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TOPIC:

PROACTIVE RISK MITIGATION STRATEGIES AND SUPPLY CHAIN RISK MANAGEMENT PERFORMANCE OF MANUFACTURING FIRMS IN GHANA: THE MODERATING ROLE OF RISK MANAGEMENT CULTURE

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DECLARATION

I, Anthony Woangbah Kodjoe, hereby declare that this submission is my own work towards the Masters of Business Administration and that to the best of my knowledge, it contains no material previously published by another person nor material which has been accepted for the award of any degree of the University, except where due acknowledgement has been made in the text.

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ABSTRACT

Proactive risk mitigation strategies continue to generate attention in our modern-day manufacturing industry due to their strengths in helping manufacturing firms to become proactive and resilient to mitigating risks. Risks have become inevitable in manufacturing

operating; hence, proactive risk mitigation strategies are needed to identify risks and adopt relevant strategies to address them. This study investigates the effects of proactive risk mitigation strategies comprising supply chain agility, supply chain visibility and knowledge sharing on supply chain risk management (SCRM) performance as well as the moderating role of of risk management culture. It also examines the correlation between SCRM performance on operational performance. The theory of constraints, which served as the foundation for this quantitative study, enabled for the collection of primary data from 257 randomly selected owner-managers of industrial companies located in the metropolises of Accra, Kumasi, and Tema. Using the structured questionnaires, a valid data set of 229 was obtained, processed with the IBM SPSS Statistics and SmartPLS software and analysed via the PL-SEM. The result revealed that all the three proactive risk mitigation strategies affect

the SCRM performance of the manufacturing firms. The study also found SCRM performance to improve the firms‟ operational performance. It was finally found that risk management culture moderates the correlation between only knowledge sharing strategy and SCRM performance. It was concluded that manufacturing firms that adopt the proactive risk mitigation strategies can attain high SCRM performance. It is suggested that management of the manufacturing firms need to focus on and invest in the proactive risk mitigation strategies in order strengthen their SCRM performance levels within the scope of Ghana.

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LIST OF ABBREVIATIONS

KS	Knowledge Sharing
RMC	Risk Management Culture
OP	Operational Performance
SCA	Supply chain Agility
SCRMP	Supply Chain Risk Management Performance
SCV	Supply Chain Visibility

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DEDICATION

To my family for all the blessings and support they have given me throughout my life.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

The manufacturing sector plays valuable roles in economic development through revenue generation, job creation and resource utilisation (World Bank, 2020; Asamoah et al., 2021). In developed economies such as China, Germany and USA, this sector averagely accounts for 30 percent to Gross Domestic Product (GDP) per annum (World Bank, 2020; Trading Economies, 2020). Similarly, in fast-growing economies like Nigeria, Brazil, India and Kenya, the sector contributes over 34 percent and 25 percent to job creation and GDP respectively (Trading Economics, 2020). The sector comprises sub-sectors like the food and chemical/pharmaceutical processors, plastic/rubber producers, paper processors and metal/aluminium smelters, among others whose activities are crucial to economic development (Association of Ghana Industries, 2020; World Bank, 2020).

Despite the significant contributions of the manufacturing sector, its activities are constantly exposed to numerous threats which disrupt its performance objectives (Baryannis et al., 2019; Nyamah et al., 2022). Undoubtedly, threats such as fluctuating customer demands, long lead times and uncertain supply markets have forced focal firms to have long supply chains (SCs) to curb them; but, the longer the chain, the higher the risk levels. Baryannis et al. (2019) asserted that practitioners and researchers are becoming more interested in exploring the various strategies that can reduce the threats and their associated negative results. Wang and Jie (2020) also revealed that risks have become inevitable in modern SCs and failure to address them could have devastating effects on all the actors‟ operational activities.

Recently, the concept of supply chain risk management (SCRM) continues to garner attention due to the need for SCs to recognise, evaluate and mitigate risks (Kurniawan et al., 2017).

SCRM particularly describes the processes involved in identifying potential risks and adopting relevant strategies via integrated approach among SC actors to address them. These processes comprise risk identification, assessment or analysis risk mitigation (Chang et al., 2015). Although risk mitigation is basically the last stage in SCRM, it represents an important stage of risk management (Can Saglam et al., 2020; Rahman et al., 2022). With risk mitigation, SC members focus on preparing and lessening the impacts of any disruption or threat they face. It ensures that members in SCs are either proactive or reactive to potential or actual threats to minimise SC vulnerabilities or disruptions. Asamoah, Nuertey, AgyeiOwusu and Acquah (2022) similarly noted that supply chains can minimise the occurrence of disruptions if attention is given to SC security practices and organisational security culture. They proposed that adopting facility management security, for instance, minimises the occurrence of disruptions along manufacturing SCs.

Given the significance of risk mitigation, its strategies are gaining more attention (DuHadway et al., 2019; Foli et al., 2022). Risk mitigation strategies (RMS) are different tactics businesses use to prevent and lower the likelihood that a risk may materialize (Ho et al., 2015). The strategies ensure that SC members prioritise risks, accept, avoid, reduce, or transfer them; hence, their implementation are crucial. Researchers have classified risk mitigation into "proactive and reactive" (Kurniawan et al., 2017); but this study gives much attention to the former. This is because, the proactive risk mitigation strategies comprise the strategies that focus on identifying and addressing probable risks (Ho et al., 2015; Can Saglam et al., 2020). With these strategies, SC actors adopt strategic or proactive approach to prepare toward threats to ensure that its likelihood and severity of occurrence are controlled.

Proactive RMS have been found to include SC flexibility, collaboration, responsiveness, resilience, agility, knowledge sharing and visibility (Chang et al., 2015, 2019; Wang et al. 2017;

Can Saglam et al., 2020). Based on suggestions by Saglam et al. (2020), the present study concentrated on knowledge sharing, SC agility and visibility. SC agility focuses on SC members‟ ability to respond quickly to threats to prevent them from becoming severe (ALfarajat, 2023). With knowledge sharing, SC members‟ exchange ideas, experience, and skills to address threats or risks (Kim et al., 2021). Chawla et al. (2022) noted that knowledge sharing emphasises the interaction levels among SC members to prevent or reduce threats drastically. With SC visibility, SC members track or monitor their entire operations to detect any threats and address them appropriately (Saqib & Zhang, 2021).

Proactive strategies are crucial to SC members‟ ability to ensure risk mitigation (Can Saglam et al., 2020). The theory of constraints, which contends that focal enterprises and its SC members are constantly exposed to a variety of hazards that impair their capacity to operate effectively, supports this argument (Goldratt, 1990). The theory, therefore, proposes the adoption of proactive strategies to identify, reduce or control risks along the SC (Cox III & Boyd, 2020). Given the competitiveness and uncertainties surrounding operations in manufacturing environments, the implementation of proactive risk mitigation strategies is crucial; however, little or no attention has been given to them in modern-day literature. In Ghana, likewise other developing economies, for instance, manufacturing firms‟ adoption of strategies like knowledge sharing, SC visibility and SC agility in mitigating risks remain low; hence, their impacts on SCRM performance have remained unclear.

Also, Kumar and Anbanandam (2020) revealed that having a risk management culture (RMC) is vital for Turkish manufacturing firms to become more proactive; however, its presence does not indirectly affect the proactive risk mitigation strategies and SCRM performance linkage. Despite this surprising finding, it can be argued that manufacturing firms which ensure that its culture fits with their risk mitigation strategies are more likely to attain higher SCRM

performance and invariably become more competitive. Saeidi et al. (2021) suggested that having a risk culture is required for successful implementation of risk mitigation strategies; thereby, improving SCRM performance. Within the Ghanaian context, manufacturing SCs can be able to manage SC risks and perform better if they develop an RMC. The conceptual understanding of the relationships between proactive RMS and SCRM performance in the Ghanaian setting may therefore be improved by research on the indirect effect of RMC.

1.2 Problem statement

The manufacturing sector is among the fastest growing sectors in emerging economies like Brazil, Kenya, and Nigeria; but its overall growth still lags far behind other fast-growing economies like China, India, and Japan (Esfahbodi et al., 2016; World Bank, 2020). This situation is not any different from manufacturing enterprises in Ghana where their overall contributions to the country‟s economic development remains inconsistent (Asamoah et al., 2021). More precisely, Ghana‟s manufacturing sector has continued to perform abysmally and its overall contribution to GDP has remained below 10 percent for decades (Trading Economics, 2020). The sector‟s appalling performance and slow growth have largely been linked to unhealthy competitions, overreliance on outmoded technologies, financial instabilities, poor government support, demand uncertainties, appalling inventory strategies and fluctuations of macro-economic factors (Boon & Anuga, 2020; Ministry of Trade and Industry, 2020; Opoku et al., 2023; Nyamah et al., 2022). Asamoah et al. (2021) also attributed it to inter-organisational systems use and SC management capabilities.

These factors are considered as risks which continue to threaten or disrupt the activities of manufacturing firms and their SC actors (Agyapong, 2020; Nyamah et al., 2022). Other SC risks have been found to include demand and supply fluctuations, long lead times, high regulatory requirements, financial risks, and natural disasters like Covid-19 (Agyapong, 2020;

Wang & Jie, 2020; Senna et al., 2020). The presence of these risk events including procurement process risks threatens the survival and stability of Ghanaian manufacturing firms and their SC members (Nyamah et al., 2023). Anin et al. (2021) noted that modern manufacturing supply chains in Ghana has become complex and invariably affecting their operational performance. They argued that the complex nature of manufacturing SCs exposes their actors to various risks which require proper governance mechanisms.

Based on these assertions, it can be argued that Ghanaian manufacturing firms would continue to face performance challenges if these risks or threats are left unmanaged. This suggests that risk management is a prerequisite for manufacturing firms to identify, minimise and overcome any risk in order to attain higher SCRM performance. Chang et al. (2015), Kurniawan et al. (2017) and Can Saglam et al. (2020) revealed that ensuring risk mitigation is vital for manufacturing firms to address their risk-related issues and perform sustainably. They specifically stressed that implementing proactive risk mitigation strategies lead to higher performance of Turkish manufacturing firms. Despite the importance of managing risks in SCs, little is known about how SC members within Ghana‟s manufacturing industry can effectively mitigate them and their associated impacts. To date, some researchers have highlighted proactive mitigation strategies to include SC agility, knowledge sharing and SC visibility (Afifa & Santoso, 2022; Can Saglam et al., 2021; Rahman et al., 2022); however, their effects on SCRM performance remain scanty in Ghanaian literature and that of developing economies.

To the researcher‟s best knowledge, the influence of mitigation strategies comprising SC agility, knowledge sharing and SC visibility on SCRM performance in the manufacturing context has not been empirically explored. Also, although Braunscheidel and Suresh (2009) revealed that culture is vital to improving SCRM efforts, however, its role in the link between proactive risk mitigation strategies (PRMS) and SCRM performance remain scanty. Hence,

current knowledge on this subject matter in Ghana‟s manufacturing sector remain woefully insufficient. Given the increasing global competition coupled with fluctuating supply and customer demands, examining the role of RMC would offer valuable outcomes for manufacturing enterprises. It is, therefore, against this background that the study investigates PRMS, risk management culture, SCRM performance and operational performance within the context of a developing economy.

1.3 Objectives of the study

The study investigates the moderating role of risk management culture on the link between proactive risk mitigation strategies and SCRM performance of manufacturing firms in Ghana.

1.3.1 Specific objectives

Given the study‟s main objective, the following specific objectives were developed to:

1. To examine the relationship between supply chain agility and SCRM performance of the manufacturing firms
2. To examine the relationship between knowledge sharing and SCRM performance of the manufacturing firms
3. To analyse the relationship between supply chain visibility and SCRM performance of the manufacturing firms
4. To examine the relationship between SCRM performance and operational performance of the manufacturing firms
5. To test the moderating role of risk management culture in the relationship between proactive risk mitigation strategies and SCRM performance of the manufacturing firms

1.4 Research Questions

The study is guided by the following research questions:

1. What is the relationship between supply chain agility and SCRM performance of the manufacturing firms?
2. What is the relationship between knowledge sharing and SCRM performance of the manufacturing firms?
3. What is the relationship between supply chain visibility and SCRM performance of the manufacturing firms?
4. What is the relationship between SCRM performance and operational performance of the manufacturing firms?
5. What is the moderating role of risk management culture in the relationship between proactive risk mitigation strategies and SCRM performance of the manufacturing firms?

1.5 Significance of the Study

The study investigates whether proactive risk mitigation strategies affect the SCRM performance of manufacturing firms in a developing economy like Ghana. It also includes other variables such as operational performance and risk management culture in the association. In view of this, the study‟s outcomes are expected to improve existing policies and practices associated with supply chain risk management within the manufacturing sector.

More precisely, the study‟s outcomes would provide policymakers in Ghana‟s manufacturing industry with comprehensive information to guide them in developing relevant risk management policies to help the manufacturing firms address their risk-related issues. When policymakers are exposed to the relevance of the proactive mitigation strategies, it would guide them in developing policies that aim at making their adoption easier and beneficial.

The study would also expose practitioners and owner-managers to the various proactive risk mitigation strategies and how they influence manufacturing firms‟ SCRM performance levels. The study would, therefore, help the firms‟ management to identify the most suitable strategies

to mitigate risks and invariably attain higher SCRM performance. Also, the study‟s outcomes would contribute to existing literature on SCRM and assist potential researchers in conducting similar studies within the scope of manufacturing sector in a developing economy.

1.6 Research Methodology

The study made use of a cross-sectional design, a quantitative technique, and an explanatory research design. Through the use of a standardized questionnaire, it collected reliable data from Ghanaian owner-managers of manufacturing companies. The study had a target population size of 6394 owner/managers of the manufacturing firms where a sample of 257 was drawn from it using the Adam‟s (2020) sampling determination table. The members of the firms, which were spread across Accra, Tema, and Kumasi, were then chosen using the disproportionate stratified sampling technique. The data obtained underwent screening and editing and processed through the IBM SPSS version 26 and Smart-PLS software. The processed data was then analysed via both descriptive and inferential (i.e., PLS-SEM) techniques. Precisely, the descriptive tools were used to describe the respondents while the inferential tool was used to test the hypotheses.

