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ANALYSING THE IMPACT OF INFORMATION SYSTEMS CAPABILITY AS A MODERATING FACTOR ON THE RELATIONSHIP BETWEEN INNOVATION, SUPPLY CHAIN INTEGRATION AND SUPPLY CHAIN PERFORMANCE.

BY

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DECLARATION

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

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ABSTRACT

The dynamics of the modern global economy demand innovation for maintaining a competitive edge, particularly within the context of supply chain management. This study aimed to examine the effect of innovation on supply chain performance and to evaluate the mediating role of supply chain integration and the moderating role of information systems capability within this relationship. Anchored on the Resource-Based View (RBV) and the Dynamic Capabilities View (DCV), the study underscores innovation as a key driver of superior supply chain performance. A quantitative research design was employed, utilizing a survey approach to collect data from firms operating in the Greater Accra region of Ghana. The gathered data were analyzed using inferential and descriptive statistical techniques, including SPSS and SmartPLS tools. The findings of the study affirmed the direct positive influence of innovation on both supply chain integration and performance. It also underscored the positive impact of supply chain integration on supply chain performance, thereby validating the mediating role of supply chain integration between innovation and supply chain performance. On the other hand, the moderating role of information systems capability on the relationship between supply chain integration and supply chain performance was found to be insignificant. As a result, it is recommended that supply chain managers focus on boosting innovation and supply chain integration to achieve superior supply chain performance. Enhancements in inventory management practices, supplier development programs, and improved collaboration across supply chain partners are suggested as viable strategies. The study significantly contributes to the existing body of knowledge by providing empirical evidence on the influence of innovation and supply chain integration on supply chain performance, specifically in the Ghanaian context. The findings provide a better understanding of how firms can leverage their innovation capabilities to enhance supply chain integration and consequently improve supply chain performance.

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LIST OF ABBREVIATIONS

AVE	Average Variance Extracted
CFA	Confirmatory Factor Analysis
EDI	Electronic Data Interchange
ERP	Enterprise Resource Planning
IS	Information Systems
RBV	Resource-Based View
SCI	Supply Chain Integration
SCP	Supply Chain Performance
SEM	Structural Equation Modelling

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Innovation is a critical driver of economic growth, competitiveness, and sustainability. It refers to the development of new ideas, products, processes, or services that create value for individuals, organizations, and society. Innovation can take many forms, including technological, organizational, marketing, and social innovations (Le and Lei, 2018). In today's fast-paced business environment, innovation is essential for organizations to remain competitive and meet the changing needs and expectations of customers. Innovation can help organizations differentiate themselves from competitors, reduce costs, increase efficiency, and improve the quality of their products and services (Yuan and Zhang, 2020). It can also lead to new markets and revenue streams. Innovation can occur within an organization or through collaboration with external partners, such as suppliers, customers, universities, or research institutes (Martinez-Conesa *et al.*, 2017)

Innovation is a powerful driver of supply chain performance, enabling organizations to optimize processes, improve quality, enhance collaboration, and increase flexibility while reducing costs and waste. Innovation can help to optimize supply chain processes, reducing the time and resources required to complete tasks (Tajpour et al., 2020). For example, new technologies such as automation and robotics can help to streamline manufacturing and distribution processes, reducing lead times and minimizing waste. Innovation can lead to the development of better products and services, which can improve the quality of supply chain output. This can lead to increased customer satisfaction and loyalty, as well as better supplier relationships.

The study, however, postulates that supply chain integration acts as a catalyst for innovation. Supply chain integration can help facilitate the adoption of innovative technologies or processes by providing a collaborative environment for experimentation and learning (Saleheen *et al.*, 2018). By working closely with supply chain partners, organizations can share risks and costs, and jointly develop new solutions that are better aligned with customer needs and preferences. Supply chain integration can also help to scale up innovative solutions by providing the necessary resources and capabilities. By leveraging the strengths of each partner, organizations can build more robust and sustainable supply chains that can adapt to changing market conditions and customer demands (Mani *et al.*, 2018).

As supply chains become increasingly complex and global, innovation is playing a critical role in enabling organizations to optimize processes, improve visibility, and enhance coordination, resulting in greater supply chain integration and performance (Kurdi et al., 2022). Innovation can facilitate communication and information sharing between supply chain partners. New technologies such as cloud-based platforms, electronic data interchange (EDI), and blockchain can enable real-time data sharing and analytics, allowing partners to make more informed decisions and respond quickly to changes in demand or supply. Innovation can improve coordination between supply chain partners by providing greater visibility and control over supply chain processes. Innovation can help to build trust and collaboration between supply chain partners by providing greater transparency and accountability (Bag *et al.*, 2020).

Furthermore, by enabling greater collaboration, communication, and coordination between partners, supply chain integration can drive improvements in efficiency, agility, quality, visibility, and customer service, leading to greater supply chain performance (Govindan *et al.*, 2015). Supply chain integration can improve the overall efficiency of supply chain processes

by reducing redundancies, delays, and errors. By streamlining processes, reducing cycle times, and minimizing waste, organizations can achieve cost savings and improve their bottom line. Supply chain integration can enable organizations to be more agile and responsive to changes in the marketplace (Ferreira *et al.*, 2016). By sharing information and collaborating closely with partners, organizations can quickly adapt to changes in demand, supply, or market conditions, and stay ahead of the competition (Kobarg et al., 2020).

However, the extent to which supply chain integration drives supply chain performance is highly reliant on varying levels of information systems capability. Information systems capability can streamline supply chain processes by automating routine tasks and reducing manual interventions (Aydiner *et al.*, 2019). By automating tasks such as order processing, inventory management, and logistics, organizations can reduce lead times, minimize errors, and improve overall efficiency. Information systems capability can improve the coordination of supply chain processes by providing a centralized platform for communication and collaboration (Liu and Ambati, 2021). By enabling real-time communication and collaboration between partners, organizations can enhance coordination, reduce errors, and improve overall supply chain performance (Aydiner *et al.*, 2019).

Against this backdrop, this study, drawing on the resource-based view theory assesses the mediating role of supply chain integration on the relationship between innovation and supply chain performance, including the moderating role of information systems capability on the relationship between supply chain integration and supply chain performance.

1.2 Statement of the Problem

A large body of empirical work exists on the relationship between innovation and performance outcomes. However, there are still knowledge and empirical gaps. In terms of the knowledge gap, while some studies find that innovation positively affects performance (Afonasova et al., 2019; Popa et al., 2017; Shahbaz et al., 2018), other studies report that it positively impacts performance indirectly (Che et al., 2019; Tavassoli, 2018). Still, other studies find that the relationship between these concepts is negative (Kobarg et al., 2020; Wallace et al., 2016)

In part, these conflicting findings can be attributed to researchers linking innovation to different performance dimensions such as operational performance, circular supply chain, supply chain agility, firm performance, new product development, supply chain management, supply chain flexibility, green supply chain management, and supply chain performance (see, e.g., Hald and Nordio, 2020; Khan et al., 2021; Rojo et al., 2016; Scott, 2016). However, little attention has been given to understanding the relationship between innovation, supply chain integration supply chain performance, and the role of information systems capability. This study seeks to address the existing knowledge gaps.

In addition to the knowledge gap, there also exists an empirical gap. Scholars argue that innovation, although essential, is not enough to drive performance outcomes alone: mediating and moderating variables consequently influence the relationships (Wallace et al., 2016). Consequently, several calls have been made for the literature on innovation to be extended institutional pressure (Dubey et al. (2015); relationship quality (Chang et al., 2016) competitive strategy (Huo et al., 2014), and information system capability (Tarafdar and Qrunfleh, 2017).

Accordingly, this study draws on the resource-based view theory to examine the roles of supply chain integration and information systems capability in the relationship between innovation and supply chain performance.

1.3 Research Objectives

The research aims to examine the effect of innovation on supply chain performance, as well as assess the mediating and moderating roles of supply chain integration and information systems capability, respectively. Specifically, the study seeks to:

i. To examine the relationship between innovation and supply chain performance
ii. To examine the relationship between innovation and supply chain integration
iii. To examine the relationship between supply chain integration and supply chain performance
iv. To assess the mediating role of supply chain integration on the relationship between innovation and supply chain performance.
v. To assess the moderating role of information systems capability on the relationship between supply chain integration and supply chain performance.

1.4 Research Questions

The study asks the following questions

1. How does innovation relate to supply chain performance?
2. How does innovation relate to supply chain integration?
3. How does supply chain integration relate to supply chain performance?
4. How does supply chain integration mediate the relationship between innovation and supply chain performance?
5. How does information systems capability moderate the relationship between supply chain integration and supply chain performance?

1.5 Significance of the Study

The study has significance both for theory and practice. This study can contribute to the existing body of knowledge on supply chain management by examining the moderating role of information systems capability in the relationship between innovation, supply chain integration, and supply chain performance. This can help to enhance our understanding of the complex interplay between these key constructs and provide theoretical insights into how organizations can better leverage their information systems capabilities to enhance supply chain performance. Furthermore, by testing the mediating effect of supply chain integration on the relationship between innovation and supply chain performance, the study contributes to the theoretical debate on the causal relationships between these constructs and provides a more nuanced understanding of the specific mechanisms through which innovation can drive supply chain performance.

The study also provides practical insights for managers and supply chain practitioners on how to enhance supply chain performance by leveraging information systems capability as a key moderator of the relationship between innovation and supply chain integration. This can help organizations make more informed decisions regarding their investment in information systems and technology and enable them to develop more effective strategies for improving supply chain performance. Furthermore, by examining the mediating effect of supply chain integration on the relationship between innovation and supply chain performance, the study provides practical guidance for managers on how to foster a more integrated and collaborative supply chain and develop more effective innovation strategies that can drive sustainable competitive advantage. This can help organizations to better respond to the challenges of today's dynamic and complex business environment and achieve long-term success.

1.6 Overview of Methodology

The study adopts an explanatory research design, examining the relationship between innovation, supply chain integration, information systems capability, and supply chain performance. The study adopts a survey design, targeting senior-level managers of firms operating within the Greater Accra region of Ghana. The study adopts a quantitative research approach involving developing and testing hypotheses. The study relies on primary data. A questionnaire is the only data collection instrument. Purposive sampling is used to draw a sample of two hundred (200) from the target population (500). Data analyses are performed using IBM SPSS version 26 and SmartPLS version 4. The descriptive analysis includes mean, min, max, skewness, kurtosis, and standard deviation. Inferential statistics include exploratory factor analysis, KMO, Cronbach Alpha, composite reliability, average variance explained, and confirmatory factor analysis. The model for the study is tested using PLS-SEM.

1.7 Scope of the Study

The scope of the study are categorised into three: geographical, concept, and context. This study focuses on firms operating in the Greater Accra Region of Ghana, as this context provides a suitable setting for examining the moderating role of information systems capability in the relationship between innovation, supply chain integration, and supply chain performance. Conceptually, this study focuses on four key concepts: innovation, supply chain integration, information systems capability, and supply chain performance.

1.8 Limitations of the Study

Limited sample size: The study involves a small number of organizations, which could limit the generalizability of the findings.

Selection bias: The sample may not be representative of the larger population of organizations or industries, which could introduce selection bias and limit the applicability of the results.

1.9 Organisation of the Study

This study is organised into five major chapters. Chapter One, the introduction, discusses the background of the study, the problem statement, the objectives of the study, the research questions, the relevance of the study, the research methodology, the scope of the study, the study's limits, and the organisation of the thesis. The second chapter reviews the literature and includes a conceptual analysis, a theoretical framework, an empirical analysis, and a conceptual framework and hypotheses. The third chapter discusses the research methodology, including the study's design, population, sampling strategy, data collecting method, data analysis, reliability and validity analysis, and ethical considerations. Chapter four discusses data analysis, including descriptive and inferential analyses, and a discussion of the findings. The last chapter summarises the results, draws conclusions, makes recommendations, and makes suggestions for further research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter aims to conduct a literature review on innovation, supply chain integration, information systems capability, and supply chain performance. The chapter presents the conceptual review, empirical review, theoretical review, and conceptual framework

2.2 Conceptual Review

A conceptual review is a type of literature review that aims to identify and analyze the conceptual frameworks, theories, and models that underlie a particular topic or research question. The focus of a conceptual review is on the development of ideas and concepts related to the topic, rather than on the empirical evidence or data that supports those ideas. This section reviews the concept of innovation, supply chain integration, information systems capability, and supply chain performance

2.2.1 Innovation

In today's fast-paced and complex business environment, supply chain management has become a critical aspect of organizational success. Supply chains are the backbone of modern business operations, and efficient and effective management of supply chain processes is essential for companies to remain competitive and meet customer demands (Popa *et al.*, 2017c). In recent years, innovation has emerged as a key driver of success in the industry. Companies are exploring new ways to optimize their supply chain processes, increase efficiency, and reduce costs while enhancing the customer experience (Shahbaz *et al.*, 2018b).

Innovation comprises several facets:

- Product Innovation:

  Product innovation involves the creation, improvement, or introduction of new products or services to the market. This facet of innovation focuses on developing offerings that meet evolving customer needs or preferences, incorporate novel features, enhance functionality, or provide superior value compared to existing products or services (Tidd et al., 2015).

  For instance, the introduction of smartphones revolutionized communication by combining multiple functions like calling, messaging, internet browsing, and entertainment in a single device. Companies invest in product innovation to maintain a competitive edge, drive growth, and capture new markets or customer segments.

- Process Innovation:

  Process innovation centers on implementing new methods, techniques, or approaches within an organization's operational processes to enhance efficiency, reduce costs, or improve quality. It involves rethinking and restructuring workflows, production methods, supply chain logistics, or service delivery mechanisms (Tidd et al., 2015).

  For example, the implementation of lean manufacturing techniques by Toyota revolutionized the automotive industry. By streamlining production processes and minimizing waste, Toyota significantly improved efficiency and quality, setting new benchmarks for the industry.

- Technological Innovation:

  Technological innovation pertains to the adoption or creation of new technologies aimed at achieving better outcomes, whether in terms of product development, process

optimization, or organizational effectiveness (Damanpour, 2021). This facet encompasses advancements in hardware, software, digital tools, automation, and disruptive technologies.

For instance, the adoption of Artificial Intelligence (AI) and Machine Learning (ML) in various industries has enabled predictive analytics, automation of routine tasks, and personalized customer experiences. These technological innovations drive efficiency, scalability, and competitive advantage.

- Organizational Innovation:

  Organizational innovation involves the implementation of new structures, practices, strategies, or management approaches within an organization to enhance its performance, adaptability, or responsiveness to market changes (Tidd et al., 2015).

  An example of organizational innovation is the adoption of flexible work arrangements or agile project management methodologies. These innovations promote a more adaptable and responsive organizational culture, fostering creativity, collaboration, and quicker adaptation to changing market dynamics.

  Each facet of innovation plays a crucial role in fostering competitiveness, growth, and sustainability for organizations. They are interrelated and often complement each other, contributing collectively to an organization's ability to thrive in dynamic and competitive environments.

2.2.1.1 Key Definitions of Innovation

Innovation refers to the adoption of new and creative ideas, processes, and technologies to transform traditional supply chain management and improve the overall supply chain

performance (Le and Lei, 2018b). This definition emphasizes the need for creative and transformative solutions to optimize supply chain processes, improve performance, and enhance overall business outcomes.

Yuan and Zhang (2020) also defined innovation as the development and implementation of novel and inventive strategies and technologies to improve supply chain visibility, responsiveness, and sustainability. This definition highlights the importance of innovation in driving supply chain improvements that are geared toward enhancing visibility, responsiveness, and sustainability.

Innovation is also the process of continuous improvement and evolution of supply chain strategies, technologies, and practices, aimed at achieving greater efficiency, effectiveness, and value creation (Ferreira *et al.*, 2019). This definition underscores the importance of continuous improvement and evolution of supply chain practices to achieve greater value creation and competitiveness.

Innovation was further defined by Tajpour et al. (2020) as the integration of advanced technologies and analytics into the supply chain process to improve forecasting, demand planning, and inventory management. This definition emphasizes the role of advanced technologies and analytics in supply chain innovation and the benefits they bring in terms of improving forecasting, demand planning, and inventory management.

According to Wallace et al. (2016), innovation involves the use of sustainable and ethical practices throughout the supply chain process to minimize environmental impact, promote social responsibility, and drive business growth. This definition emphasizes the need for sustainable and ethical practices throughout the supply chain process to minimize environmental impact, promote social responsibility, and drive business growth.

