UNIVERSITY OF EDUCATION, WINNEBA

EXAMINING THE RELATIONSHIP BETWEEN IT CAPABILITIES AND SUPPLY CHAIN PERFORMANCE: THE MEDIATING ROLE OF SUPPLY CHAIN VISIBILITY

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DECLARATION

Student's Declaration

I, **Pearl Doiley Kodjoe**, hereby declare that this study is the original research and to the best knowledge of the author same or a portion of it has not been submitted to University of Education,Winneba nor any other institution for the partial fulfilment for the award of an academic certificate.

Signature:…..……

Date:……..…….

Supervisor's Declaration

I certify that this study is the original research and to the best of my knowledge same or a portionof it has not been submitted to University of Education, Winneba nor any other institution for thepartial fulfilment for the award of an academic certificate.

Supervisor's Name : Dr. Ishmael Nanaba Acquah

Signature:…….……

Date:……..…….

DEDICATION

This work is dedicated to the Glory of the Most High God through whose favor and mercy I havebeen able to complete this work and all those who have directly and indirectly contributed toward its completion.

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I acknowledge my supervisor for his scintillating supervisory prowess exhibited through the courseof this study and all the other lecturers who in one way or another provided auxiliary supervisory support to the work.

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LIST OF ABBREVIATIONS

IT - Information Technology

SCM - Supply Chain Management

RBV - Resource-Based View

DCV - Dynamic Capability View

CSMP: Council of Supply Chain Management Professionals

ABSTRACT

A growing body of scholars has stressed the importance of embracing IT capabilities concept fromthe perspective of a dynamic capability view that emphasizes the need to adapt and change in theface of rapidly changing market requirements. These capabilities are the firm's inter-linked processes that are vital for future resource creation and allow firms to manage upcoming challengesin a dynamic business environment by directing all the focus to creating, renewing or altering a resource mix to get a competitive advantage, thus increasing supply chain performance. The review of cognate literature demonstrates that the outcomes of IT capability research are diverse and that the relationship between IT capability and supply chain performance remains underexplored. Further, the mechanisms and contingencies through which IT capabilities contribute to performance is little understood. The study investigated the mediating role of supplychain visibility and in the link between IT capability and supply chain performance. The study employed quantitative research approach and cross-sectional survey research strategy. The study also utilized explanatory research design. Firms operating in Central, Western and Greater Accra Regions of Ghana were sampled conveniently for the study. Survey data was gathered from 100 firms using structured questionnaires. Data was analyzed using Statistical Software Packages suchas SPSS. The study revealed that IT capability and supply chain visibility has a positive significant link with supply chain performance. Further, the study revealed that supply chain visibility partially mediates the link between logistics capability and supply chain performance. It is concluded that firms should invest in developing their IT capabilities and competences in order to harness it to improve supply chain performance.

CHAPTER ONE

INTRODUCTION

1.0 Background of Study

Supply chain performance often regarded as the yardstick for organizational success, encompasses a myriad of factors, including cost-effectiveness, timeliness, and overall operational excellence (Christopher, 2016). Supply chain performance is one of the challenging themes in supply chain management literature (Bititci, Firat, & Garengo 2012). Najmi and Makui (2012) measure supplychain performance through analysing flexibility, reliability, responsiveness, quality and asset management. Similarly, Bourlakis et al. (2014) consider performance indicators related to flexibility, efficiency, responsiveness, and quality. In another approach, based on Dreyer et al. (2016), performance improvements can be measured in terms of variety, innovation, time, price and availability.

Successful supply chain performance relies on sharing information effectively. It is a crucial part of building and maintaining relationships within the supply chain (Baihaqi & Sohal 2013). To ensure effective information sharing, companies are investing in technological innovations to develop effective communication channels and collaboration mechanisms and, subsequently, to improve supply chain performance through enhanced information sharing (Govindan, Mangla, & Luthra, 2017). For successful business performance, having a strong connection between differentparts of the supply chain is crucial. Gecevska et al. (2012) emphasize that a high level of process integration is necessary to enhance supply chain performance.

Additionally, collaboration and integration throughout the supply chain, as highlighted by Datta in 2017, enable flexibility and contribute to improvements in supply chain performance.

Supply chain performance is greatly influenced by both agility and resilience, as noted by Altay etal. (2018), owing to their crucial role in effective supply chain risk management. As supply chainpractices cross-functional boundaries, it has been challenging to address the above-mentioned factors and to improve supply chain performance. To deal with this issue many companies have started to harness their IT Capabilities by applying technological solutions (Najmi & Makui 2012).The integration of supply chain systems and the subsequent improvement in performance can be facilitated by Information Technology (IT) through connecting business systems (Samaranayake, 2013; Rashid & Tjahjono, 2016). Many organizations are, already, applying information technologies through E-Business solutions to enhance their integration and operational excellence(Luo et al., 2018), and looking for the application of novel and innovative technologies to enhancetheir process integration and analytical capabilities.

The dynamic nature of technology necessitates continuous adaptation and innovation, making IT capability a critical factor in responding to market changes and maintaining a competitive edge (Bharadwaj, 2000). Organizations with a strong IT capability are better positioned to streamline processes, facilitate decision-making, and foster innovation throughout their supply chains.

The role of IT Capability within this context is pivotal, as it empowers organizations to harness the potential of IT resources strategically to optimize processes, enhance decision-making, and adapt to market changes (Bharadwaj, 2000). However, the relationship

between IT capabilities andsupply chain performance is not linear; it is influenced by the degree of visibility an organizationmaintains across its supply chain.

Supply chain visibility, defined as the real-time and comprehensive awareness of supply chain activities, plays a mediating role in the intricate interplay between IT capabilities and supply chainperformance (Ivanov & Dolgui, 2020). The ability to track and trace products, monitor inventory levels, and anticipate disruptions in real-time provides the transparency necessary for organizations to make informed decisions, mitigate risks, and optimize their supply chain operations. Additionally, improved operational performance is believed to result significantly fromenhanced visibility and transparency throughout the supply chain (Swift et al., 2019).

This thesis aims to examine the link between IT capabilities, supply chain performance, and the mediating role of supply chain visibility. This study seeks to provide a comprehensive understanding of how IT capabilities influence supply chain performance, and the extent to whichthis influence is mediated by the level of visibility maintained throughout the supply chain.

1.1 Problem Statement

According to the RBV, researchers have analyzed the value of IT capabilities in firms (Santhanam& Hartono, 2003; Bhatt & Grover, 2005; Lu & Ramamurthy, 2011; Hwang et al., 2015) and identified the links between IT capabilities and firm performance (Mithas et al., 2011; Prajogo & Olhager, 2012). The present studies have also shown that IT is related to SCM based on the RBV.For instance, Su (2012), Peng et al. (2016), Oh et al. (2016), and Gunasekaran et al. (2017) explained that IT resources can enhance SC capabilities and further improve firm performance. Jinet al. (2014), Cai et al. (2016), and Bargshady et al.

(2016) indicated that IT capabilities are strongly related to the agile and flexible SC, which, in turn, is associated with a firm's competitiveperformance. Tseng and Liao (2015), Kim (2017), and Jimenez-Jimenez et al. (2019) explored the mediating role of SC collaboration/integration in the relationship between IT and businessmanagement.

Based on the above discussion, these findings indicated that IT capabilities have direct and indirectimpacts on enterprise performance through SCM, and further showed the mediating role of somefactors in the relationship between IT and SCM, such as SC knowledge management capability (Niu, 2010), agility (Vickery et al., 2010), logistics integration (Prajogo & Olhager, 2012), information sharing (Ye & Wang, 2013; Baihaq & Soha, 2013), information integration (Zhou &Wan, 2017), market orientation (Tseng & Liao, 2015), updating of ICT (Mendoza-Fong et al., 2018) and SC integration (Sundram et al., 2018).

Recently, drawing on the resource-based view (RBV) theory, information systems (IS) scholars have argued that firms should develop their IT capability to achieve competitive advantage (Bharadwaj, 2000; Stoel & Muhanna, 2009). At its core, the notion of IT capability underscores the importance of mobilizing and deploying IT-based resources in combination with, and leveraging the value of, other resources and capabilities (Bharadwaj, 2000). Empirical evidence also indicates that it contributes to organizational performance (Melville et al, 2004; Stoel & Muhanna, 2009). Despite the strong appeal of the concept, there is lack of agreement in the IS literature about how IT capability contributes to superior performance (for useful reviews, see Melville et al. (2004) and Kohli and Grover (2008). It appears that rather than tracing a direct linkbetween IT capability and organizational performance we should instead seek to identify the processes by which a firm uses its IT

capability to achieve superior performance in an unpredictable business environment. This perspective aligns with the findings of Yang Chen et al.(2013).

Despite the significant positive relationship between IT capabilities and Supply Chain Performance (Aydiner et al., 2017), however, this relationship has not been studied thoroughly (Karimi et al., 2007) and the underlying mechanism through which IT capabilities influences the performance of the firm is not yet clear. Our knowledge about those mechanisms will likely to beenhanced if such processes are examined by intervening mechanisms (Melville et al., 2004). By analyzing the intervening mechanisms, we can better predict the circumstances under which IT capability indirectly affect supply chain performance. Despite the increasing importance of IT capabilities and supply chain visibility in enhancing supply chain performance, few studies have investigated the relationship between IT capabilities and supply chain performance, mediates by supply chain visibility. Thus, there is a need for research to investigate the role of supply chain visibility as a mediator in the relationship between IT capabilities and supply chain performance.Thereby, this study fills the knowledge gap by examining the relationship between IT capability on Supply Chain Performance considering the role of supply chain visibility as a mediator.

1.2 Objectives of the Study

The main objective of this study is to examine the mediating role of supply chain visibility in the relationship between IT capabilities and supply chain performance. The specific objectives are:

1. To examine the relationship between IT capabilities and supply chain performance

2. To examine the relationship between IT capabilities and supply chain visibility

3. To examine the relationship between supply chain visibility and supply chain performance.

4. To examine the mediating role of supply chain visibility in the relationship between ITcapabilities and supply chain performance.

1.3 Research Questions

1. What is the relationship between IT Capabilities and Supply Chain Performance?

2. What is the relationship between IT Capabilities and Supply Chain Visibility?

3. What is the relationship between Supply Chain Visibility and Supply Chain Performance.?

4. What is the mediating role of supply chain visibility in the relationship between IT capabilitiesand supply chain performance?

1.4 Significance of the Study

The purpose of this study is to examine the relationship between IT capabilities and Supply ChainPerformance, with the mediating role of supply chain visibility. The study aims to explore the extent to which IT capabilities and supply chain visibility can lead to improved supply chain performance. Furthermore, the study seeks to provide insights into the role of supply chain visibility as a mediator in the relationship between IT capabilities and supply chain performance. The study contributes to the literature on the RBV and DCV theories by examining how these theories can be applied to explain the relationship between IT capabilities, supply chain visibility,and Supply Chain Performance. The findings of this

study can inform managers and policymakers on how to effectively manage their IT capabilities and supply chain visibility to enhance their Supply Chain Performance. For the academicians, the findings of the study will be a point of reference and a basis for further research in the same field.

1.5 Scope of the Study

The focus of this section is to outline the boundaries of the study. Therefore, the study is purposedto examine the mediating role of Supply Chain Visibility on the link between IT Capability and Supply Chain Performance. In terms of the geographical scope of the study, the study will be carried out in the Central, Western and Greater Accra. Manufacturing firms numbering 100 will be sampled for the study to enable the investigation of the study objectives. These Regions were chosen because they are the closest places for the researcher to gain accessibility to data to addressthe research objectives.

1.6 Limitations of the Study

All research carried out are confronted with some challenges and this study was not an exception.The most important constraint in undertaking this study is the inadequacy of time. The time available for the research study is short, hence it restricted the depth in which the research can bedone and also it limits the area of research that could be covered. The limitations of the study firstinvolve the use of a relatively small sample size as well as the usage of single respondents. In addition, the study is cross-sectional in nature which limits the ability to draw causal inferences.

