

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

INSTITUTE OF DISTANCE LEARNING

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**THE IMPACT OF GREEN SUPPLY CHAIN MANAGEMENT PRACTICES ON
ENVIRONMENTAL PERFORMANCE. THE MEDIATING ROLE OF KNOWLEDGE
MANAGEMENT CAPABILITIES**

PWADAM CLAUDE

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DECLARATION

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

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DEDICATION

I dedicate my thesis to my family

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I thank the Almighty God for the gift of life and strength throughout this study. I would also like to express my sincere gratitude to my supervisor Prof David Asamoah for his support, and

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ABSTRACT

Modern manufacturing activities are affected by environmental, social and economic factors. The need to consider the environmental responsibilities in production has produced a new term called green supply chain management, which requires manufacturing companies to implement sustainable environmental strategies during production. However, the manufacturing company's knowledge capability will determine the effectiveness of the GSCMP in achieving environmental

outcomes. This study investigated the relationship between green supply chain management practices and environmental performance and further examined the mediation effect of knowledge management capability in this relationship. In addition, the study examined the direct relationship between knowledge management capability and environmental performance in the context of manufacturing firms in Ghana. The study used a survey method and collected useable data from 200 respondents from the targeted 300 respondents. Applying the PLS-SEM estimator, the results showed that GSCMP drives environmental performance. In addition, knowledge management has a direct positive and significant relationship with environmental performance. The study further revealed that knowledge management capability significantly and positively mediates the relationship between GSCMP and environmental performance. Based on these findings, the study recommends that manufacturing firms adopt GSCMP to achieve environmental outcomes. For instance, manufacturing firms can incorporate eco-design in their product development, avoid producing under hazardous circumstances, use eco-friendly processes regarding material selection, transport, and sub-contracting, and produce reusable and recyclable products. In addition, manufacturing companies must invest in knowledge management. For instance, human resource development, training and information sharing regarding GSCP to achieve higher environmental performance.

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LIST OF ABBREVIATIONS

AVE	Average Variance Extracted
CR	Composite Reliability
COR	Conservation of Resources
EP	Environmental Performance
EPA	Environmental Protection Agencies
NRBV	Natural Resource Based View
GSCMP	Green Supply Chain Management Practices
LSCM	Logistics and Supply Chain Management
PLS	Partial Least Square
KMC	Knowledge Management Capability
SEM	Structural Equation Modelling
RBV	Resource Based View
UNGC	United Nation Global Compact

CHAPTER ONE INTRODUCTION

1.1 Background of the Study

Modern companies' corporate strategies are influenced by environmental, social and economic analysis (Mahdi et al. 2019). The incorporation of environmental responsibilities in production processes has given rise to a new approach to supply chain management termed Green Supply Chain Management Practices (hereafter referred to as GSCMP), which requires that production processes and products are produced under environmentally friendly conditions (Mahdi et al. 2019; Al-Sheyadi et al. 2019). Consequently, governments' and customers' demand for eco-friendly supply chain and logistics activities has influenced several supply chain companies to identify and implement environmentally sustainable practices into supply chain function (Cerchione, et al. 2016). GSCMP refers to the strategy of incorporating environmental thinking into all the stages of the supply chain, from product design, procurement of raw materials, production process, packaging, delivery, and product end-of-life (EOL) (Mahdi et al. 2019).

To fulfil environmental sustainability requirements and environmental performance, dynamic organisations have adopted multiple strategies proven to have a significant positive influence on environmental performance (EP). One of which is knowledge management capability (KMC) (Abbas and Sagsan, 2019). Knowledge is an intangible asset and a vital resource for organizational success, without which an organisation is stacked with ideas to innovate and develop (Abbas and Sagsan, 2019). Dynamic organisations use knowledge management to satisfy customer needs (Abbas and Sagsan, 2019) and achieve competitive advantage (Bresciani et al., 2022).

In the last decades, firms have embraced knowledge management as a tool to achieve quality product design, manage resources effectively and comply with sustainable practices (Attia and

Salama, 2018). Knowledge management involves idea generation, knowledge and information sharing and storage to achieve competitive advantage (Anshari and Hamdan, 2022; Yu et al., 2022). Knowledge management capability refers to the firm ability to generate and use knowledge across all its processes to achieve competitive advantage (Mostafiz et al., 2022; Anshari and Hamdan, 2022). Studies demonstrate that knowledge management capability drives innovation and firm performance (Rafi et al., 2022; Urban and Matela, 2022; Chaithanapat et al., 2022). Given this, KMC has become a sought-after resource by firms to achieve a competitive advantage.

This study argues that firms KMC can influence GSCMP to achieve environmental outcomes. Dynamic firms have adopted environmental strategies in their production and supply chain activities by considering green practices such as green purchasing, eco-design, customer collaboration and inventory return (Basha et al., 2023; Appiah et al., 2022; Darwish et al., 2022). The environmental impact refers to the supply chain effect on the environment such as the release of substances into the environment (Vidal et al. 2022). Unsafe supply chain practices can lead to environmental costs. Environmental costs include direct costs (internal costs to the company such as waste treatment cost, energy consumption, and product take-back costs), and external costs - costs not borne by the organisation that produced the cost (e.g., cost imposed on the community, such as forest degradation, social welfare costs, carbon emissions, air pollution) (Vidal et al. 2022). To prevent or reduce these costs, firms are encouraged to comply with sustainable supply chain practices. The GSCMP is an extension of the modern form of traditional supply chain management. The modern concept links supply chain activities to environmental consideration which has created environmental innovations in the supply chain process. Studies have argued that supply chain and logistics practices such as packaging, transportation and distribution can have devastating environmental consequences (Nureen et al., 2022; Rogerson et al., 2022), and this study argues that

manufacturing firms in Ghana cannot be exempted. Therefore, concerns that manufacturing must have a unique resource that promotes environmentally friendly supply chain practices are valid. One such resource is the knowledge management capability.

With KMC, the firm is not only developing innovative competencies but also managerial and administrative competencies. KMC allows firms to integrate eco-friendly knowledge with technology. Moreover, KMC is linked to efficient application of GSCMP such as integrating ecodesign early in the product development process, producing recyclable and reusable products, green packaging, proper management of waste and avoiding the release of hazardous chemicals into the environment (Appiah et al., 2022; Famiyeh et al., 2018; Yu et al., 2022). Therefore, this study has implications for practices that encourage knowledge creation to effectively apply GSCMP to achieve environmental performance.

1.2 Statement of the Problem

Modern literature highlights the determinants of environmental performance. First, empirical studies show that GSCMP drives environmental performance (Al-Sheyadi et al. 2019; Darwish et al. 2021; García et al. 2022; Laari et al. 2018; Lutra et al. 2014; Yubing et al. 2019; Famiyeh et al., 2018; Aslam et al., 2019; Abdallah and Al-Ghwayeen, 2020). They argue that GSCMP allows firms to adopt sustainable environmental practices such as green transport, green packaging, green delivery systems, and safe production processes. Thus, integrating GSCMP can improve the

environmental performance of manufacturing firms in Ghana. The second determinant of EP is knowledge management capability. KMP has received both theoretical and empirical attention to drive environmental performance (e.g., Abbas and Sagsan 2019; Bahar et al. 2020; Bresciani et al. 2022; Cerchione and Esposito, 2016; Mahdi et al. 2019; Zhang et al. 2021).