1.7 Scope of the Study

The research was conducted within the context of proactive risk mitigation strategies, risk management culture, SCRM performance and operational performance. With respect to the proactive mitigation strategies, attention was given to supply chain agility, supply chain visibility and knowledge sharing. Regarding study area, attention was given to manufacturing firms operating within the Tema, Accra, and Kumasi metropolises because they are three major manufacturing hubs in Ghana.

1.8 Limitations of the study

Every research has some limitations which if left undetected could affect its overall quality and outcome. In relation to the study, some of the key limitations were identified. First, the survey‟s results were restricted to the views of owner-managers of manufacturing companies in the three Ghanaian metropolises that were chosen. Therefore, any biased opinion or recommendation from a respondent could have had an impact on the effectiveness of the study's findings. This was addressed by ensuring that all the respondents participated in the exercise voluntarily. Also, the research was well explained to the respondents to ensure that only those who were ready to provide valid and accurate responses participated. Another limitation was that the researcher had no control over the participants; hence, could not interfere in their responses.

Also, the study was cross-sectional in nature; as such, primary data was obtained from the respondents at only one time. This was a limitation because, respondents who later wanted to change their responses and provide differing opinions were not allowed. Hence, the likelihood of obtaining wider opinions from the respondents to improve the study‟s outcomes was denied. It is to note that all the limitations were addressed in the study to ensure that its outcomes were valid, accurate, and generalisable. Precisely, the respondents were assured of confidentiality, anonymity, right to privacy and honesty which helped address the limitations and improve the quality of the study‟s findings.

1.9 Organisation of the Thesis

The research was carried out under five chapters. Chapter one particularly focused on the introduction and it contained the “background, problem statement, research objectives, questions, significance, scope, limitations, and organisation”. Chapter two presented the literature review and discussed elements like key concepts, theoretical review, and conceptual framework and hypotheses development. Chapter three was concerned with the research methodology comprising “research approach, design, population, sampling technique and data

analysis" while Chapter four showed how the data was analysed. Chapter five finally presented the study"s summary, implications of the results and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

The chapter presents study"s literature reviews based on the objectives. The reviews were done under three key sub-headings: Key concepts, theoretical review and conceptual framework and hypotheses development. These reviews were done to clearly describe the key concepts and obtain adequate information to support or disapprove the study"s outcomes.

2.1 Key concepts

The section presents the study"s key concepts comprising supply chain, supply chain risk, supply chain risk management (SCRM), proactive risk mitigation strategies, SCRM performance and operational performance.

2.1.1 Supply chain

Supply chain (SC) has become wide, complex, and uncertain as they continuously passthrough different cultures and countries around the world (Asamoah et al., 2019). According to Janvier-James (2012), SC varies significantly in size and complexity but their key principles are applicable to all operations. It can be defined as the process of integrating different individuals or organisations to transform input including raw materials into output notably end-products to satisfy end-users (Ghadge et al., 2020). It also depicts a network of people or organizations engaged in interdependent processes or activities that provide value to end users and are connected upstream and downstream. It describes the network of interdependent or connected firms or individuals who work together to attain mutual benefits (Doan, 2020). With SC, actors work together to manage, control, and expand the flow of resources (i.e., material, capital, and information) from upstream actors like suppliers to downstream actors like consumers (Amedofu et al., 2019).

Stevens and Johnson (2016) noted that, "SC is also a network of organizations engaged in a variety of processes and activities that generate value in the form of goods and services that are delivered to the final user or consumer via upstream and downstream links". According to LeMay (2017), SC is a system of individuals, endeavours, data, and organizations concerned with transporting an end-product or service from supplier through focal businesses (i.e., manufacturers) to end-users. From the various definitions, the study conceptualises SC as a conceptual network of activities, systems, firms, and people involved in the flow of resources (information, funds, and materials) from upstream (suppliers) to satisfy the needs of downstream actors notably end-users. Simply put, a SC contains different actors (individuals and firms) over several tiers who work independently and collaboratively to achieve a common purpose. Hence, the nature, complexity and size of SC is dependent on the core functions of

the focal firm. This suggests that focal firms have the toughest task of defining the chain to promote its quality.

2.1.2 Supply chain risk

The concept of supply chain risk (SCR) has gained dominance due to uncertainties and disruptions surrounding SCs which continue to threaten the activities of their actors (Myšková & Doupalová, 2015; Pournader et al., 2020). In our modern-day business environments, risks in SCs can never be overemphasised because they occur at anytime and anywhere. Risk is any uncertainty or problem that impedes the attainment of business objectives. Myšková and Doupalová (2015) views risk as a situation where the possibility of unfavourable deviations from expected outcomes. Within the context of SCs, risk occurs due to changing situations in the business environment that is increasing the vulnerability to risk among actors in a network (Pournader et al., 2020; Munir et al., 2020). These commercial trends include a reduction in the number of suppliers, integration of business processes, a reduction in buffers, shorter product life cycles, increment in on-time deliveries, and a rise in the usage of sub-supplier outsourcing for manufacturing tasks.

Supply chain risk has, therefore, been defined as any event that affects the three (3) main flows of the chain (material, information, funds) to deviate expected outcomes (Ho et al., 2015). Similarly, SCR is an unexpected event that could disrupt flows within a chain network or expected operations. According to Norrman and Jansson (2004), one of the most widely recognised disruptions is the case of Ericsson‟s Albuquerque accident. With the accident, a fire broke out at Phillips semiconductor plant on 18th March, 2000 which disrupted the production of Ericsson, leading to a loss of US$400 million. Another SCR was revealed by Petit et al. (2013) where Toyota‟s production was disrupted by a tsunami and nuclear crisis which led to a cut in vehicle production by 40,000. This incident led to the company incurring

$72 million in losses per day. Deductively, SCR describes the various uncertainties or unforeseen events that predominantly affect the activities and growth of actors in a network.

2.1.3 Proactive risk mitigation strategies

The concept of risk mitigation is garnering more attention due to the presence of risks in business environments (Afifa & Santoso, 2022; DuHadway et al., 2019). Given the inevitability nature of risk in business environments including SCs, it is crucial for focal firms and their actors to explore ways of either eliminating or minimising its occurrence and impact. Risk mitigation describes the strategies or methods that individuals or firms implement to prepare for or minimise the impacts of threats facing them (DuHadway et al., 2019). It also represents the processes involved in minimising individuals or firms‟ exposure to risks and their likelihood of occurrence. It focuses on consistently devising measures to address risks or concerns to fully protect one‟s business.

Chowdhury et al. (2019) stressed that risk mitigation takes the form of processes, controls or procedures that guide or regulate the activities of businesses to protect them from risks or threats. In a typically risk management process, risk mitigation represents the last step or stage where attention is given to finding solutions to addressing the risks identified and defined in the first two stages. It, therefore, focuses on the various actions that are taken to avoid, minimise or overcome risk. Hence, risk mitigation has four key dimensions comprising risk elimination (actions implemented to avoid risks), risk retention (actions taken to absorb risks), risk transfer (actions taken to transfer risks to other partners like specialists, insurance companies and other actors in a chain) and finally, risk reduction (actions taken to minimise or reduce risks) (Gunasekaran et al., 2015; Can Saglam et al., 2020).

With risk mitigation, focal firms and their SC actors address their risks or threats by avoiding, reducing, or minimising and eliminating them (Can Saglam et al., 2020). This indicates that when firms embrace risk mitigation strategies, they would be able to address their risk-related

issues to remain competitive. Risk mitigation strategies are needed for risk mitigation to be possible. These strategies provide the various methods, processes, or techniques for tackling risks including threats and disruptions that may occur during business operations (Foli et al., 2022). They have been classified into two: proactive and reactive strategies (Chang et al., 2015; Sreedevi & Saranga, 2017; Can Saglam et al., 2020). This study gives much attention to the proactive risk mitigation (PRM) strategies because firms need to adopt them to quickly detect and address risks before they occur.

PRM strategies represent the various strategies that are concerned with identifying and overcoming possible risks prior to their occurrence (Ho et al., 2015; Can Saglam et al., 2020). Ivanov (2018) stressed that SCs need to adopt the PRM strategies to strategically, and proactively deal with possible threats. Also, Gunasekaran et al. (2015) stressed that firms and their actors in a chain need to prepare toward any risk so that its likelihood or probability and severity of occurrence can be easily detected, analysed, and addressed. Previous studies have revealed several PRM strategies but in this study, much attention is given to supply chain agility, knowledge sharing and supply chain visibility.

2.1.3.1 Supply chain agility

Supply chain (SC) agility continues to receive attention in current literature due to SCs exposure to disruptions and uncertainties surrounding their business activities (Al Humdan et al., 2020). SC agility describes a firm‟s willingness or ability to minimise production throughput times, modify its delivery capacities and reduce material replacement times. It also represents the ability of actors especially focal firms to quickly, and flexibly adjust to changes in the SC (Kamalahmadi & Parast, 2016). Also, Liu et al. (2018) noted that SC agility relates with how quickly a business reacts to an externally induced event. Its key dimensions include the speed with which SC actors reduce lead times, adjust their supply and delivery capabilities, and improve overall responsiveness (Aslam et al., 2020; Al Humdan et al., 2020; Patel &

Sambasivan, 2021). In line with this, the study conceptualises SC agility as a proactive approach to ensuring that firms and their SC actors quickly identify and respond to threats or disruptions to either prevent them from occurring or minimise their severity when they occur.

2.1.3.2 Knowledge sharing

Knowledge sharing (KS) is a vital strategy for proactively mitigating risks. According to Serenko and Bontis (2016), One of the major areas of study for business management in the modern era is KS.. It focuses on the exchange of valuable knowledge or information between actors in a chain to tackle risks together (Ahmad & Karim, 2019). Kim et al. (2021) revealed that with KS, individuals or firms exchange key information to provide value to end-users without compromising mutual gains. It is also defined as the level of interaction between human actors where knowledge is considered a raw material. It focuses on sharing information, ideas, skills, experience and explicit knowledge between individuals or groups (Ali, Golgeci & Arslan, 2021; Singh et al., 2021). Chawla et al. (2021) stressed that KS describes the extent to which a group of individuals or firms transfer experiences, information, and expert insights to address a phenomenon. Concerning this study, KS focuses on the exchange of valuable knowledge between/among SC actors to meet end-users‟ requirements.

2.1.3.3 Supply Chain Visibility

For supply chains (SCs) to be able to identify and overcome any disruption, the concept of supply chain (SC) visibility has become crucial. SC visibility describes an individual or firm‟s ability to track inventory (i.e., raw materials, sub-assemblies, components, and final products) as they move from suppliers to focal firms and end-users (Yang et al, 2021; Saqib & Zhang, 2021). It also refers to a firm‟s ability to track individual raw materials, components, and end products throughout the production lifecycle (Hamadneh et al., 2021). For instance, focal firms track the raw materials they obtain from suppliers through production or conversion to delivery of end-products to end-users. Hence, with visibility, attention is given to

transparency throughout the SC by tracking items and activities from upstream to downstream. It is, therefore, a key strategy for proactively managing threats or disruptions

2.1.4 Operational performance

In manufacturing environments, measuring firm performance via operational performance (OP) has become a common phenomenon (Jenatabadi, 2015). Jenatabadi, (2015) stressed that a manufacturing firm‟s OP level drives the other performance dimensions. When a company's overall performance (OP) is measured, non-financial or non-monetary indicators are used, such as “product quality, delivery speed and value addition” (Hwang et al., 2014; Addis et al., 2017; Maestrini et al., 2017). It also describes how well a firm utilises its assets to achieve operational success, competitiveness and meet revenue targets over a period (Phorncharoen, 2020). According to Kaydos (2020), OP compares the performance of a manufacturing firm to a set of standards or metrics. Regarding the study, OP is conceptualised as the measurement of a manufacturing enterprise‟s overall performance via some subjectively prescribed non-monetary indicators including product quality, meeting environmental conditions, consistent production and delivery, timeliness and rapid movement of information and materials.

2.1.5 Supply chain risk management performance

Risks are inevitable in modern SCs due to their complexities and the uncertainties surrounding business activities (Kumar et al., 2018); hence, focal firms have been tasked to adopt various measures to effectively manage them. In line with this, Kaur et al. (2022) defined supply chain risk management (SCRM) as, “the ability of a firm to understand and manage its economic, environmental and social risks in a SC”. Munir et al. (2020) views SCRM as an art that is not only focused on responding to anticipated threats but also building a culture in a chain that responds to risk and withstand unexpected threats. With SCRM, focal firms and their partners adopt relevant strategies to manage risks along the SC. They also continuously assess their

operational objectives to reduce their vulnerability levels and consequently ensure business continuity.

2.1.6 Risk management culture

Given the nature, likelihood, and consequences of risks, focal firms and their SC actors have been pushed into developing a culture that emphasise risk management. In general terms, risk management culture (RMC) describes how a firm‟s management and employees collaborate to handle risks to either prevent them from occurring or minimise their impacts drastically (Kurniawan et al., 2017). When firms have RMC, they can constantly monitor their business activities to identify and assess possible risks or uncertainties in order to properly manage them. Risk culture, as it relates to SCs, refers to the shared values, beliefs, attitudes, and knowledge of hazards among SC partners (Institute of Risk Management, 2020). Huy et al. (2021) noted that all SC actors come together to develop a mutually beneficial culture to tackle risks. Risk culture in SCs is necessary because all the actors in the chain need to have a common purpose to address possible threats (Ali et al., 2021). It is therefore, vital for SCs to ensure that risk management is embedded in their organisational culture during RM.

2.2 Theoretical review

This section presents the theory of constraints which underpins its objectives.