1.7 Organization of the Study

The study is organized into five primary chapters and numerous sections. The focus of chapter oneis to introduce the study and comprises of the following sections; the study's background, problem, objectives, questions, significance, scope in addition to the limitations. The focus of chapter two is on the review of relevant and related literature in relation to the study constructs and comprisesof the following sections; conceptual review, empirical review, theoretical review in addition to conceptual framework and hypotheses development. The focus of chapter three is on the researchmethodology and comprises of the following; research design, approach, population, sample and sampling techniques, sources of data, data analysis in addition to ethical considerations. The focusof chapter four is on analysis, presentation and discussion of the study findings and ultimately chapter five focuses on summarizing the findings of the study whilst in addition to concluding and offering recommendations based on the study findings and limitations.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

The literature review section of this study will provide an overview of the existing research on therelationship between IT capabilities and supply chain performance, with a focus on the mediatingrole of supply chain visibility. The study variables were reviewed through what was mentioned inthe previous studies, to formulate the literature review for this study. It is the basis of the field study, and this chapter has been divided into two parts: First, the literature review for IT capabilities and supply chain visibility in terms of concept, dimensions, and importance. It also reviews the theories backing this study such as the RBV and Dynamic Capability theories. Second: It deals with reviewing the most important literature dealt with in previous studies about the currentstudy

2.1 Supply Chain

Over the years, the supply chain has garnered significant attention and has been analyzed from various perspectives by multiple authors. Its essence lies in the achievement of corporate objectives. According to Christopher (2005), a supply chain constitutes a network of interconnected businesses with upstream and downstream relationships, collaborating to deliver goods and services to the end consumer through various value-added processes. In broad terms, asupply chain is the linkage between two or more legally distinct enterprises, primarily characterized by the exchange of goods, information, and financial transactions. The target audience, including the ultimate consumer, is encompassed within the supply chain's definition. As asserted by Chopra and Meindl

(2016), the paramount goal of all supply chains is to fulfill customer demands while maintaining profitability. A pivotal driving force influencing actions within a supply chain is the escalating competition among businesses. This shift is due to the collective responsibility of the entire supply chain, rather than individual organizational units, in satisfying end consumers with products and services (Stadtler, 2015). This underlines the fact thatsupply chains are now the focal point of competition, as opposed to individual enterprises.

A typical supply chain is conventionally considered to comprise three key entities: a company, a supplier, and a customer, all actively engaged in the flow of goods, services, finances, and information, as established by Mentzer et al. (2001). The creation of value for the customer hingesnot on specific tasks but on the integration of business processes that transcend the boundaries ofan organization. Recognizing the roles played by each firm through coordination and integration is crucial for the success of the chain in addressing challenges stemming from interdependence (Xu & Beamon, 2006). According to Chopra and Meindl (2016), a supply chain encompasses all parties involved in the direct and indirect fulfillment of customer requests. This includes manufacturers, suppliers, carriers, warehouses, retailers, and customers.

All organizational functions, such as manufacturing, which is responsible for receiving and fulfilling customer orders, are integral components of the supply chain. Interdisciplinary collaboration across departments, including new product development, marketing, operations, distribution, finance, and customer service, is vital for firms to effectively meet customer requests(Chopra & Meindl, 2016). The interplay between corporate decisions and interactions with external parties gives the supply chain a dynamic nature over time. These

interactions and changesmake supply chains complex, intricate structures (Swaminathan et al., 1998).

2.2 Supply Chain Management

The concept of supply chain management, which gained prominence in the 1980s, revolves aroundensuring the smooth flow of goods and services to the end consumer while also aligning and integrating activities within the supply chain. The complexity of organizations, dependence on external entities, and fierce business competition have heightened interest and emphasis on supplychain management. Several scholars have provided clear explanations of what supply chain management entails to enhance comprehension. Stadtler (2015) defines supply chain managementas a strategy aimed at meeting customer demand with the ultimate goal of enhancing the overall competitiveness of the supply chain. This involves integrating organizational functions across thesupply chain and coordinating the flow of resources, including finances, materials, and information. The flows of materials, information, and funds necessitate numerous critical decisionsconcerning supply chain design, planning, and operation. All these decisions are aimed atincreasing the supply chain surplus, which is the difference between the revenue generated by thesupply chain and its total cost (Chopra & Meindl, 2016). The integration of networks and coordination of material, information, and financial flows are two integral aspects of supply chainmanagement.

The Council of Supply Chain Management Professionals (CSMP) defines Supply Chain Management as an integrative role with primary responsibility for unifying core business activitiesand processes both within and across firms into a cohesive, high-performing business model (Stadtler, 2015). Mentzer et al. (2001, p. 18) characterize "supply chain

management as the systematic, strategic coordination of traditional business functions and tactics across these functions within a specific organization and across organizations." This definition encompasses a broader spectrum of activities than mere procurement, transportation, and production, extending to areas like marketing, sales, research and development, finance, information systems, and customer support. Supply chain management encompasses all operations related to the storage ofraw materials, work-in-progress inventory, sub-assembly parts, and finished goods from the point of origin to the consumption site, with the aim of both turning a profit for the company and delighting the customer (Kang, 2013).

In recent years, supply chain management has been hailed as the new source for creating, sustaining, and gaining a competitive advantage. Many have highlighted the substantial financial benefits and significant rewards that businesses derive from establishing efficient supply chains. Others have emphasized the close correlation between effective supply chain management and shareholder value (Meindl & Chopra, 2001; Mentzer et al., 2001). Due to the effects of globalization and intense competitive pressures, supply chains have become larger and more complex, incorporating global components. Effective supply chain management in such anenvironment is a challenging endeavor, further complicated by unexpected disruptions experienced by supply chains (Blackhurst et al., 2007). Critical decisions related to supply chain design, planning, and operation are essential for the flow of goods, information, and finances. Theprimary goal of these pivotal decisions is to enhance the profitability of the supply chain, as definedby the difference between the revenue generated and the overall cost incurred throughout the supply chain (Chopra & Meindl, 2016).

2.3Supply Chain Performance

As competition has shifted from the organizational level to a broader scope encompassing entire supply chains, companies find themselves compelled to reevaluate how they measure their performance in today's dynamic market. Establishing strong supply chain partnerships with tradingpartners can be challenging for many businesses. Therefore, organizations must shift their focus to the performance of their entire supply chain network as a critical success factor (Salah et al., 2014). Companies are recognizing the shift away from organizational performance metrics that primarily targeted financial and market-oriented goals to a focus on supply chain objectives. The ultimate objective is to enhance profitability throughout the supply chain, achieved through increasing market share, reducing inventory and cycle time, and improving operational efficiency(Sandberg & Abrahamsson, 2011; Baykasoglu & Kaplanoglu, 2007). Realizing a company's financial objectives hinges on optimizing supply chain performance, presenting companies with the challenge of enhancing their performance metrics to attain superior performance in a competitive and volatile market (Shen, 2005).

Cost, time, and dependability are crucial factors affecting supply chain performance metrics, according to Banomyong and Supatn (2011). These metrics are believed to directly impact a company's ability to meet customer demands cost-effectively in light of the competitive market dynamics. In response to the competitive nature of the market, businesses must continually reviewand assess their performance. Various measurement tools and methodologies have been employed to evaluate supply chain performance. Efficiency, flexibility, responsiveness, and quality are suggested as components of a performance assessment system by Aramyan et al. (2009). Additionally, Chan (2003)

introduces a framework for measuring supply chain performance that combines quantitative metrics with qualitative measures, including customer satisfaction, adaptability, integration of information and material flows, and effective risk management, particularly for evaluating performance in strategic planning, procurement, supplier relationships,production, and delivery. According to Whitten et al. (2012), supply chain performance can be defined in two ways. The first perspective concentrates on the supply chain's ability to minimize overall costs while the second focuses on the capacity to deliver the right product, in the right condition, at the right time. Performance measurement, as defined by Neely et al. (1995), assessesthe effectiveness or productivity of an action.

Supply chain performance metrics serve as the yardstick for the effectiveness of the entire supplychain system. They are measured to enhance overall performance and gain a deeper understandingof the supply chain. Analyzing the performance of the complete supply chain is vital for identifyingsuccesses, assessing the frequency with which consumer expectations are met, comprehending organizational processes, identifying areas of expertise, and ultimately improving planning (Kim & Kumar, 2010). It aids in reengineering corporate processes, aligning with customer priorities, and directing management focus. Neglecting proper supply chain measurements, as pointed out byLambert and Pohlen (2001), can jeopardize customer satisfaction, lead to subpar companyperformance, and potentially result in missed opportunities for improving supply chain efficiency.

The selection of the appropriate supply chain performance indicators is crucial, as an excessive number of indicators can hinder comprehension. Researchers have consequently chosen to limit their set of performance measures. For instance, cost is regarded as a fundamental performance indicator in supply chain management. Alongside cost, customer

responsiveness and supply chainflexibility are considered key components of supply chain management success and performance(Christy & Grout, 1994; Lee & Bullington, 1993). The significance of choosing the right supply chain performance indicators is underscored due to the potential for excessive indicators to impact their clarity and usefulness. Researchers have thus been prudent in restricting their selection of performance measures, emphasizing factors like cost as a central indicator of supply chain management performance

2.4 Supply Chain Visibility

Supply chain visibility refers to the extent to which actors within the supply chain have access to the timely and accurate information that they consider to be key or useful to their operations (Barratt & Barratt, 2011; Barratt & Oke, 2007). More specifically, it refers to the visibility of demand and inventory information across the supply chain. Improved visibility about customer demands and inventory levels increases the accuracy of demand forecast, accelerates the adjustment of production plans to match changed demands, improves delivery performance, and reduces the amount of inventory in all levels of the supply chain. (Barratt & Barratt, 2011; Bartlettet al., 2007; Bottani et al., 2010; Goel, 2010; Heah & Omar, 2005; Kim et al., 2011; Rai et al., 2006). Supply chain visibility from first-tier suppliers to end customers, so-called end-to-end supply chain visibility, enables supply chain partners to achieve a higher level of market responsiveness and mitigate the risk of disruptions to the flows of materials and products (Butner,2007; KPMG, 2016; Wei & Wang, 2010). End-to-end visibility is highly recommended as the bestway to reduce the risk of supply chain failure and to improve supply chain analytics (KPMG, 2016). Yet, in most supply chains, supply chain visibility are far from being fully achieved (KPMG,2016).

Among various obstacles, a lack of common supply chain visibility metrics has been identified as a critical concern and challenge for supply chain managers, which detains supply chain visibility from further development and implementation in organizations (Butner, 2010; McIntyre, 2014). The lack of a clear definition of the characteristics of SCV has made it difficult to evaluate the effectiveness of a supply chain visibility project and, as a consequence, hinders theprogress of promoting such projects (McIntyre, 2014).

For many companies the first challenge is gaining internal visibility (Holcomb et al., 2004). Companies with intra-company sales involving great distances and cross-border transactions involving many hand-offs experience high frustration trying to obtain accurate, timely information.The technical difficulties often are exacerbated by the lack of leverage one firm has over another supply chain member to ensure compliance (Clark et al., 2001). For this reason, compliance is most often accomplished through cooperation and collaboration. Supply chains with a low degree of collaboration further complicate the goal of achieving the desired state of visibility. Because most systems have typically evolved over the years, often on a functional basis, various supply chain processes are disconnected (Romano, 2003). This greatly hinders the ability of the firm andthe supply chain as a whole to achieve end-to-end seamless visibility. Research indicates that significant opportunities exist for companies to become more integrated with their suppliers and customers (Fawcett & Magnan, 2002). Specifically, firms having real-time (or near real-time) information available about product, customers, and order fulfillment across the supply chain can achieve two significant objectives: improve customer service and increase operating efficiencies and effectiveness (Holcomb et al., 2004).

2.5 Linking Visibility and Supply Chain Performance

Costs can be identified and reduced by applying supply chain visibility, which results in improvedsupply chain performances (Jüttner & Maklan, 2011; Lee et al., 2014; Maghsoudi & Pazirandeh, 2016; Srinivasan & Swink, 2019; Handfield et al., 2019). Bartlett et al. (2007) observed that visibility of the supply base was expected to lead to reductions in unnecessary costs. One particularcost dimension concerns inventories. In general, inventory management is expected to benefit from higher levels of supply chain visibility. For instance, improved stock levels and reduced uncertainties can be achieved by employing visibility of inventories (Barratt & Oke, 2007; Barratt& Barratt, 2011; Caridi et al., 2014; Maghsoudi & Pazirandeh, 2016).