The knowledge-based theory views organisations as creators of knowledge and their ability to engage in the knowledge-creation process can be their source of competitive advantage (Bhardwa et al., 2023; Horng, et al., 2022; Ismail, 2023; Chiu and Lin, 2022), and environmental performance (Abbas and Sagsan, 2019; Bresciani et al., 2022; Sahoo et al., 2023; Rehman et al., 2021; Shahzad et al., 2020; Hock-Doepgen et al., 2021). Although extensive studies have emerged in the literature on GSCMP and EP, the extent to which KMP influence this relationship has not been adequately addressed and discussed in the literature. Therefore, based on the resource-based theory and the knowledge-based theory, this study examines whether the relationship between GSCMP (green purchasing, eco-design, customer collaboration and inventory return) is influenced by KMC. By doing this, the study solves the literature gap in emerging economies and enhances the literature on GSCMP and EP.

1.3 Research objectives

This study examined the relationship among GSCMP, KMP and EP in Ghana. Specifically, the study seeks;

1. To examine the relationship between green supply chain management practices and environmental performance in Ghana.
2. To study the relationship between knowledge management capability and environmental performance in Ghana.

3. To investigate the mediating role of knowledge management capabilities on the relationship between supply chain management practices and environmental performance.

1.4 Research questions

The following specific questions have been answered in the study:

1. To what is the relationship between green supply chain management practices and environmental performance in Ghana?
2. Is there any relationship between knowledge management capability and environmental performance in Ghana?
3. What is the mediating role of knowledge management capability on the relationship between GSCM practices and environmental performance in Ghana?

1.5 Significance of the Study

The study contributes to theories and practice. First, the study has implications for the effective application of GSCMP. For instance, investors, owners and policymakers are provided insights into the type of GSCMP that promotes environmental performance. Second, this study uses two variables i.e., GSCMP and KM to model the determinants of environmental performance in emerging economy Ghana which is less explored. Thus, the study solves the literature gap in this area for emerging economies and enhances the resource-based and knowledge-based theories of GSCM, KM and EP. Third, the study proposes that KMC affects the relationship between GSCMP

and EP. Thus, manufacturing companies are encouraged to engage in KMC processes to ensure environmental performance.

1.6 Summary Methodology

A quantitative method has been used for the study. This type of approach or method examines the relationship between variables by using statistics and numbers to analyze and explain their findings. The study employed both descriptive and explanatory research designs to examine the significant connection between the research variables. The descriptive research seeks to describe, and the explanatory study aims to explain the relationship. The researcher purposive sampling strategy and a simple random sampling technique to select respondents from various manufacturing or processing firms in Kumasi.

The questionnaires designed from the primary data have both closed and open-ended types to enable the respondents with less difficulty and limitations. The items in the study constructs are adopted and modified from the literature. The respondents' complete responses or data will be analyzed using PLS-SEM, AMOS or LISREL. A reliability test will be conducted using Cronbach's Alpha to determine the internal consistency of the data. Lastly, a validity test was performed by adopting the Confirmatory factor analysis (CFA) or Exploratory factor analysis (EFA) to determine the suitability of the data for structural detection.

1.7 Scope of the Study

The present study investigates the impact of supply chain management practices on environmental performance and investigates whether knowledge management capabilities moderate the relationship between GSCMP and EP. The study was conducted in the Ashanti region. The largest city and regional capital is Kumasi. Geographically, this region, which is in the south of Ghana, has a total geographical area of 24,389 km² (9,417 sq. miles), making it the second-largest administrative territory in Ghana. Conversely, in regards to population, it is the largest inhabited area, with 4,780,380 inhabitants (or 19.4% of Ghana's total population), as reported by the 2020 census.

1.8 Limitations of the Study

Limitations are circumstances that are out of the researcher's control that may prevent the study's goals from being met and their applicability to other circumstances (Kalyar et al., 2020). The study limitations included: time constraints provided the study is expressly tailored to fulfil specified academic timeframes; financial resources for carrying out a more thorough investigation over a lengthy period to cover a bigger population in the county and voluntary sharing of information. Nevertheless, looking at Ghana in the context of the study is broad, therefore, the researcher will limit the study to some selected manufacturing firms in Kumasi. The implications of the limitation are that interpretation and conclusion were drawn in the context of the selected country and the assumptions made. However, the conclusions and recommendations can be applied in other

economies since GSCM practices environmental policies and laws, and business expectations of environmental impact are similar.

1.9 Organization of the Study

The rest of the study is organized as follows; Chapter Two reviews relevant literature. Chapter Three discusses data and methods. Chapter Four shows the results and discussion. Chapter Five concludes and provides some recommendations.

CHAPTER TWO LITERATURE REVIEW

2.0 Introduction

This chapter reviews relevant literature. It has five (5) main sections. Section 2.1 reviews concepts such as environmental performance, green supply chain management and Knowledge management capability. Section 2.2 reviews the theories on which the study is premised. Section 2.3 reviews empirical studies. Section 2.4 formulates hypotheses and section 2.5 presents conceptual framework.

2.1 Conceptual Review

2.1.1 Environmental Performance

The environmental performance illustrates the positive impact of GSCMP on the natural environment (Li et al., 2021; Albloushi et al., 2023), which consequently affects the firm's internal and external environment (Li et al., 2021; Al-Sheyadi et al., 2019). Promoting environmental performance through GSCMP has several benefits. For instance, safe environmental practices can be the source of the firm's competitive advantage (Ismail, 2023; Chiu and Lin, 2022), enable firms to adapt to changes regarding supply chain process, regulatory requirements, stakeholder satisfaction and supply chain cost (Grover and Dresner, 2022; Chkanikova and Sroufe, 2021; Jernsittiparser et al., 2019), and can easily explore new market opportunities (Appiah et al., 2022). A firm can overturn environmental challenges by inspiring sustainable environmental practices.

Environmental concerns about some destructive supply chain practices by some firms have increased policy, research and social attention on the need to protect the environment. Therefore, firms are encouraged to regularly have environmental audits to assess whether their activities pose environmental challenges and address them. Firms that incorporate environmental strategies achieve long-term organisational performance (Li et al., 2021; Kalya et al., 2020). This study considers GSCMP and KMP as primary antecedents of EP. However, few manufacturing firms are willing to disclose their environmental practices information. Moreover, standardized reporting measures lack clarity. Thus, assessing firms' environmental performance becomes challenging.

2.1.2 Green Supply Chain Management Practices

Green supply chain practices refer to the various processes adopted by organisations during the supply chain process to ensure that their activities do not pose any environmental challenges (García Alcaraz et al., 2022; Kalyar et al., 2020; Laari et al., 2018). GSCMP are considered to

affect organisational and environmental performance (see Al-Sheyadi et al. 2019; Kalyar et al., 2019; Darwish et al. 2021; García et al. 2022; Laari et al. 2018; Lutra et al. 2014). The concept of green practices, although has been in existence since the 1980s, has been recently popularized, which explains the difficulty of its practice by some manufacturing terms, given the prevailing theories which are still being developed to facilitate efficient implementations of green practices in firms (Govindan, 2018). The primary aim of GSCM is to minimize environmental pollution, prevent the disposal of hazardous chemicals by manufacturing companies and promote sustainable product conception (Paul et al., 2014; Kalpande and Toke, 2021; (Yubing et al. 2019; Famiyeh et al., 2018; Aslam et al., 2019; Abdallah and Al-Ghwayeen, 2020).

The concept of GSCP started with the revolution of quality in the 1980s and the supply chain in the 1990s (Srivastava, 2007). Essentially the GSCM strategies include reverse logistics, green purchasing and collaboration with partners in all the supply chain processes (Khan et al., 2023; Jianguo and Solangi, 2023). GSCMP is governed by the promotion of safe environmental practices by firms. Apart from its environmental benefits, GSCMP has positive implications for firms' performance and operations (Khaksar et al., 2015; Laari et al., 2018; Amoako-Gyampah et al. 2017)). In principle, GSCMP involves green purchasing, customer collaboration, inventory return, and eco-design as adopted by several empirical studies (Appiah et al., 2022; García et al. 2022). By adopting GSCM, companies can absorb government and policy environmental requirements, as well as pressures from society and civil organisations on safe environmental practices. GSCMP requires that firms possess the knowledge and capacity to implement them. However, limited studies exist on implementing KMC to achieve GSCM. Therefore, research on KMC as a way to make GSCMP more environmentally friendly is important.