2.2.1 Theory of constraints

Eliyahu Goldratt developed the theory of constraints (TOC) as a scheduling tool for basic manufacturing in 1984. (Goldratt, 1990). The theory initially served as a crucial tool for creating a constrained manufacturing schedule for bottleneck operations, but during the 1980s it developed into a significant managerial philosophy with its assumptions stretching across many management areas (Cox III et al., 2010). The TOC concentrated on how businesses can handle constraints, which were defined as everything that prevents a system from achieving higher-than-expected performance levels.

Goldratt (1990) explained that any limiting factor represents the lowest link in a system. This factor exposes a firm‟s operational activities to serious threats from different environmental forces including suppliers, consumers and competitors if left undetected or unmanaged. The philosophy provides suggestions for continuous improvement in a firm‟s manufacturing planning and control system to limit the threats of the constraints or bottlenecks. The theory was developed under the following assumptions: assess the limiting factors; make decisions on how to exploit them; invest resources into those decisions made; elevate the constraints and finally, ensure that the limiting factors are continuously detected and eliminated (Cox III & Boyd, 2020; Goldratt, 1990).

Şimşit et al. (2014) state that in order to overcome any constraint, continual system improvement through the application of suitable practices, methodologies, and general quality management are required. The theory practically offers clear and scientific processes for addressing any limiting factor until it ceases to exist. Mishra (2020) revealed that firms can only be efficient and effective when they eliminate bottlenecks in their production systems without compromising value addition to consumers. Cox III and Boyd (2020) also suggested that firms are likely to experience severe supply shortages, inventory-related issues (i.e., thefts, contamination, expiries), financial difficulties, poor demand forecasting and long lead times if they fail to manage risks. This could consequently threaten their survival and competitiveness in the face of production bottlenecks.

With respect to this research, TOC argues that manufacturing supply chains are subject to a variety of inventory-related constraints like supply delays, material ordering problems, inventory shortages, production wastes and resource scarcity, which endangers the quality of their output, the value they add to consumers' lives, the survival of the firm as a whole, and their ability to compete. In view of this, the theory posits that manufacturing firms can overcome these constraints if they embrace proactive risk mitigation strategies. If they were

properly managed, desired OP in terms of "product quality, operational effectiveness, and lower production costs" would be achieved. Hence, TOC underlines the value of adopting knowledge sharing, SC agility and SC visibility as PRMS in modern manufacturing SCs to improve SCRM performance.

2.3 Empirical Literature Review

This section evaluated previous researches that addressed this study"s objectives. The reviews were done in line with examining the effects of supply chain agility, knowledge sharing and supply chain visibility on SCRM performance. Literature related to the relationships between SCRM performance and operational performance as well as the moderating role of risk management culture in the causal link between the proactive risk mitigation strategies and SCRM performance were also reviewed in the section.

Chaudhuri et al. (2018) examined the relationships among supply chain flexibility, risk management and the flexibility of manufacturing plants in Asia. Among the various objectives, the study investigated whether external integration (EI), internal integration (II) and supply chain risk management (SCRM) impact on manufacturing flexibility MF). The study also explored the moderating role of SCRM in the association between EI, II and MF. Data was gathered from 343 manufacturing plants located in Asia between 2013-2014 as an aspect of the International Manufacturing Strategy Survey (IMSS VI). With the hierarchical regression analytical tool, the study found II and SCRM to directly and positively affect manufacturing flexibility. It was also found that SCRM significantly moderates the association between EI and manufacturing flexibility. The study concluded that EI and II are key to improving manufacturing flexibility.

Ayoub et al. (2019) investigated the correlation between supply chain agility (SCA) and export performance (EP) using supply chain innovativeness (SCI) and supply chain responsiveness

(SCR) as mediators. The study purposely examined the effects of SCA on SCI, SCR and EP by focusing on the industrial sector in Jordan. Also, the influence of SCI and SCR on EP was also investigated in this study. Additionally, whether SCI and SCR mediate the relationship between SCA and EP were established. This study collected primary data from 29- firms which represented the different types of manufacturing in Jordan. The partial least square-structural equation modelling (PLS-SEM) tool was employed to analyse the data and it was found that SCA had a positive and direct effect on EP. Also, SCI and SCR were positively influenced by SCA while SCR and SCI played full mediating roles in the relationship between SCA and EP. The study concluded that the presence of SCR and SCI can fully mediate the SCA-EP link within the context of Jordan industrial sector.

Tse et al. (2019) examined the role of control mechanisms in managing quality risk in supply chain and firm performance. This research examined the effects of proactive product recall and supplier development on firm performance. It also analysed the moderating roles of formal control and social control, as antecedents of risk management practices, in the direct relationships between the risk management practices and firm performance. Primary data was accessed from 209 manufacturing firms operating in China and both the hierarchical regression and structural equation modelling analytical tools were adopted. It was discovered that supplier development and proactive product recall had significant effects on the quality and financial performance of the manufacturing firms. Also, both social control and formal control were significant antecedents of the two RMPs‟ studied. Precisely, these two control mechanisms positively moderated the association between the RMPs and the performance of the Chinese manufacturing firms.

Ganiyu et al. (2020) examined whether supply chain risks (SCR) and supply chain risk management (SCRM) strategies can influence the performances of enterprises in Ghana. The study mainly identified potential risks in Ghanaian enterprises‟ supply chain networks and how

they impact their performance. A dataset of 210 was gathered from the enterprises and evaluated by modelling supply chain risks, SCRM and enterprise performance. The structural model outcome indicated that enterprises with special units dedicated to SCRM in order to mitigate SCR perform better than their rivals. It was also found that SCR has a negative impact on the Ghanaian enterprises‟ performance levels; concluding that the presence of the SCRM strategies can play a significant role in addressing these enterprises supply chainrelated risks.

Kumar and Anbanandam (2020) conducted their research to determine whether risk management culture affects supply chain resilience using manufacturing firms operating in India. The research aimed at establishing the impacts of the key antecedents of supply chain resilience (SCR) comprising risk management culture (RMC), supply chain visibility (SCV), supply chain agility (SCA), supply chain connectivity (SCCo) and supply chain collaboration (SCC) on SCC and consequently firm performance. After gathering adequate data from respondents, the PLS-SEM technique was employed and it was found that the development of a risk management culture can help the manufacturing firms to improve upon their supply chain resilience levels. It was also found that SCV and SCCo through the adoption of communication technologies play critical roles in improving supply chain resilience and invariably assist manufacturing firms to quickly recover or respond to supply chain disruptions.

Can Saglam et al. (2021) carried out an empirical analysis on the relationship between "proactive risk mitigation strategies (PRMS) and supply chain risk management (SCRM) performance" of manufacturing firms operating in Turkey. The study also looked at the moderating role of risk management culture in the direct relationships by relying on the survey approach. Primary data using questionnaires was collected from 500 randomly sampled manufacturing firms in Turkey. The obtained was processed using the Smart-PLS software and analysed with the PLS-SEM technique. The study revealed that supply chain responsiveness and supply chain resilience, as PRMS, are positively associated with SCRM performance.

However, supply chain flexibility had no significant effect on SCRM performance. Interestingly, the research discovered that risk management culture does not play any significant moderating role in the relationships between the PRMS and SCRM performance. They concluded that manufacturing firms that adopt PRMS like SC responsiveness and resilience are likely to attain higher SCRM performance as against those who adopt the SC flexibility dimension.

Sturm (2021) investigated how demand and supply-side risk management practices (RMPs) affect business performance. It aimed at providing better explanation on how demand and supply side RMPs impact competitive advantage in dynamic business environments. The study specifically establishes a model that links supply chain agility, supply chain flexibility, supply chain resilience and supply chain robustness with business performance of 89 multinational firms operating in Europe. Relying on the PLS-SEM tool, the study found supply chain agility and flexibility to favourably linked, whereas, supply chain robustness and resilience are also positively linked. It was further found that supply chain resilience, agility and flexibility positively influence the individual indicators of business performance.

Foli et al. (2022) examined whether innovation performance (IP) is affected by supply chain risk management (SCRM) of SMEs during turbulent times. The study also examined whether technological turbulence plays an indirect role in the causal association between SCRM and IP. The research gathered data from 207 SMEs using the structured questionnaire and obtained a response rate of 66%. The data was processed with the SmartPLS software and analysed with the structural equation modelling. It was found that technological turbulence positively affected SCRM and innovation performance of the SMEs in Turkey. It was also found that SCRM maturity affected the SMEs‟ ability to manage risks. Also, any unitincrement in SCRM ability can also lead to a unit-increment in innovation performance of the Turkish SMEs.

Çıkmak and Ungan (2022) used the mixed methods approach to establish an assessment model to identify the relevant risk mitigation strategies needed to manage supply chain risks in the automotive industry. Primary data was collected 20 supply chain professionals in 15 different automotive firms located in Turkey. Both interviews and questionnaires were used in the study to create a Bayesian network model to ascertain the risk likelihoods and associated mitigation strategies. The model‟s robustness was assessed with the scenario and sensitivity analysis. The study ranked the various supply chain risks and found operational risk at the least ranked. It was also found that flexible transport and collaboration among supply chain partners are the key risk mitigation strategies that are required to address supply chain risks in the automotive sector.

Recently, Piprani et al. (2023) focused on "unlocking sustainable supply chain performance through dynamic data analytics with supply chain resilience and sustainable innovation acting as mediators". The research particularly examined the links among innovation capabilities (IC), dynamic data analytics capability (DDAC), supply chain resilience (RES) and sustainable supply chain performance (SSCP). It also examined the mediating effects of RES and IC in the relationships between DDAC and SSCP. With this quantitative based study, survey questionnaires were used to gather large data of 259 from manufacturing firms in Pakistan. The PLS-SEM tool was adopted and it was found that DDAC has a favourable influence on both resilient and innovative capabilities which consequently lead to higher SSCP. The research also illuminates the sequential mediating roles of resilience, process and product, underlining the need to integrate resilience with a data driven innovation in a bid to attain SSCP.

2.4 Conceptual framework and hypotheses development

This section offers the study"s framework to develop the hypotheses. The framework was developed using four key variables: proactive risk management strategies ("supply chain agility, knowledge sharing and supply chain visibility") as independent variables, SCRM performance and operational performance as dependent variables, risk management culture as a moderating variable and finally, firm size, age, industry, and ownership type as control variables (see Figure 2.1).

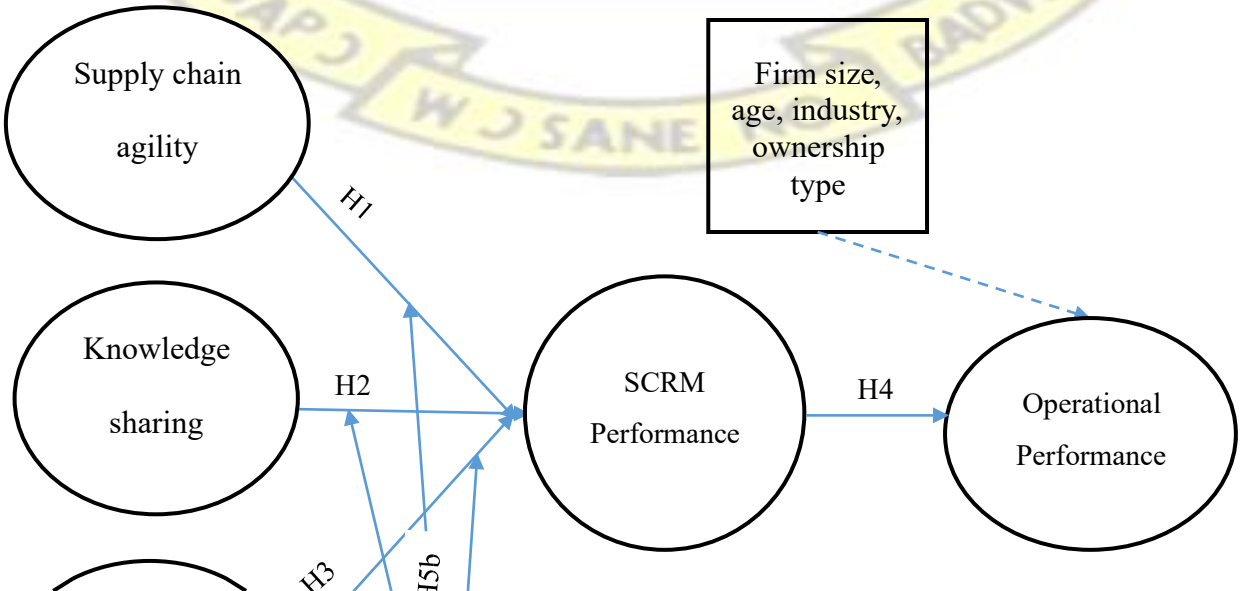

Figure 2.1 Conceptual framework of the study
Source: Author‟s own construct (2022)

From Figure 2.1, eight arrows were used to show the relationships among the variables. For instance, three arrows moved from the independent variables to SCRM performance to indicate the relationships among them in line with the hypotheses. Also, an arrow moved from SCRM performance to operational performance to show the relationship that exists between them. Also, the three arrows that moved from RMC showed that RMC moderates the association between the variables. In line with the framework, the hypotheses were established in the ensuing sections:

2.4.1 Supply chain agility and SCRM performance

In our modern-day business environments, actors in SSCs are constantly exposed to various changes and threats such as unfavourable or long delivery times, supply disruptions and demand fluctuations, among others which affect their ability to meet set targets (Zhu & Gao, 2019). Also, these changes or uncertainties continue to expose them to numerous risks in areas of operational, financial, and managerial risks, among others (Agyapong, 2021; Nyamah et al., 2022) which if left unmanaged could impede their survival and

competitiveness. As such, to quickly detect and address these changes and invariably improve firm performance, the SCA practice is gaining more attention (Fayezi et al., 2017). SCA describes a firm‟s ability to easily identify short-term, monetary, and non-monetary changes in its business environment in order to speedily react to them (Alvarado-Vargas & Kelley, 2019). In order to function better, SC actors, in particular focal enterprises, will be able to promptly respond to potential hazards and avoid or overcome them.