Several studies have indicated that supply chain visibility has a positive effect on customer service(Barratt & Oke, 2007; Barratt & Barratt, 2011; Holcomb et al., 2011; Williams et al., 2013; Caridiet al., 2014). Caridi et al. (2013) argued that internal logistics delays can be improved by increasingvisibility. Improved effectiveness of responses (Jüttner & Maklan, 2011), enhanced sales data (Srinivasan & Swink, 2018), ability to meet customer requirements (Swift et al., 2019), and providing information to customers about their purchases (Van Hoek, 2019) are also described asoutcomes of supply chain visibility. A number of studies have recognized that supply chain visibility can lead firms to better competitive positions and higher levels of profitability (Holcombet al., 2011; Kim et al., 2011; Caridi et al., 2014; Lee et al., 2014; Swift et al., 2019).

2.6 IT Capabilities

From a RBV perspective, Bharadwaj (2000) defines IT capability as ”a firm’s ability to mobilize and deploy IT-based resources in combination or co-present with other resources and capabilities”.Stoel and Muhanna (2009) also state that IT capabilities are ‘complex bundles of IT-related resources, skills and knowledge, exercised through business processes that enable firms tocoordinate activities and make use of the IT assets to provide desired results.

Over the last two decades, Information Technology (IT) has been considered a key resource for the business’s competitiveness (Fink, 2011; Oh & Pinsonneault, 2007; Schryen, 2010). IT resources and related applications allow firms to develop IT capabilities. These capabilities are referred to as “IT-enabled firms’ resources that are in a capacity to utilize and mobilize in coordination and combination with other capabilities and resources of a firm” (Bharadwaj, 2000).The utilization and development of IT capabilities help firms to gain an advantage over their competitors for instance, increase in profit, reduction in cost and higher sale growth (Jacks et al., 2011). When firms possess strong IT capabilities, they tend to accelerate in decision making through swift response to changing market needs. Despite the strong appeal of IT capabilities concept, there has been a limited understanding there has been a limited understanding of the dimensional role of IT capabilities towards Supply Chain Performance. It was also suggested by Nevo and Wade (2010), that IT capabilities tend to support other dynamic capabilities through extending new modules and various ways of routine business processes. In this way IT capabilities support innovation activities and business alliance (Del Giudice & Straub, 2011) capturing and responding to market changes and increase Supply Chain Performance.

IT capability is important for a firm to generate business value and sustain a competitive edge (Lu& Ramamurthy, 2011). In today's modern world, IT capabilities are becoming increasingly important, since IT is subjected to numerous imitations and cloning by rivals and other organizations, and all firms need to acquire IT capabilities to forecast unprecedented and unpredictable external situations. Therefore, the concept of IT capabilities appeared to create IT forces that make the process of imitation and cloning more difficult and complex, through three dimensions that enable it to create robust capabilities: (strengthening the IT infrastructure, and theability of management to exploit information technology resources to enhance goals, and portability The company is the first to develop innovations to create new opportunities). These capabilities have a role that enables any organization to continue and succeed in its work to be a leader in its field of work, especially in modern organizations, as the impact of technological capabilities on the workers of the organization is solid, which helps it to face competitors and external challenges from matters of imitation, piracy and other matters that It may weaken the company and threaten it to exit from the market.

2.7 Empirical Review

Several studies have investigated the relationship between IT capabilities and Supply Chain Performance, and the majority of these studies have found a positive association. For example, Yang and Chen (2016) found that IT capabilities have a significant positive impact on Supply Chain Performance, and this relationship is stronger in firms with high levels of IT investment. Similarly, Ahmed et al. (2018) found that IT capabilities positively affect Supply Chain Performance, and this relationship is moderated by the level of competition in the industry. In recent years, there has been growing interest in the role of

supply chain visibility in enhancing Supply Chain Performance.

Supply chain visibility refers to the ability of firms to track and monitor the flow of products and information across the supply chain, and has been found to have a positive impact on several dimensions of supply chain performance (Christopher & Peck, 2004). For example, Chen et al. (2016) found that supply chain visibility has a positive impact on customer satisfaction, while Xuet al. (2018) found that it positively affects operational performance. The mediating role of supplychain visibility in the relationship between IT capabilities and Supply Chain Performance has alsobeen explored in the literature. For example, Tarafdar et al. (2015) found that supply chain visibility mediates the relationship between IT capabilities and operational performance, while Huang et al. (2017) found that it mediates the relationship between IT capabilities and financial performance. Overall, the literature suggests that both IT capabilities and supply chain visibility are important factors that can positively impact Supply Chain Performance. However, there is a need for further research to explore the specific mechanisms through which these factors interact to affect Supply Chain Performance, and this study aims to fill this gap by examining the mediating role of supply chain visibility in the relationship between IT capabilities and Supply Chain Performance.

2.8 Theoretical Review

2.8.1 RBV and Functional Capabilities

The following, as cited in the work of Wantao Yu et al. (2017) states that the RBV considers a firm to be a bundle of tangible and intangible resources and organizational capabilities (Wernerfelt,1984). From this vantage point, the RBV provides an established

theoretical framework to analyze how competitive advantage is achieved through resources and capabilities (Corbett & Claridge 2002). The RBV holds that firms will have different resources and varying levels of capability in regards to resource exploitation (Barney 1991; Grant 1991). In general, resources are tangible andintangible firm assets that can be put into productive use (e.g. Amit & Schoemaker 1993; Grant 1991). In contrast to resources, capabilities are embedded in the dynamic interactions of multipleknowledge sources and are more firm-specific and less transferable, which leads to competitive advantage (Peng et al., 2008). Capabilities can be broadly categorized into those that relate to performing basic functional activities of the firm and those that guide the improvement and renewal of the existing activities (Collis 1994). Organizational capabilities relate to the ability of the firm to use its resource "to affect a desired end" (Amit & Schoemaker 1993, p. 35). Firm survival depends on the ability to create new resources, build upon existing capabilities and makethe capabilities more inimitable (Day & Wensley, 1988; Peteraf, 1993). To create economic value and sustain competitive advantage, an organization requires a wide range of capabilities (Day 1994; Estampe et al. 2013; Song, Nason, and Di Benedetto 2008). Although it is impractical to listthem all since every business develops its own configuration of capabilities rooted in the realitiesof the markets in which it competes, past commitments and anticipated requirements along with categories of capabilities common to many organizations have been identified and used in previousresearch (Day, 1994; DeSarbo et al. 2006). In this study, we focus on one important functional capability: IT capability (Day, 1994; Grant 1991; Song, Di Benedetto, and Nason et al., 2007; Song, Nason, and Di Benedetto 2008) and investigate its impacts on SCP. IT capabilities are proficiencies in various activities and tasks that enable the organization to diffuse

information effectively across all relevant functional areas, so that it can manage functional areas and facilitateintra- and interorganizational communication and information flows more effectively (Song, Di Benedetto, and Nason 2007; Song, Nason, and Di Benedetto 2008.

2.8.2 RBV and IT Capabilities

The theoretical foundations are based on the Resource Based View theory of information systems(Gupta et al., 2018) and dynamics (evolutionary nature) of complex systems (Malerba and McKelvey, 2020). IT capabilities can directly and dynamically influence business performance and this paper explores this relationship. This study is based on the Resource-Based View (RBV)and the Dynamic Capabilities View (DCV) theories. The RBV theory posits that firms' resourcesand capabilities can be a source of competitive advantage, which can lead to superior supply chainperformance (Barney, 1991). According to the DCV theory, firms must have dynamic capabilitiesto be able to adapt to changing environments and maintain a competitive advantage (Teece, Pisano,& Shuen, 1997). This study adopts these theories to explain the relationship between IT capabilities, supply chain visibility, and Supply Chain Performance.

The extant literature shows the significant positive relationship between IT capabilities and supplychain performance; however, this relationship has not been studied thoroughly (Karimi et al., 2007) and the underlying mechanism through which IT capabilities influences the performance ofthe firm is not yet clear. Our knowledge about those mechanisms will likely to be enhanced if suchprocesses are examined by intervening mechanisms (Melville et al., 2004). By analyzing the intervening mechanisms, we can better predict the circumstances under which IT capability indirectly affect Firm’s

performance. The framework of this paper is supported by dynamic capability view which is an extension of the resource-based View (RBV). Although RBV helps tounderstand the relationship between IT capabilities and Supply Chain Performance however researchers overlook the potential role of IT capabilities in the dynamic business environment (Rojas et al., 2017).

Hence, by applying dynamic capabilities view, new insights can be analyzed regarding IT capabilities, beyond the traditional understandings of IT capabilities in relation to RBV (Wade &Hulland, 2004). In the field of management sciences and information technology, RBV has been criticized on the basis of its static nature, additionally, the dynamic capabilities are considered as an essential counterpart of RBV, which help to understand the relation between IT capabilities andSupply Chain Performance in the dynamic business environment (Mithas et al., 2011). Dynamic capabilities allow firms to renew their current resources and capabilities when the opportunity or need arises (Pavlou & El Sawy, 2006). Hence, firms should possess dynamic capabilities in order to develop and renew its resources (Teece et al., 1997) which is particularly true for the firms competing in the dynamic business environment (Wheeler, 2002). Wheeler (2002); Zahra and George (2002b) hypothesized that the effective building, renewal, and exploitation of dynamic capabilities involves firms to embrace a strategic entrepreneurial context. Similarly, they argue that there exists a significant association between IT capabilities, and firm's activities which helpfirms to gain competitive advantage.

2.9 Conceptual Framework

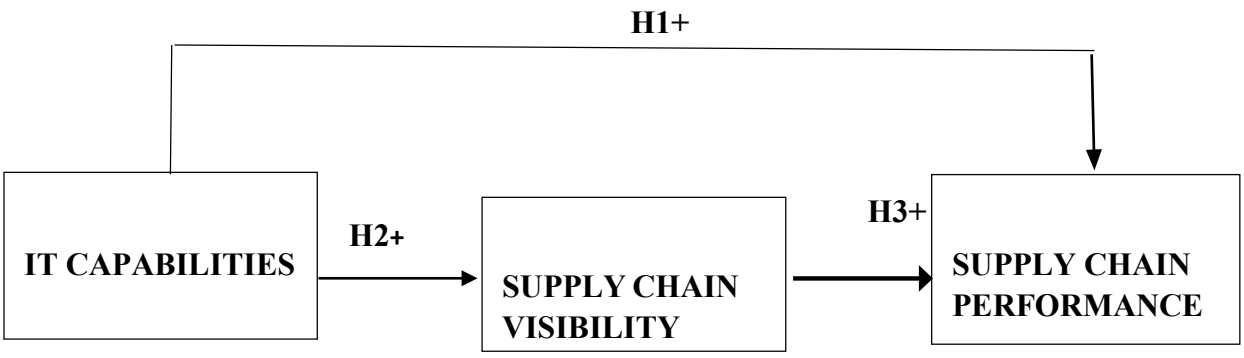

Figure 1: Hypotheses Development

The conceptual framework depicts IT capabilities as the independent variable, supply chain visibility as the mediator, and supply chain performance as the dependent variable. The frameworkproposes that IT capabilities have a direct and positive influence on supply chain visibility, which in turn has a positive impact on firm performance. The framework also suggests that supply chainvisibility mediates the relationship between IT capabilities and supply chain performance.

2.10 IT Capability and Supply Chain Performance

In today's dynamic business environment, supply chain management plays a critical role in determining the success of organizations. The effective management of the flow of goods, information, and finances across the supply chain is essential for enhancing competitiveness and meeting customer demands (Chopra & Meindl, 2016). Information Technology (IT) capabilities have emerged as a crucial enabler in this context, offering a range of tools and systems that can significantly impact supply chain performance (Lacity et al., 2008).

One of the key contributions of IT capabilities to supply chain performance is its ability to enableinformation sharing and visibility (Melville et al., 2004). IT systems facilitate real-time data exchange among supply chain partners, providing insights into inventory levels, demand patterns,and production schedules. This visibility helps in reducing stockouts, optimizing inventory levels,and improving overall responsiveness to customer needs. For example, advanced analytics tools can analyze large datasets to identify trends and patterns, enabling proactive decision-making andbetter demand forecasting (Rai et al., 2006).

IT capabilities also play a crucial role in enhancing coordination and collaboration across the supply chain network (Gunasekaran & Ngai, 2008). Collaborative platforms and communication tools enable seamless interaction between various stakeholders, leading to better coordination of activities and improved overall efficiency. For instance, cloud-based systems allow for real-time collaboration on shared documents and projects, facilitating smoother coordination betweensuppliers, manufacturers, and distributors.