2.2.1.2 Types of Supply Chain innovation

Process and product innovations are two types of innovation that can drive significant improvements in supply chain management. While they are different, they are closely related and often interdependent.

Process innovation involves making changes to the way that products or services are produced, delivered, or distributed. This can involve improvements to existing processes or the development of new ones. The goal of process innovation is to increase efficiency, reduce costs, and improve quality (Kobarg *et al.,* 2020c).

In the context of supply chain management, process innovation can take many forms. For example, it may involve automating certain tasks, streamlining workflows, or re-engineering supply chain processes to reduce bottlenecks and increase throughput. Process innovation can also involve the implementation of new technologies, such as AI, blockchain, or IoT, to optimize supply chain processes and improve decision-making.

Product innovation, on the other hand, involves the creation of new or improved products or services. The goal of product innovation is to enhance customer satisfaction, differentiate the product or service from competitors, and increase market share (Che *et al.,* 2019b).

In the context of supply chain management, product innovation can take many forms. For example, it may involve the development of new products that meet evolving customer needs, or the modification of existing products to improve quality or reduce costs. Product innovation can also involve the creation of new business models, such as servitization, where products are sold as services rather than goods.

2.2.1.3 Benefits of Innovation

Innovation remains the lifeblood of a competitive business landscape, acting as a catalyst that triggers wide-ranging effects. According to the seminal study by Afonasova et al. (2019), the benefits of innovation are multifaceted and transformative, covering areas such as increased efficiency, cost savings, improved quality, enhanced customer satisfaction, and the development of a robust competitive advantage.

Consider, initially, the role of innovation in increasing efficiency. Through process or product innovations, organizations can automate tasks, reduce waste, and improve overall productivity. It's akin to observing a well-oiled machine working seamlessly with all components interacting flawlessly. Innovation, in this context, breathes life into an organization's processes and products, fostering an environment where efficiency becomes a standard.

Next, the discussion shifts to the financial implications of innovation, particularly, the significant cost savings. As innovation minimizes waste and improves efficiency, organizations can experience tangible financial benefits. Innovation serves as a crucial tool for financial prosperity, identifying and rectifying inefficient processes and creating novel products that positively affect the organization's bottom line.

The benefit of quality enhancement through innovation also warrants consideration. By refining processes and products, organizations can significantly mitigate errors, defects, and delays. Here, innovation plays a central role in shifting quality from an abstract ideal to a tangible reality that elevates the company's offerings.

A critical aspect of innovation lies in its impact on external stakeholders, particularly in the realm of customer satisfaction. Product innovations tailored to customer needs and preferences serve to increase customer delight, while process innovations contribute to faster delivery and

superior service. The role of innovation in fostering customer satisfaction is paramount in a market where customers have immense power and influence.

Finally, innovation provides a path to achieving competitive advantage. Organizations that pioneer process and product innovations effectively differentiate themselves from their competitors. This unique differentiation, a direct result of innovative thinking and execution, becomes a unique selling point, enabling these organizations to rise above the competition and secure a dominant position in the marketplace.

2.2.2 Supply Chain Integration

Supply chain integration is becoming increasingly important in today's global economy, where businesses must operate efficiently and effectively to remain competitive. Integration can help businesses reduce costs, increase efficiency, improve customer service, and enhance their overall competitiveness (Khan and Wisner, 2019).

Supply chain integration involves the use of various technologies and processes to enable seamless communication and collaboration among supply chain partners. This includes the use of electronic data interchange (EDI), enterprise resource planning (ERP) systems, and other technologies that enable real-time tracking of inventory, production, and shipping activities (Cao et al., 2015). Supply chain integration is a critical component of modern business operations, helping businesses optimize their operations and remain competitive in an increasingly complex and dynamic global marketplace (Kang *et al.*, 2018).

Supply Chain Integration involves various interconnected elements:

- Internal Integration:

Internal integration refers to the coordination and alignment of various departments or functions within an organization's boundaries. It involves breaking down silos and fostering collaboration among different units such as production, procurement, marketing, and distribution (Chen & Paulraj, 2014).

For example, effective internal integration ensures that different departments work cohesively towards common goals, sharing information and resources efficiently. This integration streamlines processes, enhances communication, and minimizes conflicts or redundancies, ultimately improving the overall efficiency and effectiveness of operations within the organization.

- External Integration:

  External integration involves the collaboration and integration of an organization with its external partners, including suppliers, distributors, customers, and other stakeholders in the supply chain (Frohlich & Westbrook, 2021). It emphasizes establishing strong relationships and seamless interactions with entities beyond the organization's boundaries.

  For instance, external integration enables close collaboration with suppliers to ensure timely deliveries of high-quality raw materials or components. It also involves integrating with customers to understand their needs better and tailor products or services accordingly. Effective external integration enhances visibility, responsiveness, and agility across the supply chain network.

- Information Sharing:

  Information sharing is a fundamental aspect of supply chain integration that involves the transparent and efficient exchange of critical data and information among supply

chain partners (Chen & Paulraj, 2014). It includes sharing information related to inventory levels, demand forecasts, production schedules, and other relevant data.

Information sharing facilitates better decision-making, improves coordination, and helps in synchronizing activities among different entities in the supply chain. By having access to accurate and real-time information, organizations can mitigate uncertainties, reduce lead times, and optimize inventory levels.

- Collaborative Planning:

  Collaborative planning involves joint efforts among supply chain entities in planning and decision-making processes (Frohlich & Westbrook, 2021). It includes sharing ideas, aligning strategies, and making collective decisions to achieve mutual benefits.

  For example, collaborative planning might involve suppliers and manufacturers jointly forecasting demand and production schedules, enabling more accurate planning and reduced risk of overstocking or stockouts. Collaborative planning fosters trust, reduces costs, and enhances the overall efficiency and responsiveness of the supply chain.

  The integration of these elements – internal and external integration, information sharing, and collaborative planning – is essential for achieving a highly efficient and responsive supply chain, ultimately contributing to improved customer satisfaction, reduced costs, and increased competitiveness in today's dynamic business environment.

2.2.2.1 Key Definitions of Supply Chain Integration

Supply chain integration is the coordination of activities and information sharing among different parties in the supply chain to improve efficiency and optimize performance (Munir *et al.*, 2020).

Supply chain integration involves the seamless flow of information, materials, and products across the entire supply chain, from suppliers to customers (Vanpoucke et al., 2017).

Supply chain integration is the process of aligning the goals and objectives of all parties in the supply chain to create a more efficient and effective supply chain (Zhang and Huo, 2013).

Supply chain integration involves the integration of technologies, processes, and people across the entire supply chain to create a more responsive and agile supply chain (Huo et al., 2016).

Supply chain integration is the ability of different parties in the supply chain to work together effectively to respond to changing market conditions and customer needs (Wong *et al.*, 2017a).

Supply chain integration is the alignment of business processes and systems across the entire supply chain to improve visibility, reduce costs, and increase efficiency (Meidute-Kavaliauskiene *et al.*, 2022).

Supply chain integration is the sharing of information, resources, and capabilities across the entire supply chain to improve collaboration and coordination (Ataseven and Nair, 2017).

Supply chain integration is the process of integrating the entire supply chain into a single, cohesive unit that operates efficiently and effectively (Mofokeng and Chinomona, 2019).

Supply chain integration involves the alignment of supply chain goals, objectives, and strategies with overall business objectives to create a more competitive and profitable business (Flynn et al., 2016).

Supply chain integration is the ability to respond quickly and effectively to changes in demand, supply, or market conditions by leveraging the capabilities of all parties in the supply chain (Zhang and Huo, 2013).

2.2.2.2 Types of Supply Chain Integration

There are several types of supply chain integration, each with its focus and level of collaboration. Supplier, internal, and customer integration are all critical components of supply chain integration. By working closely with suppliers, internal departments, and customers, a company can optimize the flow of goods, information, and money throughout the supply chain, resulting in improved efficiency, reduced costs, and increased profitability.

Supplier integration refers to the collaboration and coordination between a company and its suppliers. The goal is to optimize the flow of goods, information, and money between the two parties (Munir *et al.*, 2020).

One of the most notable advantages lies in the domain of supply chain visibility. With the consistent sharing of information, a company can attain an elevated level of transparency in its supply chain processes. This elevated visibility, as Munir et al. (2020) suggest, enables a company to foresee potential disruptions, providing the opportunity to implement proactive measures to mitigate risk. It's akin to having a high-resolution lens into a usually complex system, revealing the intricacies that can affect smooth operations.

Alongside the benefits of supply chain visibility, supplier integration also leads to substantial cost reductions. This is possible when a company, through close collaboration with its suppliers, negotiates superior prices and terms. According to ((Zhang and Huo,2013), these improved terms can significantly reduce costs and amplify profitability. Picture a negotiation table where both parties work towards a mutually beneficial goal, optimizing not just the quality of goods and services but also ensuring financial prudence.

The concept of internal integration, as defined by Munir et al. (2020), entails coordination and collaboration among different departments within an organization. It aims to optimize the flow of goods, information, and money within the organization's boundaries, yielding several tangible benefits.

A critical advantage of internal integration lies in its capacity to improve efficiency. By coordinating activities between departments, an organization can eliminate redundancies and streamline processes, as suggested by (Huo et al., 2016). This is comparable to watching a finely choreographed performance where every step is in sync, and the result is an elegantly executed routine. Likewise, in an organization, well-integrated internal departments function in unison, eliminating unnecessary overlaps and optimizing the use of resources.

Furthermore, internal integration aids in expediting decision-making processes. Through the sharing of information and collaborative efforts, departments can make decisions more swiftly and with greater assurance, as indicated by Meidute-Kavaliauskiene et al. (2022). This benefit of internal integration is analogous to a well-informed council where decisions are taken with full knowledge and confidence, enhancing the overall effectiveness and timeliness of decision-making.

The notion of customer integration, as explored by Wong et al. 2017), emphasizes the symbiotic collaboration and coordination between a company and its customers. It seeks to optimize the flow of goods, information, and money between these two parties, resulting in several noteworthy benefits.

A paramount advantage of customer integration manifests in the realm of customer satisfaction. By forging close relationships with customers, a company can attain a nuanced understanding of their needs and preferences. This understanding then informs the provision of products and

services, leading to higher levels of customer satisfaction, as highlighted by Jacobs et al. (2016). Imagine a company that acts not just as a seller but as an attentive listener, understanding and meeting customer needs with unmatched precision.

In addition, customer integration plays a significant role in enhancing product design. As companies work closely with customers, they gain valuable insights into their preferences, which can inform the design process. Ataseven and Nair (2017) assert that such a close collaboration can yield products that resonate deeply with the customers' tastes and needs. This is akin to having a personal designer who not only creates but tailors products to one's liking.

2.2.2.3 Benefits of Supply Chain Integration

Supply chain integration, a key strategy for companies seeking to stay afloat and thrive in the fast-paced global business landscape, has been highlighted for its capacity to optimize processes, reduce costs, and enhance customer satisfaction. As pointed out by Huo et al. (2016), the key benefits of this approach span across various domains of business operations.

A central advantage lies in the enhancement of efficiency. Supply chain integration, by eliminating redundant processes and promoting effective communication and collaboration, paves the way for heightened efficiency throughout the supply chain. Think of it as a well-coordinated orchestra where each instrument plays its part flawlessly, resulting in a harmonious symphony of operations.

Furthermore, supply chain integration plays a significant role in cost reduction. By rooting out waste, refining processes, and bolstering collaboration, it brings about substantial cost savings.

It's comparable to a meticulous auditor who identifies and trims unnecessary expenditures, optimizing the financial health of the business.

Improved visibility into the supply chain is another significant benefit. This is achievable through enhanced communication and collaboration between different parties in the supply chain. It equips businesses with the ability to identify and tackle potential disruptions swiftly, like having a clear, unhindered view into a usually complex network.

Moving onto the customer-facing benefits, supply chain integration contributes to improved customer service. It equips businesses to respond swiftly and accurately to customer demands, which can boost customer satisfaction and loyalty. It's akin to a highly responsive service team that not only meets but anticipates and exceeds customer expectations.

Additionally, supply chain integration enhances flexibility. By refining processes and promoting effective communication, businesses become more agile, and capable of adapting to changing market conditions and customer demands promptly. It's similar to a skilled surfer who adeptly navigates the ever-changing waves, turning challenges into opportunities.

Supply chain integration also nurtures innovation. It encourages the sharing of knowledge and expertise, leading to the development of new products and services. This collaborative spirit drives innovative thinking, similar to a vibrant think-tank where shared insights fuel groundbreaking ideas.

Lastly, competitive advantage is a significant outcome of supply chain integration. Businesses that adopt this approach can outpace competitors by being more responsive, efficient, and adaptable. This strategy differentiates a business, like a unique characteristic that sets it apart in a crowd, helping it to rise above the competition.

2.2.2.4 Challenges of Supply Chain Integration

While the advantages of supply chain integration are substantial, it's equally essential to address the challenges it presents. As articulated by Khan and Wsner (2019), these challenges span across various facets of the integration process.

Firstly, resistance to change emerges as a considerable hurdle. The transition to a more integrated supply chain necessitates shifts in operational methods among employees and partners, which can trigger resistance. It's like attempting to change the course of a river; the natural flow resists the new direction.

The complexity of supply chain integration also poses challenges. Implementing and managing this process, which involves multiple systems, processes, and stakeholders, can be daunting. It's akin to solving a complex puzzle where each piece must fit precisely for the complete picture to emerge.

Next, data management becomes a critical issue. With supply chain integration involving data sharing across various systems and parties, challenges related to data quality, privacy, and security often arise. It's comparable to maintaining a vast library where every piece of information must be accurately cataloged and safeguarded.

The fourth challenge resides in the realm of cultural differences. As supply chain integration involves collaborating with partners from different cultures and countries, challenges related to language, communication, and understanding cultural nuances may surface. This is similar to navigating a multicultural city where understanding diverse cultural codes becomes essential.

Coordination difficulties also feature prominently in supply chain integration challenges. Achieving effective coordination between different parties in the supply chain can be

challenging, especially in scenarios involving multiple suppliers or customers. It's like conducting a large orchestra where each musician must play in harmony with others for a successful performance.

Lastly, the cost of supply chain integration can be a considerable barrier, particularly for small and medium-sized businesses. These organizations may lack the resources to invest in necessary technologies and processes, similar to a fledgling artist lacking the funds for premium materials and tools.

2.2.3 Information Systems Capability

Information Systems (IS) Capability refers to an organization's ability to effectively manage and leverage its information technology resources to achieve strategic goals and objectives. IS Capability encompassing a range of factors, including hardware, software, network infrastructure, data management, and human resources (Liu and Ambati, 2021).

Information Systems (IS) Capability according to Steininger et al. (2022) is the ability of an organization to effectively manage and utilize its information systems resources to enable business processes and achieve organizational objectives. This definition emphasizes the importance of aligning IS capabilities with business processes and goals. It suggests that IS capabilities should be viewed as a means to an end, rather than an end in themselves.

Information Systems (IS) Capability is also the combination of people, processes, and technology that enables an organization to use information to achieve its goals (Cepeda-Carrion *et al.*, 2012). This definition highlights the importance of a holistic approach to IS Capability that includes not only technological infrastructure but also organizational culture and processes.

Che et al. (2019) defined Information Systems (IS) Capability as the ability of an organization to integrate and leverage its information technology resources in a manner that is responsive to the dynamic needs of the business environment. This definition emphasizes the importance of flexibility and adaptability in IS Capability. It suggests that effective IS Capability requires an ability to respond to changing market conditions and customer needs.

It is also the ability of an organization to create, acquire, apply, and transfer knowledge and expertise related to its information systems and technologies (van Baalen *et al.*, 2008). This definition highlights the importance of organizational learning and knowledge management in IS Capability. It suggests that effective IS Capability requires not only technical expertise but also a culture of continuous learning and innovation.

Information Systems (IS) Capability is also the combination of infrastructure, applications, and skills that enable a firm to achieve its objectives through the effective use of information (Chakhar and Martel, 2003). This definition emphasizes the importance of a balanced approach to IS Capability that includes not only technical infrastructure but also skilled human resources and effective application of technology to achieve organizational goals.