Also, Yusuf et al. (2014), Mandal (2016) and Chan et al. (2017) revealed that SCA is crucial to improving business performance in various ways. First, SCA can aid businesses in promptly identifying environmental changes and developing countermeasures or strategies. Chan et al.

(2017) specifically noted that SCA can help firms to detect and address changes in customers‟ demands in a speedy manner without compromising product quality and delivery. Secondly, SCA ensures that firms can produce and deliver products that directly meet customers‟ requirements in a timely manner. This situation addresses possible risks such demand uncertainties, quality issues and long delivery times; thereby, improving SCRM performance. Thirdly, SCA is a key strategy for mitigating risk in SCs via resource reconfiguration to ensure uninterrupted and speedy flow of services to customers.

According to Liu et al. (2018), firms that emphasise SCA tend to establish „win-win‟ connections with external allies which help them to quickly recover from risk-related issues and consequently attain positive performance levels. Zhu and Gao (2021) also found SCA to expand business performance of manufacturing enterprises in China; concluding that SCA improves sustainable competitive advantage because it helps firms to quickly and timely respond to threats. Mukhsin et al. (2022) recently concluded that SCA positively affect both SC and firm performance. These assertions suggests that Ghanaian manufacturing firms that focus on building agile SCs are likely to reduce risks across their chains and consequently expand their performance levels; hence, the hypothesis that:

H1: Supply chain agility has a significant positive relationship with SCRM performance

2.4.2 Knowledge sharing and SCRM performance

Knowledge sharing (KS) has become an important strategy for mitigating risks in our modern SCs (Kremer et al., 2019); but its effect on SCRM performance remains less explored. KS represents the desire of collaborators to share the knowledge they have individually created with each other in order to identify and reduce risks (Castaneda & Cuellar, 2020). As a proactive strategy for mitigating risk, KS ensures that focal firms exchange or share key information with their partners which helps them in detecting and addressing possible risk (Khan & Abonyi, 2022). Additionally, KS makes important information available to SC actors, assisting them in

creating effective risk management plans to prevent or reduce the incidence of risks and so enhancing corporate performance. Lombardi (2019) also noted that KS focuses on transferring experiences and knowledge between/among individuals or groups through proper communication channels to ensure value addition to customers.

Imamoglu et al. (2019) similarly revealed that KS has a substantial influence on firm performance. According to Kim et al. (2021), sharing knowledge promotes innovation between or among partners which assist them in minimising risks across their chains. They explained that when actors in SCs are engaged in KS, they exchange the expertise required to create or modify existing products or services to provide value to end-users. Arguably, when Ghana‟s manufacturing firms and their SC partners develop and exchange adequate knowledge, experiences, expertise, and information among themselves, they would be able to reduce risks across their chains in a timely and effective manner which would be key to expanding their performance levels. It was, therefore, hypothesised that

H2: Knowledge sharing has a significant positive relationship with SCRM performance

2.4.3 Supply chain visibility and SCRM performance

Supply chain visibility (SCV) is increasingly becoming an important strategy for ensuring risk mitigation (Nooraie & Parast, 2015; Hamadneh et al., 2021; Saqib & Zhang, 2021). This is because, with SCV, firms and their actors track all their activities from the raw material supply stage, through to manufacturing and delivery to consumers. During the tracking, any disruption or threat throughout the production stages can be easily detected and either avoided or minimised drastically. Baah et al. (2022) revealed that SCV helps firms to keep track of their products throughout the production stages in the supply and distribution chains to minimise errors and improve financial and environmental performance. Dubey et al. (2020) noted that when the activities of upstream SCs are tracked, possible supply disruptions or risks are easily detected and addressed to improve sustainable performance.

Saqib and Zhang (2021) also revealed that SCV allows SC actors to track and identify any threat or risk and adopt appropriate measures to tackle them. They asserted that the linkage between sustainable practices and sustainable performance is significantly moderated by SCV. Baah et al. (2022) added that SCV is needed if firms intend to attain higher SC performance. They explained that SCs that focus on visibility can mitigate risks proactively other than merely reacting to them. Agrawal et al. (2022) stressed that better visibility in SCs translates into less disruptions, minimise operational costs and increase customer satisfaction. Regarding the study, it can be argued that when manufacturing SCs track their operations, they are able to easily detect and fix weaknesses or threats including inventory shortfalls, supply delays, long lead times or order fulfilment challenges before they eventually become major problems. Hence, the ability of manufacturing firms and their SC actors to track material and information inflows from suppliers through to production, and to the end-users‟ doorsteps is key to addressing risk-related issues to consequently expand firm performance. It was, therefore, proposed that:

H3: Supply chain visibility has a significant positive relationship with SCRM performance

2.4.4 SCRM performance and operational performance

Operational performance focuses on the subjective evaluation of a firm‟s overall performance via non-financial indicators like product quality, operational speed, flexibility, and dependability (Qrunfleh & Tarafdar, 2013). For decades, manufacturing firms‟ ability to attain higher operational performance has largely been affected by business uncertainties and threats (Ho et al., 2015). Hence, these firms need to properly manage their risks if they are to attain or exceed their performance expectations. Munir et al. (2018) stressed that SCRM is required for manufacturing firms to minimise their risks and losses by preventing, reducing, or controlling them, leading to stronger financial performance. SCRM ensures that firms and their SC actors

overcome risks by either controlling or preventing them; a situation that produces higher performance.

According to Agyapong (2021) and Nyamah et al. (2022), risks such as procurement process risks are prevalent in our modern SC; hence, firms‟ ability to address them lead to higher operational performance. Within the study‟s context, it is argued that SCRM which involves identifying, assessing, or examining and adopting mitigation measures to avoid, reduce or minimise potential and existing threats along SCs is needed for focal firms to meet their operational performance targets. More precisely, when manufacturing SCs in Ghana are able to manage their risks effectively, they can operate flexibly and improve product quality. Thus, the researcher concludes that Ghanaian manufacturing firms OP level would improve if SCRM performance improves. Therefore, it was hypothesised that:

H4: SCRM performance has a significant positive relationship with operational performance

2.4.5 The moderating effect of risk management culture

Risk management culture (RMC) has become necessary in SCs given the need for proper risk management. RMC encompasses the attitudes, awareness, behaviours, and values toward risk and how it can be managed (Kumar & Anbanandam, 2020). It also represents the set of common behaviours and beliefs of actors in chain network in relation to risk management.

For focal firms to manage risks effectively and efficiently, they should have a risk culture that „fits‟ with that of their partners (Fan et al., 2017). This suggests that the presence of RMC plays a crucial role in developing effective proactive risk management strategies to improve SCRM performance. Managing risk in SCs can never be done in isolation because it requires a culture that best fits its strategies. For instance, when SC actors have common and positive attitudes toward risk management, they feel ready to develop proactive strategies like agility, visibility and knowledge sharing which is key to attaining stronger SCRM performance. Also, the presence of RMC ensures that top management of the various actors are actively involved in

risk decisions which lead to development of relevant proactive mitigation strategies; thereby, strengthening SCRM performance. Also, when firms dedicate their efforts into creating a SC risk-focused workforce, they become more proactive and effectively manage risks (Fellows & Liu, 2020). Although one can assert that having an RMC would significantly influence PRMS and SCRM performance, an opposing view was obtained by Can Saglam et al. (2020). The authors found RMC to have no significant moderating effect in the link between proactive risk mitigation strategies and SCRM performance. Despite this surprising outcome, Kurniawan et al. (2017) argue that when RMC among SC partners supports risk mitigation strategies, it can improve their efficiencies and consequently expand SCRM performance. The researcher assumes that the presence of higher RMC will expand the PRMS-SCRM performance link. Hence, the hypothesis:

H5: Risk management culture has a positive indirect effect in the relationship between proactive risk mitigation strategies and SCRM performance.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

The chapter extensively discussed the key methodologies adopted in this research. Research methodologies improve comparisons with past studies which allow for better understanding

of work plans and the possibility of future replications. It discussed the study‟s methodologies "research approach, design, study population, sampling technique and data analysis".

3.1 Research Approach

Previous researchers (Saunders et al., 2009; Creswell & Creswell, 2017; Creswell & Clark, 2017) have revealed two major approaches to research comprising the quantitative and qualitative approaches. When these approaches are combined research, it is termed as mixed methods. The qualitative approach is used in research where the researcher intends to develop theories based on information obtained from a small group of people (i.e., < 20). With this approach, techniques such as interviews, case studies, observations, ethnographies, and narrative analysis are used. Data obtained for such studies are more subjective in nature and it is interpreted via narrative, thematic or discourse analysis. According to Creswell and Creswell (2017), the qualitative approach does not require rigorous or comprehensive processes to draw its conclusions. This is because, the researcher relies on the participants‟ opinions, whether factual or not, to narrate the findings.

The quantitative approach, on the other hand, requires rigorous tools or techniques to come out with objective findings about an event or situation. The approach is used when the researcher is interested in investigating a phenomenon that requires objective or information obtained from large population (> 50). It is also useful for explaining or describing events to establish causal relationships. With this approach, tools such as questionnaires, SPSS software and linear regression are used and the findings are generalisable across an entire population. The approach establishes causal links among "proactive risk mitigation strategies, SCRM performance, operational performance, and risk management culture". After analysing the data, the findings can be generalised across the entire manufacturing firms in Ghana.

Therefore, given the study‟s objectives, the quantitative approach was considered the most appropriate.

3.2 Research design

Research design offers the plan or structure for investigating an event (Creswell & Creswell, 2017). It provides the direction and techniques for gathering information, processing, and analysing them to obtain reliable outcomes. Current studies have revealed several research designs in social science research and popular among them include survey, explanatory, case study, experimental, ethnography, archival and cross sectional, and descriptive designs.

Creswell and Clark (2017) revealed that one‟s selection of research design is dependent on research approach and the nature of research. Given this study‟s nature and approach, the cross-sectional design and explanatory design were adopted. With this design, the researcher gathers data from respondents once or at only one given point in time (Beins & McCarthy, 2016).

Also, the study used an explanatory research approach because it provides for better, more objective conclusions that make it easier to generalize results across a group. The design allows the use of questionnaires to gather primary data from a large group of people and analyse the data via rigorous analytical tools like regression, t-tests and correlation (Hox et al., 2017). The design is also suitable when the researcher intends to explain or predict how a variable affects the other. In this case, the explanatory design provides the tools, processes, and techniques for investigating how proactive risk mitigation strategies explain or predict any change in SCRM performance. Hence, the design was the most appropriate for the study.

3.3 Population of the study

Population is characterized by the entire group of people who are involved in the study; hence, its outcomes may directly or indirectly affect them (Singh, 2006). However, the target population describes the actual proportion of the population who possess the information required to investigate. In view of this, the target population consisted of manufacturing firms currently operating within the Tema, Accra, and Kumasi. These three metropolitan areas were adopted because they combine to contain over 80% of all the manufacturing firms in Ghana.;

hence, obtaining data from manufacturing firms in these areas would promote generalisation of findings. Precisely, the target population consisted of owner-managers of 6394 manufacturing firms based on GSS report in 2017 (see Table 3.1).

Table 3.1: Target Population

METROPOLIS	POPULATION	PROPORTION (%)
Accra	3198	50.0
Kumasi	1065	16.7
Tema	2131	33.3
Total	6394	100.0

Source: Ghana Statistical Service (2017)

3.4 Sample Size and Sampling technique

Given the study‟s large population size, a reasonable sample was chosen from the population. Sampling is the process involved in choosing an adequate number of people or units to represent an entire population. In relation to the study, Adam‟s (2020) sampling table was employed to select a minimum sample from the target population. From the table, a minimum sample size of 257 manufacturing firms were chosen from the target population of 6394 based on the following assumptions: continuous data (margin of error=0.03), 95% confidence level, t=1.96 and p=4.

The actual members of each stratum were then chosen using the disproportionate stratified sampling procedure. Each candidate is given an equal probability of being chosen by this probabilistic method. More precisely, the technique allowed the researcher to select adequate number of manufacturing firms from each of the three metropolises understudy. Based on this technique and a minimum sample size of 257, Table 3.2 presented the summary of sample.

Table 3.2: Summary of sample

METROPOLIS	POPULATION	SAMPLE SIZE

Accra	3198	128
Kumasi	1065	43
Tema	2131	86
Total	6394	257

Source: Field data (2022)

3.5 Measurement Instrument

This section describes the measurement instrument used in the study. The instrument was prepared after extensively reviewing existing literature in line with the study‟s key concepts. Based on the study‟s objectives, the interval scale was used where "1 represented weak agreement while 7 represented strong agreement". The scale was chosen because it allowed the items to be measured on a continuous scale; hence, analysis can be done via adoption of rigorous analytical tools notably linear regression. Precisely, the scale provides the analytical tool for establishing causal relationships among variables, as is the case in this study.

The instrument was drafted under six parts where Part A contained items to obtain information on the respondents‟ socio-demographic characteristics. Part B contained items 15 items on the three proactive risk mitigation strategies; Part C had five items on risk management culture while Part D contained five items on operational performance. Also, Part E contained five items on SCRM performance while Part F had four items which measured the control variables. Table 3.3 provides the constructs, measurement items and sources.