The integration of supply chain processes and automation of routine tasks are other areas where IT capabilities make a significant impact (Gattiker & Goodhue, 2005). IT systems can streamlineworkflows, automate repetitive tasks, and ensure data consistency across different stages of the supply chain. This integration improves process efficiency, reduces manual errors, and enhances overall productivity. For example, Enterprise Resource Planning (ERP) systems integrate variousbusiness functions such as finance, procurement, and logistics, providing a unified view of operations and enabling better decision-making.

IT capabilities also empower supply chain managers with advanced analytics and decision support tools (Bose, 2008). These tools leverage data analytics techniques to derive actionable insights from supply chain data, helping managers make informed decisions.

For instance, predictive analytics can forecast demand patterns and identify potential supply chain risks, allowing for proactive risk management and mitigation strategies.

Finally, IT capabilities contribute to the flexibility and adaptability of supply chain operations (Lacity et al., 2008). IT systems enable agile responses to changing market conditions, customer demands, and disruptions. For example, supply chain visibility solutions powered by IoT (Internet of Things) technology can track the location and condition of goods in real time, enabling proactivemeasures to address issues such as delays or damages.

IT capabilities have a profound impact on supply chain performance by enabling improved information sharing, coordination, process integration, analytics, and flexibility (Chopra & Meindl, 2016). Organizations that effectively leverage IT in their supply chain management practices are better positioned to achieve cost efficiencies, enhance customer satisfaction, and respond quickly to market dynamics. As technology continues to advance, the role of IT in shapingthe future of supply chain management will only become more prominent, making it essential for organizations to continually invest in and harness the power of IT capabilities. Based on the aboveexposition, the study hypothesizes that;

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

2.10.1 IT Capability and Supply Chain Visibility

The effective utilization of IT capabilities enables businesses to seamlessly integrate and leveragedata across the supply chain. The synergy between IT capabilities and visibility ensures that businesses can make informed decisions, respond to market dynamics, and optimize their overallsupply chain performance.

According to Ivanov and Dolgui (2020), the effective deployment of IT capability plays a pivotalrole in enhancing transparency and real-time awareness throughout the supply chain. IT capabilityfacilitates the necessary technological infrastructure and software applications for tracking and monitoring supply chain activities, ultimately contributing to heightened visibility.

The relationship between IT capabilities and supply chain visibility is grounded in the ability of technology to collect, process, and disseminate information efficiently. A well-established IT infrastructure and knowledgeable personnel ensure that the supply chain operates smoothly, leading to enhanced visibility. This visibility, in turn, relies on accurate, timely, and comprehensive data made possible by sophisticated IT capabilities. The intertwined nature of theseelements forms the foundation for an agile, responsive, and transparent supply chain. Investing inand upgrading IT capabilities, such as advanced software, analytics tools, or improved infrastructure can lead to more efficient data processing, faster communication, and enhanced collaboration, thereby increasing supply chain visibility. Based on the above exposition, the studyhypothesizes that;

H2: There is a significant relationship between ITC and SCV

2.10.2 Supply Chain Visibility and Supply Chain Performance

The application of supply chain visibility is an effective means to identify and reduce costs, ultimately leading to improvements in supply chain performance (Jüttner & Maklan, 2011; Lee etal., 2014; Maghsoudi & Pazirandeh, 2016; Srinivasan & Swink, 2019; Handfield et al., 2019). According to Christopher and Peck (2004) increased visibility across the supply chain is instrumental in mitigating uncertainties, reducing lead times, and enhancing

overall supply chain performance. The critical role of visibility in improving the accuracy and timeliness of decision- making processes, consequently influencing supply chain performance positively. Visibility enables organizations to monitor and respond proactively to disruptions, fostering resilience and agility within the supply chain. Their work highlights the dynamic interplay between visibility andperformance, illustrating the multifaceted impact of visibility on various dimensions of supply chain effectiveness.

Moreover, Guide and Van Wassenhove (2009) contribute to this understanding by discussing how improved supply chain visibility leads to better coordination and collaboration among supply chain partners, ultimately contributing to enhanced supply chain performance.

H3: There is a significant relationship between SCV and SCP

2.10.3 The Mediating Role of Supply Chain Visibility

Supply chain visibility is a critical aspect of effective supply chain management (Lee, 2004). Visibility in the supply chain enables firms to monitor and track the movement of goods,information, and funds across the entire supply network (Chopra & Meindl, 2007). This visibility is crucial for enhancing supply chain performance as it allows for better coordination, faster response to disruptions, and improved decision-making (Mentzer et al., 2001).

In parallel, IT capability has been acknowledged as a key driver of supply chain performance (Gunasekaran & Ngai, 2004). IT capabilities encompass the use of technology to streamline processes, improve communication, and enhance overall operational efficiency within the supplychain (Mukhopadhyay et al., 2009).

The mediating role of supply chain visibility in the relationship between supply chain performanceand IT capability is grounded in the idea that enhanced visibility facilitated by IT capabilities leadsto improved supply chain performance (Chen & Paulraj, 2004). IT systems enable real-time data sharing and analysis, which, in turn, contributes to better visibility into various aspects of the supply chain, such as inventory levels, order status, and production schedules (Frohlich & Westbrook, 2001). Supply chain visibility, facilitated by robust IT capabilities, contributes to improved performance across various dimensions, including cost management, product quality, customer satisfaction, and strategic responsiveness. A high level of IT capabilities ensures real- time tracking of orders, reducing errors and delays. This visibility into order status and demand patterns helps optimize order management processes, leading to lower costs. Based on the above exposition, the study hypothesizes that;

H4: Supply Chain Visibility significantly mediates in the relationship between supply chainperformance and IT Capability

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter presents the research methodology employed to empirically analyze the relationships between IT capabilities, supply chain visibility, and supply chain performance. It outlines the research design, data collection process, measurement instruments, and data analysis techniques utilized in this study. The methodology aims to address the research questions identified in chapterone and provide valuable insights into the topic under investigation.

3.1 Research Approach

In the realm of research, three primary methods are commonly employed. These approaches to conducting research are known as quantitative, qualitative, and mixed-methods approach (Saunders et al., 2019). The selection of a specific research approach, be it quantitative, qualitative,or mixed-methods, is typically determined by the nature of the research questions posed and the characteristics of the subject under examination. To simplify, quantitative research is a methodology that places emphasis on the numerical analysis of data. It serves as a method for testing hypotheses by examining the relationships between variables. In this approach, variables are often measured using instruments, resulting in numerical data that can be statistically analyzed(Creswell & Creswell, 2018).

Quantitative research aligns with a deductive approach to theory development and is rooted in thephilosophical standpoint of positivism. Conversely, qualitative research is a means of exploring and comprehending the significance that various individuals and groups

attribute to a particular social or human issue (Creswell & Creswell, 2018). Qualitative research prioritizes words over numbers in data collection and analysis (Bell & Bryman, 2022). This approach aligns with an inductive approach to theory building and is founded on the philosophical standpoint of interpretivist. The mixed-methods approach to research incorporates both quantitative and qualitative research approaches, making use of both numerical and non-numerical data to draw conclusions. This approach aligns with an abductive approach to theory development and is rootedin the philosophical standpoint of pragmatism. The choice of a research approach depends on theresearch questions, and the study has adopted the quantitative approach due to its focus on investigating relationships between the variables under study.

The research approach for this study will be quantitative, as it aims to examine relationships between IT capabilities, supply chain performance, and supply chain visibility, as well as explore the mediating role of supply chain visibility in the relationship between IT capabilities and supplychain performance.

3.2 Research Design

Research design according to Saunders et al. (2011) focuses on decisions that bothers on what, where, how much in addition to the means through a research or study is conducted. In that regard,Kothari (2007) considers research design as the conceptual structure for the conducting of a research or study and primarily focuses on the guidelines for the collection of data, measurement in addition to the measurement of data. Similarly, research design aids in the accomplishment of research objectives by serving as a blueprint for the research approaches, philosophies, strategies and the means of obtaining answers or investigation relationship between a study variable. Research is emphasized to aim at accomplishing

three which are the exploration of a novel topic,the description of a phenomenon or providing explanations as to why something happens (Saunders et al., 2018). In that regard, the purposes of research are classified as either exploratory,descriptive or explanatory and these purposes are not mutually exclusive.

On the one hand, the focus of exploratory research is on the discovery of ideas and insights abouta specific problem or phenomenon whereas descriptive research focuses on providing succinct descriptions of events, situations, persons or a phenomenon. On the other hand, explanatory focuses on the testing of formulated hypothesis and establishes the causal relationship between variables (Kothari, 2007; Saunders et al., 2018). There are various research strategies utilized by researchers in the conduct of research. These research strategies comprise of case survey, case study, experiment, archival research, action research, ethnography and grounded theory (Saunderset al., 2018).

In view of the objectives of the study, cross-sectional survey research strategy will be employed. The survey approach will aim at generating sufficient data in a proficient manner to investigate themediating role of supply chain visibility in the relationship between IT capabilities and supply chain performance. The study is descriptive and causal in nature; therefore, explanatory approach will be utilized in presenting quantitative description whilst investigating the hypothesized relationships.

3.3 Study Population

The concept of "population," as articulated by Nyang and Ongisa (2017), pertains to the set from which study samples are selected. In a research context, the term "research population" is used tocharacterize the complete group of similar cases from which a

representative sample is drawn, asoutlined by Saunders et al. (2019). Consequently, the research population denotes a group about which a researcher seeks to make broader generalizations. Singh (2007) further defines population as any assembly of individuals or units sharing one or more specific features of interest to the researcher. In the context of this study, the population of interest encompasses all manufacturing companies from which data can be collected and from which meaningful inferences can be drawn. More specifically, the accessible population for this study consists of manufacturing companies located in the Central, Western and Greater Accra Regions.

3.4 Sample Size and Sampling Technique

Sampling is the statistical process of selecting a portion or "sample" from a larger population, which allows researchers to make observations and draw statistical conclusions about the entire group (Bhattacherjee, 2012). Due to practical and financial constraints, it is often necessary to choose a sample that is representative of the population when observing and drawing conclusionsabout it (Bhattacherjee, 2012). The primary objective when selecting a representative sample sizeis to enable the extrapolation of the sample's findings to the broader population (Bhattacherjee, 2012). According to Hair et al. (2014), the sample size of a study represents the fraction of the complete population that exhibits characteristics typical of the population under study, thus allowing for inferences and explanations about the entire population. While there are no strict rulesfor determining the ideal sample size (Singh, 2007), larger sample sizes are generally preferred (Pallant, 2013). Sample sizes of 50 or 100 are considered acceptable for various purposes, including multiple regression analysis (Hair et al., 2014).

Researchers have a range of options for selecting samples in their studies, with two main types ofsampling techniques: probability sampling (random) and non-probability sampling (Bhattacherjee,2012; Saunders et al., 2019). This study employs a non-probability sampling approach, specifically employing convenience and purposive sampling techniques. Manufacturing companies for the study will be sampled conveniently based on their availability and willingness to participate. This method ensures practicality in data collection. Research participants from various manufacturing companies will be chosen using purposive sampling. This approach allows for the precise selectionof sample units based on the researcher's judgment, ensuring that the selected units are most relevant to the research inquiry (Zikmund et al., 2010). It was primarily employed to ensure that respondents possessed a deep understanding of the research topic and could provide valid and reliable responses.

The study will involve a total of 100 respondents, specifically individuals in management and senior positions, including CEOs, managing directors, supply chain/operations managers, and supply chain managers etc. This sample size has been chosen to provide a robust basis for analysisand to facilitate meaningful insights.

3.5 Data Sources

To address the research questions of this study, both primary and secondary data sources will be utilized. Primary data refers to first-hand information gathered explicitly for the purpose of investigating research objectives, making it more reliable and consistent compared to secondary data (Zikmund et al., 2014; Saunders et al., 2018). In the course of this research, a comprehensivereview of secondary sources has been conducted, yielding valuable insights. The secondary sources used for this study include peer-reviewed journal

articles and relevant books. These sources contribute to the depth and breadth of the study by providing a solid foundation of existingknowledge and research in the field. Given the explanatory nature of this research, primary data was gathered from respondents occupying executive and senior positions within the selected manufacturing firms. This approach was chosen to ensure a direct and comprehensive understanding of the specific context and factors under investigation.