2.1.3 Knowledge Management Capability

Knowledge management refers to the creation, transfer, use and storage of knowledge to achieve a competitive advantage (Attia and Salama, 2018; Bahar et al., 2020; Bresciani et al., 2022). On the other hand, knowledge management capability is the ability of firms to engage in the knowledge management process to achieve competitive advantage (Mostafiz et al., 2022; Anshari and Hamdan, 2022). Empirical studies demonstrate that KMC promotes firm performance and innovation (Abbas and Sagsan 2019; Bahar et al. 2020; Bresciani et al. 2022). In this current business environment where organisational peculiar resources determine their successes in the market, Knowledge management has become increasingly important to theory and practice.

KM is a process of ensuring that the firm human resources possess the necessary skills and information to achieve efficient operation (Habib and Bao, 2019). According to Zhang et al. (2021), there are two forms of KM which are; (i) people management and information management. People management involves tacit knowledge such as skills and ability, while information management involves explicit knowledge that makes a firm competitive (Zhang et al., 2021). In a knowledge-based society, knowledge creation and use have become a firm unique resource for competitive advantage, organisational development and relation with external partners (Chiu and Lin, 2022; Al-Omouh et al., 2022). To preserve the environment, international organisations such as the United Nations Global Compact (UNGC) and national bodies such as Environmental Protection Agencies (EPA), Ghana, have urged all businesses including manufacturing companies to practice environmentally friendly supply chain activities (UNGC, 2018). KM characteristics such as knowledge sharing and research and development are important tools required to integrate sustainable environmental practices in product development (Habib et al., 2019). From the perspective of sustainability, KM is used to create fundamental and innovative knowledge that has economic, social and environmental benefits (Lim et al., 2017). According to,

Sahoo et al., (2023) organisations must combine all the organisational strategies with KM strategies to achieve holistic sustainability in an organisation. Therefore, KMC can enable manufacturing firms to use GSCMP to promote environmental strategies.

2.2 Theoretical Review

The study uses the resource-based view and the knowledge-based view to explain the relationship among the variables.

2.2.1 The Natural-Resource-Based View

The resource-based (RBV) view has been extensively applied to examine the relationship between GSCMP and organisational performance in literature (Appiah et al., 2022; Khanra et al., 2022; Sharma and Vredenburg 1998). The RBV suggests that organisations must develop unique resources and leverage them to achieve competitive advantage (Barney 2001). These resources can either be tangible or intangible resources including human resources, technology, supply chain channels, assets or knowledge (Abu-AlSondos, 2023; Sahoo et al., 2023). RBV define strategic organisation resources as assets that are unique, rare, inimitable, and non-substitutable (Khanra et al., 2022). Organisations that develop their key strategic resource achieve higher competitive advantage and performance. Hart (1995) has expanded the RBV to include environmental opportunities and constraints. The view by Hart is referred to as the natural resource-based view (NRBV). The NRBV states the implementation of strategic environmental practices such as sustainable development, pollution prevention, stewardship, and green supply chain and environment can be a source of organisational competitive advantage (Hart, 1995). Pollution prevention seeks to prevent the release of hazardous chemicals into the atmosphere. Stewardship

places responsibilities on all persons involved in the supply chain process to reduce environmental impacts. Sustainable development extends the environmental concerns of supply chain activities to social and economic concerns.

Several empirical studies have used RBV to practice a positive relationship between GSCMP and firm or environmental performance (Zaid et al., 2021; Gera et al., 2022; Aldaas et al., 2022)

2.2.2 Theory of Knowledge Management

The knowledge-based theory argues that knowledge is a source of competitive advantage and the organisational ability must effectively engage in the knowledge management processes (Cerchione and Esposito, 2016; Bahar et al., 2020; Attia, Salama, 2018; Darroch, 2005; Zhang et al., 2021).

The theory describes knowledge as a competitive weapon and the possession of unique knowledge in the market can be the most important source of competitive advantage (Zhang et al., 2021). The current knowledge-based business environment along with its rapid changes in organisational processes, an organization's success in these processes depends on the level of knowledge (Habib, and Bao, 2019). The two forms of knowledge from the knowledge life cycle which are knowledge production and knowledge integration involve several other knowledge processes such as idea generation, problem-solving, group thinking, information sharing and knowledge assessment (McElroy, 2010). This knowledge is constantly improved through knowledge evaluation to integrate it into the supply chain process to achieve competitive results.

Knowledge integration is the application of the knowledge acquired in the production process (Hislop, 2003). Some researchers have attempted to relate organisational competitiveness not only to internal resources but also the organisational knowledge management (Dyer and Singh 1998';

Bahar et al., 2020; Zhang et al., 2021), thereby making the knowledge-based theory applicable in an environmental context.

They argue that knowledge gained in partners' collaboration during the supply chain process influences the elimination of hazardous materials during the production process (Appiah et al., 2022). In addition, Zhang et al. (2021) state that KMP influence cooperation on GSCMP.

2.3 Empirical Studies

2.3.1 Green Supply Chain Management Practices and Environmental Performance

Kalyar et al. (2019) investigated the direct effect of GSCMP on organisational financial performance and also examined whether environmental performance influences this relationship in Pakistan. They used a survey method to collect data from 238 textile firms. Applying the Hayes PROCESS macro, they find that GSCM (green purchasing, eco-design, customer collaboration) directly drive firm performance, and indirectly through EP. Adegoke et al. (2021) investigate the relationship between GSCMP and organisational performance in Ghana. They measure organisational performance with EP, competitive advantage and sustainable economic performance. Applying the SEM model, their results show that GSCMP drives environmental performance, economic performance and competitive advantage. Their results imply that green practices in supply chain processes positively explain an organization's economic and environmental performance, which are sources of competitive advantage.

Afum et al., (2020) explore the link between GSC integration, green manufacturing practices and environmental performance in in emerging economy using Ghana as a case study. A survey was used to collect data from 178 manufacturing companies. By applying the OLS-SEM mode, they

find that GSCMP has a positive and significant effect on sustainable performance (environmental performance and organisational performance).

Contrary, Laosirihongthong et al., (2013) investigated the relationship between GSCMP (reverse logistics) on environmental and firm performance in manufacturing firms in Thailand. They find that reverse logistics (pro-active practices) has no significant impact on environmental performance. Semen et al., (2019) investigate the relationship between GSCMP and innovation and EP using data from 123 manufacturing companies. Using the PLS-SEM model, they show that GSCMP and innovation promote EP. Moreover, Appiah et al. (2022) investigate the relationship between GSCMP and EP, and further investigate the mediation effect of ecocentricity on this relationship in Ghana. Applying the SMART PLS method, they show that GSCMP such as green purchasing, eco-design, customer collaboration and inventory return have a positive relationship with EP, and are mediated by ecocentricity.

Darwish et al. (2021) studied the impact of GSCMP on EP in Bahrain. Their results show that GSCMPs such as green purchase, and internal environmental management have a positive effect on EP. Their study supports the role of green supply chains in influencing strategic environmental practices. Fianko et al. (2021) investigate the relationship between internal and external GSCMP and environmental performance. Their study was based on survey data of 217 respondents from 50 construction firms. The results are as follows; (i) eco-design has an insignificant impact on EP but turns positively significant with external green practices, and (ii) green purchasing has a positive relationship with EP.

