Journal of Innovation Management in Defensive Organizations*, *5*(18), pp.35-58.

Negi, S. (2021) 'Supply chain efficiency framework to improve business performance in a competitive era', *Management Research Review*, 44(3), pp. 477–508.

Novikov, A. and Novikov, D. (2019) *Research methodology: From philosophy of science to research design*.

Odoom, R. and Mensah, P. (2019) 'Brand orientation and brand performance in SMEs: The moderating effects of social media and innovation capabilities', *Management Research Review*, 42(1).

Ojha, D., Acharya, C. and Cooper, D. (2018a) 'Transformational leadership and supply chain ambidexterity: Mediating role of supply chain organizational learning and moderating role of uncertainty', *International Journal of Production Economics*, 197, pp. 215–231.

Ojha, D., Acharya, C. and Cooper, D. (2018b) 'Transformational leadership and supply chain ambidexterity: Mediating role of supply chain organizational learning and moderating role of uncertainty', *International Journal of Production Economics*, 197, pp. 215–231.

Olhager, J. and Prajogo, D. (2011) 'Supply chain integration and performance: The effects of long-term relationships, information technology and sha... Cite this paper Supply chain integration and performance: The effects of long-term relationships, information technology and sharing, and logistics integration', *Elsevier* [Preprint].

Partanen, J., Kohtamäki, M., Patel, P.C. and Parida, V. (2020). 'Supply chain ambidexterity and manufacturing SME performance: The moderating roles of network capability and strategic information flow'. *International Journal of Production Economics*, *221*, p.107470.

Pawar, N. (2020) '6. Type of Research and Type Research Design', *Social Research Methodology*, 8(1).

Penrose, E. (1996) 'The theory of the growth of the firm', *Long Range Planning*, 29(4). pouline, habimana, T. (2013) 'Data Collection Instruments (Questionnaire & Interview)', *Training in Sexual and Reproductive Health Research Geneva*, 1(Geneva Workshop 2013).

Prajogo, D. and Olhager, J. (2012) 'Supply chain integration and performance: The effects of long-term relationships, information technology and sharing, and logistics integration', *International Journal of Production Economics*, 135(1).

Pu, X., Wang, Z. and Chan, F.T.S. (2020) 'Leveraging Open E-Logistic Standards to Achieve Ambidexterity in Supply Chain', *Journal of Computer Information Systems*, 60(4).

Puspita, L.E., Christiananta, B. and Ellitan, L. (2020) 'The effect of strategic orientation, supply chain capability, innovation capability on competitive advantage and performance of furniture retails', *International Journal of Scientific and Technology Research*, 9(3).

Rafailidis, A., Trivellas, P. and Polychroniou, P. (2017) 'The mediating role of quality on the relationship between cultural ambidexterity and innovation performance', *https://doi.org/10.1080/14783363.2017.1309122*, 28(9–10), pp. 1134–1148.

Rajapathirana, R.P.J. and Hui, Y. (2018a) 'Relationship between innovation capability, innovation type, and firm performance', *Journal of Innovation and Knowledge*, 3(1).

Rajapathirana, R.P.J. and Hui, Y. (2018b) 'Relationship between innovation capability, innovation type, and firm performance', *Journal of Innovation & Knowledge*, 3(1), pp. 44–55.

Ramanathan, R., Ramanathan, U. and Bentley, Y. (2018) 'The debate on flexibility of environmental regulations, innovation capabilities and financial performance – A novel use of DEA', *Omega (United Kingdom)*, 75.

Roemer, E., Schuberth, F. and Henseler, J. (2021) 'HTMT2–an improved criterion for assessing discriminant validity in structural equation modeling', *Industrial Management and Data Systems*, 121(12).

Rojo, A., Llorens-Montes, J. and Perez-Arostegui, M.N. (2016) 'The impact of ambidexterity on supply chain flexibility fit', *Supply Chain Management*, 21(4).