3.5.1 Data Collection Procedure

To facilitate easy access to manufacturing firm respondents, an introductory letter was obtained from the Department of Procurement and Supply Chain Management Administrator. This introductory letter explicitly conveyed the study's purpose to the selected firms' respondents beforethey participated in the research. The data collection process spanned two months. During this time, the selected manufacturing firms were contacted to request their participation in the study. Upon their acceptance, respondents holding senior-level positions, possessing ample knowledge of the firms' operations relevant to the research, were purposively sampled. They were selected toprovide responses that would enable the study to be carried out effectively. This approach facilitated the collection of first-hand information required to investigate the hypothesized relationships in the study.

3.5.2 Instrument of Data Collection

Researchers employ various research strategies when investigating a phenomenon, such as surveys, case studies, experiments, action research, ethnography, grounded theory, and archival research. The selection of a research strategy significantly influences the choice of

data collectioninstrument (Saunders et al., 2019). For this study, a survey approach was utilized, as it enables theefficient gathering of substantial quantities of data to address the study's objectives (Saunders et al., 2019). Researchers have at their disposal a range of means for data collection, including interviews, observations, and questionnaires, among others. Specifically, a structured questionnaire was employed to collect data from the research participants. Questionnaires are widely used for data collection due to their stability, consistency, uniformity, and speed (Singh, 2007). The questionnaire consisted of open-ended statements that limited respondents' responses to the provided options. It comprised five sections: **SECTION A** focused on gathering demographic information about the firms and their representatives. **SECTION B – D** contained items designed to measure the variables of IT capability, supply chain visibility, and supply chain performance, respectively. The structured questionnaire was chosen for its efficiency and ability to collect data systematically, making it a suitable instrument for this research.

3.6 Data Analysis

The collected data will be analyzed using appropriate statistical techniques to address the researchquestions. Thus, to the address research questions, data will be analyzed using statistical techniques such as correlation analysis and regression analysis. Correlation analysis will be used to determine the strength and direction of relationships between IT capabilities, supply chain visibility, and supply chain performance. Regression analysis will allow the creation of models toassess the significance of these relationships.

Also, to investigate the mediating role of supply chain visibility, Hayes Macro Process mediationwill be conducted using the SPSS. This analysis will help determine if supply chain visibility strengthens or weakens the relationship between IT capabilities and supply

chain performance.

3.7 Ethical Considerations

Maintaining ethical standards is essential for reliable research outcomes. To ensure integrity, the researcher obtained an introductory letter from the department, facilitating access to respondent firms. Participants voluntarily joined the study and were provided with clear information about the study's purpose, procedures, and potential risks, and their voluntary participation was explicitly sought. Questionnaires were designed for anonymity, assuring confidentiality, and data will only be used for academic research. Confidentiality of sensitive information was maintained through anonymization and secure data storage. Any potential harm to participants, either physical or psychological, was minimized, and participants were assured of their right to withdraw from the study without consequences. The study also adhered to ethical citation practices, properly referencing information from relevant literature throughout the thesis and the findings will be reported in an aggregated and anonymous manner.

CHAPTER FOUR

DATA ANALYSIS AND PRESENTATION OF FINDINGS

4.0 Introduction

The study sought to examine the mediating role of supply chain visibility on the link between IT capabilities and supply chain performance. This chapter thus elaborates on the presentation of the analysis of data and presentation of the findings of the study. To concisely present the findings, the results are presented in simpler details using tables. This chapter is also made up of three sections. The focus of the first chapter is on the background characteristics in addition to the descriptive statistics of the various constructs. The second section focuses on inferential analysis in order to arrive at the findings of the study whereas the last section focuses on discussing the findings of the study in relation to prior research.

4.1 Background Characteristics of Respondents and Firms

To obtain data to investigate the study objectives, a total of 100 questionnaires were administeredto 100 firms in the Greater Accra, Western and Central Regions and the Statistical Package for Social Sciences (SPSS) was used for the data analysis. The background characteristics of respondents and their firms comprised of gender, education, area of expertise, position, and yearsof firm existence, number of employees and type of ownership, firm industry and annual revenue. The background characteristics provide insights about the category respondents and firmsengaged in the study.

4.2 Demographic Background of Respondents and Firms

From the Table 4.1 above, the gender of the respondents of the study is relatively male dominated.Male respondents are 68% whereas female respondents are 32%. The age groups are divided into five categories, ranging from "25 years and below" to "41 years and above" and within these categories: 13 individuals (13%) are aged "25 years and below" , 17 individuals (17%) fall within the age group "26–29 years", 28 individuals (28%) are in the "30–35 years" age category, 32 individuals (32%) belong to the "36–40 years" age group and lastly 10 individuals (10%) are "41 years and above."

In terms of the respondents' educational backgrounds, 29% of the respondents held a bachelor's degree, and 58% of the respondents held a master's degree and the remaining 13% held a Ph.D./Doctorate. The educational backgrounds of the respondents indicate that the respondents engaged are highly educated and can be judged qualified to provide legitimate responses to assistin achieving the objectives of the study. In terms of the position/status of respondents, 7% of the respondents were CEOs whereas 12% of the respondents were purchasing and supply chain manager and 21% of the respondents were General Managers. In addition, 13% respondents wereIT managers whereas 17% were Operations Managers and lastly 22% occupied different managerial positions. The findings of the position/status of respondents indicate that many of therespondents hold position in supply chain management and allied disciplines. Further, it can be concluded that the respondents have sufficient knowledge of their supply chain operations to provide valid and reliable responses.

Years of firm existence revealed that 11% of the respondents' firms have existed between 5-10 years whereas 21% of firms had existed between 11-15 years. Firms that have existed

between 16 – 20 years were 45% and lastly 23% of the firms have existed beyond 20 years. The years of firmexistence signify that majority of the firms engaged in the study have existed for relatively long enough and have adequate experience in supply chain activities to provide reliable and valid responses.

In terms of number of employees, 15% of the respondents' firms have less than 50 employees whereas 27% of the firms have employees between 51 and 100 employees. Also, firms with employees between 101 and 500 were 42%. Lastly, firms with employees above 500 were 16%. The number of employees by the respondents' firms' shows that majority of the firms engaged arerelatively large firms.

Further, in relation to firm industry, the study revealed that Food, beverages, drinks had the highestrespondent firms with 30%, followed by Pharmaceuticals, health care with 21%, followed Paper and packaging with 17% whiles Plastics and rubber had 15% of respondents' firms. Chemicals and Textiles and clothing had 7% and 10%. The industry of the firms signifies that the firms engaged are not relatively evenly distributed.

Table 4.1 Demographic Background of Respondents and Firms

GENDER				
	Frequency	Percent	Valid Percent	umulativePercent
Male	68	68.0	68.0	68.0
Female	32	32.0	32.0	100.0
Total	100	100.0	100.0	
AGE				
25 years and below	13	13.0	13.0	13.0
26–29 years	17	17.0	17.0	30.0
30–35 years	28	28.0	28.0	58.0
36–40 years	32	32.0	32.0	90.0
41 years and above	10	10.0	10.0	100.0
Total	100	100.0	100.0	

EDUCATIONAL BACKGROUND				
1st Degree	29	29.0	29.0	29.0
Master's Degree	58	58.0	58.0	87.0
Ph.D./Doctorate	13	13.0	13.0	100.0
Total	100	100.0	100.0	
POSITION IN THE FIRM				
CEO	7	7.0	7.0	7.0
General Manager	29	29.0	29.0	36.0
Purchasing andSupply Chain Manager	12	12.0	12.0	48.0
Information Technology	13	13.0	13.0	61.0
Operations Manager	17	17.0	17.0	78.0
Other Managerial position	22	22.0	22.0	100.0
Total	100	100.0	100.0	
NUMBER OF YEARS THE FIRM HAS BEEN IN OPERATION				
5-10 years	11	11.0	11.0	11.0
11-15 years	21	21.0	21.0	32.0
16-20 years	45	45.0	45.0	77.0
above 20 years	23	23.0	23.0	100.0
Total	100	100.0	100.0	
NUMBER OF EMPLOYEES IN THE FIRM				
Less than 50 employees	15	15.0	15.0	15.0
51-100 employees	27	27.0	27.0	42.0
101-500 employees	42	42.0	42.0	84.0
More than 500 employees	16	16.0	16.0	100.0
Total	100	100.0	100.0	
FIRM INDUSTRY				
Chemicals	7	7.0	7.0	7.0
Plastics & rubber	15	15.0	15.0	22.0
Food, beverages, drinks	30	30.0	30.0	52.0
Pharmaceuticals, health care	21	21.0	21.0	73.0
Paper and packaging	17	17.0	17.0	90.0
Textiles and clothing	10	10.0	10.0	100.0
Total	100	100.0	100.0	

Field Study (2023)

4.3 Descriptive Analysis

The goal of the study was to evaluate the role of supply chain visibility as a mediator between IT capabilities and supply chain performance. A five (5) point likert scale questionnaire was prepared and distributed to firms surveyed for the study in order to facilitate the exploration of the objectives of the study. The descriptive statistics of respondents' responses to the several items measuring thestudy's variables are shown in the following tables using mean and standard deviation. The mean and standard deviation indicate the level of agreement or disagreement with each survey item.

4.3.1 Descriptive Statistics for IT Capabilities

IT capabilities were measured as a multi-dimensional variable and had three dimensions which areIT knowledge etc, etc. Each dimension of IT capabilities was measured with three items. Two of the dimensions had 4 items. The responses to questions related to "IT Knowledge," "IT Operations," and "IT Infrastructure" consistently demonstrate a high level of agreement, with scores primarily ranging from 4.00 to 5.00. The responses for all survey questions fall within a narrow range, with scores primarily between 4.00 and 4.46, indicating a high level of agreement or positive sentiment regarding various aspects of computer-based systems and knowledge amongthe respondents. The overall mean score across all questions is approximately 4.44, suggesting thatrespondents, on average, hold a very favorable view regarding the firm's computer-based technicalexpertise and knowledge. In summary, the survey results demonstrate that the respondents expresshigh levels of agreement and positive opinions regarding their firm's computer-based systems, technical expertise, and knowledge.

Table 4.2 Descriptive Statistics for IT Capabilities

	N	Min.	Max.	Mean	Std. Dev.
IT KNOWLEDGE					
Overall, our technical support staff is knowledgeable when it comes to computer-based systems	100	4.00	5.00	4.46	.50
Our firm possesses a high degree of computer-based technical expertise	100	4.00	5.00	4.40	.49
We are very knowledgeable about new computer-based innovations	100	4.00	5.00	4.40	.49
IT OPERATIONS					
We routinely utilize computer-based systems to access information from outside databases	100	4.00	5.00	4.41	.49
We use computer-based systems to analyze customer and market information	100	4.00	5.00	4.41	.49
We utilize decision-support systems frequently when managing customer information	100	2.00	5.00	4.44	.55
We have set procedures for collecting customer information from online sources	100	4.00	5.00	4.40	.49
IT INFRASTRUCTURE					
Our company has a formal MIS department	100	4.00	5.00	4.41	.49
Our firm employs a manager whose main duties include the management of our information technology	100	4.00	5.00	4.44	.49
Our firm's members are linked by a computer network	100	4.00	5.00	4.43	.49
Our firm creates customized software applications when the need arises	100	4.00	5.00	4.46	.50

Source: Field Study (2023)

4.3.2 Descriptive Statistics for Supply Chain Visibility

Supply chain visibility was conceptualized as a second-order construct comprising of demand visibility, supply visibility and market visibility. Each dimension of supply chain visibility had their respective items. The descriptive statistics reveal that respondents have a consistently positiveperception of demand, supply, and market visibility, as the quality and timeliness of information shared by major customers, suppliers, and various sources is rated highly, with average scores ranging from 4.41 to 4.87, indicating strong agreement

and satisfaction with the completeness and usefulness of the information received in these domains. The responses to a series of questions about the quality and timeliness of information shared by major customers and suppliers consistently reveal a high level of agreement and satisfaction, with scores primarily ranging from 4.00 to 5.00. The overall mean scores for these questions are notably high, with an average of approximately 4.45, indicating that respondents have a positive perception of the quality, accuracy, completeness, and usefulness of the information received from major customers and suppliers. This suggests that the information shared by major business partners is viewed favorably and is deemed to be an integral and reliable component of the organization's operations and decision- making processes.