Table 3.3 Measurement constructs

CONSTRUCT	MEASUREMENT INDICATORS	SOURCE
Supply chain agility (SCA)	Speed in reducing lead-time, cycle time, adjusting delivery capability, improving responsiveness, delivery capability	Chan et al. (2017)
Knowledge sharing (KS)	Experience, sharing lessons, source of knowledge, expertise	Wang et al. (2016)

Supply chain visibility (SCV)	Visible information, demand levels, inventory levels, order processing, production schedule	Dubey et al. (2017)
Risk management culture (RMC)	Top management involvement, firm dedication, level of belief, supply chain participation, partners‟ cooperation	Can Saglam et al. (2020)
Operational performance (OP)	Reliability, number of faultless deliveries, operational costs, speed, dependability	Abdel-Maksoud et al. (2008)
SCRM performance (SCRMP)	Frequency of risk occurrence, effectiveness of SRM, resource input, risk management, firm capability	Can Saglam et al. (2020)
Control variables	Firm size, firm age, firm industry, firm ownership	Zadeh and Eskandari (2012)

Source: Author‟s own study (2022)

3.6 Data Collection Method

Given the study‟s nature, primary data was obtained because the analysis required first-had information from the respondents. Primary data for research can be obtained from several sources including questionnaire, observation, interview, and focus-group discussion. In relation to the study, the questionnaire was the most appropriate instrument for gathering fresh or first-hand data from respondents. The entire research including the questionnaire was developed using information obtained from secondary sources such as peer reviewed journals, conference proceedings, reports and published books.

3.7 Validity and Reliability

The validity and reliability of research instrument reflect how well it measures the parameters it was designed to measure (Sürücü & Maslakçi, 2020). Validity, according to Bolarinwa (2015), specifically refers to how well an instrument measures its objectives.

Validity was carried out in the study to modify and validate the content of the instrument. With validity, peer and expert reviews were used after drafting instrument (i.e., questionnaire). Precisely, the drafted questionnaire was given to two research-inclined peers to review it and

after the effecting the necessary corrections, it was given to two practitioners in the manufacturing industry for further validation. This was done to ensure that each question item directly related to the study area. Also, the instrument was given to the researcher‟s supervisor (i.e., expert) for further review and approval. After obtaining approval from the supervisor, the instrument was considered valid.

Also, the study instrument underwent a reliability test to confirm its reliability. A measurement instrument's level of consistency when used repeatedly in various settings and at various times is especially tested for reliability (Beins & McCarthy, 2016). Regarding the study, Cronbach‟s alpha (α) was used to determine the internal consistency of the questionnaire‟s items. Previous studies have shown that the closer the α is to 1, the more reliable the instrument is (Bolarinwa, 2015); hence, a α threshold of 0.7 or greater is often seen as acceptable.

To test for reliability in the study, a pre-testing was first carried out. Pretesting a questionnaire can help find unclear and biased question items while doing situational analysis. Pretesting was carried out utilising 30 responses acquired from owners/managers of manufacturing firms in Sekondi-Takoradi. The SPSS software was then used to process the data and analysed using the “reliability analysis” technique in the software. After that, the α scores were recorded and compared to the proposed threshold. Table 3.4 revealed the α of each construct.

Table 3.4: Constructs reliability results

CONSTRUCT	SUB-CONSTRUCT	NO. OF ITEMS	RELIABILITY SCORE
Proactive risk mitigation strategies	Supply chain agility	5	0.881
	Knowledge sharing	5	0.893
	Supply chain visibility	5	0.859
Risk management culture		5	0.911
SCRM performance		5	0.866
Operational performance		5	0.925

Control variables		4	0.855

Source: Field data (2022)

3.8 Ethical Considerations

Ethics continue to remain a major challenge in social science research. To promote acceptance of the study‟s findings, the ensuing principles were adhered to: “informed consent, voluntary participation, right to privacy, plagiarism, anonymity, and confidentiality”. Respondents were made aware of their involvement in the data gathering method as far as informed consent was concerned. In practice, the study obtained approval letter from KNUST School of Business and given to the researcher‟s field workers. The letter improved the respondent‟s confidence levels in the exercise which also encouraged them to provide valid and accurate information.

In terms of voluntary participation, nobody who responded to the study was forced or pressured into doing so against their will. Also, the respondents‟ right to privacy was ensured by giving them the option to participate and within their convenient time. To avoid plagiarism, all relevant information was paraphrased and properly cited from relevant sources. The study was then subjected to a plagiarism check to check whether any evidence of plagiarism was present. To ensure anonymity, “all personally identifying information such as names and other sensitive personal data that could identify the respondents was eliminated. These measures were put in place to keep the identities of the responders hidden from third parties. Respondents were further assured of confidentiality by assuring them that all information provided would be kept private, well protected, and used only for academic purposes”.

3.9 Data analysis

Data analysis describes a researcher‟s ability to break down data and clarify its nature and the correlations among them (Saunders et al., 2009). Prior to data analysis, the primary data obtained after distributing the questionnaires were edited or cleaned and coded. Since data cleaning was done to make sure it was correct and suitable for further analysis, there were no

missing values in the data. The data was then processed using SmartPLS4.0 and the SPSS program (v.26).

Following data processing, descriptive and inferential tools were used to analyse the data. The descriptive tool, which included frequencies and percentages, was used to describe the sociodemographic characteristics of the respondents. Concerning the study‟s hypotheses, the partial least square-structural equation modelling (PLS-SEM) analytical technique was used. This analytical technique was used because it provides rigorous analysis to produce more valid and generalisable outcomes (Hair et al., 2017). It can also manage complicated models where the main focus is on determining the causal connections between various variables. PLS-SEM minimises the residual variances of endogenous variables and does not also require hard assumptions. It places minimal attention to sample size and data normality (Hair et al., 2021). To use this technique, scholars such as Hair et al. (2017, 2021), and Memon et al. (2021) have proposed the following assessments: measurement (reliability, validity, and multicollinearity) and structural (coefficient of determination, predictive relevance, predictive accuracy). They suggested that the PLS-SEM can then be used to test the hypotheses if all the assessments are met because they are used to check the quality and accuracy of the model. After meeting the quality criteria, the hypotheses are tested using 5000 bootstraps and the results are presented in figures and tables. The results are then discussed extensively and linked to literature.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

4.1 Introduction

The study investigates proactive RMS, SCRM performance and risk management culture. This chapter presents the results and discussion in line with five research objectives. Prior to presenting and discussing the results, the chapter first presented the respondents‟ sociodemographic characteristics and the profile of the manufacturing firms.

4.2 Profile of Participants and Manufacturing firms

This section provides a brief information about the study participants socio-demographic details. It focused on only participants who provided valid information for the study. It also presented the profile of the manufacturing firms. The study distributed 257 questionnaires to the sampled participants in the target population of 6,394 manufacturing firms operating in Accra, Kumasi and Tema. Out of the questionnaires distributed, 218 of them were deemed valid

after retrieving 229 completed questionnaires during the data collection exercise. The study had a valid response rate of 84.8% which was deemed appropriate for analysis.

4.2.1 Respondents Socio-Demographic Characteristics

This section described the participants‟ socio-demographic features in relation to sex, age, and their highest educational qualification. In view of this, the section described the sociodemographic characteristics of the 218 participants (see Table 4.1).

Table 4.1: Socio-demographic Characteristics of Participants

ITEM	FREQUENCY	PERCENT (%)
SEX		
Male	165	75.7
Female	53	24.3
Total	218	100.0
Male	165	75.7
AGE GROUP		
18-29	15	6.9
30-39	38	17.4
40-50	106	48.6
over 50	59	27.1
Total	218	100.0
HIGHEST EDUCATIONAL QUALIFICATION		
No formal education	19	8.7
HND or Lower	74	33.9
degree (first, second, etc)	125	57.3
Total	218	100.0

Source: Field data (2023)

From Table 4.1, majority (75.7%) of the participants were males and 24.3% of them were females. This indicates that males made up the majority of the owner-managers of the manufacturing companies that took part in the data collection effort. Regarding the participants‟ age groups, 48.6% of them were between the ages of 40 and 50 years; 27.1% of them were over 50 years; 17.4% of them were between 30 and 39 years while 6.9% of them were between 18 and 29 years. The result shows that all the participants are above 18 years and possess the legal age to respond to issues related to the study. The study focused on participants above 18 years because they are generally considered matured and also prevent any issue related to law suits. Finally, concerning the participants‟ highest level of education, majority (57.3%) of them were degree holders (first, second, terminal), 33.9% of them and Higher National Diploma (HND) certificates or lower (WASSCE and BECE certificates) and finally, 8.7% of them had no formal education. Deductively, majority of the participants have undergone formal education.

4.2.2 Profile of the Manufacturing Firms

The manufacturing companies operating in Accra, Tema, and Kumasi metropolises were profiled in this section. It specifically described the firms‟ business characteristics in terms of firm size, ownership type, firm age and nature of activity or industry type. Table 4.2 presented these firms‟ business profile.

Table 4.2: Profile of the Manufacturing Firms

ITEM	FREQUENCY	PERCENT (%)
FIRM SIZE		
Small	82	37.6
Medium	102	46.8
Large	34	15.6
Total	218	100.0
FIRM OWNERSHIP TYPE		

Private	193	88.5
Public	25	11.5
FIRM AGE:		
<5	22	10.1
5-10	46	21.1
11-15	53	24.3
16-20	67	30.7
Over 20	30	13.8
FIRM INDUSTRY TYPE		
Food and Beverage	75	34.4
Wood and Paper Processing	34	15.6
Aluminum and Metal smelting	22	10.1
Electronic and Electrical	18	8.3
Pharmaceutical and Chemical	12	5.5
Rubber and Plastic	27	12.4
Textile and Apparel	18	8.3
Machinery and Equipment	12	5.5
Total	218	100.0

Source: Field data (2023)

From Table 4.2., 46.8% of the participants‟ manufacturing firms were medium-sized. This was followed by 37.6% of them which were small-sized and finally, 15.6% of them were large-sized. This demonstrates that the majority of manufacturing companies operating in Tema, Accra, and Kumasi are medium-sized, with between 30 and 99 employees, followed by those with less than 30 employees. Regarding the ownership type of the manufacturing firms, Table 4.2 revealed that 88.5% of them are privately-owned; thus, every investment or risk is borne by private owners and managers. On the other hand, 11.5% of these firms are owned by the public or government; hence, funds obtained from the public are used to fund their activities or operations.

Also, Table 4.2. revealed that ages of the manufacturing firms and indicated that 30.7% of them are 16 to 20 years old, 24.3% of them have been operating for 11 to 15 years, 21.1% of them have been operating for 5 to 10 years, 13.8% are over 20 years old while 10.1% of them have been in operation for less than 5 years. Finally, the section presented the nature of the manufacturing firms; revealing that 34.4% of them manufacture food and beverage products, 15.6% of them are into wood and paper processing, 12.4% of them convert rubber and plastic materials into outputs while 10.1% of them are into aluminium and metal smelting. Also, Table 4.2 revealed that 8.3% and 8.3% of the manufacturing firms are into electrical and electronic and textile and apparel respectively. It was also revealed that 5.5% and 5.5% of the manufacturing firms are into pharmaceutical and chemical processing as well as machinery and equipment manufacturing.

4.3 Presentation of Results

After analysing the data gathered using the PLS-SEM analytical tool, the study's findings are presented in this part. Prior to presenting the results, the PLS-SEM tool underwent both measurement and structural assessments. The assessments were done to ensure that the study‟s model is quality; hence, it can produce objective outcomes. The results were presented after the reflective model was first specified or developed and it has undergone the necessary assessments.

4.3.1 Specification of Path Model

The first step in any PLS-SEM-based analysis is the development or specification of a path model (Hair et al., 2017). The path model is first specified to show all the constructs and their assigned items or indicators. This is done to allow both measurement and structural model assessments (Hair et al., 2021). The model was specifically developed with seven latent constructs where three of them were the exogenous constructs comprising three proactive risk mitigation strategies (supply chain agility [SCA], knowledge sharing [KS] and supply chain

visibility [SCV]). The model had two endogenous constructs comprising SCRM performance (SCRMP) and operational performance (OP), one moderating variable (risk management culture [RMC]) and one combined control variable. Figure 4.1 presented the specified model. From Figure 4.1, the SCA consisted of SCA1-SCA5, KS comprised KS1-KS5, SCV also consisted of SCV1-SCV5, SCRMP had SCRMP1- SCRMP5, OP (OP1-OP5), RMC also contained RMC1-RMC5 and the control variables included firm size, firm age, firm ownership and industry type.

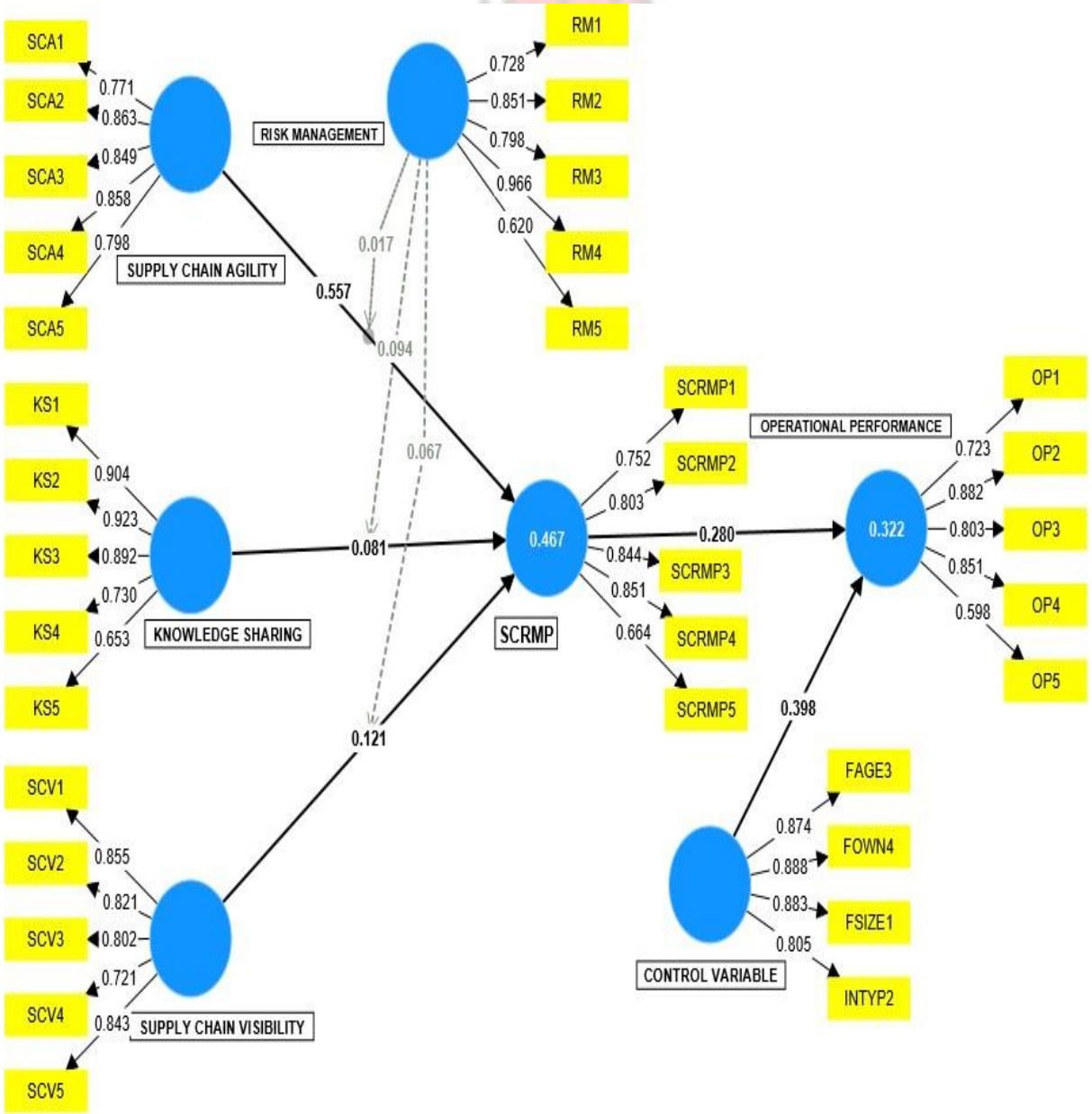

Figure 4.1. Initial Model Specification
Source: Field data (2023)