2.3.2 Knowledge Management Capability and Environmental Performance

The modern business environment requires organisations to create and use knowledge. According to the NRBV, knowledge management can be a cause of organisational competitive advantage. The advantage can come in the form of the use of knowledge to promote sustainable environmental practices. The literature argues that KMC drives EP. For instance, Abbas and Sagsan (2019) examine the relationship between Knowledge management (knowledge sharing, knowledge transfer) on corporate sustainability (environmental sustainability) in Pakistan. They used a survey approach to collect data from managers of SMEs. By applying the SEM model. They find that knowledge management significantly promotes environmental sustainability.

Bahar et al. (2020) investigate the relationship between knowledge management capability on organisational performance in Malaysia. Using survey data from 183 respondents from the logistics industry, they show that knowledge management capital strongly impacts performance. Bresciani et al. (2022) explore environmental knowledge management and environmental performance. A survey method of data collection was applied. The estimation was based on the PLS-SEM and the multiple regression method. They find that environmental knowledge management and environmental performance are positively and significantly related.

2.3.3 The Mediating Role of Knowledge Management Capability

Few studies have been conducted on the mediation role of knowledge management capability on the relationship between GSCMP and environmental performance. For instance, Jermstittiparsert

et al. (2019) investigate the antecedent and outcome of GSCMP in Thailand. They used survey data from 166 managers in the electronic industry. They show that green management capability and internal environmental management strongly and positively relate to GSCMP. Their results further show that GSCMP significantly and positively mediates the relationship between green management capability internal environmental management, and environmental performance. The result implies that firms with sustainable green practices apply green management capability to improve internal environmental management which leads to environmental performance.

2.4 Conceptual Framework and Hypotheses Development

This study considers four components of green supply chain management (GSCM) including green purchasing, eco-design, customer collaboration and investment recovery. Knowledge management capability (KMC) is used as the mediator as indicated in the hypotheses and is expected to have a positive relationship with environmental performance.

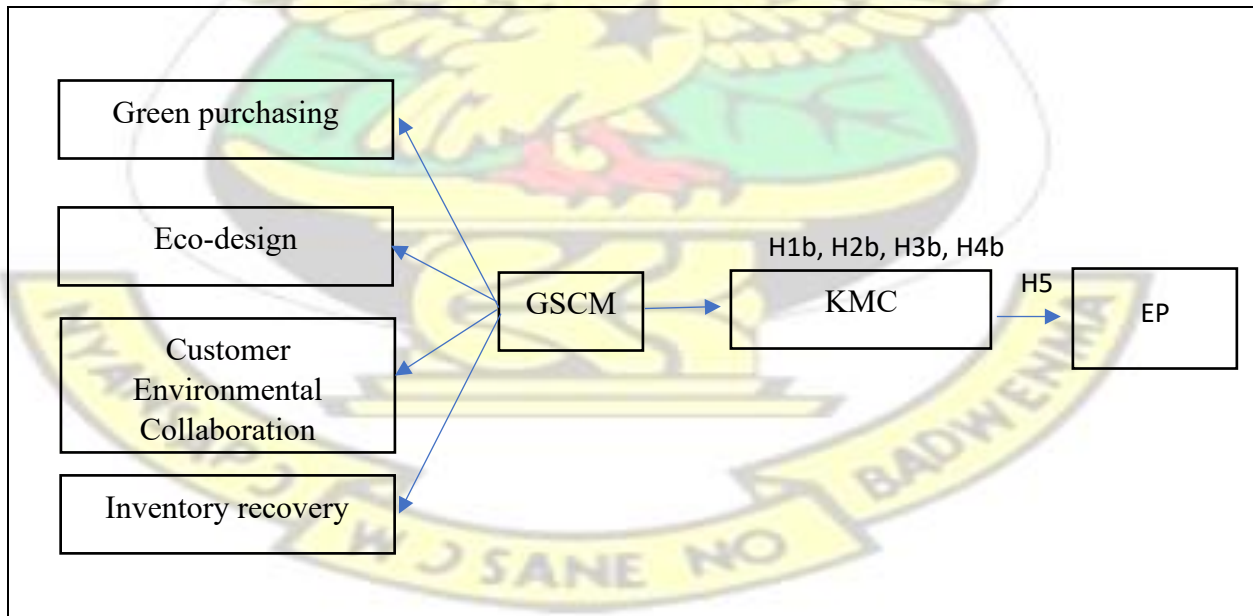


Fig: 2.1: Conceptual framework

2.4.1 Green Supply Chain Management Practices and Environmental Performance

Empirical studies demonstrate that GSCMP has a positive relationship with environmental performance (Kalyar et al., 2019; Semen et al., 2019; Appiah et al., 2022; Darwish, 2021; AlSheyadi et al. 2019; García et al. 2022; Laari et al. 2018; Lutra et al. 2014; Yubing et al. 2019; Famiyeh et al., 2018; Aslam et al., 2019; Abdallah and Al-Ghwayeen, 2020). Contrary, some studies contest the positive relationship between GSCMP and EP and organisational performance (Laosirihongthong et al., 2013; Agyabeng-Mensah et al., 2020). Therefore, the relationship between GSCMP and EP remains controversial with most studies supporting the positive relationship.

2.4.1.1 Green Purchasing and Environmental Performance

Green purchasing is a fundamental component of the GSCMP and encompasses all activities including procurement, material selection and management (Agyabeng-Mensah et al., 2021). Through green purchasing, organisations are expected to use sustainable and green transportation, sub-contracting and to achieve environmental performance (Appiah et al., 2022). With this, manufacturing companies are expected to monitor that their suppliers are providing sustainable environmental material for production. Therefore, the following hypotheses are developed.

H1a: Green purchasing has a positive and significant relationship with environmental Performance.

H1b: Knowledge management capability g positively and significantly and positively mediates the relationship between green purchasing and environmental Performance.

2.4.1.2 Eco-design and Environmental Performance

Moreover, eco-design ensures that manufacturing companies adopt eco-friendly practices during the production processes. For instance, eco-design ensures that manufacturing companies consume less material and energy during production (Kong et al., 2022). Further, it highlights the production of recyclable and reusable products that have no environmental impact (Corsi et al., 2023). Based on these arguments, the study formulates that;

H2a: Eco-design has a positive and significant relationship with environmental Performance. *H2b*: The relationship between eco-design and EP can be positively and significantly mediated by knowledge management capability.

2.4.1.3 Customer Environmental Collaboration and Environmental Performance

Furthermore, customer environmental collaboration requires that manufacturing companies involve their partners in their activities. Manufacturing firms' efforts to achieve a sustainable environment are insufficient unless collaborated by other important actors (Afum et al., 2020). Interactions among customers, partners, suppliers and government to share information and knowledge regarding sustainable environmental practices will promote environmental performance (Appiah et al., 2022; Aldaas et al., 2022). Based on these, the study proposes that;

H3a: customer environmental collaboration has a positive and significant relationship with environmental Performance.

H3b: Knowledge management capability significantly and positively mediates the relationship between customer environmental collaboration and environmental performance.

2.4.1.4 Inventory Recovery and Environmental Performance

Inventory recovery highlights the sales of excess inventory, waste or assets (Appiah et al., 2022). It can also be defined as the reuse or recycling of byproducts. Therefore, the returns from inventory recovery can be viewed as an efficient supply chain process. Inventory recovery has a brand impact on the company and can affect green communication and green internal practices (Al-Sheyadi et al., 2019). Therefore, the study proposes that;

H4a: Inventory recovery has a positive and significant relationship with environmental performance.

H4b: The positive relationship between inventory recovery and environmental performance can be positively and significantly mediated by knowledge management capability.