4.3.3 Descriptive Statistics for Supply Chain Performance

Three items as indicated in the table below were used in the measurement of supply chain performance and under each item are sub-items. The data shows that respondents consistently rate their organization positively in terms of low order and logistics management costs, as well as highprofit rates, with average scores around 4.43 to 4.45, indicating a high level of satisfaction in thesesupply chain performance aspects. Respondents also express a positive perception of their organization's supply chain service performance, including high product quality and safety, consumer satisfaction, and on-time delivery rates, with an average score of approximately 4.42 to4.52, reflecting strong agreement and satisfaction in these service-related dimensions. The data suggests that respondents believe their organization can efficiently and rapidly respond to changesin consumer demand and market price fluctuations, as well as develop new products or services with major partners, with an average score of around 4.46 to 4.49, indicating a positive view of their strategy-

related performance. In summary, the descriptive statistics demonstrate positive Perceptions across different dimensions of supply chain performance, reflecting a high level ofagreement and satisfaction among the respondents.

Table 4.3 Descriptive Statistics for Supply Chain Visibility

	N	Min.	Max.	Mean	Std. Dev.
DEMAND VISIBILITY					
The sales information we receive from our major customers is timely, accurate, complete and in a useful format	100	4.00	5.00	4.46	.50
The forecast information we receive from our major customers is timely, accurate, complete and in a useful format	100	4.00	5.00	4.47	.50
The customer inventory information is timely, accurate, complete and in a useful format	100	4.00	5.00	4.87	4.08
The promotional information we receive from major customers is timely, accurate, complete and in a useful format	100	4.00	5.00	4.45	.50
SUPPLY VISIBILITY					
The supplier inventory information is timely, accurate, complete and in a useful format	100	4.00	5.00	4.43	.49
The advance shipment information we receive from suppliers is timely, accurate, complete and in a useful format	100	4.00	5.00	4.41	.49
The order information we receive from major suppliers is timely, accurate, complete and in a useful format	100	4.00	5.00	4.41	.49
The information we have regarding finished goods locations status in the distribution network (e.g., distribution is timely, accurate, complete and in a useful format	100	4.00	5.00	4.41	.49
MARKET VISIBILITY					
The overall market level supply information is timely, accurate, complete and in a useful format	100	4.00	5.00	4.41	.49
The market level demand information we gather is timely,accurate, complete and in a useful format	100	4.00	5.00	4.42	.49

Source: Field Study (2023)

Table 4.3 Descriptive Statistics for Supply Chain Visibility

	N	Min.	Max.	Mean	Std. Dev.
DEMAND VISIBILITY					
The sales information we receive from our major customers is timely, accurate, complete and in a useful format	100	4.00	5.00	4.46	.50
The forecast information we receive from our major customers is timely, accurate, complete and in a useful format	100	4.00	5.00	4.47	.50
The customer inventory information is timely, accurate,complete and in a useful format	100	4.00	5.00	4.87	4.08
The promotional information we receive from major customers is timely, accurate, complete and in a useful format	100	4.00	5.00	4.45	.50
SUPPLY VISIBILITY					
The supplier inventory information is timely, accurate, complete and in a useful format	100	4.00	5.00	4.43	.49
The advance shipment information we receive from suppliers is timely, accurate, complete and in a useful format	100	4.00	5.00	4.41	.49
The order information we receive from major suppliers is timely, accurate, complete and in a useful format	100	4.00	5.00	4.41	.49
The information we have regarding finished goods locations status in the distribution network (e.g., distribution is timely, accurate, complete and in a useful format	100	4.00	5.00	4.41	.49
MARKET VISIBILITY					
The overall market level supply information is timely, accurate, complete and in a useful format	100	4.00	5.00	4.41	.49
The market level demand information we gather is timely,accurate, complete and in a useful format	100	4.00	5.00	4.42	.49

Source: Field Study (2023)

Table 4.4 Supply Chain Performance

	N	Min.	Max.	Mean	Std. Dev.
SUPPLY CHAIN FINANCIAL PERFORMANCE					
We have low order management cost	100	4.00	5.00	4.43	.49
We have low logistics management cost	100	4.00	5.00	4.43	.49
We have high profit rate	100	4.00	5.00	4.45	.50
SUPPLY CHAIN SERVICE PERFORMANCE					
We have high product quality and safety	100	4.00	5.00	4.42	.49
We have high consumer satisfaction	100	4.00	5.00	4.43	.49
We have high on-time delivery rate	100	4.00	5.00	4.52	.50
SUPPLY CHAIN STRATEGY PERFORMANCE					
We could rapidly develop and promote new products or services with major partners	100	4.00	5.00	4.46	.50
We could quickly respond to changes in consumer demand with major partners	100	4.00	5.00	4.49	.50
We could efficiently respond to market price fluctuations with major partners	100	4.00	5.00	4.47	.50

Source: Field Study (2023)

4.4 Test of Reliability

Testing the validity and reliability of the scales used to measure the independent variable, the dependent variable and the mediating variable is of high importance for the results of the researchstudy. Cronbach's alpha will be employed to test scale reliability and factor analysis will be performed to test validity

4.4.1 Internal Consistency – Cronbach's alpha

Internal consistency is associated with the homogeneity of the items or the extent to which a construct is measured by a group of items (Henson, 2001). To measure how closely

related the research question items which represent each one of the independent and dependent variables areas a group, Cronbach's alpha was employed. It takes values from 0 to 1, with 1 being the highest value, meaning perfect internal consistency. A Cronbach's Alpha with value higher than 0.7 is considered as reliable in comparison with values lower than 0.7 (Nunnally, 1978). Cronbach's Alpha test in SPSS Statistics was used to identify Cronbach's alpha, thus the reliability of the itemsof the variables. The results of the test are presented in the table below.

Table 4.5 indicates Cronbach's Alpha of 0.936 which shows a high internal consistency among the 11 items measuring IT capabilities. This suggests that the items are reliably measuring the intendedconstruct of IT capabilities in the study. Cronbach's Alpha of 0.971 is also exceptionally high, indicating very strong internal consistency among the 10 items measuring supply chain visibility.This suggests a high level of reliability in assessing the construct of supply chain visibility. Finally,Cronbach's Alpha of 0.925 indicates a high level of internal consistency among the 9 items measuring supply chain performance. The measurement scale for supply chain performance is reliable in capturing the intended construct. In summary, the Cronbach's Alpha values for all threevariables are well above the commonly accepted threshold of 0.7, indicating that the measurementscales used in the study are highly reliable and consistent in assessing the respective constructs of IT capabilities, supply chain visibility, and supply chain performance.

Table 4.5 Reliability Test Table

Variable	Cronbach's Alpha	N of Items
IT Capabilities	.936	11
Supply Chain Visibility	.971	10
Supply Chain Performance	.925	9

Source: SPSS Output (2023)

4.5 Correlations Analysis of IT Capabilities, Supply Chain Visibility and Supply Chain Performance

Correlation analysis is a statistical technique used to measure the strength and direction of the relationship between two or more variables. It is commonly used in research to assess the degree to which changes in one variable are associated with changes in another variable (Cohen et al.,2003). The Pearson correlation of ($r = 0.643^{**}$, $p < 0.01$) suggests a moderately positive andstatistically significant correlation between IT capabilities and supply chain visibility. The Pearsoncorrelation of ($r = 0.902^{**}$, $p < 0.01$) indicates a very high positive and statistically significantcorrelation between IT capabilities and supply chain performance. The Pearson correlation of ($r = 0.685^{**}$, $p < 0.01$) suggests a moderately positive and statistically significant correlation betweensupply chain visibility and supply chain performance. In summary, all three variables (ITcapabilities, supply chain visibility and supply chain performance) are significantly and positivelycorrelated with each other, with particularly strong correlations between IT capabilities and supplychain performance, and slightly weaker but still strong correlations between IT capabilities andsupply chain visibility, as well as between supply chain visibility and supply chain performance.

Table 4.6 Correlations Analysis of IT Capabilities, Supply Chain Visibility and Supply Chain Performance

		ITC	SCV	SCP
IT Capabilities	Pearson Correlation	1	.643**	.902**
	Sig. (2-tailed)		.000	.000
	N	100	100	100
Supply Chain Visibility	Pearson Correlation	.643**	1	.685**
	Sig. (2-tailed)	.000		.000
	N	100	100	100
Supply Chain Performance	Pearson Correlation	.902**	.685**	1
	Sig. (2-tailed)	.000	.000	
	N	100	100	100

**. Correlation is significant at the 0.01 level (2-tailed).
Source: SPSS Output (2023)

4.6 Regression Analysis

Regression analysis is a statistical method used to examine the relationship between one dependent variable and one or more independent variables. It seeks to model the relationship between the variables by fitting a linear equation to observed data. The primary goal of regression analysis is to understand how changes in the independent variables are associated with changes in the dependent variable. It helps in predicting the value of the dependent variable based on the values of the independent variables. (Cohen et al., 2003). Below are the tables showing the regression analysis of the relationship between IT capability and supply chain performance and theirrespective interpretations.

4.6.1 Regression Analysis of the relationship between IT Capability and Supply Chain Performance

The results indicate that the regression model with IT capability as the predictor explains 81.3% of the variance in supply chain performance. The adjusted R-squared value of 0.811 suggests thatthis model is a good fit for the data. The F-test for overall significance is

significant ($p < 0.001$), indicating that the model as a whole is statistically significant in predicting the dependent variable. The Durbin-Watson statistic is used to detect autocorrelation in the residuals of a regression analysis, and a value of around 1.681 suggests that there is no autocorrelation present in the modelresiduals.

Table 4.7. Model Summary for IT Capability and Supply Chain Performance

					Change Statistics					
Model	R	R Square	AdjustedR Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.902[a]	.813	.811	1.54	.813	426.037	1	98	.00	1.68

a. Predictors: (Constant), IT Capability
b. Dependent Variable: Supply Chain Performance

Source: SPSS Output (2023)

The ANOVA table indicates that the regression model is highly significant in predicting the dependent variable supply chain performance ($F(1, 98) = 426.037$, $p < 0.001$). This suggests that the independent variable (IT capability) has a significant impact on supply chain performance. The regression sum of squares (SS) is 1016.067, indicating the amount of variance in SCP explained by the model. The residual sum of squares is 233.723, representing the unexplained variance. The total sum of squares is 1249.790, indicating the total variance in supply chain performance. These results suggest that the regression model provides a good fit for the data and that the relationship between IT capability and supply chain performance is unlikely to be due to chance.

Table 4.8. ANOVA for IT Capability and Supply Chain Performance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1016.067	1	1016.067	426.037	.000[b]
	Residual	233.723	98	2.385		
	Total	1249.790	99			

a. Dependent Variable: Supply Chain Performance
b. Predictors: (Constant), IT Capabilities
Source: SPSS Output (2023)

The coefficients table provides key insights into the relationship between the independent variable, IT capability, and the dependent variable, supply chain performance. The coefficient for IT capability is 0.743, indicating that, on average, supply chain performance is expected to increase by 0.743 units for each one-unit increase in IT capability. This suggests a strong positive relationship between IT capability and supply chain performance. The standardized coefficient (Beta) for IT capability is 0.902, indicates a robust and positive impact of IT capability on supplychain performance. The high t-value of 20.641 and the associated p-value of less than 0.001 suggest that the relationship between IT capability and supply chain performance is statistically significant. Additionally, the collinearity statistics (tolerance and VIF) indicate no issues with multicollinearity, suggesting that IT capability is not highly correlated with other independent variables in the model.

Table 4.9 Coefficients for IT Capability and Supply Chain Performance

Model		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	3.93	1.75		2.23	.02	.44	7.42		
	IT Capability	.743	.036	.902	20.64	.00	.672	.815	1.00	1.00

a. Dependent Variable: Supply Chain Performance

b. Predictors: (Constant), IT Capability

Source: SPSS Output (2023)

4.7 Regression Analysis of the relationship between IT Capabilities and Supply Chain Visibility

The regression model examining the relationship between IT capability and supply chain visibilityyielded an R-squared value of 0.414, indicating that approximately 41.4% of the variance in supplychain visibility can be explained by IT capability. The adjusted R-squared value, accounting for the number of predictors, is 0.408, suggesting that the model's goodness of fit remains strong. Thestandard error of the estimate is 4.82989, indicating the average distance between the observed values and the predicted values. The change statistics show that the addition of IT capability to themodel significantly improved the prediction of supply chain visibility, with an F-change value of 69.235 ($p < 0.001$). The Durbin-Watson statistic of 1.879 suggests that there is no autocorrelationin the model residuals.