Information Systems (IS) capability encompasses various dimensions crucial for effective operations:

- Technological Infrastructure:

  Technological infrastructure within the IS capability refers to the foundational elements that support the functioning of information systems. This includes hardware, software, networks, and the overall IT architecture that form the backbone of an organization's IT infrastructure (Bharadwaj, 2020). A robust technological infrastructure ensures reliability, scalability, security, and efficiency in information processing and communication, laying the groundwork for effective IS capabilities.

- Information Management:

  Information management is the systematic process of acquiring, organizing, storing, managing, and utilizing information resources efficiently and effectively (Bharadwaj, 2020). It involves:

  - Acquisition: Gathering data from various sources within and outside the organization.
  - Organization: Structuring and categorizing data in a manner that enables easy retrieval and analysis.
  - Storage: Safely storing information using databases, data warehouses, or cloud storage solutions.
  - Management: Ensuring data accuracy, integrity, security, and compliance with regulations.
  - Utilization: Leveraging information to make informed decisions and support organizational objectives.

  Effective information management enables organizations to derive insights from data, make informed decisions, improve processes, and gain a competitive advantage through timely and accurate information.

- System Integration:

  System integration involves combining different IS components and systems to ensure seamless functionality, interoperability, and data flow across the organization (Rai et al., 2016). It focuses on:

- Integration of Applications: Ensuring that various software applications work cohesively without data silos or duplication.
- Data Integration: Facilitating the flow and exchange of data across different systems or databases.
- Process Integration: Aligning business processes to work in harmony across different departments or functional areas.
- Technology Integration: Ensuring compatibility and smooth interaction among diverse hardware and software systems.

Efficient system integration enables improved communication, streamlined processes, and enhances the overall efficiency and effectiveness of organizational operations.

- Strategic Alignment:

Strategic alignment refers to the harmonization of IS strategies with organizational objectives and goals to enhance performance (Rai et al., 2016). This involves:

Understanding Organizational Goals: Aligning IS strategies with the broader goals and vision of the organization.

- IT Planning and Implementation: Developing IS strategies that support and contribute to achieving organizational objectives.
- Resource Allocation: Allocating resources (financial, human, technological) in a manner that aligns with strategic priorities.
- Performance Measurement: Assessing IS performance based on its contribution to achieving organizational objectives.
- Strategic alignment ensures that IS capabilities are directed towards fulfilling the organizational mission, maximizing value, and gaining a competitive edge in the market.

These dimensions collectively contribute to building robust IS capabilities within organizations, fostering agility, innovation, and efficiency in leveraging information technology to achieve business objectives.

2.2.4 Supply Chain Performance

In the business world, performance is a critical aspect of organizational success. High-performing companies are more likely to achieve their strategic objectives, attract and retain top talent, and satisfy their customers. Effective performance management is therefore essential for companies to optimize their operations and achieve their goals (Park and Li, 2021).

Effective performance management is essential for individuals and organizations to optimize their operations and achieve their goals. It involves setting clear expectations, providing regular feedback, coaching, and evaluation, and developing action plans to address areas of weakness (Alfalla-Luque *et al.*, 2015a).

Performance refers to the level of achievement or effectiveness of an individual, group, organization, or system in meeting its objectives or goals. It can be measured using various metrics and is a critical aspect of success in various fields (Ataseven and Nair, 2017). Performance is also referred to a specific task or activity, such as a musical performance or a sports performance. It is the quality of the output or result achieved, often measured against established standards or expectations (Dweekat *et al.*, 2017).

Supply chain performance therefore refers to the level of effectiveness and efficiency with which goods and services are moved from the point of origin to the point of consumption. It is measured using key performance indicators such as on-time delivery, lead time, inventory turnover, order accuracy, and cost (Sheel and Nath, 2019). Huo et al. (2016) also defined supply

chain performance as the ability of a company to meet customer demand with the right product, at the right place, and at the right time. This includes managing inventory levels, transportation, and warehousing activities to ensure that products are available when and where they are needed. Supply chain performance. according to Maestrini et al. (2017) is defined as the ability of a company to manage and optimize its supply chain processes, from sourcing and procurement to production and delivery. This includes managing supplier relationships, ensuring quality control, and minimizing waste and inefficiencies in the supply chain.

Supply Chain Performance encompasses diverse dimensions:

- Cost Efficiency:

  Cost efficiency in supply chain performance involves minimizing expenses incurred throughout the supply chain processes while maintaining or enhancing the value provided to customers (Flynn et al., 2020). This includes reducing costs related to procurement, production, inventory management, transportation, and distribution without compromising quality or service levels. Efficient cost management contributes to improved profitability and competitiveness.

- Delivery Reliability:

  Delivery reliability focuses on ensuring consistent, on-time, and accurate deliveries of products or services to customers as promised (Cao & Zhang, 2021). It involves meeting delivery schedules, avoiding delays, minimizing lead times, and providing accurate order fulfillment. Reliability in deliveries enhances customer trust, fosters long-term relationships, and strengthens the reputation of the supply chain.

- Flexibility:

  Flexibility within supply chain performance refers to the ability to adapt and respond swiftly to changes in market demand, supply disruptions, or shifts in customer preferences (Flynn et al., 2020). A flexible supply chain can quickly adjust production levels, alter distribution strategies, or modify processes to accommodate changes without sacrificing efficiency or incurring excessive costs. It enables the supply chain to remain responsive and agile in dynamic market environments.

- Quality:

  Quality in supply chain performance involves maintaining high standards in products or services throughout the supply chain processes (Cao & Zhang, 2021). It encompasses aspects such as product reliability, consistency, durability, safety, and meeting predefined quality benchmarks or standards. Consistent quality assurance ensures customer satisfaction, minimizes defects, and builds brand reputation.

- Customer Satisfaction:

  Customer satisfaction reflects the degree to which a supply chain meets or exceeds customer expectations regarding product quality, delivery, service, and overall experience (Flynn et al., 2020). It involves understanding customer needs, providing personalized services, resolving issues promptly, and consistently delivering value. Satisfied customers are more likely to become repeat buyers and advocates for the brand.

  Each dimension of supply chain performance is interconnected and collectively contributes to the overall effectiveness of the supply chain in meeting organizational objectives and satisfying customer demands. By focusing on these dimensions,

organizations can enhance operational efficiency, strengthen competitive advantages, and achieve sustainable growth in today's dynamic marketplace.

2.2.4.1 Dimensions of Supply Chain Performance

Reliability, flexibility, and efficiency are three key dimensions of supply chain performance. Each of these dimensions plays a critical role in determining the overall effectiveness of the supply chain and its ability to meet the needs of customers.

Reliability refers to the ability of the supply chain to consistently deliver products or services on time and in the expected condition. This dimension is particularly important for industries with time-sensitive products, such as perishable goods or medical supplies. Reliable supply chains have a high level of order accuracy, low lead times, and minimal disruptions due to factors such as weather or transportation delays. Measures of reliability performance include on-time delivery rate, order fulfillment rate, and order accuracy rate (Kurdi *et al.*, 2022b).

Flexibility refers to the ability of the supply chain to adapt quickly to changes in demand or supply chain disruptions. This dimension is particularly important in industries with unpredictable demand or supply chain disruptions, such as natural disasters or trade restrictions (Fatorachian and Kazemi, 2021). Flexible supply chains have the ability to adjust production schedules, transportation routes, or inventory levels to meet changing customer needs or respond to disruptions. Measures of flexibility performance include time to respond to changes in demand, the percentage of orders fulfilled with available inventory, and the ability to quickly locate alternative suppliers (Koçoğlu *et al.*, 2011).

Efficiency refers to the ability of the supply chain to minimize waste and costs while maximizing output (Munir *et al.*, 2020). This dimension is particularly important in industries with low-profit margins or high competition. Efficient supply chains have streamlined

processes, optimized transportation routes, and reduced inventory carrying costs. Measures of efficiency performance include total cost of ownership, inventory turnover rate, and transportation cost per unit (Nyamah *et al.,* 2017).

2.2.5. Moderating Role of Information Systems Capability:

The moderating role of Information Systems (IS) capability influences the relationship between innovation, supply chain integration, and supply chain performance (Zhu et al., 2006). A strong IS capability amplifies the positive effects of innovation and supply chain integration on performance metrics (Sabherwal & Chan, 2001). Organizations with advanced IS capabilities can adapt more efficiently to market changes, improving responsiveness and overall supply chain performance (Zhu et al., 2006).

2.3 Theoretical Review

The theoretical framework elucidates the underlying concepts of innovation, supply chain integration, information systems capability, and supply chain performance. The resource-based view theory is used as the theoretical framework for this study.

2.3.1 Resource-based view (RBV)

The resource-based view (RBV) theory relates a firm's value creation process to a manager's abilities and talents in discovering and developing resources (Almada and Borges, 2018). The resource-based perspective holds that resources and organisational capabilities influence an organisation's strategic business performance (Collins, 2021). Furthermore, this idea encourages businesses to focus on obtaining resources to carry out their business objectives

and to use their particular capabilities and resources to enhance their performance (Barney and Markey, 2016)

According to RBV proponents, it is much more practical to capitalise on external chances by repurposing existing resources than attempting to learn new skills for each opportunity. The RBV model prioritises resources in assisting businesses to achieve improved organisational performance (Barney and Mackey, 2016). There are two kinds of resources: tangible resources and intangible resources. Physical items are considered tangible assets. Land, buildings, machinery, equipment, and capital are all physical assets. Physical resources are readily obtained on the market; hence they provide minimal benefit to corporations in the long term since competitors may quickly acquire the same assets (Barney and Mackey, 2016). Intangible assets are any assets that do not have a physical existence but might still be held by the firm. Intangible assets include brand reputation, trademarks, and intellectual property. Brand reputation, unlike tangible resources, is established through time and is something that other firms cannot purchase in the market. Intangible resources are often retained inside a corporation and are the primary source of long-term competitive advantage (Barney and Mackey, 2016).

Barney (2020), indicates that RBV has two important assumptions: resources must be diverse and immobile. The first premise is that companies' talents, capacities, and resources vary. If businesses had the same quantity and mix of resources, they couldn't use diverse methods to compete with one another. The other may copy what one firm does, and no competitive advantage can be gained. As a result, RBV implies that enterprises gain a competitive edge by using their various resource bundles. The second RBV assumption is that resources are not movable and do not shift from business to firm, at least not in the near term. Companies cannot duplicate competitors' resources and apply the same strategy because of this immobility.

Intangible resources, including brand equity, procedures, information, and intellectual property, are often static.

Although possessing varied and immobile resources is necessary to create a competitive advantage, it is not sufficient to maintain. Barney, (2020) established the VRIN framework, which assesses whether resources are valuable, scarce, expensive to mimic, and non-substitutable. The resources and competencies that respond yes to all of the questions provide long-term competitive advantages.

Firstly, RBV suggests that Information Systems Capability can be a valuable resource that enables firms to innovate and create new products or services. By leveraging technology and data, firms can gain insights into customer needs, market trends, and new opportunities for growth. This can lead to the development of new products or services that can differentiate the firm from competitors and provide a competitive advantage.

Regarding innovation, RBV suggests that a firm's innovative capabilities can be a valuable and rare resource that provides a competitive advantage. By investing in research and development, fostering a culture of innovation, and utilizing advanced technology, firms can develop unique products, services, and processes that differentiate them from competitors. Additionally, innovative firms can leverage their resources and capabilities to capture first-mover advantages in new markets or technologies, further solidifying their competitive advantage.

Regarding supply chain integration, RBV suggests that a firm's supply chain capabilities can be a valuable, rare, and inimitable resource that provides a competitive advantage. By integrating their supply chain processes, systems, and relationships with suppliers and customers, firms can improve efficiency, responsiveness, and flexibility, enabling them to meet customer demands and respond to changes in the marketplace faster than their competitors.

Additionally, firms with highly integrated supply chains can achieve cost savings, reduce risks, and improve quality, further strengthening their competitive advantage.

2.4 Empirical Review

An empirical review is a systematic and objective assessment of existing research studies or experiments that have used empirical data to investigate a particular research question or topic. This type of review aims to provide a thorough and balanced summary of the literature, including the methods, results, and conclusions of each study or experiment, as well as any limitations or gaps in the research. Table 2.1 provides the empirical review of innovation

Table 2.1 Empirical Review of innovation and performance outcomes

Author(s) and Year	Country	Purpose of the Study/Research Objectives	Construct(s)/ Concept(s) Used	Underlying Theoretical Framework	Methodology	Findings	Identified Gap (From Area of Further Research)
Kalyar, M.N., Shafique, I. and Ahmad, B. (2019)	Pakistan	to investigate the potential role of innovativeness in determining supply chain (SC) integration and to foster the SC performance of manufacturing small and medium enterprises (SMEs). The study also proposes that the SC integration–performance relationship is contingent to the degree of environmental uncertainty (EU).	Supply chain management, Innovativeness, Environmental uncertainty, SC integration, SC performance	contingency theory organizational information processing theory (OIPT)	survey questionnaire cross-sectional	The results indicate that innovativeness positively influences the dimensions of SC integration which in turn affects SC efficiency and effectiveness. The results support the presence of moderation for the relationship between the dimensions of both SC integration and performance. The findings suggest that firms should endeavor to accomplish innovativeness and SC integration, as they jointly promote SC performance.	the sample size is small and convenience sampling was used to collect the data from respondent firms Future researchers are, therefore, encouraged to use longitudinal research design and involve SC partner firms to create dyads or triads to capture more realistic data on SC integration.
Dubey, R., et, al., (2014	India	to test the impacts of supplier relationship management (SRM) and total quality management (TQM) on environmental performance under the influence of leadership and the	Leadership Supplier relationship Institutional pressure Total quality management	institutional theory	pretested structured questionnaire.		extend this study to other industries, and institutional theory can further be extended by developing scales. In the present study, we have

		moderation effect of institutional pressures (IP).	Environmental performance				considered only regulatory and market pressures. There is further scope to explore more dimensions under social and economic variants of institutional pressures.
Lintukangas, K.,et, al., (2019)	Finland	To examine whether supply management innovativeness and supplier orientation make positive impacts on firms' overall sustainability performance	Sustainability Innovativeness Supply management Supplier orientation Purchasing Supply chain	Dynamic capability view	empirical study based on a survey targeting large- and medium-sized manufacturing companies	shows that innovativeness in supply management considerably influences a firm's overall sustainability performance supplier orientation positively relates to sustainability performance. The benefits of innovativeness in supply management and strategic supplier orientation are directly realised in sustainability performance supply management is not only a gatekeeper against sustainability risks arising from the supply base but is also a function by which new	more empirical research in other contexts is therefore required Because of the relatively low explanatory power of the model, several other factors that influence a firm's overall sustainability performance can be identified studying other possible influencing factors from the viewpoint of purchasing and supply management, as well as the overall influence of the purchasing

						ideas aiming to influence supply markets and firms' sustainability are presented.	and supply management function when compared with the other functions of a firm would be interesting
Stek, K. and Schiele, H., (2021)	Netherlands	This study aimed to overcome two gaps in the PSM skills literature – the lack of differentiation in purchasers" objectives and the lack of differentiation between important and secondary skills –	Purchasing and supply chain management skills and competences Effectiveness factors Necessary condition analysis Taxonomy Soft skills		online survey	procurement performing in delivery objectives, cost focus is a necessary skill, purchasers with forecasting skills outperformed their colleagues, showing lower competence in this skill. Statistically, it was found that typically delivery specialists had fewer contracting skills, which are more important to fulfil other objectives.	Future research might want to test for cultural aspects of purchasing skills Using peer assessment or a superior's evaluation could test for the relevance of the Dunning-Kruger effect
C. Clifford Defee Terry Esper Diane Mollenkopf, (2009)	USA	to develop a closed-loop supply chain orientation as a strategic alternative available to supply chain organizations seeking competitive advantage in a setting that puts a premium on socially responsible decisions	Supply chain management, Environmental management, Corporate social responsibility	transformational leadership theory	Conceptual paper The literature describing the concepts of supply chain orientation and supply chain leadership is used to develop a framework for achieving a competitive advantage	Creating a closed-loop supply chain orientation may be facilitated when the supply chain leader demonstrates a transformational leadership style, and when socially important environmental issues are present	The paper presents a synthesis of previously unconnected concepts in a conceptual framework that sets a stage for future research in this area.