From Figure 4.1, five thick lines were drawn to show the direct hypothesised correlations among the variables which also included the control variable. Three doted lines were also drawn to show the moderating effect of the RMC in the relationship between the proactive risk mitigation strategies and SCRM performance. After specifying the initial model, the next section presented the measurement model and its assessment criteria.

4.3.2 Assessment of Measurement Model

This section assessed the measurement model in terms of reliability (indicator and construct) and validity (convergent and discriminant). The measurement model was first measured to check the reliability and validity of the specified path model. This activity was based on the four step processes developed by Hair et al. (2014, 2021). Step 1 for instance, assessed the model‟s indicator reliability; Step 2 assessed the model‟s internal consistency reliability; Step 3 assessed the model‟s convergent or construct validity and Step 4 examined the model‟s discriminant validity. The indicator reliability was first evaluated to determine the extent to which a particular item or indicator truly reflects the construct it intends to measure. This shows whether a measurement item actually measures its assigned construct (Hair et al., 2021). Indicator reliability is assessed using the item loadings with the rule that an item‟s loading should be > 0.70 because to show that it explains over 50% of a construct in a given path model (Hair et al., 2017).

Hair et al. (2017) and Hair and Alamer (2022) noted that items with loadings between 0.40 and 70 must be removed only when their removal would improve the model‟s internal consistency reliability and convergent validity while those below 0.40 should be removed automatically from the model because they are considered inferior or poor measures of their assigned constructs. However, Hair and Alamer (2022) and Ringle et al. (2023) proposed that items

above the 0.70 threshold can still be removed if their removal would improve the path model‟s overall significance levels. Based on the rulings, the initial model in Figure 4.1 was assessed and the final model was presented in Figure 4.2.

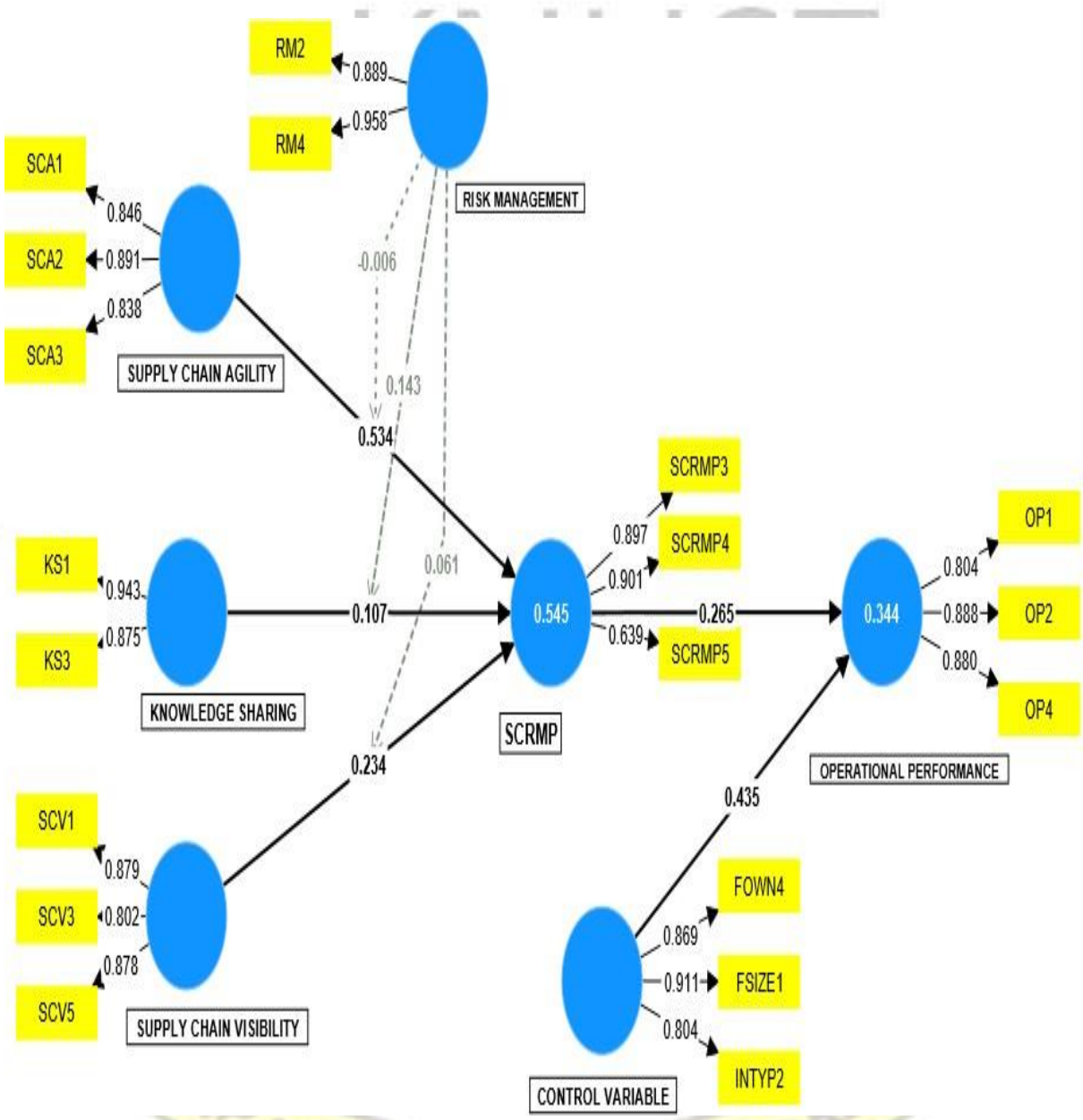

Figure 4.2: Final Model Structure
Source: Field data (2023)

Based on the rulings, none of the items was below the threshold of 0.40; however, other items above this threshold were all removed because their removal improved the “model‟s internal

consistency reliability, convergent validity and the paths‟ significance levels”. Precisely, items or indicators such as SCA4 (0.858), SCA5 (0.798), RM1 (0.728), RM3 (0.798), RM5 (0.620), KS2 (0.923), KS4 (0.730), KS5 (0.653), SCV2 (0.821), SC4 (0.721), SCRMP1 (0.752), SCRMP2 (0.803), OP3 (0.803), OP5 (0.598) and FAGE3 (0.874). It could be seen that most of the items exceeded the 0.70 threshold but they were still removed because their removal improved the study‟s path significance levels. Hence, Figure 4.2 presented only the indicators which truly measured their assigned constructs as well as were within the model‟s significance thresholds. Therefore, the other assessments were based on this model.

4.3.2.1 Assessment of Construct Reliability and Validity

After assessing the model‟s indicator reliability, the path model underwent construct reliability (CR) testing using the internal consistency reliability (rho_A) scores and construct validity using the average variance extracted [AVE]) (see Table 4.3). Table 4.4 also presented the model‟s discriminant validity by reporting the HTMT ratio.

Table 4.3: Assessment of Construct Reliability and Construct Validity

ITEMS	**CRONBACH ALPHA (CA)**	**RHO_A**	**CV (AVE)**
Control Variables	0.842	0.989	0.743
Knowledge Sharing (KS)	0.798	0.878	0.827
Operational Performance (OP)	0.820	0.825	0.737
Risk Management Culture (RMC)	0.838	0.974	0.854
Supply Chain Visibility (SCV)	0.815	0.835	0.729
SCRM Performance (SCRMP)	0.759	0.841	0.674
Supply Chain Agility (SCA)	0.824	0.844	0.737

Construct reliability (CR) – rho_A; Construct validity (CV) - AVE scores Source: Field data (2023)

Table 4.3 first presented the model‟s construct reliability by reporting the rho_A scores instead of the Cronbach Alpha values because of its superiority in providing better reliability outcomes. Construct reliability, also known as internal consistency reliability describes how well indicators combine to truly or adequately measure their latent constructs (Hair et al., 2017; Wong, 2019). The rule suggests that rho_a values should be ≥ 0.70 and from the table, all the constructs met the required threshold. This is because, the items ranged between 0825 (OP) and 0.989 (control variables); suggesting that the measurement model is quality and its outcome can be relied upon.

Also, the model‟s convergent or construct validity, which reflects how well an indicator or item measures the construct it is supposed to measure, was evaluated using the AVEs (Hair et al., 2021). It demonstrates whether the items are consistent with the instrument‟s claims. The AVE for each construct serves as a criterion for determining construct validity with the rule that an AVE should be ≥ 0.50 (Hair et al., 2021). From Table 4.3, all the constructs‟ AVEs met the threshold because they fell between 0.674 (SCRMP) and 0.854 (RMC). These results show that the model‟s convergent validity was satisfied.

4.3.2.2 Discriminant Validity

The measurement model finally underwent discriminant validity (DV) assessment to check whether the instrument can effectively be distinguished from different theoretical constructs (Hair & Alamer, 2022). It ensures that the instrument can truly measure a particular construct without significant overlap with other related constructs (Wong, 2019). DV is assessed using either the “Fornell and Larcker criterion (FL), cross loadings or Heterotrait-Monotrait (HTMT) ratio) in a PLS-SEM model”. Memon et al. (2021) asserted that the FL and cross loadings are ineffective, particularly when the indicator loadings of a construct are just marginally different. Sarstedt et al. (2020) revealed that the FL criterion fails to reliably detect DV problems. Given

these constraints, the authors proposed the use of the HTMT ratio; justifying its adoption in the study. Table 4.4 presented the model‟s HTMT ratio.

Table 4.4: Heterotrait-Monotrait (HTMT) Ratio

PATH RELATIONSHIPS	**(HTMT)**
Knowledge Sharing <-> Control Variables	0.069
Operational Perf <-> Control Variables	0.577
Operational Perf <-> Knowledge Sharing	0.168
Risk Magt Culture <-> Control Variables	0.169
Risk Magt Culture <-> Knowledge Sharing	0.230
Risk Magt Culture <-> Operational Perf	0.207
SC Visibility <-> Control Variables	0.808
SC Visibility <-> Knowledge Sharing	0.077
SC Visibility <-> Operational Perf	0.671
SC Visibility <-> Risk Magt Culture	0.108
SCRM Performance <-> Control Variables	0.448
SCRM Performance <-> Knowledge Sharing	0.257
SCRM Performance <-> Operational Perf	0.504
SCRM Performance <-> Risk Magt Culture	0.111
SCRM Performance <-> SC Visibility	0.640
Supply Chain Agility <-> Control Variables	0.497
Supply Chain Agility <-> Knowledge Sharing	0.142
Supply Chain Agility <-> Operational Perf	0.433
Supply Chain Agility <-> Risk Magt Culture	0.121
Supply Chain Agility <-> SC Visibility	0.626
Supply Chain Agility <-> SCRM Performance	0.807

Source: Field data (2023)

From Table 4.4, all the constructs‟ HTMT values were below the 0.90 threshold with the lowest value of 0.069 in the link between Knowledge Sharing and Control Variables while the highest value of 0.808 in the correlation between SC Visibility and Control Variables. The outcome

indicates that the constructs are actually distinct from one another, and as a result, the links between the interactions are truly discriminant.

4.3.3 Assessment of Structural Model

This section assessed the structural model to explore the association or interactions among the constructs (Hair et al., 2017). It is assessed to understand the complex correlations between the latent constructs by reporting the "coefficient of determination (R^2), effect size (f^2)" and possible multicollinearity using the variance inflation factor (VIFs). Finally, the path coefficients‟ significance levels were also examined for each hypothesis. Table 4.5 first presented the model‟s R^2 and adjusted R^2 values.

Table 4.5: Coefficient of Determination (R^2)

	R-SQUARE	R-SQUARE ADJUSTED
Operational Perf	0.344	0.338
SCRM Performance	0.545	0.529

Note: Coefficient of determination (R^2) exogenous constructs: SCA, SCV, KS and RMC Source: Field data (2023)

Table 4.5 first reported the model‟s R^2 value to show the contribution of the combined exogenous constructs comprising SCA, SCV, KS and RMC to the endogenous constructs (i.e., SCRMP and OP) (Hair et al., 2021). Ringle et al. (2023) suggested that R^2 values < 0.25, 0.50 and > 0.75 signify weak, moderate and substantial contributions respectively. From Table 4.4, operational performance (OP) had an R^2 of 0.344 to indicate that SCRM performance and the control variables combine to linearly account for 34.4% of any variation in operational performance. This means that, these variables combine to moderately contribute to any change in operational performance. For any adjustments in the exogenous constructs, they combine to cause about 33.8% of change in the manufacturing firms‟ operational

performance. Hence, whenever these constructs are adjusted, they combine to represent over 30% of change in OP.