2.4.2 Knowledge Management Capability (Mediator) and Environmental Performance

Knowledge management capability is the ability of a firm to actively engage in the knowledge management process. KMC has been addressed both in the theoretical and conceptual literature (Bahar et al. (2020; Bresciani et al. 2022), but has received less attention in empirical literature (Hock-Doepgen et al., 2021). According to the knowledge-based theory, knowledge production and integration can be a source of a firm competitive advantage (Zhang et al., 2021). Firms that are consistently engaged in knowledge production and integration can effectively adopt sustainable environmental supply chain practices (Zaid et al., 2021; Gera et al., 2022; Aldaas et al., 2022).

Based on these arguments, the study proposes that;

H5: Knowledge management capability has a positive and significant relationship with environmental performance

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CHAPTER THREE METHODOLOGY

3.1 Introduction

The chapter presents the methodology used for the study. Key methodological issues discussed in the chapter include research approach and designs, population, sample and sampling; data type and instrument, measures, data collection, data analysis, reliability and validity, and ethical consideration.

3.2 Research Design

The research design presents a framework of techniques and methods the researcher selects logically to handle the research problem efficiently. This study uses a cross-sectional survey design. This design involves collecting data on multiple variables from a large number of cases at a single point in time (Bryman, 2012). Cross-sectional enhances external validity/generalization.

In addition, this study uses an explanatory design. The explanatory design is suitable for predicting the effect of the GSCMP and KMC on EP.

3.3 Research Approach

How research is conducted varies, and that means there exist different data options as well as data collection and analysis techniques. Broadly speaking, the research approach has to do with whether particular research focuses on developing a theory based on available evidence (inductive approach) or testing a theory using a suitable piece of data (deductive approach (Saunders et al., 2007)). The study adopts a deductive research approach. It focuses on testing a theory/model about the nature of the relationship between GSCMP, KMP and EP. The deductive approach uses quantitative data and statistical methods and focuses on making inferences based on a sample.

3.4 Target Population

This study targets the manufacturing industries in Ghana. Manufacturing companies are the backbone of the economic development of several countries in the world (Shabbir and Wisdom, 2020). However, manufacturing companies are one of the most pollutant industries in the world with their activities having severe environmental impacts. In effect, there are increasing concerns for manufacturing companies to adopt safe environmental practices (Kong et al., 2022; Bahar et al., 2020). The socioeconomic effect of manufacturing activities can be enormous and include pollution of water bodies with harmful chemicals, air pollution with hazardous gases, nonproductive energy consumption and human resource exploitation (Shabbir and Wisdom, 2020)

3.5 Sample Size Determination

The study aimed at obtaining a usable sample of at least 300 hundred responses. After careful consideration of issues on non-responses (e.g., missing data), two hundred and fifty manufacturing companies are targeted.

3.6 Sampling Technique

Purposive sampling was employed to select the respondents in this study. The justification for using a purposive sampling approach is to solicit the right information from the right participant. The only member of managing staff could comprehensively relay information about the environmental strategy adopted by their company and how that particular strategy has yielded results over time.

3.7 Key Respondents

A structured/self-completion questionnaire has been used to collect data from the manufacturing companies. Participants consist of the CEO/managing director/ general manager, procurement manager, and supply chain manager of the selected firms. Two key informants were selected each from each company.

3.7. Measurement of Constructs

3.7.1 Dependent Variable.

The study's dependent variable is EP. EP assess how the adoption of GSCMP has affected the natural environment (Afum et al., 2020), which affects either the internal or external environment of the organisations (Al-Sheyadi et al., 2019). The items used to measure tendering performance are adopted from Bresciani et al. (2022) and Laosirihongthong et al., (2013) and contain 5 items as indicated in Appendix 1. Each item was measured with a 7-point Likert scale that ranged from

“strongly disagree (=1)” to (7) =to the strongly agree”. Using this scale, the respondents are asked to indicate to which level their firms have performed on each item over the past 12 months.

3.7.2 Independent variable.

GSCMP has been used as the main independent variable. GSCM involves eco-friendly business practices and includes green purchases, eco-design, customer environmental collaboration and inventory recovery (Appiah et al. 2022).

Green purchasing

Green purchasing involves the use of environmentally safe supply chain processes including green procurement, green transport, and sub-contracting. The study followed Zhu et al. (2007) and Zhu et al., (2013) to measure green purchasing with 5 items

Customer Environmental Collaboration

Customer environmental collaboration involves collaboration with customers, suppliers, and partners including the government to share knowledge on sustainable environmental practices. Consistent with Alshyadi et al. (2019), three items have been adopted for the composite index.

Investment Recovery

Inventory recovery is putting to efficient use excess waste, stock and fixed assets (Choudhary and Sangwan (2019). Following Appaih et al., (2022), the study used two items to measure inventory recovery

Eco-design

Eco-design involves implementing sustainable environmental needs into product design. Ecodesign requires that manufacturers produce products that are reusable and recyclable. Four items were used to measure eco-design consistent with Fiano et al., (2021) and Ng et al. (2012)

3.7.3 The Mediation Variable

Knowledge management capability has been used as a mediation variable. KMC refers to the manufacturing company's ability to engage in knowledge management processes to achieve competitive advantage and environmental sustainability (Attia and Salama, 2018; Bahar et al., 2020). Four items were adopted from Abbas and Sagsan, in 2019 to measure KMC. Through the mediating variable of KMC, the relationship between GSCM and EP was determined.

3.7.4 Control Variables.

This study uses firm-specific variables known to affect environmental and firm performance to control the model. For instance, the gender of the LSCM supervisor and age have been used as control variables.

3.8 Data Collection Instrument

Consistent with prior survey studies focusing on managers as key informants in Ghana (Agyapong et al., 2019; Boso et al., 2020), this research adopted a face-to-face data collection approach,

delivery-and-collection, and structured questionnaires. The data collection approach ensures a high response rate.

Table 3.1: Constructs Measurement and Sources

Constructs	Sub-constructs	No. of items	Source
Environmental Performance		5	Laosirihongthong et al., (2013)
Knowledge management capability		4	Abbas and Sagsan (2019)
Green Supply Chain Management	Green purchasing	5	Zhu et al., (2007), Zhu et al. (2013)
	Eco-design	4	Fiano t al., (2021) Ng et al. (2012)
	Customer Collaboration	3	Alshyadi et al., (2019)
	Inventory Recovery	2	Appiah et al., (2022)

Source: Authors' elaboration

3.9 Data Collection Procedures and Techniques

Given the difficulty in administering the questionnaires using the face-to-face approach to reach required SMEs, the study used field study agents (c.f Adomako et al., 2018). The researcher ensured that quality data was obtained by ensuring that all ethical issues were adhered to by the agents. The agents are instructed to obtain completed questionnaires from the selected respondents and follow up with questionnaires not received within 10 days.

3.10 Approach to Data Analysis

Given the explanatory nature of the study, a quantitative approach to data analysis, involving the use of statistical tools, is employed. Two broad types of statistical analysis are conducted. The first, descriptive analysis, involving the use of statistical tools such as frequency (percentages) and means (standard deviation), focused on generating descriptive results on the demographic characteristics and the firms and the construct of interest of the study. The study used the partial least square structural equation model to estimate the hypotheses.