Tuomela-Pyykkönen et al. (2015)	Finland	Aimed to form a preliminary understanding of context-specific attributes with respect to Procurement in the real estate and construction sector (RECS.) .	Relationship Management Supply Risk Coordination Learning / Knowledge Sharing	-Context-specific attributes related to procurement in the real estate and construction sector	Literature review based on the four general themes highlighted by the Journal of Purchasing and Supply Management's Special Issue in 2010.	-The understanding that the overall picture of procurement in the RECS might demand advanced Knowledge of both the industrial sector and procurement in order to be managed efficiently and competently. -The presented synthesis offers four themes – relationship management, supply risk, coordination, and Learning/knowledge sharing – through which the overall picture of construction procurement can be formed.	Strategic management and a competent approach in relation to procurement in This specific context, recs. Fruitful discussion if these attributes (i.e., relationship management, supply risk, coordination, and learning/knowledge sharing) were to be evaluated in a Practical business sense.
Loosemore, M., Alkilani, S., And Murphy, R., (2021)	Australia	To deepen this institutional analysis further by mobilising	Social procurement Social value Social impact Social outcomes Institutions Isomorphism	New Institutional Theory	This research was guided by social Constructivist lens and an interpretive epistemology which employed Qualitative methods of data collection and analysis Data was collected through semi-structured interviews with senior Managers and executives of construction organisations who were	Coercive isomorphism emerged as by far the most important driver Of social procurement by mimetic and then normative Isomorphism. The main coercive force driving the adoption of social procurement policies in	Further research is needed In other industry tiers and national contexts. To compare the impacts of contrasting voluntary regulatory In countries such as the UK.

					Responsible for complying with social procurement requirements at a Project level	Construction projects are mandatory targets being imposed by social Procurement legislation and regulations are then translated into targeted contractual requirements for supply chain participants at a Project level. The results show that policies designed for permanent organizational settings cannot be assumed to work as Effectively in project-based industry settings, without some adjustment For the unique challenges that project organizations present The results highlight the importance of research into social Impact measurement in project management and the development of New performance measurement systems to clarify, monitor, and enforce The social value targets being set by these new policies	Further research in the role of social procurement, champions would be useful, drawing Potential parallels to the evolution of environmental initiatives in the Construction industry. Integrative models of project team learning such as that Proposed by decuyper et al. (2010) may be especially interesting in Exploring how to establishment a conducive dialogical space amongst Project stakeholders, in the effective implementation of social procurement Policies.

Bajomo, M., Ogbeyemi, A. And Zhang, W., (2022)	Canada	To explore the underlying causes of problems encountered by Project management in the Engineering, Procurement, and Construction (EPC) and study policies to tackle them.	Supplier Processing, (2) Shipment and Order Fulfilment, And (3) EPC contractor Material Management	Systems dynamic model of the construction material supply chain	A simulation technique known as System Dynamics A simulation study based on the three sub-models was conducted to Examine the behaviour of a particular CMSC to see the usefulness of the Models The EPC order of 5000 materials per week were assumed for a period of 52 weeks (1 year) The model was run to simulate an equilibrium condition by Varying the input level and parameters of the model	The supplier does not have the Timely information on the order change of the epc contractors therefore, The supplier's inventory will be forced to increase the expected Order rate from the epc contractor and wip, thereby creating a gap Between the desired and actual inventory. There is a higher processing start rate than the desired Processing rate. The result indicates that When the epc firm orders the materials continually from its supplier, the supplier makes decisions on the safety stock and service level before Shipping.	Environmental issues (Ntabe et al., 2015), such as weather and climate conditions in the construction sites And their effect on project performance, Studies should Be conducted on human factors along with the SS level to the shipping Time delay and processing time delay The socio-cultural aspects Of EPC management in the context of global economic development, A problem gaining more attention amid of COVID-19 pandemic
Jalaei, F., Masoudi, R. And Guest, G., (2022)	Canada	This study aims to propose the incorporation of the life cycle carbon	-Life cycle assessment	Building Information Modeling (BIM) – Life cycle	Case study and analyzing the Results through using an integrated bim-lca tool	An integrated embodied carbon measurement application is Developed in a building information model (bim)	Focus on digitalization solutions for the Proposed compliancy form

		quantification into the government procurement Of real property process in order to reach out to low-carbon durable and sustainable structures as a Theoretical contribution	-Environmental products declaration -Building information modeling -Low carbon procurement -Ready-mixed concrete	Assessment (LCA) Framework Low carbon procurement framework		environment to act as a decision-making tool in a government Office building as a case study. The study supports updating procurement policies and procedures to request construction Materials with lower embodied carbon in construction. A novel concrete embodied carbon measurement approach is proposed where cradle-to-construction impacts were Accounted for.	on lca-based tools as well as automated Approaches to procure low-carbon building materials through bim to Develop an integrated lca-bim procurement policy approach as well as Its associated tool
Ershadi, M., Jefferies, M., Davis, P. And Mojtahedi, M., (2021)	Australia	To identify barriers Hindering SPM in the private sector through an empirical study.	Sustainable procurement management (SPM) (1) resources, (2) policies, (3) Compliance, (4) culture, and (5) communication .	Resource-based view A theoretical framework of SPM barriers	A case study analysis based on interviews was Conducted to solicit the viewpoints of construction professionals in a high-profile construction organization. A qualitative Research method The data collection in the case study organization includes Interviewing experts	Two Categories of intra-organizational and extra-organizational barriers were identified The intra-organizational Barriers relate to the mechanisms, resources, and capacities within an organization Extra-organizational Barriers relate to a broader environment in which an organization	The methodological approach has a limitation in terms of undertaking a total of six interviews based on a single case study, which implies that the generalizability of the findings can be limited. Further empirical research is required to test and validate

					The data was qualitative and, therefore, a thematic analysis method Using deductive coding was adopted for data analysis.	interacts with stakeholders in an integrated Supply chain Intra-organizational SPM barriers: Lack of management commitment to sustainability, Lack of SPM integration, Inadequate SPM controls, Inadequate training of SPM principles, Lack of teamwork	the proposed barriers by undertaking a Cross-case analysis or quantitative survey. Consider replicating and adjusting the framework for other Industries and highlight differences.
Mojumder, A. And Singh, A., 2021.	India	The aim of the present research work is first to investigate the adaptability of green supply chain practices by various categories of Indian Construction companies followed by identifying the correlation of drivers, enablers, and barriers with the Construction industry readiness of adaptation of green supply chain practices. Finally, these drivers, Enablers and barriers are prioritized by using the Analytical Hierarchy	Green supply chain Construction supply chain ANOVA Correlation Analytical hierarchy process	Institutional theory, complexity theory, ecological modernization theory, resource-based view and Resource dependency theory	Mixed Approach (qualitative and quantitative) for collecting and analyzing The research data. Questionnaire survey was Disseminated to senior construction project managers Descriptive statistics	Results demonstrate that Institutional theory, complexity theory, ecological modernization theory, resource-based view and Resource dependency theory is well supported. The results Demonstrate that there are significant differences in the degree of Adherence to GSCM practices by various categories of construction Firms.	The present study can be extended to construction firms in other countries Having varied firm sizes and areas of engagement where negative Externalities of construction activities are high. The study can Further be extended for identifying the strength and importance of The driver, enabler, and barrier to

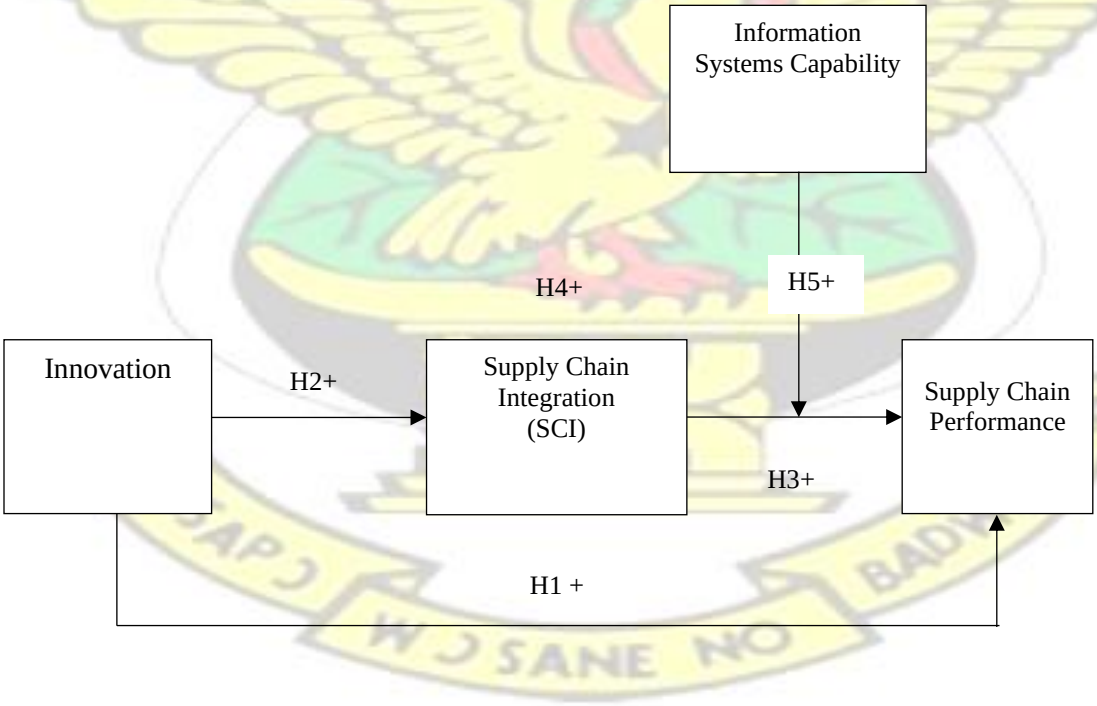
		Process (AHP) methodology.				The effort to adhere to gscmps is gradually decreasing From large size to small size firms. The correlation test has shown That there exists a positive relationship between the extent of a Firm's embracing gscmps implementation with the GSCM drivers Or enablers It has been seen that the willingness to adopting Gscmps by any given firm is inversely proportional to the scale of Barriers to GSCM implementation.	facilitate the adaptation of green Supply chain practices by using the Regression equations. The study Can also be extended to identify various stakeholders like clients, Suppliers, employees, designers, government, agencies, NGOs, and The exploratory study can be undertaken to evaluate the degree of Contribution of these stakeholders towards the success of GSCM Implementation.
Ajayi, S. And Oyedele, L., 2018.	UK	This study aims to explore and confirm strategies for achieving waste-efficient materials procurement in construction Activities.		Construction waste Management	Using focus group discussion, statistical analysis, and structural equation modelling a quantitative approach where tested Questionnaires were used to elicit broader practitioners'	The study suggests that for materials procurement to enhance waste minimisation in construction projects, The procurement process would be characterised by four features	Evaluate how procurement processes Could be optimised to reduce waste on roads and other infrastructural Projects.

					Opinion before the use of structural equation modelling (sem) for Confirmatory factor analysis Sequential exploratory mixed method approach	These include suppliers' commitment To low waste measures, low waste purchase management, effective materials delivery management And waste-efficient Bill of Quantity	The environmental and economic benefits of implementing The strategies suggested in this study, and other similar studies, are possible areas for further investigation.

2.5 Conceptual Framework

This section develops the study's model and then hypotheses based on the model. According to the model, innovation has a positive effect on supply chain performance. The model further posits a sportive effect of innovation on supply chain integration. The model further contends that supply chain integration has a positive and significant effect on supply chain performance. furthermore, the model also posits that supply chain integration acts as a catalyst for the relationship between innovation and supply chain performance. Lastly, the model also postulates that information systems capability positively moderates the relationship between supply chain integration and supply chain performance

Figure 2.1: Research Model



Source: Researcher's Construct (2023)

2.5.1 Innovation and Supply Chain Performance

The RBV theory suggests that innovative capabilities can be a valuable and rare resource that provides a competitive advantage. This hypothesis assumes that firms with strong innovative capabilities can develop unique products, services, and processes that differentiate them from competitors and improve their supply chain performance. In other words, firms with stronger innovative capabilities are expected to have better supply chain performance compared to those with weaker innovative capabilities. The logic behind this hypothesis is that innovative capabilities can be used to improve efficiency, reduce costs, increase responsiveness, and enhance the quality of products and services. By using innovative technology and processes, firms can better manage their supply chain, respond to customer demands more quickly, and achieve greater flexibility (Popa et al., 2017). This, in turn, can lead to better supply chain performance. Innovation can lead to the development of new technologies and processes that can reduce costs in the supply chain (Shahbaz et al., 2018). For example, the use of automated systems and robotics can help to reduce labor costs and improve efficiency in manufacturing and warehousing. Innovation can also help to improve efficiency in the supply chain by streamlining processes and reducing waste. For example, the use of data analytics and predictive modeling can help to optimize inventory levels and reduce stockouts. Innovation can enable greater collaboration among supply chain partners, leading to improved communication and coordination (Afonasova et al., 2019). Based on the above, the researcher states the following:

H1: Innovation is positively associated with improved supply chain performance

2.5.2 Innovation and Supply Chain Integration

The RBV theory further suggests that innovative capabilities can also be used to improve supply chain integration. Firms with strong innovative capabilities can use advanced technology and systems to facilitate communication and collaboration with suppliers and customers, which can improve the efficiency, responsiveness, and flexibility of their supply chain. This hypothesis assumes that firms with stronger innovative capabilities are more likely to have better supply chain integration compared to those with weaker innovative capabilities. The logic behind this hypothesis is that innovative capabilities can be used to improve communication and collaboration between firms and their supply chain partners. By using innovative technology and processes, firms can better manage their relationships with suppliers and customers, share information more effectively, and coordinate their activities more efficiently (Tavassoli, 2018). This, in turn, can lead to better supply chain integration. Innovation can enable better communication among supply chain partners, leading to improved coordination and collaboration (Che et al., 2019). Innovation can enable greater visibility into supply chain operations, enabling firms to identify and address bottlenecks and inefficiencies. Innovation can help to reduce the complexity of supply chain operations by streamlining processes and automating routine tasks (Wallace *et al.*, 2016a). Innovation can enable greater flexibility in supply chain operations, allowing firms to respond more quickly to changes in demand or disruptions in the supply chain (Sung and Kim, 2021). Based on the above, the study states the following:

H2: Innovation has a positive nd significant effect on supply chain integration

2.5.3 Supply Chain Integration and Supply Chain Performance

The study further draws on the RBV theory to explain the impact of supply chain integration on performance. According to the RBV theory, a firm's resources and capabilities can provide a competitive advantage in the marketplace. Supply chain integration can be seen as a resource that firms can leverage to gain a competitive advantage. By integrating their supply chain activities, firms can achieve better coordination and collaboration, leading to improved efficiency and effectiveness in their operations. This can result in cost savings, increased productivity, and faster time-to-market for products and services. (Henneaux, 2015). Supply chain integration refers to the coordination and collaboration of various entities within a supply chain to enhance performance (Flynn et al., 2016). This study contends there is sufficient evidence in the literature to suggest supply chain drives various performance outcomes such as supply chain performance, firm performance, operational performance, financial performance, and sustainability performance (Cao *et al.*, 2015b; Chaudhuri *et al.*, 2018a; Flynn *et al.*, 2016c; Khan and Wisner, 2019b; Khanuja and Jain, 2020). The rationale is that supply chain integration can enhance supply chain performance by improving coordination, reducing costs, improving quality, and enhancing innovation. By leveraging the power of network effects, supply chain integration can help to create a more efficient and effective supply chain ecosystem. Alfalla-Luque et al. (2015) indicate that supply chain integration can help to reduce costs by eliminating redundancies and reducing the need for intermediaries. This can help to improve the overall efficiency of the supply chain. However, other studies have reported mixed findings across various studies with the multi-dimensional concept, as there are different performance outcomes of the relationship, making it difficult to draw a conclusion. While some studies have reported positive impacts of supply chain integration (Cao *et al.*, 2015b; Chaudhuri *et al.*, 2018a; Flynn *et al.*, 2016c; Khan and Wisner,

2019b; Khanuja and Jain, 2020), others have reported negative effects (Huo *et al.*, 2016b; Jacobs *et al.*, 2016b), whiles others have also reported indirect effects (Kamble *et al.*, 2021; Vanpoucke *et al.*, 2017b). Based on the above, the study develops the following hypothesis

H3: Supply chain integration is positively associated with improved supply chain performance

2.5.4 Mediating effect of Supply Chain Integration

The RBV theory suggests that firms with highly integrated supply chains can achieve cost savings, reduce risks, and improve quality, further strengthening their competitive advantage. This hypothesis assumes that firms with strong innovative capabilities that are also highly integrated with their supply chain are expected to have superior supply chain performance compared to firms that lack integration. The logic behind this hypothesis is that supply chain integration can enhance the effects of innovation on supply chain performance. By integrating their supply chain more closely, firms can reduce costs, improve quality, and respond more quickly to customer demands (Chaudhuri et al., 2018). This, in turn, can amplify the effects of innovative capabilities on supply chain performance. The argument behind this hypothesis is that supply chain integration can help firms realize the full potential of their innovative capabilities, leading to better supply chain performance (Cao et al., 2015). Firms that invest in innovation and are able to integrate their supply chain more closely are likely to have better supply chain performance compared to those that lack integration (Wong et al., 2017). Accordingly, the study states the following:

H4: Supply chain integration positively mediates the effect of innovation on supply chain performance.