Roldán Bravo, M.I., Ruiz-Moreno, A. and Lloréns Montes, F.J. (2018) 'Examining desorptive capacity in supply chains: the role of organizational ambidexterity', *International Journal of Operations and Production Management*, 38(2).

Rombe, E. and Hadi, S. (2022) 'The impact of supply chain capability and supply chain performance on marketing performance of retail sectors', *Uncertain Supply Chain Management*, 10(2).

Saad, S., Mohamed Udin, Z. and Hasnan, N. (2014) 'Dynamic supply chain practices in Malaysia', in *ISTMET 2014 - 1st International Symposium on Technology Management and Emerging Technologies, Proceedings*.

Saleheen, F. and Habib, M.M. (2023) 'Embedding attributes towards the supply chain performance measurement', *Cleaner Logistics and Supply Chain*, 6. dos Santos, P.M. and Cirillo, M.Â. (2021) 'Construction of the average variance extracted index for construct

validation in structural equation models with adaptive regressions', *Communications in Statistics: Simulation and Computation* [Preprint].

Sarkar, B., Omair, M. and Kim, N. (2020) 'A cooperative advertising collaboration policy in supply chain management under uncertain conditions', *Applied Soft Computing Journal*, 88.

Saunders, M.N.K., Lewis, P. and Thornhill, A. (2019) 'Chapter 4: Understanding research philosophy and approaches to theory development', in *Research Methods for Business Studies*.

Schamp, C., Heitmann, M. and Katzenstein, R. (2019) 'Consideration of ethical attributes along the consumer decision-making journey', *Journal of the Academy of Marketing Science*, 47(2), pp. 328–348.

Setiawan, E.B., Agusinta, L., Suryawan, R.F., Ricardianto, P., Saria, M., Mulyono, S. and Sakti, R.F.J. (2021). 'Changes in demand and supply of the crude oil market during the COVID-19 pandemic and its effects on the natural gas market'. *International Journal of Energy Economics and Policy*.

Sian, T. and Singh2, P. (2019) *A Practice in a Research Methodology Class*, *ERIC*.

Skaten, M. (2018) *Ghana's Oil Industry*. Oxford, United Kingdom.

Snowden, A., Watson, R., Stenhouse, R. and Hale, C. (2015). 'Emotional Intelligence and Nurse Recruitment: Rasch and confirmatory factor analysis of the trait emotional intelligence questionnaire short form'. *Journal of advanced nursing*, *71*(12), pp.2936-2949.

Sparks, C.S. and Joyner, K. (2019) 'Population Research Briefs in Population Research and Policy Review', *Population Research and Policy Review*.

Stelmaszczyk, M. (2020) 'How absorptive capacity and organisational learning orientation interact to enable innovation capability? An empirical examination', *Entrepreneurial Business and Economics Review*, 8(1).

Sulistyo, H. and Siyamtinah (2016) 'Innovation capability of SMEs through entrepreneurship, marketing capability, relational capital and empowerment', *Asia Pacific Management Review*, 21(4).

Taber, K.S. (2018) 'The Use of Cronbach's Alpha When Developing and Reporting Research Instruments in Science Education', *Research in Science Education*, 48(6), pp. 1273–1296.

Tarigan, Z.J.H., Siagian, H. and Jie, F. (2021) 'Impact of internal integration, supply chain partnership, supply chain agility, and supply chain resilience on sustainable advantage', *Sustainability (Switzerland)*, 13(10).

Teece, D.J. (2018) 'Business models and dynamic capabilities', *Long Range Planning*, 51(1).

Tema Oil Refinery (2022) *Tema Oil Refinery – TOR – The Nations Premier Refinery*.

Thongrawd, C., Ramanust, S., Narakorn, P. and Seesupan, T. (2020). 'Exploring the mediating role of supply chain flexibility and supply chain agility between supplier partnership, customer relationship management and competitive advantage'. *International Journal of Supply Chain Management*, *9*(2), pp.435-443.