3.10.1 Model Specification

Model 1: To examine the relationship between GSCMP, knowledge management capability and EP ;

$$EP_i = \beta_0 + \beta_1 GP + \beta_2 ED + \beta_3 IR + \beta_4 CC + \beta_5 KMC + \beta_6 FS + \beta_7 Age + e_i \dots \dots \dots 1$$

Model 3: To examine the mediation role of knowledge management on GSCP and environmental performance.

$$EP_i = \beta_0 + \beta_1 GSCMP + \beta_2 KMC + \beta_4 (GSCMP * KMC) + \beta_3 KMC + \beta_4 FS + \beta_5 Age + e_1 \dots \dots \dots 2$$

Where EP is environmental performance, GP is green purchasing, IR is investment recovery, CC is customer collaboration, ED is eco-design, KMC is knowledge management capability, FS is firm size and Age is the respondent's age.

3.11 Data Quality (Validity and Reliability) Consideration

The research employed current approaches to capture the constructs to enhance the study's quality and provide a trustworthy result. The validity of each measure was evaluated using exploratory

factor analysis and second, by evaluating the level of correlation across the scales, while the reliability of each measure was evaluated using the Cronbach's alpha test."

3.12 Ethical Issues

Any study that collects data from primary sources, such as interviews and questionnaires, has several ethical difficulties since the dignity and privacy of research participants are so important (Saunders et al, 2007). The three main organizational concerns listed by Saunders et al. (2007) are time, issue sensitivity, data confidentiality, and respondent anonymity. All participants are given a full explanation of the research's goals to allay any concerns they may have about whether the study will adhere to the chosen organization's standards for ethical research. Only people who voluntarily choose to take part in the research have the option to fill out surveys. Participants' names, including those of SMEs, are kept anonymous, all data for the report is protected with passwords, and the data collected for this study is only used for the purposes allowed by the university's ethical rules.

CHAPTER FOUR RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents data, analysis and discussion. The data was collected using a selfadministered questionnaire. It has seven (7) sections as follows; Section 4.2 presents respondents' demographics. Section 4.3 presents measurement issues and tests for data validity, reliability and correlation. Section 4.4 shows descriptive results. Section 4.5 shows the results for the hypotheses.

Section 4.6 discusses the results. Finally, 4.7 concludes the chapter.

4.2 Respondents' Demographics

Table 4.1 presents the demographic distribution of the respondents. Most respondents (60%) are males and 40 % are females. Most of the respondents (39%) are of the ages 18-25. Similarly, 30.5% of the employees are between the ages of 26 – 35. Further, the majority of respondents (56.5%) have a first degree, followed by 28.5% with master's degrees. In addition, on average, the majority of the employees have worked with the company for an average of 6 to 12 years

Table 4.1: Respondents' Demographic

Profile	Description	Frequency	Percentage
Gender	Males	120	60%
	Females	80	40%
Age	18-25	78	39%
	26-35	61	30.5%
	36-45	42	6%
	46-60	18	9%
	>60	1	0.5%
Education	Diploma	30	15
	First Degree	113	56.5
	Master's Degree	57	28.5
Years of Employment	1-3	70	35%
	3-6	39	39%
	6-12	53	26.5%
	12-15	12	10%
	>15	26	6%
Total		200	100%

Source: Survey data, 2023

4.3 Measurement Issues

This section presents variability reliability and validity results. The study uses the confirmatory factor analysis, composite reliability, variance variable extracted and correlation to assess the data validity and reliability.

4.3.1 Reliability and Validity

The study loads 25 items onto 6 latent constructs which are environmental performance, GSCM (green purchase, eco-design, customer collaboration, and inventory recovery), and knowledge management. The confirmatory factor analysis (CFA) was used to assess the validity and reliability

of the measurement of the constructs. First, the study assesses whether there is a strong correlation between the indicator and constructs (R^2) to ascertain how much the latent variable explains the variance of the constructs (at least 50%) is satisfactory. According to Hair et al., (2006), the standardized loadings must be greater than 60 per cent. All the latent variables significantly explain the variance of the constructs.

Second, this study uses composite reliability (P_c) to measure the internal consistency of the items in constructing the variables. The composite reliability (P_c) is preferred to Cronbach's Alpha (α) (Henseler et al., 2009). Cronbach's alpha assumes that all items are reliable to the constructs, but composite reliability prioritizes the items according to the level of reliability leading to a more reliable composite (Henseler et al., 2009). A composite value above (0.70) is more reliable and measures strong internal consistency (Henseler et al., 2009). As indicated in Table 4.2 the composite index of all the variables (EP, KM, ED, CC and IR) all exceeded the threshold, suggesting strong internal consistency.

Third, this study uses the Average Variance Extracted (AVE) to measure convergent and discriminant validity or to ensure all the items measure the underlying constructs (Henseler, et al., 2009). A higher AVE value indicates that the items strongly represent the underlying construct, and must be above (50%). As shown in Table 4.2 the AVE for all the variables are satisfactory.

Table 4.2: Individual Loadings (λ), Composite Reliabilities (P_c), and AVE

Constructs	Items	λ	AVE	P_c
Environmental performance	EP1	0.784	0.643	0.800
	EP2	0.675		
	EP3	0.654		
	EP4	0.501		
	EP5	0.606		
Knowledge Management	KM1	0.754	0.743	0.843
	KM2	0.86		
	KM3	0.834		
	KM4	0.765		
Green Purchasing	GP1	0.765	0.764	0.910
	GP2	0.654		
	GP3	0.743		
	GP4	0.346		
	GP5	0.654		
Eco-design	ED1	0.765	0.786	0.820
	ED2	0.875		
	ED3	0.854		
	ED4	0.786		
Customer Collaboration	CC1	0.675	0.687	0.713
	CC2	0.564		
	CC3	0.754		
Inventory Recovery	IR1	0.865	0.843	0.901
	IR2	0.802		

Source: Author's analysis with 2023 Survey data

4.3.2 Correlation

Table 4.3 checks the potential multicollinearity problem among the independent variables. This study uses a correlation matrix and the Variance Inflation Factor (VIF). The correlation coefficient of less than 0.8 suggests the absence of a multicollinearity problem between the independent variables. In addition, a VIF of more than 10 indicates a multicollinearity problem.

Inventory recovery has a positive and significant correlation with knowledge management and customer collaboration, ($\beta = 0.342, p < 5\%$; $\beta = 0.321, p < 5\%$, respectively). GSCM has a positive and significant correlation with inventory recovery, ($\beta = 0.231, p < 5\%$). Furthermore, there is a positive and significant correlation between GSCM and knowledge management ($\beta = 0.342, p < 5\%$). From the results, none of the correlation coefficients is more than 0.8, and the highest VIF is 2.98 suggesting the absence of multicollinearity.



Table 4.3: Correlation Matrix and Variance Inflation Factor

Var	EP	KM	ED	CC	IR	GP	GSCM	GENDER	AGE	VIF
EP	1									1.03
KM	0.341*	1								1.06
ED	0.231*	0.045	1							2.04
CC	0.034	0.056	0.236	1						1.05
IR	0.432*	0.342*	0.067	0.321*	1					2.45
GP	0.231*	-0.054	0.005	0.054	-0.004	1				2.26
GSCM	0.321*	0.342*	0.005	0.032	0.231*	0.056	1			2.76

Note 1: EP is environmental performance, KM is knowledge management, ED is eco-design, CC is customer collaboration, IR is inventory recovery, GP is green purchasing, and GSCM is green supply chain management. **Note 2:** $p < 0.05$ significance level



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4.4 Descriptive Results

Table 4.4 presents a summary of the statistics of the study variables. The mean of environmental performance is 3.07 with a standard deviation of 1.242, suggesting that the manufacturing firms are complying with environmental practices. Knowledge management shows an average of 3.04 which is relatively lower compared to other firms in the developed countries (Bahar et al., 2020). The average of GSCM practices is 3.565 which is satisfactory for firms operating in developing countries (Darwish et al., 2021).