2.5.5 Moderating effect of Information Systems Capability

According to the RBV theory, firms can achieve a sustained competitive advantage by leveraging their valuable, rare, inimitable, and non-substitutable resources and capabilities. In this case, information systems capability can be considered a valuable and rare resource that can contribute to a firm's competitive advantage in the marketplace. In the context of supply chain integration and performance, firms with a high level of information systems capability may be better able to integrate their supply chain activities, resulting in improved performance outcomes (Espino-Rodríguez and Gil-Padilla, 2007). Furthermore, information systems capability may act as a non-substitutable resource, as it may be difficult for competitors to replicate or imitate a firm's unique set of information systems and technology (Che et al., 2019). Therefore, the possession of high levels of information systems capability may lead to a sustained competitive advantage for a firm in the long run. Based on the RBV theory, the hypothesis suggests that information systems capability can moderate the relationship between supply chain integration and supply chain performance (Steininger *et al.*, 2022). This implies that the effect of supply chain integration on performance may be contingent upon the level of information systems capability possessed by the firm. A high level of information systems capability may strengthen the relationship between supply chain integration and performance, while a low level of information systems capability may weaken this relationship. Accordingly, the study states the following:

H5: Information systems capability positively moderates the effect of supply chain integration on supply chain performance.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter describes the methodology that was used in the present study. The methodology provides a detailed description of the research design, data collection methods, sampling strategy, and data analysis techniques employed in the study. In addition, the chapter discusses the ethical considerations addressed during the study and the steps taken to ensure the validity and reliability of the data.

3.2 Research Design

A research design is a framework or blueprint for conducting a research study. It outlines the procedures, methods, and techniques that will be used to collect and analyse data, as well as the overall structure and approach of the study. A research design is critical to a research study because it provides a structured and systematic approach to answering research questions or testing hypotheses (Levy and Lemeshow, 2008). Descriptive, exploratory, explanatory, and evaluative research designs are all. This study's design is explanatory since the overall goal is to investigate and evaluate the link between innovation, supply chain integration, information system capabilities, and supply chain performance. The researcher chose an explanatory research design that allows the researcher to explore the cause-and-effect relationships between the study variables, helping the researcher to understand why certain phenomena occur.

A research strategy is a plan of action that outlines a researcher's approach to answering their research question or problem. The overarching framework guides a researcher's decisions throughout the research process. A research strategy typically includes several components, including the research design, data collection methods, sampling technique, data analysis methods, and ethical considerations. The research strategy outlines the methods used to collect and analyse data, the sources of data, and how the data will be organised and presented (Blaxter *et al.*, 2010). Examples of research strategies include experimental research, surveys, case studies, action research, and grounded theory research, among others. The current study adopts a survey focusing on firms operating within the Greater Accra region. A survey is a research method used to gather information from a sample of individuals or organisations about their opinions, attitudes, experiences, behaviours, or characteristics (Sarstedt and Mooi, 2019). By using standardised questions, surveys ensure that each participant is asked the same questions in the same way, reducing the potential for bias in the data collection process, hence its adoption in this study

Research approaches are the different ways or methods that a researcher can use to conduct a research study. The approach chosen by the researcher depends on the research question or problem, the nature of the data being collected, and the resources available for the study (Kothari, 2004). Kothari (2004) distinguishes three categories of approaches: qualitative, quantitative, and mixed. The study employs a quantitative research approach. Quantitative research is a research approach that involves the collection and analysis of numerical data using statistical methods (Kothari, 2004). The goal of quantitative research is to test hypotheses, identify patterns and relationships, and make objective inferences about a population based on a sample of that population. Quantitative research often involves using surveys, questionnaires, and standardised instruments to collect data from a sample of individuals. The study chose quantitative research

because it provides precise and objective measures of variables, which can help to minimise ambiguity and subjectivity in the research process.

3.3 Population of the Study

In research, the population of a study refers to the entire group of individuals, objects, or events that a researcher is interested in studying. It is the group to which the researcher would like to generalise their findings or conclusions (Levy and Lemeshow, 2008). The study's unit of analysis is firm; hence the population consists of one employee from firms operating within the Greater Accra region.

3.4 Sample and Sampling Technique

Sampling refers to selecting a subset of individuals, objects, or events from a larger population of interest to study them and make inferences about the larger population (Carter and Hurtado, 2007). In research, sampling is a critical component of the research process because it determines the degree to which the findings of a study can be generalised to the larger population (Almalki, 2016). There are two sampling methods that researchers can use, depending on the research question, the size of the population, and the resources available for the study: probability and non-probability sampling. With probability sampling, every member of the population has a known and equal chance of being selected for the sample. With non-probability sampling, members of the population do not have an equal chance of being selected for the sample. The research used convenient sampling to draw a sample of two hundred (200) from the target group. Convenience sampling is a non-probability method in which participants are selected based on their accessibility or availability to the researcher (Barnham, 2015). Convenience sampling was chosen because it is

a quick and easy way to gather data, as the participants are easy to access and do not require much effort to recruit. A sample size of 200 was selected for this study because of resource constraints, including limited time or budget: conducting a larger study requires more time and resources.

3.5 Data Collection Method

Data collection in research refers to gathering information or data from various sources to answer a research question or hypothesis. Data collection is a critical part of any research project, as the quality and validity of the findings depend on the accuracy and completeness of the data collected (Barnham, 2015). This study used mainly primary to address the objectives and answer the research questions. Primary data refers to data collected by a study from the field to enable the researcher to address the objectives and answer the research questions (Abutabenjeh and Jaradat, 2018). Primary data for this study is collected from one hundred employees of firms operating within the Greater Accra Region.

3.5.1 Questionnaire Design

This section provides a detailed description of the questionnaire design used to collect the data for the study. The questionnaire comprises five sections. Section A focuses on the profiles of the respondents. Section B focuses on the independent variable, innovation. Section C focuses on the mediating variable, supply chain integration. Section D focuses on information systems capability, the moderating variable, and, Section E focuses on the outcome variable, supply chain performance. Table 3.1 provides a summary of the measurement items

Table 3.1 Summary of Measurement Items

Variables	No. of Items	Sources
Innovation	5	Kalyar et al. (2019)
Supply Chain Integration		
• Internal integration	4	Kalyar et al. (2019)
• Supplier integration	5	Kalyar et al. (2019)
• Customer integration	5	Kalyar et al. (2019)
Information Systems Capability	5	Tarafdar and Qrunfleh (2017)
Supply Chain Performance		
• Reliability performance	5	Asamoah et al. (2021)
• Efficiency performance	4	Asamoah et al. (2021)
• Flexibility performance	5	Asamoah et al. (2021)

Source: Researcher's Construct (2023)

3.6 Data Analysis

Data analysis is examining and interpreting data to extract meaningful insights, draw conclusions, and make informed decisions. Data analysis can be performed on various data types, including numerical, categorical, or textual data (McNabb, 2010). SPSS version 26 and SmartPLS version are used to perform all data analysis. Data analysis is categorised into two: inferential and descriptive. Descriptives Statistics include Mean, Standard deviation, Skewness, and Kurtosis. Inferential Statistics include Cronbach Alpha, Composite reliability, Average variance explained, exploratory factor analysis, and confirmatory factor analysis. The model for the study is tested using PLS-SEM.

3.7 Validity and Reliability

Reliability and validity are two important concepts in research that are essential for ensuring the quality and accuracy of research findings. Reliability refers to the consistency, stability, and repeatability of research measures. In other words, a measure is considered reliable if it produces consistent results across different researchers and in different situations over time. A reliable measure should produce similar results when used repeatedly, as long as the underlying measured construct has not changed (Maciej Serda, 2013). Reliability is assessed using Cronbach Alpha, and Composite Reliability is used to assess the internal consistency of the data obtained. Validity refers to the accuracy and meaningfulness of research measures. A measure is considered valid if it measures what it is intended to measure and if the results can be used to draw accurate conclusions about the research question (Maciej Serda, 2013). There are several types of validity, including content, construct, and criterion. Content validity refers to whether a measure covers all aspects of the measured construct. Construct validity refers to whether a measure is measuring the intended construct, and criterion validity refers to whether the results of the measure can be used to predict behaviour or outcomes. Validity is assessed in this study using Explanatory factor analysis, Average variance explained, and confirmatory factor analysis.

3.8 Ethical Considerations

Ethics in research is essential to ensure that the research is conducted in a respectful, responsible, and ethical way towards the participants, the research community, and society as a whole. To ensure compliance with ethical principles, the researcher ensured the following: (1) Providing informed consent**:** All participants were fully informed about the research and provided their voluntary consent to participate; (2) Maintaining confidentiality and privacy: The study kept participants' personal information and data confidential and private; (3) Minimising harm: Steps were taken to minimise potential harm to participants, including physical and psychological harm.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSION OF RESULTS

4.1 Introduction

This chapter presents the results of the data analysis and research, which have been structured into six distinct sections. The initial part scrutinizes the demographics of the participants, while the second section evaluates the reliability and validity of the constructs. The third section focuses on the descriptive statistics of the research constructs, and the fourth section utilizes partial least square (PLS) structural equation modelling. The fifth section verifies or contradicts the hypotheses, and the sixth section discusses the outcomes of the study. In order to gather data, a questionnaire was devised and administered to employees of companies located in Greater Accra. Of the 200 questionnaires disseminated, 186 were completed, resulting in a response rate of 93%. The 186 responses were scrutinized using SPSS and SMART PLS, and the conclusions are presented in the subsequent sections.

4.2 Demographics of the Respondents

This segment presents details about the people and organizations involved in the study, along with their demographic characteristics. Essential data collected from participants, such as gender, age range, employee count, business sector, yearly income, type of establishment, and company ownership, can be found in Table 4.1

Table 4.1 Demographics of Respondents

Variables	Categories	Frequency	Valid Percentage
Gender	Male	109	58.6
	Female	77	41.4
Age	18 to 29 years	43	23.1
	30 to 39 years	54	29
	41 to 49 years	66	35.5
	50 or more years	23	12.4
Number of employees	Below 6	9	4.8
	6 to 29	23	12.4
	30 to 59	59	31.7
	60 to 99	62	33.3
	100 and above	33	17.7
Firm Industry	Manufacturing	16	8.6%
	Financial services	4	2.2%
	Oil and Gas	8	4.3%
	Retail	8	4.3%
	Construction	11	5.9%
	Transportation	19	10.2%
	Telecommunication	14	7.5%
	Pharmaceuticals	24	12.9%
	Electronics	17	9.1%
	Mining	33	17.7%
	Health	16	8.6%
	Others	16	8.6%
Legal form of entity	Sole proprietorship	16	8.6%
	Limited liability	52	28%
	Partnership	50	26.9%
	Public limited liability	62	33.3%
	Other	6	3.2%
Ownership of Company	Solely Ghanaian owned	49	26.3%
	Foreign-owned	72	38.7%

	Joint ventures	61	32.8%
	Others	4	2.2%
Estimated Annual Revenue (GHS)	Below 40,000	9	4.8%
	40,001-80,000	7	3.8%
	80,001-120,000	8	4.3%
	120,001-160,000	13	7%
	160,001-200,000	36	19.4%
	200,001 – 500,000	51	27.4
	500,001 – 1,000,000	32	17.2
	Above 1,000,000	30	16.1%

Source: Field Study (2023)

Table 4.1 presents the results of the respondents' demographics. This demographic analysis presents the results of a study involving a diverse sample of 186 participants across various industries in Ghana. The participants' characteristics are categorized based on several variables, including gender, age, number of employees, firm industry, legal form of entity, ownership of the company, and estimated annual revenue. The sample includes 58.6% males (109) and 41.4% females (77), indicating a higher representation of males. This implies that the study's sample is highly represented. Respondent's ages are categorized into four groups: 23.1% (43) are 18-29 years old, 29% (54) are 30-39 years old, 35.5% (66) are 41-49 years old, and 12.4% (23) are 50 years or older. The majority of the sample falls within the 41-49 age range, suggesting that the study's sample consisted of experienced professionals. The firms' sizes vary, with 4.8% (9) having below six employees, 12.4% (23) having 6-29 employees, 31.7% (59) having 30-59 employees, 33.3% (62) having 60-99 employees, and 17.7% (33) having 100 or more employees. The study predominantly represents firms with 30-99 employees, while smaller firms with fewer than six employees are underrepresented. This may affect the generalizability of the results to smaller firms.

The sample comprises firms from various industries, with the highest representation in mining (17.7%, 33) and the lowest in financial services (2.2%, 4). This distribution indicates that the results may be more relevant to specific industries, and generalizing the findings to other industries should be approached with caution. Entities in the sample are categorized as 8.6% (16) sole proprietorships, 28% (52) limited liability companies, 26.9% (50) partnerships, 33.3% (62) public limited liability companies, and 3.2% (6) other forms. The majority are public limited liability companies, suggesting that the study might be more relevant to larger, publicly traded firms. Ownership types include 26.3% (49) solely Ghanaian-owned, 38.7% (72) foreign-owned, 32.8% (61) joint ventures, and 2.2% (4) other categories. This diverse distribution implies that the sample has a good mix of ownership types, which could provide valuable insights into how ownership affects the outcomes being studied. Revenues range from below GHS 40,000 (4.8%, 9) to above GHS 1,000,000 (16.1%, 30), with the majority of firms (27.4%, 51) generating an estimated annual revenue between GHS 200,001 and GHS 500,000. This distribution suggests that the study is most relevant to small and medium-sized firms, while very small and very large firms are less represented.

4.3 Reliability and Validity Test

In this segment, the analysis evaluates the reliability and validity of the data collected in the study. Both concepts are crucial in research, as they pertain to the precision and dependability of data and findings. Reliability denotes the consistency with which a measurement tool or instrument generates identical results over time or among various raters or observers. Conversely, validity pertains to the extent to which a research investigation accurately gauges or represents the intended subject matter.

4.3.1 Cronbach Alpha, Composite Reliability, and Average Variance Extracted

The reliability of the constructs was assessed using Cronbach's alpha and composite reliability values, which determined the consistency of the metrics in evaluating the variables. A value of 0.7 is considered acceptable for these measures (Hair et al., 2013). Furthermore, the Average Variance Extracted (AVE) was employed in structural equation modeling (SEM) to assess a construct's convergent validity. An AVE of 0.5 or higher is a widely accepted benchmark, signifying satisfactory convergent validity. On the other hand, a low AVE implies that the construct is poorly defined or that the indicators do not sufficiently measure the construct. The outcomes of the Cronbach's Alpha, Composite Reliability, and Average Variance Extracted tests can be found in Table 4.2.