Table 4.10 Model Summary for IT Capabilities and Supply Chain Visibility

Model	R	R Square	Adjusted R Square	Std. Errorof the Estimate	Change Statistics					Durbin-Watson	
					R Square Change	F Change	df1	df2	Sig. F Change		F Chan
1	.643[a]	.414	.408	4.82989	.414	69.235	1	98	.000	1.879	69.2

a. Predictors: (Constant), IT Capability
b. Dependent Variable: Supply Chain Visibility

The analysis of variance (ANOVA) table indicates that the regression model is highly significant($F(1, 98) = 69.235$, $p < 0.001$), suggesting that IT capability is a significant predictor of supply chain visibility. The regression sum of squares is 1615.109, indicating the amount of variance in supply chain visibility explained by the model. The residual sum of squares is 2286.131, representing the unexplained variance. The total sum of squares is 3901.240, indicating the total variance in supply chain visibility.

Table 4.11 ANOVA for IT Capabilities and Supply Chain Visibility

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1615.109	1	1615.109	69.235	.000[b]
	Residual	2286.131	98	23.328		
	Total	3901.240	99			

a. Dependent Variable: Supply Chain Visibility
b. Predictors: (Constant), IT Capability

The coefficients table shows that IT capability is 0.937, indicating that for every one-unit increasein IT capability, supply chain visibility is expected to increase by 0.937 units. This coefficient is statistically significant ($p < 0.001$), suggesting that IT capability has a significant positive impacton supply chain visibility. The 95% confidence interval for the coefficient of IT capability is between 0.714 and 1.161, indicating the range within which we can be 95% confident that the true effect of IT capability on supply chain visibility lies.

The collinearity statistics (tolerance and VIF) suggest no issues with multicollinearity, indicating that IT capability is not highly correlated with other independent variables in the model.

Table 4.12 Coefficients for IT Capabilities and Supply Chain Visibility

Model		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	-.869	5.503		-.158	.875	-11.788	10.051		
	IT Capability	.937	.113	.643	8.321	.000	.714	1.161	1.00	1.00

a. Dependent Variable: Supply Chain Visibility

b. Predictors: (Constant), IT Capability

Source: SPSS Output (2023)

4.8 Regression Analysis of the relationship between Supply Chain Visibility and Supply Chain Performance

The regression model examining the relationship between supply chain visibility and supply chainperformance yielded an R-squared value of 0.46, indicating that approximately 46% of the variance in supply chain performance can be explained by supply chain visibility. The adjusted R-squared value, accounting for the number of predictors, is also 0.46, suggesting that the model's goodness of fit remains strong. The standard error of the estimate is 2.60, indicating the average distance between the observed values and the predicted values. The change statistics show that theaddition of supply chain visibility to the model significantly improved the prediction of supply chain performance, with an F-change value of 86.70 ($p < 0.001$). The Durbin-Watson statistic of 1.56 suggests that there is no autocorrelation in the model residuals.

Table 4.13 Model Summary for Supply Chain Visibility and Supply Chain Performance

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.68[a]	.46	.46	2.60	.46	86.70	1	98	.000	1.56

a. Predictors: (Constant), Supply Chain Visibility

b. Dependent Variable: Supply Chain Performance

Source: SPSS Output (2023)

The analysis of variance (ANOVA) table indicates that the regression model is highly significant ($F(1, 98) = 86.702$, $p < 0.001$), suggesting that supply chain visibility is a significant predictor of supply chain performance. The regression sum of squares is 586.671, indicating the amount of variance in supply chain performance explained by the model. The residual sum of squares is 663.119, representing the unexplained variance. The total sum of squares is 1249.790, indicating the total variance in supply chain performance.

Table 4.14 ANOVA for Supply Chain Visibility and Supply Chain Performance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	586.671	1	586.671	86.702	.000[b]
	Residual	663.119	98	6.767		
	Total	1249.790	99			

a. Dependent Variable: Supply Chain Performance

b. Predictors: (Constant), supply chain visibility

The coefficients table shows that the constant term is statistically significant (22.760, $p < 0.001$), suggesting that even when supply chain visibility is zero, the predicted supply chain performanceis significantly different from zero. The coefficient for supply chain visibility is 0.388, indicatingthat for every one-unit increase in supply chain visibility, supply chain

performance is expected to increase by 0.388 units. This coefficient is statistically significant ($p < 0.001$), suggesting that supply chain visibility has a significant positive impact on supply chain performance. The 95% confidence interval for the coefficient of supply chain visibility is between 0.305 and 0.470, indicating the range within which we can be 95% confident that the true effect of supply chain visibility on supply chain performance lies. The correlations and collinearity statistics suggest no issues with multicollinearity, indicating that supply chain visibility is not highly correlated with other independent variables in the model.

Table 4.15 Coefficients for Supply Chain Visibility and Supply Chain Performance

Model	Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B		Collinearity Statistics	
	B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Tolerance	VIF
(Constant)	22.76	1.88		12.09	.00	19.02	26.49		
Supply Chain Visibility	.38	.04	.68	9.31	.00	.30	.47	1.00	1.00

a. Dependent Variable: Supply Chain Performance
b. Predictors: (Constant), supply chain visibility

Source: SPSS Output (2023)

4.9 .Mediation Analysis

In statistics, a mediation model seeks to identify and explain the mechanism or process that underlies an observed relationship between an independent variable and a dependent variable via the inclusion of a third hypothetical variable, known as a mediator variable also a mediating variable, intermediary variable, or intervening variable (University of Indiana, 2016). Rather thana direct causal relationship between the independent variable and the dependent variable, a mediation model proposes that the independent variable

influences the mediator variable, which in turn influences the dependent variable. Thus, the mediator variable serves to clarify the nature of the relationship between the independent and dependent variables. (VanderWeele, 2016) According to Hayes, 2017, to establish mediation using the Hayes macro process researchers typically follow these steps. First, they run a regression model to establish the total effect of the independent variable (IV) on the dependent variable (DV) without including the potential mediator. Next, they include the potential mediator variable in the model and conduct another regression analysis to establish the effect of the IV on the mediator (Path a) and the effect of the mediator on the DV, controlling for the IV (Path b). Using the coefficients from the mediation model, researchers can calculate the indirect effect of the IV on the DV through the mediator. Thisis done by multiplying the coefficients for Paths a, significance of the indirect effect. Bootstrappinggenerates multiple samples from the data and calculates the indirect effect for each sample. The ULCI and LLCI for the indirect effect are based on the distribution of these calculated effects. Mediation is considered established if the ULCI and LLCI for the indirect effect do not include zero, indicating that the effect of the IV on the DV is mediated by the mediator variable.

The study assessed the mediating role of in supply chain visibility in the relationship between IT capability and supply chain performance. The results revealed a significant indirect effect of the impact of IT capability on supply chain performance ($b = 0.950$, $t = 2.564$), supporting H4. Furthermore, the direct effect of IT capability on supply chain performance in the presence of themediator was also found to be significant ($b = .6484$, $p < 0.01$) Hence, in supply chain visibility partially mediated the relationship between IT capability and supply chain performance. The results suggest that there is a statistically

significant total effect of IT capability on supply chain performance, and this effect is partially mediated by in supply chain visibility. In summary, the mediation analysis indicates that in supply chain visibility plays a significant role in mediating therelationship between IT capability and supply chain performance, and the indirect effect is statistically significant. Mediation analysis is presented below.

```
Run MATRIX procedure:

***************** PROCESS Procedure for SPSS Version 4.2

          *****************Written by Andrew F. Hayes, Ph.D.

                                                    www.afhayes.com
    Documentation available in Hayes (2022). www.guilford.com/p/hayes3

**************************************************************************
********Model  : 4
   Y : SCP X : ITC M  : SCV

Sample Size:  100

**************************************************************************
********OUTCOME VARIABLE:
 SCV


Model Summary
        R       R-sq        MSE          F        df1        df2          p
    .6434     .4140    23.3279    69.2352     1.0000    98.0000     .0000

Model
            coeff         se          t          p       LLCI       ULCI
constant    -.8688     5.5026    -.1579     .8749   -11.7884    10.0509
ITC          .9373     .1126     8.3208     .0000     .7138     1.1608

**************************************************************************
********OUTCOME VARIABLE:
 SCP
```

Model Summary

R	R-sq	MSE	F	df1	df2	p
.9120	.8318	2.1672	239.8462	2.0000	97.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
constant	4.0231	1.6774	2.3985	.0184	.6940	7.3522
ITC	.6484	.0449	14.4563	.0000	.5594	.7374
SCV	.1014	.0308	3.2935	.0014	.0403	.1625

********** DIRECT AND INDIRECT EFFECTS OF X ON Y **********

Direct effect of X on Y

Effect	se	t	p	LLCI	ULCI
.6484	.0449	14.4563	.0000	.5594	.7374

Indirect effect(s) of X on Y:

	Effect	BootSE	BootLLCI	BootULCI
SCV	.0950	.2411	.0379	.6661

********** ANALYSIS NOTES AND ERRORS **********

Level of confidence for all confidence intervals in output:
95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals:5000

------ END MATRIX -----

Source: SPSS Output (2023)

4.10 Discussion of Findings

The focus of this section is to discuss comprehensively the findings of the study in relation to theobjectives of the study which sought to examine the mediating role of supply chain visibility in the relationship between IT capabilities and supply chain performance. The findings of the study are however juxtaposed with prior research.

The study found a very strong positive correlation between IT capabilities and supply chain performance. This result is consistent with previous research (Aydiner et al., 2017), which suggeststhat organizations with strong IT capabilities are likely to have better supply chain performance. The regression analysis further confirmed this relationship, showing that IT capabilities significantly predicted supply chain performance. This finding aligns with the resource-based view (RBV) theory, which argues that firms should develop their IT capability to achieve competitive advantage (Bharadwaj, 2000). The strong correlation underscores the importance of investing in and leveraging IT capabilities to enhance overall supply chain effectiveness. Organizations that prioritize and enhance their IT capabilities are likely to experience improvements in various aspects of supply chain management. The results imply that organizations should strategically invest in and develop their IT capabilities to gain a competitive edge in supply chain management.In conclusion, the study underscores the pivotal role of IT capabilities in enhancing supply chain performance. Organizations that recognize and harness the potential of IT in their supply chain operations are likely to achieve greater efficiency, responsiveness, and overall performance in a dynamic and competitive business environment.

The study also found a positive correlation between IT capabilities and supply chain visibility. This suggests that organizations with strong IT capabilities are more likely to have better supply chain visibility. The regression analysis supported this relationship, showing that IT capabilities significantly predicted supply chain visibility. This finding is consistent with previous research (Ivanov & Dolgui, 2020), which highlights the role of IT capabilities in enhancing supply chain visibility. This suggests that as organizations enhance their IT capabilities, there is a meaningful improvement in the visibility of their

supply chain processes. The positive relationship emphasizesthe strategic importance of IT capabilities in providing the necessary technological infrastructure and tools to enhance visibility. The study findings indicate that IT capabilities have a direct impacton supply chain visibility. Organizations with advanced IT capabilities are better positioned to collect, analyse, and share real-time data, leading to improved visibility across the entire supply chain. In summary, the study underscores the instrumental role of IT capabilities in improving supply chain visibility. Organizations that invest in and leverage advanced technologies are better equipped to enhance transparency, collaboration, and overall visibility within their supply chains, leading to more informed decision-making and improved operational efficiency.

Again, the study found a moderately positive correlation between supply chain visibility and supply chain performance. This indicates that organizations with better supply chain visibility arelikely to have better supply chain performance. The regression analysis further confirmed this relationship, showing that supply chain visibility significantly predicted supply chain performance.This finding is consistent with the literature, which suggests that improved operational performance is linked to enhanced visibility and transparency throughout the supply chain (Swift,Guide, & Muthulingam, 2019). This suggests that as visibility within the supply chain improves, there is a meaningful impact on the overall performance of the supply chain. Organizations that invest in technologies and strategies to improve visibility throughout their supply chains are likelyto experience positive impacts on overall performance.