Tobi, H. and Kampen, J.K. (2018) 'Research design: the methodology for interdisciplinary research framework', *Quality and Quantity*, 52(3).

Valentini, F. and Damásio, B.F. (2016) 'Average Variance Extracted and Composite Reliability: Reliability Coefficients', *Psicologia: Teoria e Pesquisa*, 32(2).

Vu, H.M. (2020) 'A review of dynamic capabilities, innovation capabilities, entrepreneurial capabilities and their consequences', *Journal of Asian Finance, Economics and Business*, 7(8).

Wamba, S.F., Dubey, R., Gunasekaran, A. and Akter, S. (2020). 'The performance effects of big data analytics and supply chain ambidexterity: The moderating effect of environmental dynamism'. *International Journal of Production Economics*, *222*, p.107498.

Wang, M.C., Chen, P.C. and Fang, S.C. (2018) 'A critical view of knowledge networks and innovation performance: The mediation role of firms' knowledge integration capability', *Journal of Business Research*, 88.

Wang, Y., Yan, F., Jia, F. and Chen, L. (2023). 'Building supply chain resilience through ambidexterity: an information processing perspective'. *International Journal of Logistics Research and Applications*, *26*(2), pp.172-189.

Wetering, R., Mikalef, P. and Helms, R. (2017) 'Driving organizational sustainabilityoriented innovation capabilities: a complex adaptive systems perspective', *Current Opinion in Environmental Sustainability*.

Wichitsathian, S. and Nakruang, D. (2019) 'Knowledge integration capability and entrepreneurial orientation: Case of pakthongchai silk groups residing', *Entrepreneurship and Sustainability Issues*, 7(2).

Xiao, J., Wang, H., Huang, X. and Xie, K. (2012). 'Resource-based modelling of B2B information systems' effect on achieving supply chain ambidexterity: a focus on dynamic heterogeneity'. *International Journal of Networking and Virtual Organisations 10*, *11*(3-4), pp.345-362.

Yamane, T. (1967) 'Statistics: An introductory analysis.'

Yan, B., Yao, B., Li, Q. and Dong, Q. (2022). 'Study on the Impact of Supply Chain Dynamic Capabilities on Long-Term Performance of Enterprises'. *Sustainability*, *14*(19), p.12441.

Yusoff, Y.B.M., Ashari, H. Bin and Salleh, M.N. Bin (2016) 'The impact of supply chain management as mediator between strategic orientations and supply chain performance', *International Journal of Supply Chain Management*, 5(2).

Yusr, M.M. (2016) 'Innovation capability and its role in enhancing the relationship between TQM practices and innovation performance', *Journal of Open Innovation: Technology, Market, and Complexity*, 2(1).

Zahra, S.A. (2021) 'The Resource-Based View, Resourcefulness, and Resource Management in Startup Firms: A Proposed Research Agenda', *Journal of Management*, 47(7), pp. 1841–1860.

Zimmermann, R., Ferreira, L.M.D.F. and Moreira, A.C. (2020) 'How supply chain strategies moderate the relationship between innovation capabilities and business performance', *Journal of Purchasing and Supply Management*, 26(5).

Zubizarreta, M., Ganzarain, J., Cuadrado, J. and Lizarralde, R. (2020). 'Evaluating disruptive innovation project management capabilities'. *Sustainability*, *13*(1), p.1.

Appendix

Questionnaire

I am Charles … a graduate student from the Kwame Nkrumah University of Science and Technology pursuing my Masters in … As part of my degree, I am to conduct academic research on the topic "supply chain ambidexterity on supply chain performance in the oil and gas sector: the moderating roles of innovation capabilities". Besides the background information and supply chain management practices, all other variables were assessed via seven-point Likert-type scales anchored from [1= Not at all; 2= Rarely; 3= To a Limited extent; 4= Moderately; 5= To some extent; 6= To a large extent; 7= To a very large extent]. Please, this study is for academic purposes only, and your anonymity and confidentiality are assured. It takes 30 minutes to complete this questionnaire.