Table 4.2 Cronbach Alpha, Composite Reliability, and Average Variance Extracted Results

Construct	Number of items	Cronbach Alpha (CA)	Composite Reliability (CR)	AVE
Innovation	5	0.817	0.872	0.578
Supply Chain Integration	11	0.908	0.923	0.522
Information Systems Capability	3	0.758	0.814	0.593
Supply Chain Performance	8	0.859	0.890	0.503
Total	**26**			

Source: Field Study (2023)

Table 4.2 displays the results of Cronbach Alpha (CA), Composite Reliability (CR), and Average Variance Extracted (AVE) for the four constructs: Innovation, Supply Chain Integration, Information Systems Capability, and Supply Chain Performance. For the Innovation construct, the Cronbach Alpha value of 0.817 and Composite Reliability value of 0.872 both demonstrate good reliability. Additionally, the Average Variance Extracted result of 0.578 indicates satisfactory convergent validity. The Supply Chain Integration construct exhibits excellent reliability, as evidenced by its Cronbach Alpha value of 0.908 and Composite Reliability value of 0.923. The construct also displays adequate convergent validity with an Average Variance Extracted value of 0.522. In the case of the Information Systems Capability construct, the Cronbach Alpha value of 0.758 and Composite Reliability value of 0.814 both signify strong reliability. The construct's Average Variance Extracted value of 0.593 confirms sufficient convergent validity. Lastly, the Supply Chain Performance construct presents a Cronbach Alpha value of 0.859 and a Composite Reliability value of 0.890, both of which indicate good reliability. The Average Variance Extracted value of 0.503, though slightly above the 0.5 benchmark, still suggests acceptable convergent validity. In conclusion, the analysis shows that all four constructs possess adequate reliability and convergent validity. This implies that the instruments used to measure these constructs in the study are consistent and accurately represent the intended variables.

4.3.2 Cross-loadings

Cross-loadings indicate the correlation between an indicator and its respective construct compared to its correlation with other constructs. A high cross-loading for an indicator with its corresponding construct, compared to lower cross-loadings with other constructs, suggests that the indicator effectively measures its intended construct.

Table 4.3 Cross-Loadings

	ISC	INN	SCI	SCP
INN1	0.541	**0.769**	0.659	0.599
INN2	0.482	**0.728**	0.552	0.510
INN3	0.567	**0.758**	0.633	0.532
INN4	0.595	**0.788**	0.647	0.563
INN5	0.480	**0.756**	0.618	0.492
ISC2	**0.742**	0.475	0.569	0.513
ISC3	**0.789**	0.573	0.584	0.522
ISC4	**0.778**	0.571	0.595	0.599
SCI1	0.597	0.635	**0.700**	0.506
SCI10	0.531	0.525	**0.688**	0.529
SCI11	0.564	0.641	**0.738**	0.571
SCI12	0.518	0.568	**0.727**	0.540
SCI13	0.481	0.529	**0.711**	0.542
SCI2	0.503	0.565	**0.689**	0.545
SCI5	0.558	0.618	**0.748**	0.549
SCI6	0.635	0.589	**0.754**	0.535
SCI7	0.587	0.626	**0.751**	0.509
SCI8	0.527	0.612	**0.728**	0.585
SCI9	0.508	0.591	**0.706**	0.493
SCP1	0.483	0.570	0.578	**0.713**

SCP10	0.493	0.474	0.534	**0.723**
SCP11	0.462	0.363	0.438	**0.667**
SCP13	0.452	0.376	0.443	**0.665**
SCP2	0.529	0.558	0.575	**0.710**
SCP4	0.574	0.596	0.539	**0.700**
SCP8	0.483	0.508	0.501	**0.740**
SCP9	0.534	0.531	0.576	**0.749**

Source: Field Study (2023)

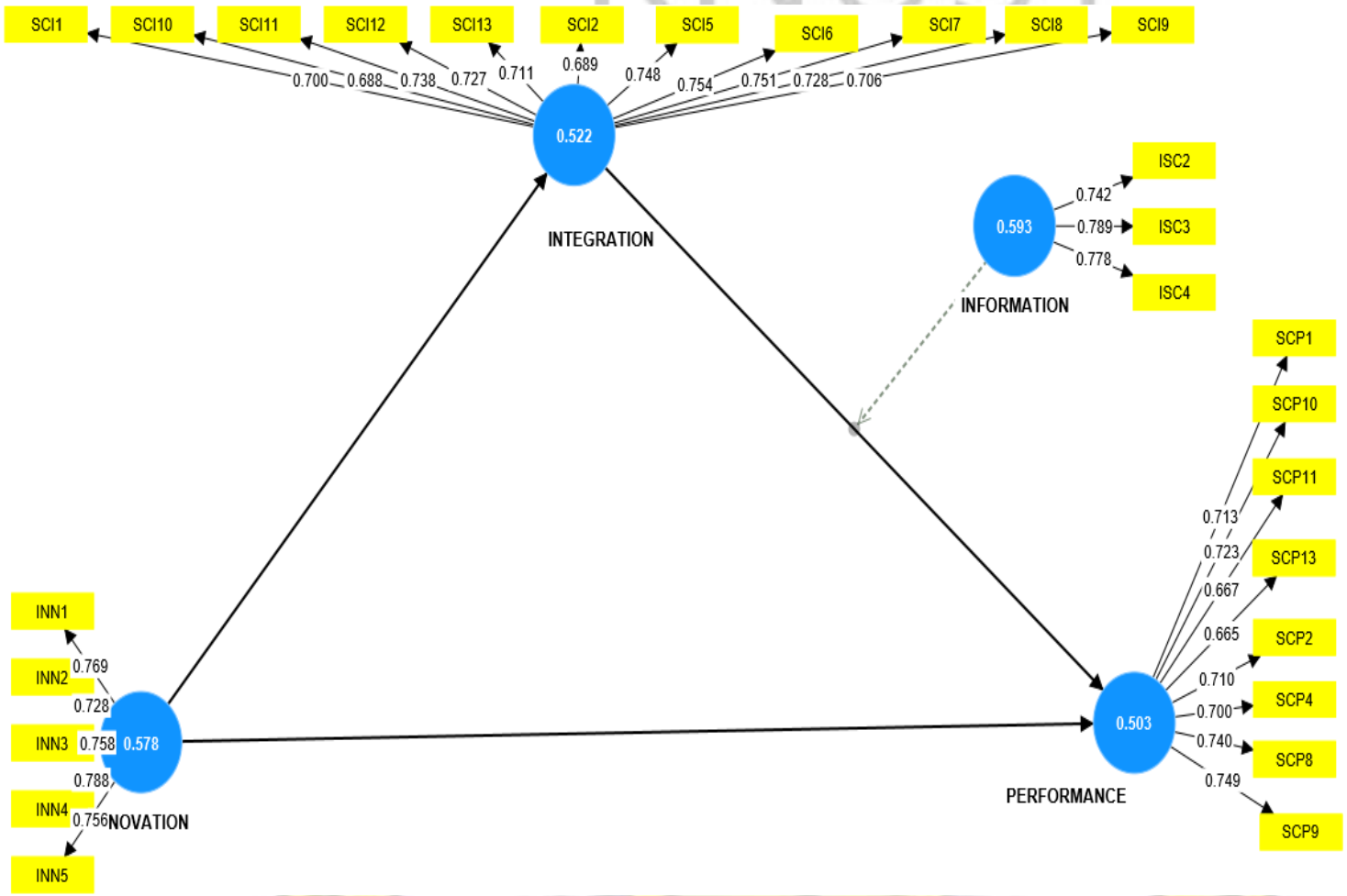
The table above displays the cross-loading results for four constructs: Innovation (INN), Information Systems Capability (ISC), Supply Chain Integration (SCI), and Supply Chain Performance (SCP). Innovation (INN) indicators (INN1 to INN5) have the highest cross-loadings with the Innovation construct, ranging from 0.728 to 0.788, which are higher than their correlations with the other three constructs. This suggests that the Innovation indicators are well-defined and effectively measure the intended construct. Information Systems Capability (ISC) indicators (ISC2, ISC3, and ISC4) exhibit the highest cross-loadings with the Information Systems Capability construct, ranging from 0.475 to 0.571. These values are higher than their correlations with the other three constructs, indicating that the ISC indicators are properly measuring the intended construct. Supply Chain Integration (SCI) indicators (SCI1 to SCI13) show the highest cross-loadings with the Supply Chain Integration construct, ranging from 0.688 to 0.754, which are higher than their correlations with the other three constructs. This implies that the SCI indicators are successfully measuring the intended construct. Supply Chain Performance (SCP) indicators (SCP1, SCP2, SCP4, SCP8, SCP9, SCP10, SCP11, and SCP13) have the highest cross-loadings with the Supply Chain Performance construct, ranging from 0.665 to 0.749, which are higher than

their correlations with the other three constructs. This suggests that the SCP indicators effectively measure the intended construct.

4.3.3 Confirmatory Factor Analysis (CFA)

Figure 4.1 in the study displays the confirmatory factor analysis, which is used to verify the factor structure of a set of observed variables. Confirmatory Factor Analysis (CFA) is a statistical method that allows researchers to examine the relationship between observed variables and their underlying latent constructs. The expected result is for each item to have a loading of at least 0.60 on the corresponding latent variable it is intended to measure. The Figure indicates that two items (ISC1 and ISC5) related to information systems capability and three items (SCI3, SCI4, and SCI14) related to supply chain integration had loadings below 0.60 and were removed from the structural equation model. Additionally, seven items (SCP3, SCP5, SCP6, SCP7, SCP12, SCP14, and SCP15) related to sustainability performance had loadings below 0.60 and were also removed from the structural equation model.

Figure 4.1 Confirmatory Factor Analysis



Source: Field Study (2023)

4.4 Descriptive Statistics

Data analysis commonly involves the use of descriptive statistics to provide an overview of a data set. These statistics are useful in providing insights into various features of the data, such as its central tendency, variability, and distribution shape. The current analysis focuses on four widely used descriptive measures, namely mean, skewness, kurtosis, and standard deviation. Mean is the measure of central tendency that represents the average value of a given data set. Skewness measures the degree of asymmetry in the distribution of data. Kurtosis, on the other hand, measures the extent of peakedness or flatness in the distribution of data. Lastly, standard deviation measures the spread or variability of data, indicating the degree of deviation of observations from the mean.

4.4.1 Innovation

To measure the predictor variable of Innovation in this study, five (5) items were chosen from Kalyar et al. (2019). These items were selected to represent different dimensions of Innovation that were relevant to the study and to capture the attitudes and perceptions of the participants. Descriptive statistics, presented in Table 4.4, were used to summarize the characteristics of the Innovation variable.

Table 4.4 Descriptive Statistics on Innovation

Items	Mean	SD	Skewness	Kurtosis
We frequently try out new ideas in the supply chain context	5.09	1.349	-1.066	1.254
We seek out new ways to do things in our supply chain	4.97	1.247	-0.462	0.026
We are creative in the methods of operation in the supply chain	4.97	1.199	-0.566	0.232
We often introduce new ways of servicing the supply chain	5.1	1.295	-0.816	0.358
We have increasingly introduced new processes in the supply chain in the last 5 years	4.85	1.252	-0.615	0.614
Overall	**4.9935**	**0.96443**	**-1.051**	**1.756**

Source: Field Study (2023)

The table presents the descriptive statistics for the five items in the study. The mean values range from 4.85 to 5.1, with an overall mean of 4.9935. The standard deviations range from 1.199 to 1.349, indicating that there is some variability in the responses for each item. The skewness values range from -1.066 to -0.462, indicating that the distribution of responses for each item is skewed to the left. The kurtosis values range from 0.026 to 1.254, with an overall kurtosis value of 1.756, indicating that the distribution of responses for each item is leptokurtic, i.e., the data has a relatively high peak and heavy tails. The mean values indicate that respondents generally agree with the statements presented in the survey, with mean values ranging from 4.85 to 5.1, and an overall mean of 4.9935. The lowest mean score of 4.85 is still relatively high, indicating that respondents generally agree that new processes have been introduced in the supply chain over the past five years. The highest mean score of 5.1 indicates that respondents somewhat agree that new ways of servicing the supply chain are often introduced. The skewness values are negative for all items, indicating that the distribution of responses is skewed to the left, with more responses towards the higher end of the scale. The kurtosis values indicate that the distribution of responses for each item is leptokurtic, meaning that the data has a relatively high peak and heavy tails. This indicates that there is some clustering of responses around the mean, with fewer responses in the extreme values. In summary, the descriptive statistics suggest that respondents generally agree with the statements in the survey, with some variability in responses for each item. The skewness values indicate that there is a tendency towards more positive responses, while the kurtosis values indicate that the distribution of responses for each item is relatively peaked and has heavy tails.

4.4.2 Supply Chain Integration

To measure the mediator variable of supply chain integration in this study, fourteen items (14) items were chosen from Kalyar et al. (2019). These items were selected to represent different dimensions of Supply Chain Integration that were relevant to the study and to capture the attitudes and perceptions of the participants. Descriptive statistics, presented in Table 4.5, were used to summarize the characteristics of the Supply Chain Integration.

Table 4.5 Descriptive Statistics on Supply Chain Integration

Items	Mean	SD	Skewness	Kurtosis
We have a high level of responsiveness within our plant to meet other departments' needs	4.87	1.267	-0.593	0.099
We have an integrated system across functional areas of plant control	5.09	1.22	-0.772	0.782
Within our plant, we emphasize information flows among purchasing, inventory management, sales, and distribution departments	4.86	1.173	-0.396	0.019
Within our plant, we emphasize physical flows among production, packing, warehousing, and transportation departments	4.77	1.317	-0.555	0.245
We share information with our major suppliers through information technologies	5.17	1.194	-0.635	0.368
We have a high degree of strategic partnership with suppliers	5.17	1.304	-0.738	0.177
We have a high degree of joint planning to obtain rapid response ordering processes (inbound) with suppliers	5.02	1.153	-0.684	0.736
Our suppliers are involved in our product development processes	5	1.213	-0.588	0.195
Our suppliers provide information to us about production and procurement processes	5.17	1.167	-0.846	1.165
We have a high level of information sharing with major customers about market information	4.91	1.202	-0.445	0.092
We share information with major customers through information technologies	5.17	1.24	-0.865	0.811
We have a high degree of joint planning and forecasting with major customers to anticipate demand visibility	4.96	1.136	-0.529	0.128
Our customers provide information to us in the procurement and production processes	5.11	1.201	-0.656	0.419
Our customers are involved in our product development processes	4.97	1.341	-0.738	0.194
Overall	**5.0177**	**0.84673**	**-1.351**	**2.891**

Source: Field Study (2023)

The table shows the descriptive statistics for each item in the study related to the level of integration and collaboration in the supply chain. The mean values range from 4.77 to 5.17, with an overall mean of 5.0177. The standard deviations range from 1.136 to 1.341, indicating that there is some variability in the responses for each item. The skewness values range from -0.865 to -0.396, indicating that the distribution of responses for each item is slightly skewed to the left. The kurtosis values range from 0.019 to 2.891, with an overall kurtosis value of 2.891, indicating that the distribution of responses for each item is leptokurtic, with a high peak and heavy tails. The mean values suggest that respondents generally agree with the statements in the survey, with mean values ranging from 4.77 to 5.17, and an overall mean of 5.0177. The highest mean scores of 5.17 are for two items related to information sharing with major suppliers and customers through information technologies. The lowest mean score of 4.77 is for an item related to physical flows among the production, packing, warehousing, and transportation departments. The skewness values indicate that the distribution of responses for each item is slightly skewed to the left, with more responses towards the higher end of the scale. The kurtosis values indicate that the distribution of responses for each item is leptokurtic, meaning that the data has a relatively high peak and heavy tails. This indicates that there is some clustering of responses around the mean, with fewer responses in the extreme values. In summary, the descriptive statistics suggest that respondents generally agree with the statements in the survey, with some variability in responses for each item. The skewness values indicate a tendency towards more positive responses, while the kurtosis values indicate that the distribution of responses for each item is relatively peaked and has heavy tails.

4.4.3 Information Systems Capability

To measure the moderating variable of Information Systems Capability in this study, five (5) items were chosen from Tarafdar and Qrunfleh (2017). These items were selected to represent different dimensions of Information Systems Capability that were relevant to the study and to capture the attitudes and perceptions of the participants. Descriptive statistics, presented in Table 4.6, were used to summarize the characteristics of Information Systems Capability

Table 4.6 Descriptive Statistics on Information Systems Capability

Items	Mean	SD	Skewness	Kurtosis
Introduce new products and services in our markets	4.1	1.36	0.24	-0.514
Share information with our suppliers and customers	5.06	1.248	-0.467	0.091
Monitor changes in our market conditions	5.37	1.151	-0.774	0.582
Respond to changes in the market	5.27	1.077	-0.554	0.065
Model possible future outcomes and identify alternative courses of action	5.07	1.11	-0.642	0.445
Overall	**4.972**	**0.82401**	**-0.678**	**1.144**

Source: Field Study (2023)

The table presents the descriptive statistics for each item in the study related to information Systems Capability. The mean values range from 4.1 to 5.37, with an overall mean of 4.972. The standard deviations range from 1.077 to 1.36, indicating that there is some variability in the responses for each item. The skewness values range from -0.774 to 0.24, indicating that the distribution of responses for each item is slightly skewed to the left or right. The kurtosis values range from -0.514 to 1.144, with an overall kurtosis value of 1.144, indicating that the distribution of responses for each item is mesokurtic, i.e., close to a normal distribution. The mean values suggest that respondents somewhat agree with the statements in the survey, with mean values ranging from 4.1 to 5.37, and an overall mean of 4.972. The highest mean score of 5.37 is for an item related to monitoring changes in market conditions, while the lowest mean score of 4.1 is for an item related to introducing new products and services in the markets.