Table 4.4 Summary Statistics

Variable	Mean	Median	Std. Dev.	Kurtosis	Skewness	Min	Max
EP	3.075	4.076	1.242	0.000	-0.543	1	7
GP	2.054	3.543	1.114	0.276	-0.134	1	7
ED	3.654	3.436	1.176	-0.254	0.246	1	7
KM	3.043	3.123	1.065	0.354	0.432	1	7
IR	3.564	3.243	1.764	0.243	0.206	1	7
GSCM	3.565	3.564	1.453	-0.342	0.235	1	7

Note 1: Note: EP is environmental performance, KM is knowledge management, ED is ecodesign, CC is customer collaboration, IR is inventory recovery, GP is green purchasing, and GSCM is green supply chain management.

Source: Author's analysis with 2023 Survey data

4.5 Hypotheses Testing

Table 4.5. presents empirical results. The results have the direct model (with no mediation variable) and the indirect model with a mediation variable. The adjusted r-square value is 0.785 suggesting that about 78.5 variations in environmental performance are explained by the independent and the mediation variables. In the direct model, the study tests the relationship between the GSCP and environmental performance, as well as the relationship between knowledge management and environmental performance. In the indirect model, the study tests whether knowledge management mediates the relationship between each of the GSCP as well as the overall GSCP and environmental performance.

The results reveal that green purchase has a direct positive and significant ($\beta = 0.214, p < 1\%$) relationship with environmental performance. Eco-design positively and significantly ($\beta = 0.34, p < 1\%$) relates to environmental performance. Customer collaboration passively and significantly ($\beta = 0.054, p < 1\%$) relates with environmental performance. Inventory recovery has a positive and significant relationship ($\beta = 0.014, p < 1\%$) with environmental performance. Overall, GSCMP has a positive and significant relationship ($\beta = 0.245, p < 1\%$) with environmental performance, suggesting that a percentage improvement in GSCMP will lead to a 24.5% increase in environmental performance. Concerning knowledge management and environmental performance, the result showed a positive and significant relationship ($\beta = 0.032, p < 5\%$), indicating that a percentage improvement in knowledge management accounts for a 3.2% increase in environmental performance. From the results, all the variables showed a positively significant relationship with environmental performance for the direct model.

Regarding the mediation model, the results show that knowledge management has a positive and significant mediation effect on the relationship between green purchasing ($\beta = 0.047, p < 1\%$), eco-

design ($\beta = 0.043$, $p < 1\%$), customer collaboration ($\beta = 0.478$, $p < 1\%$), inventory recovery ($\beta = 0.342$, $p < 1\%$), GSCMP ($\beta = 0.345$, $p < 5\%$) and environmental performance. This suggests that knowledge management significantly and positively explains the relationship between GSCMP and environmental performance.

Table 4.5: Partial least squares results and hypothesis testing

Variables	Path Coefficient	Standard Error	T-statistics
Direct effect			
GP \rightarrow EP	0.214***	0.041	5.219
ED \rightarrow EP	0.034***	0.007	4.857
IR \rightarrow EP	0.014***	0.004	3.50
CC \rightarrow EP	0.054***	0.010	5.40
GSCM \rightarrow EP	0.245***	0.021	11.66
KM \rightarrow EP	0.032**	0.010	3.20
Indirect effect			
GP \rightarrow KM \rightarrow EP	0.047***	0.004	11.75
ED \rightarrow KM \rightarrow EP	0.043***	0.007	6.142
CC \rightarrow KM \rightarrow EP	0.478***	0.032	14.93
IR \rightarrow KM \rightarrow EP	0.342***	0.078	4.384
GSCM \rightarrow KM \rightarrow EP	0.345***	0.060	5.750
Adjusted R² = 0.7855			

Note 1: Note: EP is environmental performance, KM is knowledge management, ED is ecodesign, CC is customer collaboration, IR is inventory recovery, GP is green purchasing, and GSCM is green supply chain management.

Note: *, **, *** denote 10%, 5% and 1% significance levels respectively **Source:**

Survey data, 2023

Table 4.6 summarizes the hypotheses. The results support hypotheses 1a, 2a, 3a, 4a and 5a that GSCMP has a positive and significant relationship with environmental performance. Moreover, hypothesis 5 supported that knowledge management capability has a positive and significant relationship with environmental performance. Lastly, the mediation hypothesis (H1b, H2b, H3, and H4b supported that knowledge management capability positively and significantly mediates GSCMP and EP.

Table 4.6: Summary of Hypothesis Results

Hypothesis	Beta	P-value	Decision
<i>H1a</i> : Green purchasing has a positive and significant relationship with EP.	0.214	0.000	Supported
<i>H1b</i> : Knowledge management capability positively and significantly and positively mediates the relationship between green purchasing and EP	0.047	0.000	Supported
<i>H2a</i> : Eco-design has a positive and significant relationship with EP	0.034	0.000	Supported
<i>H2b</i> : The relationship between eco-design and EP can be positively and significantly mediated by knowledge management capability.	0.043	0.000	Supported
<i>H3a</i> : customer environmental collaboration has a positive and significant relationship with EP	0.054	0.000	Supported
<i>H3b</i> : Knowledge management capability significantly and positively mediates the relationship between customer environmental collaboration and EP	0.478	0.000	Supported
<i>H4a</i> : Inventory recovery has a positive and significant relationship with environmental performance.	0.014	0.000	Supported
<i>H4b</i> : The positive relationship between inventory recovery and environmental performance can be positively and significantly mediated by knowledge management capability	0.342	0.000	Supported
<i>H5</i> : Knowledge management capability has a positive and significant relationship with environmental performance.	0.032	0.05	Supported

Source: Survey Data (2023)

4.6 Discussion of Results

4.6.1 The relationship between Green Supply Chain practices and Environmental Performance

The results showed that GSCMP has a positive and significant relationship with environmental performance, consistent with other studies (Appiah et al., 2022; Kalyar et al., 2019; Adegoke et al. 2021; Semen et al., 2019; Darwish et al., 2021). For instance, inventory recovery encourages the sale of unused fixed assets, excess inventory and production waste (Aslam et al., 2019)). This practice is viewed as an efficient use of unused resources to generate returns. Putting to use unused or sometimes wasted resources is beneficial to the environment and can improve the company's environmental performance (Appiah et al., 2022; Darwish et al. 2021).

Furthermore, customer collaboration is critical to achieving environmental performance.

Companies' efforts to achieve GSCP are insufficient unless they collaborate with partners (Agyabeng-Mensah et al. (2020). To address the prevailing environmental concerns, manufacturing companies must communicate and involve external partners in their activities (Appiah et al., 2022). Communicating with partners such as customers about the need to reduce waste and introducing recycling programs is an effective way to improve environmental performance (Ahmed et al., 2020). Direct communication to partners such as suppliers and customers about the company's green supply chain management and the intention to reduce environmental waste helps the partners to understand their expectations and what they must do to achieve collaborative environmental performance (Appiah et al., 2022)

Eco-design is critical to ensuring the environment is not polluted. Companies that factor in ecodesign in product development to ensure that the manufacturing of a product does not have environmental disadvantages are viewed as a proactive way to preserve the environment (Agyabeng-Mensah et al., 2020; Appiah et al., 2022). Eco-design requires that manufacturers design products that can be reused, and recycled and do not pose any environmental challenge (Maccioni et al., 2019)

Furthermore, green purchase is the most fundamental component of green supply chain practices. For instance, all activities that lead to production such as supplier selection, procurement, transport, material planning, and contracting must be eco-friendly and reduce environmental pollution (Appiah et al., 2022). Therefore, GSCMP such as green purchasing, customer collaboration, and eco-design promote environmental performance and must be adopted and practised to increase environmental efficiency. Consistent with the natural resource-based view (NRBV), that suggests that firms can gain a competitive advantage by implementing green strategies towards pollution presentation, environmental preservation and product stewardship (Hart and Dowell, 2011)