Please provide your candid response to the following statements and issues.

Thank you.

Respondents Background 1. Gender

I. Male [ ]
II. Female [ ]

2. Educational Level

I. Secondary level [ ]
II. Tertiary Level [ ]

3. Age Limit

I. 18-24 years old [ ]
II. 25-34 years old [ ]
III. 35-44 years old [ ]
IV. 45-54 years old [ ]
V. 55-60 years old [ ]
VI. 60+ years [ ]

4. Company

I. Tel Energy Limited [ ]
II. Engen Ghana Limited [ ]

5. Years of Experience

Please state how many years you have been working with this organization ……

6. How old is your company? …….

7. Role/Position

I. Purchasing Manager [ ]
II. Logistics Manager [ ]
III. Production Manager [ ]
IV. Warehouse Manager [ ]
V. Marketing Manager [ ]
VI. Others [ ]

Supply chain ambidexterity

To what extent do you agree or disagree with the following statements on supply chain ambidexterity within Tel Energy Ltd. and Engen Ghana Ltd. Please use Seven-point Likerttype scales anchored from [1= Not at all; 2= Rarely; 3= To a Limited extent; 4= Moderately; 5= To some extent; 6= To a large extent; 7= To a very large extent].

	Statements	1	2	3	4	5	6	7
SCA1	In order to stay competitive, my company's supply chain managers focus on reducing operational redundancies in our existing processes.							
SCA2	Leveraging our current supply chain technologies is important to my company.							
SCA3	In order to stay competitive, my company's supply chain managers focus on improving our existing technologies.							
SCA4	My company's managers focus on developing stronger competencies in our existing supply chain processes.							
SCA5	My company proactively pursue new supply chain solutions.							

SCA6	Tel Energy Ltd./Engen Ghana Ltd. continually experiment to find new solutions that will improve our supply chain.							
SCA7	To improve my company's supply chain, we continually explore for new opportunities.							
SCA8	my company is constantly seeking novel approaches in order to solve supply chain problems.							

Source: (Partanen *et al.*, 2020) (Mbima and Tetteh, 2023b)

Supply Chain Performance (SCP)

To what extent do you agree or disagree with the following statements on supply chain performance within Tel Energy Ltd. and Engen Ghana Ltd. Please use Seven-point Likerttype scales anchored from [1= Not at all; 2= Rarely; 3= To a Limited extent; 4= Moderately; 5= To some extent; 6= To a large extent; 7= To a very large extent].

	Statements	1	2	3	4	5	6	7
SCP1	My company demonstrates the ability to achieve the lowest total cost of logistics through efficient operations, technology, and/or scale economies							
SCP2	My company demonstrates ability to reduce the time between order receipt and customer delivery to as close to zero as possible							
SCP3	Our company delivers goods consistently in number and volume							
SCP4	My company provides desired quantities on a consistent basis							
SCP5	My company produces high inventory turns than the competitor							
SCP6	My company fulfills customer satisfaction							

Source: (Alamsjah and Asrol, 2022)

Innovation capabilities

To what extent do you agree or disagree with the following statements on innovation capabilities within Tel Energy Ltd. and Engen Ghana Ltd. Please use Seven-point Likert-type scales anchored from [1= Not at all; 2= Rarely; 3= To a Limited extent; 4= Moderately; 5= To some extent; 6= To a large extent; 7= To a very large extent].

	Statements	1	2	3	4	5	6	7
IC1	There is a constant generation of new product ideas in my company							
IC2	My company constantly search for new ways of doing things							
IC3	There is creativity in our methods of operation at my company.							
IC4	My company is usually a pioneer in the market							
IC5	My company is able to introduce new products/services every five years							

Source: (Odoom and Mensah, 2019)

Thanks for your participation.