Also, the R^2 value of 0.545 show that the proactive risk mitigation strategies and risk management culture combine to linearly account for over 50% of any variation in the SCRM performance of the manufacturing firms. This result shows that for any variation in SCRM performance, the strategies and risk management culture combine to contribute 54.5% of it. On the other hand, when the exogenous constructs are adjusted, they combine to linearly account for 52.9% of variation of SCRM performance. This shows that these proactive risk mitigation strategies and risk management culture combine to play critical roles in causing any change the manufacturing firms‟ SCRM performance.

Moreover, the model‟s effect size (f^2) was assessed using the Fritz et al. (2012) impact criterion which suggest that f^2 values of 0.02 indicates “small”, 0.15 “medium” and 0.35 “large” respectively. The model‟s multicollinearity was also assessed by reporting the model‟s VIF scores. Table 4.6 presented the model‟s f^2 and VIF results.

Table 4.6: Effect Size and Variance Inflation Factor

PATH RELATIONSHIP	**F-SQUARE (F^2)**	**VIF**
Control Variables -> OP	0.250	1.155
KS -> SCRMP	0.021	1.223
RMC -> SCRMP	0.001	1.063
SCV -> SCRMP	0.081	1.492
SCRMP -> OP	0.092	1.155
SCA -> SCRMP	0.434	1.438
RMC X SCA-> SCRMP	0.000	1.222
RMC X KS -> SCRMP	0.050	1.201

RMC X SCV -> SCRMP	0.006	1.275

Source: Field data (2023)

From Table 4.6, RMC revealed that it has no effect on the relationship between KS and SCRMP, followed by RMC and SCRMP with the second lowest or smallest f^2 of 0.001. On the other hand, SCA and SCRMP had a large f^2 of 0.434, followed by the control variables and OP (0.250) and SCRMP and OP (0.092). The result shows that SCA has a large effect on SCRMP while SCV (0.081) had a small effect with KS (0.021) yielding the smallest effect on SCRMP. Also, the structural model was assessed for possible multicollinearity using the VIFs to ensure that the path coefficients are free from bias (Memon et al., 2021). The presence of multicollinearity indicates that two or more exogenous constructs are strongly correlated with each other; hence, is a major concern (Hair et al., 2017). Its presence can complicate the interpretation of the model‟s outcomes because distinguishing the unique effect of each construct when they are highly correlated can be challenging and lead to ambiguities when discussing the relationships. The rule suggests that the VIF should be < 5 (Hair et al., 2017) and the result in Table 4.5 shows absence of multicollinearity. This is because, the VIFs ranged between 1.063 in the link between RMC and SCRMP and 1.492 in the link between SCV and SCRMP; implying that none of the relationships is correlated.

4.3.4 Significance of Path Coefficients

This section presented the significance of the path coefficients as the final step under the structural model. Hair et al. (2017) suggested that this assessment is done only after the model has passed the required assessment criteria; hence, it is considered “quality”. This section specifically shows whether the hypothesised relationships are statistically significant or not. It also reports the strength and direction of each relationship after testing the hypotheses using 5000 bootstraps as proposed by Hair et al. (2017). The rule suggests that a relationship is

significant if the t-stat is ≥ 1.960 (p-value ≤ 0.050) (Wong, 2019). Table 4.6 shows the results in five columns: structural paths, path coefficients (β), t-stats, p-values and decision rule.

Table 4.7. Significance of the Path Coefficients and Decision Rule

STRUCTURAL PATH	**(B)**	**ST.DEV**	**T-STATS**	**P-VALUE**	**DECISION RULE**
DIRECT EFFECT					
SCA -> SCRMP	0.534	0.098	5.439	0.000	H1 (supported)
KS -> SCRMP	0.107	0.053	2.031	0.042	H2 (supported)
SCV -> SCRMP	0.234	0.095	2.464	0.014	H3 (supported)
Control Variables -> OP	0.435	0.061	7.185	0.000	
SCRMP -> OP	0.265	0.082	3.228	0.001	H4 (supported)
MODERATING EFFECT					
RMC X SCA -> SCRMP	-0.006	0.086	0.074	0.941	H5a (not supported)
RMC X KS -> SCRMP	0.143	0.070	2.056	0.040	H5b (supported)
RMC X SCV -> SCRMP	0.061	0.081	0.754	0.451	H5c (not supported)

Source: Field data (2023)

From Table 4.7, the study controlled for four items comprising firm age, firm size, industry type and ownership type in the model. These factors were controlled because their presence could have affected the overall quality of the model‟s outcomes. Concerning the control variables, Table 4.7 revealed a t-stat of 7.185 to show that it they significantly and positively affect the model. This result means that when the variables are not controlled for, they could have impacted the study‟s overall outcomes. This shows that controlling for these variables in the model was necessary because they actually affected the study‟s outcome. It is note that, the outcome of the control variable was not extensively discussed because they do not form part of the study‟s hypotheses.

Focusing the study‟s objectives, seven hypotheses were developed out of five research objectives. Out of the hypotheses, four of them focused on testing direct relationships in line with the first four research objectives. Research objective five had three hypotheses which were also tested and the results were presented in this section. From Table 4.7, all the direct hypothesised relationships (H1, H2, H3 and H4) were "supported". This is because, SCA and SCRMP (H1) had a t-stat of 5.439 (p=0.000), KS and SCRMP (H2) also had a t-stat of 2.031 (p=0.042), SCV and SCRMP (H3) had a t-stat of 2.464 (p=0.014) and SCRMP and OP (H4) had a t-stat of 3.228 (p=0.001). Also, the β-values were SCA (0.534), KS (0.107), SCV (0.435) on SCRMP. In terms of H4, SCRMP affected OP by 0.265.

Concerning the indirect or moderating role, the study developed three hypotheses to test the moderating effect of RMC in the relationship between (a) SCA and SCRMP (b) KS and SCRMP and (c) SCV and SCRMP. The results showed that RMC significantly and positively moderates the relationship between KS and SCRMP with a t-stat of 2.056 and a β-value of 0.143. On the other hand, RMC does not significantly moderate the relationships between (a) SCA and SCRMP (t-stat=0.074 and β=-0.006) and (c) SCV and SCRMP (t-stat=0.074 and β=-0.006). The result showed that H5a and H5c were not statistically supported.

4.4 Discussion of Results

This section discussed the results that were analysed and reported in the previous section. Under this section, the significance level of each path relationship, both direct and indirect, were discussed including its implications. Each result was linked to previous literature and the theory underpinning the study. It is to note that, the section was discussed under five major sub-sections in line with the research objectives.

4.4.1 Research objective 1: Relationship between supply chain agility and SCRM performance of the manufacturing firms

Concerning objective one, the study hypothesised (H1) that supply chain agility has a significant positive relationship with the Ghanaian manufacturing firms‟ SCRM performance. The H1 was “supported” to show that supply chain agility statistically ha a significant positive relationship with SCRM performance. Given the B-value of 0.534, the result implies that when manufacturing firms have agile supply chains, they would be able to improve their SCRM performance levels by over 50%. Given the B-value, supply chain agility was ranked “1st” to show that it has a stronger influence on SCRM performance as compared to knowledge sharing and supply chain visibility. The practical implication is that when Ghanaian manufacturing firms have agile supply chains, it would enable them to quickly adapt and respond to unexpected risks and disruptions which could consequently lead to improvement in their supply chain risk management (SCRM) performance.

Also, the result implies that supply chain agility helps manufacturing firms to reconfigure their supply chain operation and processes, adjust production schedules and change underperforming suppliers more quickly which could minimise the negative impact of supply disruptions and consequently enhance SCRM performance. Similarly, the result implies that supply chain agility provides manufacturing firms with the flexibility required to implement different risk mitigation strategies. Agile firms can easily diversify their supplies, maintain safety stock and develop strong contingency plans in order to expand SCRM performance. Agile supply chains have stronger transparency and visibility throughout their supply networks which allow them to easily detect risks and disruptions more effectively, thereby, enabling manufacturing firms to strengthen their proactive risk mitigation strategies and consequently attain a healthy SCRM performance. With this proactive risk mitigation strategy, Ghanaian

manufacturing firms can quickly recover from disruptions by embracing a risk culture to promote an efficient risk management; thereby, strengthening SCRM performance.

The study result is theoretically supported by the theory of constraints which posit that organisations including manufacturing firms are constantly exposed to various risks or constraints which disrupt and eventually weaken their entire systems. The theory assumes that manufacturing firms need to implement proactive risk mitigation strategies like supply chain agility in order to modify operating capacities, reduce material replacement times and help local firms to adjust to changes along their supply chains. This would play a critical role in identifying and mitigating possible risks. According to Kamalahmadi and Parast (2016), supply chain agility plays a critical role in improving the overall performance of organisations. It specifically helps organisations to adjust their supply and delivery capabilities and reduce lead times in order to improve firm performance. Liu et al. (2018) similarly revealed that supply chain agility helps firms to establish a win-win linkage with external parties which help them to quickly recover from risk-related challenges. Mukhsin et al. (2022) concluded that supply chain agility is needed for firms and their supply chain partners to build a strong supply chain in order to improve overall performance.

4.4.2 Research objective 2: Relationship between knowledge sharing and SCRM performance of the manufacturing firms

Concerning objective two, the study proposed that knowledge sharing has a significant positive relationship with the SCRM performance of manufacturing firms in the three selected cities in Ghana. The hypothesis (H2) was statistically "supported" to indicate that knowledge sharing significantly improves the SCRM performance of the manufacturing firms" understudy. The study had a B-value of 0.107 to indicate that 10.7% of any change in SCRM performance is significantly and positively affected by knowledge sharing. In terms of the adoption of the proactive risk mitigation strategies, the knowledge sharing strategy had the 3rd ranking. The

result shows that knowledge sharing plays the weakest role in improving SCRM performance whenever it is adopted among the three key strategies. The study practically implies that when manufacturing firms share valuable knowledge with their supply chain partners, they tend to develop proactive mitigation strategies which is critical to improving SCRM performance.

The study‟s result also implies that manufacturing firms that engage in knowledge sharing within and across their entire supply chain network share information about potential vulnerabilities and risks. This collaborative effort helps them to identify risk more extensively and address its potential severity of occurrence more accurately. The study reveals that through knowledge sharing, manufacturing firms can gather collective intelligence to enhance the risk assessment process. Also, knowledge sharing offers access to a wider pool of risk-related information or data can lead to better intelligence about current market conditions, emerging risks and other factors that affect the supply chain. Effective knowledge sharing promotes supply chain collaboration which help Ghanaian manufacturing firms to implement develop and strengthen their risk mitigation strategies; thereby, attaining a stronger SCRM performance. It is to note that manufacturing firms would struggle to respond to risk-related issues if they fail to share knowledge which is critical to learning from others‟ failures and mistakes.

The study is underpinned by the theory of constraints which posit that organisations need to develop proactive risk mitigation strategies like knowledge sharing in order to identify and address possible risks which impede their effectiveness of their systems. Knowledge sharing has become a critical proactive risk mitigation strategy because it encourages exchange of quality and accurate risk-related information which are critical to addressing possible risks and thereby, achieving higher SCRM performance. Huo et al. (2021) revealed that knowledge enables focal firms to exchange healthy information with supply chain partners which allow them to detect and address possible risks; thereby, improving SCRM performance. Lombardi (2019) concluded that knowledge sharing, which focuses on transfer of adequate knowledge,

skills and experience, allow actors in a supply chain network to attain positive performance. Kim et al. (2021) indicated that knowledge sharing improves innovative thinking among supply chain actors which help them to minimise risks in their respective businesses and invariably promote SCRM performance.

4.4.3 Research objective 3: Relationship between supply chain visibility and SCRM performance of the manufacturing firms

The result of the relationship between supply chain visibility and SCRM performance of Ghanaian manufacturing firms was also presented in this section. The study proposed (H3) that supply chain visibility significantly and positively relate with SCRM performance; which was statistically "supported". The B-value of 0.234 showed that supply chain visibility significantly and positively improves the SCRM performance of manufacturing firms by 23.4%. This shows that supply chain visibility has a weak significant influence on SCRM performance; hence, was ranked 2nd. The practical implication is that when Ghanaian manufacturing firms have the ability to monitor and track the flow of information, goods and finance throughout their supply chain network, it helps them to attain higher SCRM performance. With supply chain visibility, manufacturing firms are able to attain real-time data on their materials and information which help them to detect potential risks and disruptions as they emerge, allowing for timely risk assessment and response.

Manufacturing firms with visible supply chains operate transparently by tracking activities throughout their supply chains which promote proactive risk identification and mitigation.

This practice also enables these firms to map their entire supply chain including suppliers" location, warehouses and distribution routes to ensure easy and quick detection of risks. Supply chain visibility also enables Ghanaian manufacturing firms and their actors in a supply chain to share risk-related information and develop a joint mitigation strategy to promote a healthy SCRM practice. Similarly, when disruptions occur, supply chain visibility allows

manufacturing firms to quickly identify alternative suppliers or logistics providers which supports effective risk mitigation and thereby, improve SCRM performance.

4.4.4 Research objective 4: Relationship between SCRM performance and operational performance of the manufacturing firms

Research objective four examined whether SCRM performance significantly relates with the operational performance of manufacturing firms in Ghana. After the PLS-SEM analysis for H4, the study revealed that SCRM performance statistically relates with the manufacturing firms‟ operational performance in Ghana. The B-value of 0.265 indicates that SCRM performance has a significant positive and moderate effect on operational performance. This means that manufacturing firms with positive SCRM performance can also improve their operational performance; thus, the latter is positively and moderately predicted by the former.