Lastly, the study revealed that supply chain visibility partially mediated the relationship between IT capabilities and supply chain performance. The mediation analysis showed a significant indirecteffect of IT capabilities on supply chain performance through supply chain visibility. Thisindicates that while IT capabilities directly influence supply chain performance, part of this influence is also mediated by the level of supply chain visibility. This finding is supported by previous research (Luo et al., 2018), which suggests that supply chain visibility plays a crucial rolein mediating the relationship between IT capabilities and supply chain performance.

In summary, the findings suggest that IT capabilities, supply chain visibility, and supply chain performance are closely related, with IT capabilities and supply chain visibility playing significantroles in influencing supply chain performance. The study provides valuable insights into how organizations can leverage IT capabilities and improve supply chain visibility to enhance overall supply chain performance.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

This chapter focuses on presenting the summary of the findings as well as the conclusion and recommendations based on the findings of the study. The study was purposed at examining the mediating role of supply chain visibility in the link between IT capability and supply chain performance. Beyond the summary of findings, conclusion and recommendations, the study also presents the limitations of the study which provides the basis for proffering directives forsubsequent research.

5.1 Summary of Findings

The findings of the study are summarized in this section based on the study objectives. The studyinvestigated four specific research questions which are:

1. What is the relationship between IT Capabilities and Supply Chain Performance?
2. What is the relationship between IT Capabilities and Supply Chain Visibility?
3. What is the relationship between Supply Chain Visibility and Supply Chain Performance?
4. What is the mediating role of supply chain visibility in the relationship between IT Capabilities and supply chain performance?

In providing answers to these research questions, a cross-sectional survey research strategy was utilized in gathering 100 valid responses from firms operating in the Central, Western and GreaterAccra Region of Ghana. Subsequently, the valid responses were analyzed using Statisticalsoftware packages such as SPSS

5.1.1 IT Capability and Supply Chain Performance

The investigation of this link revealed that IT capability has a positive and statistically significant link with supply chain performance. Thus, hypothesis 1 is supported. The findings from the studystrongly support the notion that IT capabilities play a crucial role in improving supply chain performance. The study emphasizes the importance of investing in IT capabilities for improving supply chain effectiveness. Strategic investment in IT can enhance efficiency, responsiveness, and overall performance, giving organizations a competitive edge in supply chain management.

5.1.2 IT Capability and Supply Chain Visibility

The study findings highlight a significant and positive relationship between IT capabilities and supply chain visibility, thus, hypothesis 2 is supported. The study reveals statistically significant,positive relationship between IT capabilities and supply chain visibility. This suggests thatenhanced IT capabilities leads to improved visibility of supply chain processes. This highlights thestrategic importance of IT in providing the technological infrastructure for visibility. Advanced IT enables real-time data collection, analysis, and sharing, enhancing transparency and collaboration.Investing in IT enhances supply chain visibility, leading to better decision-making and operationalefficiency.

5.1.3 Supply Chain Visibility and Supply Chain Performance

Also, the investigation of the third objective revealed that supply chain visibility has a positive andsignificant link with supply chain performance, thereby providing support for hypothesis 3. This finding signifies that supply chain visibility which is a dynamic capability is instrumental in helping firms improve their supply chain performance

especially in present business environment. Improved visibility enhances overall supply chain performance, highlighting its importance in the current business environment. Investing in technologies and strategies to enhance visibility can positively impact overall supply chain performance.

5.1.4 Mediating role of Supply Chain Visibility

The study explored the specific indirect effect of supply chain visibility in the link between IT capability and supply chain performance. This objective aimed at testing for the mediating effect which revealed that supply chain visibility plays a partial mediating role in the link between IT capability and supply chain performance. This suggests that while IT capability directly improves performance, it also enhances visibility, which further boosts performance. Organizations should leverage IT not just for direct benefits but also for its ability to improve visibility, leading to broader positive effects. Supply chain visibility plays a significant mediating role in translating IT investments into improved performance. Recognizing this can help organizations maximize the impact of their IT investments on supply chain performance.

5.2 Conclusion

The study set out to investigate the mediating role of supply chain visibility in the link between IT capability and supply chain performance. To objectively address the study, a cross-sectional survey strategy was employed in gathering data from firms in the Central, Western and Greater Accra Region of Ghana. Subsequently, the valid responses were analyzed using Statistical software packages such as SPSS.

The exploration of the survey data found support for all the hypotheses. The study revealed

that IT capability has a significant link with supply chain visibility and supply chain performance. Supply chain visibility was also found to have a significant link with supply chain performance. In terms of the mediating effect, supply chain visibility was found to play a partial mediating rolein the link between IT capability and supply chain performance. On the basis of the study findings, it is concluded that in business environment characterized by much uncertainty, it is essential thatfirms invest in developing their IT capability and competence in order to harness it to improve supply chain performance. Again, it is essential that firms invest and develop their supply chain visibility to provide them the capability to alter tactics and operations rapidly to respond to the changing characteristics of the business environment and to appropriately harness the IT capabilityin improving supply chain performance.

5.3 Recommendations

The recommendations below are provided based on the objectives and findings of the study whichsought to examine the mediating role of supply chain visibility in the link between IT capability and supply chain performance.

On the basis of the significant contribution of IT capability in enhancing supply chain performance,it is recommended that firms should prioritize and develop their IT capability in order to harness it to improve supply chain performance. Invest in IT capabilities to improve supply chain performance by upgrading technological infrastructure and tools to enhance visibility and overallefficiency.

Also it is recommended that firms should leverage supply chain visibility by recognizing the importance of supply chain visibility in boosting performance. Implement technologies and strategies that enhance visibility, leading to better decision-making and operational

efficiency.

Finally it is recommended that firms should strategically use IT capabilities not just for direct benefits but also to improve supply chain visibility. This broader approach can result in more significant positive impacts on overall performance.

5.4 Limitations and Suggestions for Further Research

Though the study provides valuable insights on how supply chain visibility acts an influencing mechanism in the link between IT capability and supply chain performance, the study has some limitations which provides the basis to suggest areas for further research. The limitations of the study first involve the use of a relatively small sample size as well as the usage of single respondents. In addition, the study is cross-sectional in nature which limits the ability to draw causal inferences. Based on these limitations, future researchers can consider the following.

First, future researchers can utilize multiple respondents in order to address probable response biasissues.

Also, future researchers can explore the linkages in the research model longitudinally in order to ascertain if there is causality between the variables explored in the research model.

Lastly, future researchers can explore different variables that can potentially mediate the link between IT capability and supply chain performance as well as the exploration of different moderators which can either enhance or suppress the effects of IT capability on supply chain performance.

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APPENDIX

SURVEY QUESTIONNAIRE

My name is Pearl Kodjoe, a postgraduate student at the University of Education, Winneba, Department of Procurement and Supply Chain Management. This survey instrument has been designed to enable me carry out research on the topic: **"EXAMINING THE RELATIONSHIP BETWEEN IT CAPABILITIES AND FIRM PERFORMANCE; THE MEDIATING ROLE OF SUPPLY CHAIN VISIBILITY"**. Any information provided will be used for academic purposes only. There are no risks associated with your participation, and your responses will remain confidential and anonymous.

SECTION A: RESPONDENT'S BIOGRAPHY AND COMPANY PROFILE

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

1. Gender: [ ] Male [ ] Female

2. Age: [ ] 25 years and below [ ] 26–29 years [ ] 30–35 years
[ ] 36–40 years [ ] 41 years and above

3. Educational Background:
[ ] 1st Degree [ ] Master's Degree [ ] Ph.D./Doctorate

4. Please indicate your position in the firm [ ] CEO [ ] General Manager
[ ]Procurement and Supply Chain Manager [ ] Information Technology Manager
[ ] Operations Manager [ ] Others

5. Number of years the firm has been in operation:
[ ] Less than 1 year [ ] 5-10 years [ ] 11-15 years
[ ] 16-20 years [ ] above 20 years

6. Number of employees in the firm:
[ ] Less than 10 employees [ ] 11-50 employees [ ] 51-100 employees[ ] 101-500 employees [ ] More than 500 employees

7. Please, indicate the industry your firm belongs (tick only the dominant one)
[ ] Industrial machinery, machine, tools [ ] Chemicals [ ] Plastics & rubber
[ ] Food, beverages, drinks [ ] Metals, metal working
[ ] Pharmaceuticals, health care [ ] Paper and packaging
[ ] Textiles and clothing [ ] Electronics

SECTION B: INFORATION TECHNOLOGY CAPABILITY

(Source: Zhang, M., Sarker, S., & McCullough, J. (2008)

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

1 = Strongly Disagree	**2 = Disagree**	**3 = Indifferent/Not Sure**				
4 = Agree	**5 = Strongly Agree**					
IT KNOWLEDGE						
Overall, our technical support staff is knowledgeable when it comes to computer-based systems		1	2	3	4	5
Our firm possesses a high degree of computer-based technical expertise		1	2	3	4	5
We are very knowledgeable about new computer-based innovations		1	2	3	4	5
IT OPERATIONS						
We routinely utilize computer-based systems to access information fromoutside databases		1	2	3	4	5
We use computer-based systems to analyze customer and market information		1	2	3	4	5
We utilize decision-support systems frequently when managing customerinformation		1	2	3	4	5
We have set procedures for collecting customer information from onlinesources						
IT INFRASTRUCTURE						
Our company has a formal MIS department		1	2	3	4	5
Our firm employs a manager whose main duties include the management ofour information technology		1	2	3	4	5
Our firm's members are linked by a computer network		1	2	3	4	5
Our firm creates customized software applications when the need arises		1	2	3	4	5

SECTION C: SUPPLY CHAIN VISIBILITY

(Source: Mubarik, M. S., Naghavi, N., Mubarik, M., Kusi-Sarpong, S., Khan, S. A., Zaman, S. I., & Kazmi, S. H. A. (2021).

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

1 = Strongly Disagree	**2 = Disagree**	**3 = Indifferent/Not Sure**				
4 = Agree	**5 = Strongly Agree**					
DEMAND VISIBILITY						
The sales information we receive from our major customers is timely,accurate, complete and in a useful format		1	2	3	4	5
The forecast information we receive from our major customers is timely,accurate, complete and in a useful format		1	2	3	4	5
The customer inventory information is timely, accurate, complete and in auseful format		1	2	3	4	5
The promotional information we receive from major customers is timely,accurate, complete and in a useful format		1	2	3	4	5
SUPPLY VISIBILITY						
The supplier inventory information is timely, accurate, complete and in auseful format		1	2	3	4	5
The advance shipment information we receive from suppliers is timely,accurate, complete and in a useful format		1	2	3	4	5
The order information we receive from major suppliers is timely, accurate,complete and in a useful format		1	2	3	4	5
The information we have regarding finished goods locations status in thedistribution network (e.g., distribution centers, transportation) is timely, accurate, complete and in a useful format		1	2	3	4	5
MARKET VISIBILITY						
The overall market level supply information is timely, accurate, completeand in a useful format		1	2	3	4	5
The market level demand information we gather is timely, accurate, complete and in a useful format		1	2	3	4	5

SECTION D: SUPPLY CHAIN PERFORMANCE

(P (Niu, 2010;Nyamah et al., 2017; Fiorini and Jabbour, 2017; Zhou and Wan, 2017) (Niu, 2010; Ding et al., 2014; Eckstein et al., 2015;Fiorini and Jabbour, 2017; Zhou and Wan, 2017; Dissanayake and Cross, 2018)

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

1 = Strongly Disagree	**2 = Disagree**	**3 = Indifferent/Not Sure**				
4 = Agree	**5 = Strongly Agree**					
SC FINANCIAL PERFORMANCE						
We have low order management cost		1	2	3	4	5
We have low logistics management cost		1	2	3	4	5
We have high profit rate		1	2	3	4	5
SC SERVICE PERFORMANCE						
We have high product quality and safety		1	2	3	4	5
We have high consumer satisfaction		1	2	3	4	5
We have high on-time delivery rate		1	2	3	4	5
SC STRATEGY PERFORMANCE						
We could rapidly develop and promote new products or services with major partners		1	2	3	4	5
We could quickly respond to changes in consumer demand with major partners		1	2	3	4	5
We could efficiently respond to market price fluctuations with major partners		1	2	3	4	5

Thank you for participating in the survey