The skewness values indicate that the distribution of responses for each item is slightly skewed to the left or right, with more or fewer responses towards the higher end of the scale. The kurtosis values indicate that the distribution of responses for each item is mesokurtic, meaning that the data is relatively normally distributed. In summary, the descriptive statistics suggest that respondents somewhat agree with the statements in the survey related to the market orientation of the organization, with some variability in responses for each item. The skewness values indicate a tendency towards slightly positive or negative responses, while the kurtosis values indicate that the distribution of responses for each item is close to a normal distribution.

4.4.4 Supply Chain Performance

To measure the outcome variable of supply chain performance in this study, fifteen (15) items were chosen from Asamoah et al. (2021). These items were selected to represent different dimensions of Supply Chain Performance that were relevant to the study and to capture the attitudes and perceptions of the participants. Descriptive statistics, presented in Table 4.7, were used to summarize the characteristics of Supply Chain Performance

Table 4.7 Descriptive Statistics on Supply Chain Performance

Items	Mean	SD	Skewness	Kurtosis
Our firm with supply chain partners offers products that are highly reliable	4.65	1.412	-0.399	0.052
Our firm with supply chain partners offers high-quality products to our customers	4.97	1.348	-0.686	0.711
Our firm and supply chain partners have helped each other to improve product quality	5.08	1.277	-0.881	1.097
Our firm with supply chain partners increases the rate at which we fulfill customer orders	4.93	1.282	-0.695	0.438
Our firm with supply chain partners increases our inventory turns	5.02	1.271	-0.833	0.898
Improvement in product image	4.58	1.403	-0.201	-0.187
Our firm with supply chain partners reduces the inbound and outbound costs of transport	5.06	1.319	-0.658	0.192
Our firm with supply chain partners reduces warehousing and inventory holding costs	5.04	1.32	-0.561	0.225
Our firm with supply chain partners meets on-time delivery requirements for all product	4.92	1.269	-0.445	0.303

Our firm with supply chain partners reached agreed costs per unit as compared with industry	4.99	1.372	-0.612	0.25
Our firm with supply chain partners offers a variety of products and services efficiently	4.66	1.301	0.032	-0.216
Our firm with supply chain partners offers customized products and services with different features	5.09	1.353	-0.754	0.191
Our firm with supply chain partners meets different customer volume requirements efficiently	5.17	1.326	-0.708	0.342
Our firm with supply chain partners has a short customer response time in comparison to industry	5.06	1.262	-0.446	0.336
Our firm with supply chain partners responds to and accommodates demand variations	5.08	1.191	-0.822	1.317
Overall	**4.9544**	**0.93583**	**-0.85**	**3.447**

Source: Field Study (2023)

The table presents the descriptive statistics for each item in the study related to supply chain partnerships. The mean values range from 4.58 to 5.17, with an overall mean of 4.9544. The highest mean score of 5.17 is for "Our firm with supply chain partners meets different customer volume requirements efficiently," indicating that the respondents agree that their organization and their supply chain partners are efficient in meeting varying customer volume requirements. The lowest mean score of 4.58 is for "Improvement in product image," indicating that the respondents are less likely to agree that their organization and their supply chain partners work together to improve product image. The standard deviations range from 1.191 to 1.412, indicating that there is some variability in responses for each item. The skewness values range from -0.881 to 0.032, indicating that the distribution of responses for each item is slightly skewed to the left or right. The kurtosis values range from -0.187 to 3.447, with an overall kurtosis value of 3.447, indicating that the distribution of responses for each item is highly leptokurtic, meaning that the data has a very high peak and very heavy tails. In summary, the results suggest that respondents somewhat agree with the statements in the survey related to supply chain partnerships. Respondents indicated that their organization and their supply chain partners are efficient in meeting varying customer volume requirements, but they may be less likely to work together to improve product image. The skewness values indicate slightly

positive or negative responses, and the kurtosis values indicate that the distribution of responses is highly leptokurtic with a very high peak and very heavy tails.

4.5 Structural Equation Modelling

Structural Equation Modeling (SEM) is a statistical technique employed to examine intricate connections among variables. As a multivariate approach, it merges factor analysis and multiple regression analysis to construct a model that illustrates the relationships between underlying variables and observed variables. SEM is utilized to analyze direct and moderating relationships between innovation, supply chain integration, information systems capability, and supply chain performance.

Table 4.8 Structural Equation Model (SEM) Result

Path	Coefficients	T-value	P-value
	Direct Effects		
INN → SCP	.230	3.859	0.000
INN → SCI	0.820	25.588	0.000
SCI → SCP	.316	3.074	0.002
	Indirect Effect		
INN → SCI → SCP	0.259	2.970	0.003
	Moderation Effect		
SCI × ISC → SCP	-.014	0.345	0.730

Source: Field study (2023) Note: Innovation = INN; Supply Chain Integration = SCI; Information Systems Capability = ISC; Supply Chain Performance = SCP

Table 4.8 provides the results of the SEM analysis. The study's first hypothesis examined the effect of innovation on supply chain performance. The coefficient for INN → SCP is 0.230, which means that for a one-unit increase in INN, SCP will increase by 0.230 units. The t-value of 3.859 and p-value of 0.000 indicate that this relationship is statistically significant. This suggests that there is a positive direct effect of INN on SCP. Hypothesis one is therefore supported.

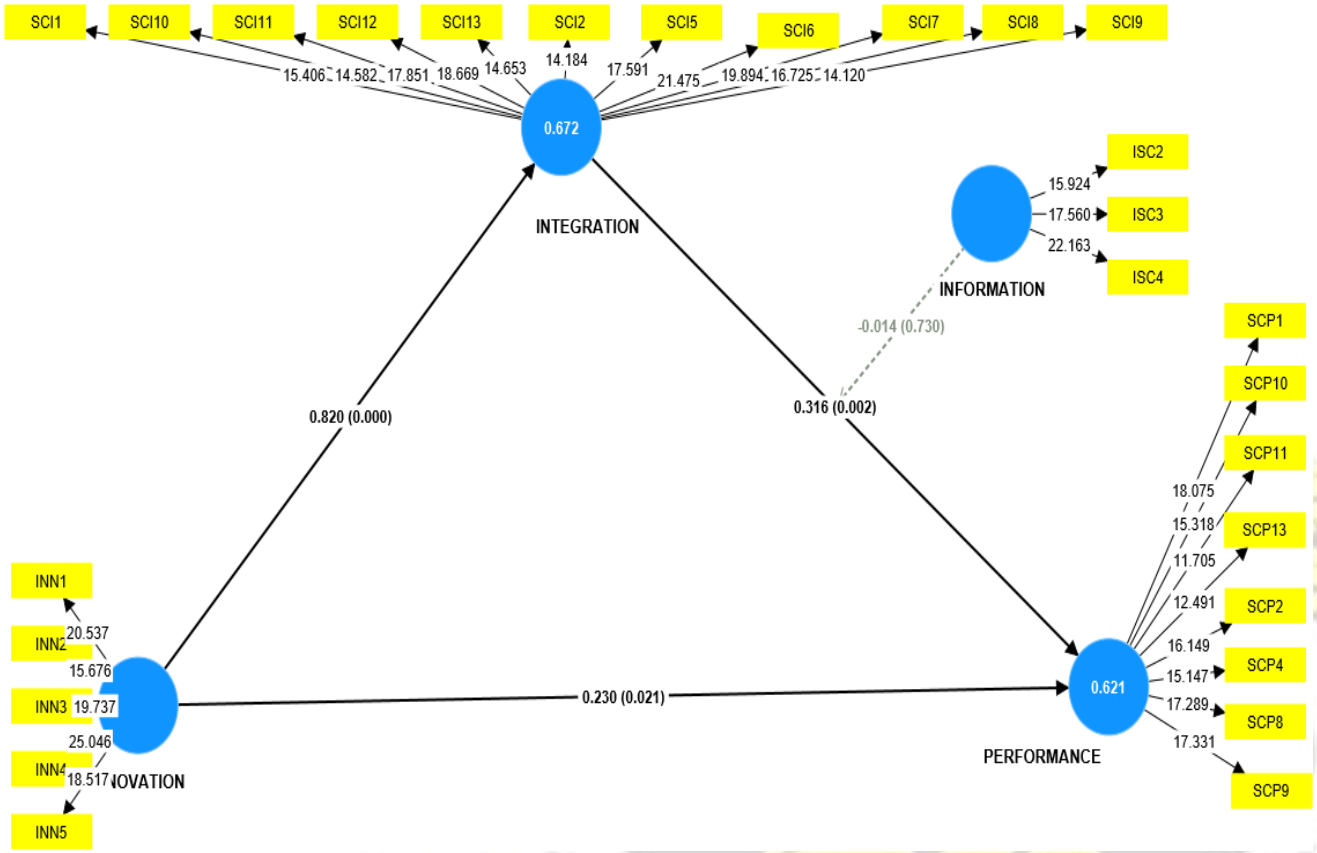
The second hypothesis examined the effect of innovation on supply chain integration. The coefficient for INN → SCI is 0.820, indicating that for a one-unit increase in INN, SCI will increase by 0.820 units. The high t-value of 25.588 and p-value of 0.000 indicate that this relationship is highly statistically significant, suggesting that there is a strong positive direct effect of INN on SCI. hypothesis two is also strongly supported.

The third hypothesis examined the effect of supply chain integration on supply chain performance. The coefficient for SCI → SCP is 0.316, indicating that for a one-unit increase in SCI, SCP will increase by 0.316 units. The t-value of 3.074 and p-value of 0.002 indicate that this relationship is statistically significant, indicating a positive direct effect of SCI on SCP. The third hypothesis is also supported.

The fourth hypothesis examined the mediation effect of supply chain integration. The coefficient for INN → SCI → SCP is 0.259, indicating that there is an indirect effect of INN on SCP through SCI. Specifically, a one-unit increase in INN leads to a 0.259 unit increase in SCP via a one-unit increase in SCI. The t-value of 2.970 and p-value of 0.003 indicate that this indirect effect is statistically significant. This suggests that INN has an indirect effect on SCP through its effect on SCI. Hypothesis four is also supported.

The last hypothesis examined the moderation effect of information system capabilities. The coefficient for SCI × ISC → SCP is -0.014, indicating that the interaction between SCI and ISC has a negligible effect on the relationship between SCI and SCP. The t-value of 0.345 and p-value of 0.730 indicate that this moderation effect is not statistically significant. This suggests that the interaction between SCI and ISC does not significantly affect the relationship between SCI and SCP. Hypothesis five is therefore not supported.

Figure 4.2 Structural Equation Model



Source: Field Study (2023)

4.6 Hypotheses Confirmation

Five hypotheses were developed for this study based on the prior literature reviewed, and the gathered data were analyzed to determine whether each of these hypotheses was supported or refuted. The analysis revealed that four out of the five hypotheses were supported, and a summary of the confirmation of each hypothesis is presented in Table 4.9 below.

Table 4.9 Hypothesis Confirmation

Hypothesis	Path	T-value	Coefficient (P-value)	Decision
H_1	INN → SCP	3.859	.295; $p < 0.05$	**Supported**
H_2	INN → SCI	25.588	0.820; $p < 0.01$	**Supported**
H_3	SCI → SCP	3.074	.316; $p < 0.01$	**Supported**
H_4	INN → SCI → SCP	2.970	0.259; $p < 0.01$	**Supported**
H_5	SCI × ISC → SCP	0.345	-.014; $p > .05$	**Not Supported**

Source: Field study (2023) Note: Innovation = INN; Supply Chain Integration = SCI; Information Systems Capability = ISC; Supply Chain Performance = SCP

4.7 Discussion of Results

This study's results are contextualized and discussed with reference to the relevant literature and theories employed in the study. The detailed discussion of the findings is presented below, aligning with the study's objectives.

4.7.1 Innovation and Supply Chain Performance

The SEM analysis supports the first hypothesis (H1), which posits that innovation is positively associated with improved supply chain performance. This finding reinforces the idea that firms with strong innovative capabilities can develop unique products, services, and processes that differentiate them from competitors and improve their supply chain performance. The positive relationship between innovation and supply chain performance highlights the crucial role that innovation plays in driving supply chain efficiency, reducing costs, increasing responsiveness, and enhancing the quality of products and services (Popa et al., 2017The positive association between innovation and supply chain performance aligns with the literature that suggests that innovative firms can better manage their supply chain, respond more quickly to customer demands, and achieve greater flexibility (Shahbaz et al., 2018). For instance, the use of automated systems and robotics in manufacturing and warehousing can reduce labor costs and improve efficiency, while the application of data analytics and predictive modeling can help optimize inventory levels and reduce stockouts. Furthermore, the positive relationship between innovation and supply chain performance indicates that firms should continuously invest in innovative capabilities to maintain their competitive advantage in the market.

Firms should develop a culture of innovation that encourages the generation of new ideas, the adoption of advanced technologies, and the continuous improvement of processes (Afonasova et al., 2019). By doing so, firms can ensure that their supply chain remains agile, efficient, and responsive, leading to better supply chain performance. The results also emphasize the importance of aligning innovation efforts with supply chain strategies to achieve maximum benefits. Firms need to carefully identify the areas in their supply chain that can benefit the most from innovative interventions, such as process improvements, technological advancements, or collaborative initiatives with supply chain partners. By targeting innovation efforts towards these areas, firms can maximize the impact of innovation on their supply chain performance.

4.7.2 Innovation and Supply Chain Integration

The SEM analysis supports the second hypothesis (H2), which posits that innovation has a positive and significant effect on supply chain integration. This finding underscores the importance of innovative capabilities in enhancing the level of integration within the supply chain. Firms with strong innovative capabilities can use advanced technology and systems to facilitate communication and collaboration with suppliers and customers, which can improve the efficiency, responsiveness, and flexibility of their supply chain (Tavassoli, 2018). The positive relationship between innovation and supply chain integration aligns with the literature that suggests that innovative capabilities can be used to improve communication and collaboration between firms and their supply chain partners (Che et al., 2019). For example, innovative technologies such as Internet of Things (IoT), blockchain, and cloud computing can enhance the sharing of information and coordination of activities across the supply chain, leading to better supply chain integration.

Furthermore, the positive association between innovation and supply chain integration highlights the need for firms to invest in innovative technologies and processes that can help streamline and automate supply chain operations (Wallace et al., 2016a). By doing so, firms can reduce the complexity of supply chain operations, enhance visibility into supply chain processes, and address bottlenecks and inefficiencies more effectively. In addition, the positive relationship between innovation and supply chain integration implies that firms should adopt a proactive approach to innovation by engaging with their supply chain partners in collaborative innovation efforts (Sung and Kim, 2021). By working together with suppliers, customers, and other stakeholders, firms can co-create innovative solutions that can address supply chain challenges and enhance overall supply chain integration.

4.7.3 Supply Chain Integration and Supply Chain Performance

The SEM analysis supports the third hypothesis (H3), which posits that supply chain integration is positively associated with improved supply chain performance. This finding highlights the crucial role that supply chain integration plays in enhancing performance by improving coordination and collaboration among various entities within a supply chain (Flynn et al., 2016). By integrating their supply chain activities, firms can achieve better efficiency, effectiveness, cost savings, increased productivity, and faster time-to-market for products and services (Henneaux, 2015). The positive relationship between supply chain integration and supply chain performance aligns with the literature that suggests supply chain integration can drive various performance outcomes, such as firm performance, operational performance, financial performance, and sustainability performance (Cao et al., 2015b; Chaudhuri et al., 2018a; Khan and Wisner, 2019b; Khanuja and Jain, 2020). Supply chain integration can help to reduce costs by eliminating redundancies and reducing the need for intermediaries, ultimately improving the overall efficiency of the supply chain (Alfalla-Luque et al., 2015).