Supply chain risk management (SCRM) performance focuses on manufacturing firms‟ ability to efficiently and effectively identify, assess, control and mitigate risks within their supply chain network. It has become a key dimension of total supply chain management due to its focus on proactive identification and management of risks that could disrupt the flow of goods, information, finances and services with the supply chain.

The study‟s result also practically implies that SCRM performance can help Ghanaian manufacturing firms to identify and reduce the likelihood and severity of potential risks within the supply chain in order to few operational interruptions and ensure production and speedy delivery of quality products. Also, an effective SCRM performance helps manufacturing firms to improve their operational performance by reducing risks, optimising inventory and processes, minimising production costs and improving supply chain stability. This can also in turn lead to a more resilient and efficient operations, higher customer satisfaction and a competitive advantage in the market. SCRM performance also ensures that manufacturing supply chains operate under stable environments devoid of risk which could threaten product

quality, operational dependability and operational speed. The result, therefore, shows that SCRM performance is a component of overall supply chain management which plays a healthy role in improving operational performance.

The study‟s outcome is corroborated by Qrunfleh and Tarafdar (2013) who revealed that manufacturing firms with favourable supply chain risk management tend to achieve higher operational performance in areas of operational flexibility, operational dependability as well as produce quality products. Shou et al. (2018) also revealed that SCRM helps manufacturing firms to mitigate possible risks in order to produce stronger financial performance. Although their study makes a strong case for financial performance, its outcome emphasises the importance of having a strong SCRM. Munir et al. (2020) similarly revealed that SCRM enables manufacturing firms and their supply chain actors to reduce risks by quickly identifying their possibility and severity of occurrence and adopting proper mitigation strategies to address them. This instance helps these firms to prevent risks along their supply chains in order to attain a healthy operational performance. In summary, a healthy operational performance can be attained if manufacturing firms in Ghana improve their SCRM performance levels.

4.4.5 Research objective 5: Moderating role of risk management culture in the relationship between proactive risk mitigation strategies and SCRM performance of the manufacturing firms

This section presents the result of objective five regarding the moderating role of risk management culture in the relationship between proactive risk mitigation strategies and SCRM performance of manufacturing firm in Ghana. This objective was attained by testing three hypotheses and the results indicated that risk management culture significantly and positively

moderate in only the relationship between knowledge sharing and SCRM performance. With a B-value of 0.143, the result indicates that when manufacturing firms have a risk management culture, it would strengthen knowledge sharing in order to expand SCRM performance by 14.3%. Precisely, Ghanaian manufacturing firms that have a risk management culture which encourage knowledge sharing are able to improve their SCRM performance by 14.3%.

On the other hand, the results showed that the presence of risk management culture does not improve or weaken the relationships between supply chain agility and SCRM performance as well as supply chain visibility and SCRM performance. This implies that whether these firms have a risk management culture or not, it does not contribute to any changes in supply chain agility and supply chain visibility. These situations, therefore, do not lead to any significant changes in SCRM performance, an outcome variable. Therefore, the practical implication of the study"s outcome is that Ghanaian manufacturing firms with an effective risk management culture tend to encourage or support knowledge sharing which consequently improves SCRM performance. Although knowledge sharing directly improves SCRM performance, the presence of a risk management culture strengthens but not weaken this relationship. It is worthy to note that, a risk management culture comprises the various behaviours, awareness and attitudes of manufacturing firms toward risk in order to promote the adoption of proactive risk mitigation strategies or measures.

The study is buttressed by the theory of constraints which claim that organisations including manufacturing firms can be able to overcome any risk or threat if they develop a risk management culture that embraces knowledge sharing. The theory supports the argument that risk is inevitable in any modern supply chain; hence, manufacturing firms in Ghana need to embrace a culture that supports knowledge sharing in order to strengthen SCRM performance. Kurniawwan et al. (2017) claimed that firms that ensure that their risk management culture support the adoption of risk mitigation strategies, they tend to attain higher organisational

performance. They concluded that a risk management culture strengthens proactive risk mitigation strategies in order to promote a resilient SCRM.

However, the study‟s outcome was partially supported by Saglam et al. (2020) who found risk management culture to play no moderating role in the relationship between risk mitigation strategies and firm performance.

4.5 Chapter Summary

This chapter presented the study‟s results and associated discussion. Prior to presentation of the results, the chapter first presented the participants socio-demographic features as well as their business profile. Since the study employed the PLS-SEM analytical tool, a model was specified and underwent the necessary measurement and structural model assessments. The PLS-SEM tool was then used to test seven hypotheses which were discussed under five research objectives. The outcomes were then presented and extensively discussed.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the study‟s summary of key findings, the conclusions drawn and the necessary recommendations to management and future researchers.

5.2 Summary of Findings

Regarding objective one, the study‟s result showed that supply chain agility has a significant positive relationship with SCRM performance. Hence, when manufacturing firms operating in the Accra, Tema and Kumasi metropolises have agile supply chains, they would be able to improve their SCRM performance levels.

The study‟s result also revealed that knowledge sharing and SCRM performance are significantly, positively and moderately related. It specifically found that manufacturing firms that engage in active knowledge sharing with their supply chain partners tend to achieve a healthy SCRM performance.

Concerning objective four, the study indicated that supply chain visibility significantly and positively improves the SCRM performance of manufacturing firms operating in the three selected metropolises in Ghana. Thus, these firms can achieve a stronger SCRM performance if they embrace supply chain visibility.

Regarding objective four, the result showed that SCRM performance has a positive relationship with operational performance. This shows that operational performance is significantly and positively improved by SCRM performance within the manufacturing industry in Ghana.

Finally, the study‟s result revealed that risk management culture plays a mixed moderating role in the relationship between proactive risk mitigation strategies and SCRM performance. This is because, the risk management culture significantly moderates the relationship between knowledge sharing and SCRM performance but it does not moderate that of supply chain agility and SCRM performance as well as supply chain visibility and SCRM performance.

5.3 Conclusions

The study establishes the moderating role of risk management culture in the relationship between proactive risk mitigation strategies and SCRM performance and establishes the relationship between SCRM performance and operational performance. The study was carried out in three major cities which have been considered as manufacturing hubs in Ghana. A total of 229 valid data was obtained from questionnaires distributed to 257 randomly sampled owner-managers in a target population size of 6,394 manufacturing firms operating within the Accra, Tema and Kumasi metropolises in Ghana. The study‟s data was processed using both

the IBM SPSS statistics and SMartPLS4 software and consequently analysed with the PLS-SEM4.0 analytical tool.

Based on the study‟s key findings, it was concluded that proactive risk mitigation strategies comprising supply chain agility, knowledge sharing and supply chain visibility have significant and positive relationships with SCRM performance of the manufacturing firms within the Accra, Tema and Kumasi metropolises. The study also concluded that SCRM performance has a significant positive relationship with operational performance and risk management culture indirectly affects only the relationship between the knowledge sharing dimension of proactive risk mitigation strategies and SCRM performance.

5.4 Recommendations

Based on the conclusions drawn, the study made the following recommendations:

Regarding objective one, the study recommended that management of the manufacturing firms should adopt the supply chain agility strategy whenever they intend to adopt risk mitigation strategies. They should also ensure that supply chain agility is aligned with their entire business strategies and objectives in order to encourage innovation and collaboration to ensure quick adaptation to risk-related events.

Also, the study recommends that management of the manufacturing firms in Ghana should develop a culture that embraces knowledge sharing across their entire supply chains. This would help them to quickly and speedily share risk-related events and how they were addressed or mitigated; thereby, ensuring positive SCRM performance.

Further, the study recommends that management of the manufacturing firms should totally support and commit to championing initiatives and resources associated with visibility throughout the supply chain network. Also, they should commit to investing in technologies that would allow effective tracking or monitoring of events in order to proactively identify and mitigate any risk.

The study recommends that management of manufacturing firms need to focuses on improving their supply chain risk management performance by investing in technologies as well as allocating adequate funds for this strategy. Management should also develop a culture that encourages or strengthens SCRM in order to improve its performance and enhance operational performance.

Finally, the study recommends that management of the manufacturing firms should develop a comprehensive risk management culture that supports knowledge sharing in order to attain a stronger SCRM performance. This can be practically achieved if management ensures that their vision, mission as well as objectives are aligned with knowledge sharing in order to prepare comprehensive proactive risk mitigation strategies. This situation would, therefore, help these firms to achieve stronger SCRM performance and become more competitive.

5.5 Future Studies

The study examined proactive risk mitigation strategies (supply chain agility, supply chain visibility, knowledge sharing), SCRM performance, risk management culture and operational performance within the context of Ghana‟s manufacturing industry. Future researchers are, therefore, encouraged the study area to include manufacturing firms operating in other metropolises across the country. Also, future researchers should replicate this study in other industries (health, education, hospitality, etc) to improve comparison purposes. Also, future researchers should focus on particular classes of firms in the manufacturing industry in order to obtain more specific outcomes and thereby, generate specific recommendations.

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APPENDICES

QUESTIONNAIRE

Dear Sir/Madam,

I am carrying out my Dissertation work on the topic "Proactive risk mitigation strategies and operational performance in the manufacturing sector of Ghana: The moderating role of firm risk management culture" and your views are very much important to the study. Every information you provide would remain highly confidential. Thank you for accepting to participate in the study.

Kindly tick in the box

PART A: SOCIO-DEMOGRAPHIC INFORMATION

1. Sex: Male [ ] Female [ ]
2. Age: 18- 29 years [ ] 30-39 years [ ] 40-50 years [ ]
   over 50 years [ ]
3. Level of education
   No formal education [ ] HND or lower [ ] Degree (first, second, doctoral) [ ]
4. What is the size of the firm
   Small [ ] Medium [ ] Large [ ]
5. Indicate the firm‟s ownership type:
   Private [ ] Public [ ]
6. What is the age of the firm?
   Less than 5 [ ] 5-10 [ ] 11-15 [ ] 16-20 [ ] Over 20 [ ]
7. Indicate the firm industry:
   a. Food and Beverage [ ] e. Pharmaceutical and Chemical [ ]
   b. Wood and Paper Processing [ ] f. Rubber and Plastic [ ]

c. Aluminum and Metal smelting [ ] g. Textile and Apparel [ ]

d. Electronic and Electrical [ ] h. Machinery and Equipment [ ]

PART B: PROACTIVE RISK MITIGATION STRATEGIES

On a scale 1-7, please rate the extent to which you agree with the occurrence of these risks with respect to your firm. **With 1-Weak Agreement and 7-Strong Agreement**

No.	**Risk Type**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
	Supply chain agility							
SCA1	Our firm has the ability to quickly reduce manufacturing lead time							
SCA2	Our firm quickly reduces its development cycle time							
SCA3	Our firm quickly adjusts its delivery capability							
SCA4	Our firm improves its delivery reliability at a fast pace							
SCA5	Our firm speed of increasing customer service levels is high							
KS1	Our supply chain actors frequently share knowledge based on their experience.							
KS2	Our supply chain actors share lessons from past failures when they feel necessary							
KS3	Our firm frequently collects knowledge from others based on their expertise.							
KS4	Our firm ensures that adequate knowledge is obtained and shared with supply chain actors							
KS5	Our firm frequently shares knowledge obtained from reports and official documents with its actors							
SCV1	Customers‟ demand levels are visible throughout our supply chain							

SCV2	Our firm‟s inventory levels are visible throughout the supply chain							
SCV3	Our firm makes key information easily accessible to its actors							
SCV4	Our firm‟s order processing is visible to key actors							
SCV5	Our production schedule is visible to key actors							

PART C: RISK MANAGEMENT CULTURE

On a scale 1-7, please rate the extent to which you agree with the occurrence of these risks with respect to your firm. **With 1-Weak Agreement and 7-Strong Agreement**

	Risk management culture	**1**	**2**	**3**	**4**	**5**	**6**	**7**
RM1	Our top managers are actively involved in risk decisions							
RM2	Our firm dedicates efforts to create a supply chain risk-focused processes or workforce							
RM3	There are strong beliefs among our supply chain members to handle risk-related issues							
RM4	Our supply chain partners participate in addressing supply chain risk-related issues							
RM5	Our supply chain partners work with us to cooperatively manage supply chain risk (e.g., regular consultation)							

PART D: OPERATIONAL PERFORMANCE

On a scale of 1 – 7, please rate the extent to which you agree with each statement. **With 1 – Weak agreement and 7 – Strong Agreement**

	Statement	**1**	**2**	**3**	**4**	**5**	**6**	**7**
OP1	Our firm‟s products meet various environmental and safety conditions							
OP2	Our firm provides quality and faultless products to its customers							
OP3	Our firm ensures consistent production and deliveries to its customers							

OP4	Our firm ensures timely production and delivery of customer‟s orders							
OP5	Our firm ensures that information and materials move rapidly within its operations							

PART E: SCRM PERFORMANCE

On a scale of 1 – 7, please rate the extent to which you agree with each statement. **With 1 – Weak agreement and 7 – Strong Agreement**

	Statement	**1**	**2**	**3**	**4**	**5**	**6**	**7**
SCRMP1	Our firm has managed to minimise the frequency of occurrence of supply risks							
SCRMP2	Our firm‟s risk management is better than that of rivals							
SCRMP3	Our firm has the capability to confront opportunities and threats in its business environment							
SCRMP4	Our firm has managed to minimise the impact of occurrence of risks							
SCRMP5	Our firm has invested adequate resources into managing risks							

Part F: CONTROL VARIABLES

On a scale of 1 – 7, please indicate your level of agreement to each of the following statements. **With 1 – Weak Agreement and 7 – Strong Agreement**

		1	**2**	**3**	**4**	**5**	**6**	**7**
FSIZE1	The size of our firm is adequate to meet its operational expectations							
INTYP2	Our firm‟s industry is competitive							
FAGE3	The age of our firm is adequate enough to survive in turbulent situations							
FOWN4	Our firm is owned and managed by people who are willing to invest into it							