Moreover, the positive association between supply chain integration and supply chain performance emphasizes the need for firms to invest in building strong relationships with their supply chain partners. By fostering trust, collaboration, and communication, firms can enhance the level of integration within their supply chain, leading to better performance outcomes. Firms should focus on developing strategic partnerships and engaging in collaborative planning, forecasting, and replenishment initiatives to improve supply chain performance. Additionally, the positive relationship between supply chain integration and supply chain performance highlights the importance of leveraging information technology to facilitate integration efforts. Advanced information systems, such as Enterprise Resource Planning (ERP), can enable better visibility, coordination, and collaboration across the supply chain, ultimately leading to improved performance (Espino-Rodríguez and Gil-Padilla, 2007).

4.7.4 Mediating role of Supply Chain Integration

The SEM analysis supports the fourth hypothesis (H4), which posits that supply chain integration positively mediates the effect of innovation on supply chain performance. This finding highlights the importance of supply chain integration as a critical mechanism through which innovation can exert its influence on supply chain performance. In other words, supply chain integration serves as a bridge that links innovative capabilities to improved supply chain performance. The mediating effect of supply chain integration is consistent with the argument that integrating supply chain processes and partners can enhance the effects of innovation on supply chain performance. By integrating their supply chain more closely, firms can better leverage their innovative capabilities to achieve operational efficiencies, reduce costs, and improve responsiveness to customer demands (Chaudhuri et al., 2018). Moreover, supply chain integration facilitates the sharing of information and the coordination of activities among supply chain partners, which can further amplify the benefits of innovation in the supply chain

(Cao et al., 2015). The mediating role of supply chain integration also suggests that firms should not solely focus on investing in innovation but also strive to enhance the integration of their supply chains. By doing so, firms can create synergies between their innovative capabilities and supply chain integration efforts, which can lead to better supply chain performance (Wong et al., 2017). As a result, a comprehensive and holistic approach to managing both innovation and supply chain integration is essential for firms to fully exploit the potential benefits of their innovative capabilities. Moreover, the mediating effect of supply chain integration highlights the need for firms to adopt a collaborative mindset and develop strong relationships with their supply chain partners. Building trust, fostering open communication, and sharing information and resources with supply chain partners can further strengthen the integration of the supply chain and enhance overall performance (Tavassoli, 2018). Ultimately, the successful integration of the supply chain can help firms unlock the full potential of their innovative capabilities, translating into a competitive advantage and improved supply chain performance.

4.7.5 Moderating role of Information Systems Capability

The SEM analysis does not support the fifth hypothesis (H5), which posits that information systems capability positively moderates the effect of supply chain integration on supply chain performance. The results suggest that the interaction between supply chain integration and information systems capability does not significantly affect the relationship between supply chain integration and supply chain performance. Although the moderating role of information systems capability is not supported by the SEM analysis, the literature still suggests that information systems play an essential role in supply chain integration and performance (Espino-Rodríguez and Gil-Padilla, 2007; Che et al., 2019). Advanced information systems, such as ERP, can help improve visibility, coordination, and collaboration across the supply

chain, leading to better supply chain performance. Information systems can also facilitate communication and collaboration with suppliers and customers, which can enhance the efficiency, responsiveness, and flexibility of the supply chain (Steininger et al., 2022). The lack of support for the moderating effect of information systems capability in the current study could be due to a number of factors. One possible explanation is that the sample used in the analysis may not accurately represent the broader population of firms in different industries or contexts. Another reason could be that other factors not considered in the study, such as organizational culture, leadership, and strategic alignment, may influence the relationship between supply chain integration, information systems capability, and supply chain performance. Despite the non-significant moderation effect, firms should still invest in information systems capabilities to support their supply chain integration efforts. Information systems can help firms achieve better coordination and collaboration within their supply chain, leading to improved performance outcomes. Firms should focus on developing and implementing advanced information systems, ensuring that these systems are aligned with their supply chain integration strategies to enhance overall supply chain performance.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Introduction

The aim of this study was to examine the effect of innovation on supply chain performance and the roles of supply chain integration and information systems capability. The chapter summarizes the research outcomes, draws conclusions, provides suggestions, and identifies potential research avenues for the future

5.2 Summary of Findings

The study's key findings are summarised in this section.

5.2.1 Innovation

The findings suggest that respondents generally have a positive view of innovation in the supply chain context. The highest mean score is for "Monitor changes in our market conditions," indicating that respondents recognize the importance of staying up-to-date with market trends. However, the low mean score for "Introduce new products and services in our markets" suggests that respondents may be less confident in introducing new products and services. The skewness and kurtosis values suggest a close-to-normal distribution of responses.

5.2.2 Supply Chain Integration

The findings suggest that respondents generally agree with the statements related to supply chain integration. The highest mean score is for "Our suppliers provide information to us about production and procurement processes," indicating that respondents value supplier involvement in the supply chain. However, the low mean score for "Within our plant, we emphasize physical flows among production, packing, warehousing, and transportation departments" suggests that respondents may not emphasize physical flows within the plant as much. The skewness values suggest slightly negative responses, and the kurtosis values indicate a close-to-normal distribution.

5.2.3 Information Systems Capability

The findings suggest that respondents generally agree with the statements related to information systems capability. The highest mean score is for "We often introduce new ways of servicing the supply chain," indicating that respondents are innovative in their approach to information systems. However, the low mean score for "We have increasingly introduced new processes in the supply chain in the last 5 years" suggests that respondents may not have introduced many new processes in recent years. The skewness values suggest slightly negative responses, and the kurtosis values indicate a close-to-normal distribution.

5.2.4 Supply Chain Performance

The findings suggest that respondents generally agree with the statements related to supply chain performance. The highest mean score is for "Our firm with supply chain partners meets different customer volume requirements efficiently," indicating that respondents value efficiency in meeting customer requirements. However, the low mean score for "Improvement in product image" suggests that respondents may not prioritize improving product image as highly. The skewness values suggest slightly negative responses, and the kurtosis values indicate a highly leptokurtic distribution, with a very high peak and heavy tails.

5.2.5 Innovation and Supply Chain Performance

The study revealed a statistically significant positive direct effect of innovation on supply chain performance, indicating that higher levels of innovation are associated with improved supply chain performance.

5.2.6 Innovation and Supply Chain Integration

The study also found a highly statistically significant positive direct effect of innovation on supply chain integration, indicating that higher levels of innovation are associated with greater supply chain integration.

5.2.7 Supply Chain Integration and Supply Chain Performance

The study found a statistically significant positive direct effect of supply chain integration on supply chain performance, indicating that greater supply chain integration is associated with improved supply chain performance.

5.2.8 The Mediating role of Supply Chain Integration

The study found a statistically significant positive indirect effect of innovation on supply chain performance through supply chain integration, indicating that the relationship between innovation and supply chain performance is partially mediated by supply chain integration.

5.2.9 The Moderating role of Information Systems Capability

The study also revealed a negative moderation effect of information systems capability on the relationship between supply chain integration and supply chain performance.

5.3 Conclusion

The investigation into the impact of Information Systems (IS) capability as a moderating factor on the relationship between innovation, supply chain integration, and supply chain performance has revealed compelling insights that align with existing knowledge while offering valuable contributions to practices and policy considerations in contemporary business environments.

Findings Recap:

The study unveiled the intricate dynamics among information systems capability, innovation, supply chain integration, and supply chain performance. Notably, the robustness of IS capability emerged as a pivotal factor that significantly influences the interplay between innovation, supply chain integration, and subsequent supply chain performance. This finding aligns with the existing body of literature emphasizing the critical role of IS capability in enhancing organizational performance (Bharadwaj, 2020; Rai et al., 2016).

Advancements in Knowledge:

The research advances our understanding by delineating the specific sub-dimensions within each construct. It elucidates the multidimensional aspects of IS capability, innovation (covering product, process, technological, and organizational innovation), supply chain integration (including internal, external, information sharing, and collaborative planning), and the diverse facets of supply chain performance (cost efficiency, delivery reliability, flexibility, quality, and customer satisfaction).

Practical Implications:

The implications of these findings extend to practical applications within organizations. Businesses can leverage insights into bolstering their IS capability to optimize the outcomes of innovation initiatives and supply chain integration efforts. Strengthening technological infrastructure, fostering a culture of innovation, promoting collaborative partnerships, and investing in information sharing mechanisms can collectively elevate supply chain performance metrics.

Policy Considerations:

The study's outcomes also hold relevance for policymakers and regulatory bodies. Recognizing the pivotal role of IS capability in shaping organizational competitiveness and supply chain efficacy, policies supporting technological advancements, fostering a conducive innovation ecosystem, and incentivizing collaborations among supply chain entities could significantly bolster economic growth and competitiveness at regional and national levels.

Future Directions:

While this research offers valuable insights, there remain avenues for further exploration. Future studies could delve deeper into the nuanced relationships between specific sub-dimensions within each construct. Additionally, longitudinal studies or comparative analyses across different industries or regions could provide a more comprehensive understanding of the dynamic nature of these relationships over time and context.

5.4 Recommendations

Based on the five findings from the analysis, there are five logical recommendations for supply chain managers

5.4.1 Recommendations for Supply Chain Managers

The study indicates that innovation has a positive direct effect on both supply chain integration and performance. Therefore, supply chain managers should consider improving their inventory management practices increasing the efficiency of their supply chain operations. For example, they could implement just-in-time inventory management practices or use inventory optimization tools to reduce excess inventory and improve overall inventory management.

The study also suggests that innovation has a strong positive direct effect on supply chain integration. Therefore, supply chain managers should consider investing in supplier development programs to improve the capabilities and performance of their suppliers. This could involve providing training and resources to help suppliers improve their processes and quality control practices.

The study also revealed that supply chain integration has a positive direct effect on supply chain performance. Therefore, supply chain managers should consider improving collaboration

and communication across their supply chain partners to enhance supply chain performance. This could involve implementing collaborative planning, forecasting, and replenishment practices, sharing information and data in real-time, and developing closer relationships with key suppliers and customers.

The study also revealed an indirect effect of innovation on supply chain performance through SCI. Therefore, supply chain managers should consider simplifying their supply chain processes and reducing complexity to improve overall supply chain performance. This could involve streamlining supply chain processes, reducing the number of suppliers and products, and standardizing supply chain operations.

5.4.2 Suggestions for Future Research

One limitation of this research is that it only focuses on information systems capability as a moderating factor, without considering other potential moderators or mediators that may impact the relationship between innovation, supply chain integration, and supply chain performance. To address this limitation, a future study could examine how specific types of information systems enable or facilitate the relationship between these variables, such as Enterprise Resource Planning (ERP) or Supply Chain Management (SCM) systems. This would provide more detailed insights into how information systems capability can moderate the relationship between these variables and inform more targeted investment strategies for organizations.

Another limitation of this research is that it only provides a cross-sectional analysis of the relationship between information systems capability, innovation, supply chain integration, and supply chain performance. To address this limitation, future studies could conduct a longitudinal analysis to track changes in information systems capability over time and examine

how these changes affect the relationship between these variables. This would provide valuable insights for managers looking to make long-term strategic decisions about their information systems investments.

A further limitation of this study is that it does not consider the impact of contextual factors on the relationship between information systems capability, innovation, supply chain integration, and supply chain performance. To address this limitation, a future study could examine how contextual factors, such as industry characteristics or organizational culture, impact the relationship between these variables. This would help provide a more nuanced understanding of how different factors interact to affect supply chain performance and may help managers identify specific areas to focus on to improve supply chain performance in their specific contexts.

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APPENDIX A

SURVEY QUESTIONNAIRE

This research explores the roles of information system capability and supply chain integration in the relationship between innovation and supply chain performance. The opinions of knowledgeable and experienced professionals like yourself are required to help the researcher complete this questionnaire. The questionnaire will take approximately 10 minutes to complete.

You are kindly reminded that there are no right or wrong answers to the questions asked, and the questionnaire is not a review of individual employee performance in your organisation. We can assure you that **all responses will be treated anonymously**. **Hence, please answer honestly**. Thank you in advance for participating; your cooperation is greatly appreciated. By continuing, you are consenting to participate.

INSTRUCTIONS: Please kindly write in ink in the box that corresponds to the statement, which in your opinion is the most appropriate answer to the related question. For the following questions, kindly select by checking (✓) all that apply.

What is your gender? ☐ Male ☐ Female

What is your age group in years? ☐ 18 to 29 ☐ 30 to 40 ☐ 40 to 49 ☐ 50 or more

Number of Employees [ ]<6; [ ] 6-29; [ ] 30-59; [ ] 60-99; [ ] 100+

Please place a check in your company's corresponding industry	□Manufacturing; □Financial Services (banking & investments); □Oil & Gas; □Health; □Retail; □Construction; □Transportation; □Telecommunication; □Electronics and Computing Machinery; □Mining & Minerals; □Pharmaceuticals; □Automobile and Heavy Equipment; □Other (specify)_____
Please indicate the Revenue of the Company in New Ghana Cedis	□<40,000; □40,000-80,000; □80,000-120,000; □120,000-160,000; □160,000-200,000; □200,000-500,000; □500,000-1,000,000; □>1,000,000

Ownership of company □Solely Ghanaian Owned; □Foreign Owned; □Joint Ventureship; □Other (specify) _____

Legal form of Entity □Sole Proprietorship; □Limited Liability; □Partnership; □Public Limited Liability; □Other (specify) _____

Instructions: Indicate your opinion for the following statement by placing a checkmark (✓) in the right column under the 7-point Likert Scale.

	7-point Likert Scale						
	Strongly Disagree	Moderately Disagree	Disagree	Neither Agree nor Disagree	Agree	Moderately Agree	Strongly Agree
We frequently try out new ideas in the supply chain context							
We seek out new ways to do things in our supply chain							

We are creative in the methods of operation in the supply chain							
We often introduce new ways of servicing the supply chain							
We have increasingly introduced new processes in the supply chain in the last 5 years							
	Strongly Disagree	Moderately Disagree	Disagree	Neither Agree nor Disagree	Agree	Moderately Agree	Strongly Agree
We have a high level of responsiveness within our plant to meet other departments' needs							
We have an integrated system across functional areas of plant control							
Within our plant, we emphasize information flows among purchasing, inventory management, sales, and distribution departments							
Within our plant, we emphasize physical flows among production, packing, warehousing, and transportation departments							
We share information with our major suppliers through information technologies							
We have a high degree of strategic partnership with suppliers							
We have a high degree of joint planning to obtain rapid response ordering processes (inbound) with suppliers							
Our suppliers provide information to us about production and procurement processes							
Our suppliers are involved in our product development processes							
We have a high level of information sharing with major customers about market information							
We share information with major customers through information technologies							
The information systems applications we have in the supply chain support us to:	Strongly Disagree	Moderately Disagree	Disagree	Neither Agree nor Disagree	Agree	Moderately Agree	Strongly Agree
Introduce new products and services in our markets							
Share information with our suppliers and customers							
Monitor changes in our market conditions							
Respond to changes in the market							
Model possible future outcomes and identify alternative courses of action							
	Strongly Disagree	Moderately Disagree	Disagree	Neither Agree nor Disagree	Agree	Moderately Agree	Strongly Agree
Our firm with supply chain partners offers products that are highly reliable							
Our firm with supply chain partners offers high-quality products to our customers							

Our firm and supply chain partners have helped each other to improve product quality							
Our firm with supply chain partners increases the rate at which we fulfill customer orders							
Our firm with supply chain partners increases our inventory turns							
Our firm with supply chain partners reduces the inbound and outbound costs of transport							
Our firm with supply chain partners reduces warehousing and inventory holding costs							
Our firm with supply chain partners meets on-time delivery requirements for all product							
Our firm with supply chain partners reached agreed costs per unit as compared with industry							
Our firm with supply chain partners offers a variety of products and services efficiently							
Our firm with supply chain partners offers customized products and services with different features							
Our firm with supply chain partners meets different customer volume requirements efficiently							
Our firm with supply chain partners has a short customer response time in comparison to industry							
Our firm with supply chain partners responds to and accommodates demand variations							

Thank you. Your participation is greatly appreciated.