4.6.2 The relationship between knowledge management and environmental performance

The results reveal a positive relationship between knowledge management and environmental performance. The knowledge-based view argues that an organisation is an entity of knowledge and must have sufficient knowledge about the business environment to remain competitive (Wang, Zhang, and Zhang 2020). Companies are expected to create and apply knowledge in their daily activities to achieve efficiency in operations (Zhang, Jiang, and Zhang 2019; Zhang, Jiang, and

Zhang 2021). The knowledge category may include problem-solving, group and individual thinking, problem assessment, knowledge generation etc. The ability of a company to apply strategic environmental decisions depends on the company's knowledge regarding GSCP and the environment. Companies require sufficient knowledge to adopt green purchasing, collaborate with the customer and implement eco-design to improve environmental performance, Insufficient knowledge of GSCMP explains the poor implementations of GSCMP in some firms. Therefore, knowledge management is critical to environmental performance, consistent with Abbas and Sagsan (2019), Bahar et al. (2020), and Bresciani et al. (2022).

4.6.3 The Mediating Role of Knowledge Management Capability

The results revealed that knowledge management positively and significantly mediates the relationship between GSCMP and environmental performance. Consistent with the knowledgebased theory (Gunjal 2019; Zhang et al. 2019), the amount of knowledge a company holds influences how it will apply strategies that affect the company's competitiveness and performance.

A company's knowledge pool allows it to adopt and implement efficient green supply chain practices. The application of GSCMP is done to achieve the full benefits of the strategy. An illinformed GSCP may lead to cost disadvantages, and loss and consequently can adversely affect the performance of the company (Tumpa et al. 2019). Therefore, companies must have sufficient knowledge to effectively implement the GSCMP to achieve environmental performance.

4.7 Conclusion

The chapter presented data and discussion. First, it showed that the majority of the respondents are males and are between the ages of 36 to 45 years. Second, the results showed a strong internal consistency and validity of the data. Third, the empirical results showed that GSCMP drives environmental performance. Moreover, knowledge management positively and significantly relates to environmental performance. In addition, knowledge management mediates the positive relationship between GSCMP and environmental performance.



CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter summarises the findings, concludes and provides some recommendations. It has six (6) sections. Section 5.2 presents a summary of the findings. Section 5.3 concludes the study. Section 5.4 provides contributions to theory and practice. Section 5.5 provides recommendations, and section 5.6 provides recommendations for further studies.

5.2 Summary of Findings

Generally, the study investigates the effect of GSCMP and knowledge management capability on environmental performance. The results are summarised in the next sections according to their specific objectives.

5.2.1 To investigate the Relationship between Green Supply Chain Practices and Environmental Performance

The study investigated the relationship between GSCMP and environmental performance. The results showed that overall GSCMP has a positive and significant relationship with environmental performance. In addition, the results revealed that GSCPP components such as green purchasing, eco-design, customer collaboration and inventory return are positively related to environmental performance. GSCMP recommends manufacturing firms comply with environmental standards, reduce air emissions and consumption of hazardous material, reduce energy consumption, and reduce material by adopting eco-labelling, waste recycling, energy efficiency, customer collaboration on green supply chain, and reducing waste.

5.2.2 To examine the Relationship between Knowledge Management Capability and Environmental Performance

Second, the study examined the relationship between knowledge management capability and environmental performance. The empirical results showed a positive and significant relationship between knowledge management capability and environmental performance. This implies that manufacturing companies' knowledge of firm operations and strategies such as green supply chain practice promote environmental performance.

5.2.3 The Mediation Role of Knowledge Management Capability on the Relationship between Green Supply Chain Practices and Environmental Performance

Finally, the study investigated the mediation role of knowledge management capability on the relationship between green supply chain practices and environmental performance. The results demonstrated that knowledge management capability significantly and positively mediates the relationship between GSCMP (green purchasing, eco-design, inventory return and customer collaboration) and environmental performance. The results imply that manufacturing firms must build their knowledge capability regarding effective GSCMP implementation to achieve high environmental performance.

5.3 Conclusion

Modern manufacturing activities are affected by environmental, social and economic factors. The need to consider the environmental responsibilities in production has produced a new term called

green supply chain management, which requires that manufacturing companies implement sustainable environmental strategies during the production processes. However, the manufacturing company's knowledge capability will determine the effectiveness of the GSCMP in achieving environmental outcomes. This study investigated the relationship between green supply chain management practices and environmental performance and examined the mediation effect of knowledge management in this relationship. In addition, the study examined the direct relationship between knowledge management capability and environmental performance in the context of manufacturing firms in Ghana. The study used a survey method and collected useable data from 200 respondents from the targeted 300 respondents. Applying the PLS-SEM estimator, the results showed that GSCMP drives environmental performance. In addition, knowledge management has a direct positive and significant relationship with environmental performance. The study further revealed that knowledge management capability significantly and positively mediates the relationship between GSCMP and environmental performance.

5.4 Implications to Theory and Practice

5.4.1 Implication of Theory

This study was based on the natural resource-based view theory and the knowledge-based view theory. The theories have been applied in the Ghanaian context and form a new model to explain the relationship between green supply chain management, knowledge management capability and environmental performance among manufacturing companies in Ghana. For the first time in Ghana, this study is the only study to develop a model using knowledge-based theory and

knowledge management capability to explain the relationship between GSCM and environmental performance and therefore has a theoretical contribution in this area for further studies. In addition, the factors of GSCM such as green purchasing, eco-design, customer collaboration and inventory return are found to be critical in modelling knowledge management capability and environmental performance in the context of emerging economies.

5.4.2 Implication to Practice

The study has developed a model for manufacturing companies to adopt and use green supply chain management practices to promote a sustainable environment. Manufacturing firms that will invest in knowledge management capability are likely to adopt efficient GSCMP to achieve environmental performance in the manufacturing sector in Ghana. Moreover, the study confirms that GSMP such as green purchase, eco-design, inventory return and customer collaboration drive knowledge management capability and environmental performance, consistent with previous studies (Appiah et al. 2022. Acquah et al., 2021; Agyabeng-Mensah et al., 2021; Habib et al., 2022).

5.5 Recommendations

The study showed that GSCMP drives environmental performance. Based on these findings, the study recommends that manufacturing firms adopt GSCMP to achieve environmental outcomes. For instance, manufacturing firms can incorporate eco-design in their product development, avoid producing under hazardous circumstances, use eco-friendly processes regarding material selection, transport, and sub-contracting, and produce reusable and recyclable products.

Second, the result showed that knowledge management capability has both direct and indirect effects on environmental performance. Given this, manufacturing companies must invest in

knowledge management. For instance, human resource development, training and information sharing regarding GSCP to achieve higher environmental performance

5.6 Limitations Recommendations for Further Studies

The study has some limitations. First, this study used subjective norms instead of objective measures for the variables. The choice was due to the nature of the study. However, according to studies, subjective norms are as valid as objective values since both measures strongly correlate with each other (Acquaah and Agyapong, 2015). Further studies that use longitudinal data will provide more robust results and enhance their earlier findings.

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Appendices



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GREEN SUPPLY CHAIN MANAGEMENT PRACTICES AND ENVIROMENTAL PERFORMANCE IN MANUFACTURING FIRMS IN GHANA: THE MEDIATING ROLE OF KNOWLEDGE MANAGEMNT CAPABILITY.

Introduction,

Thank you for considering participating in this research that seeks to assess how green supply chain practices affect environmental performance, and whether knowledge management capability affect this relationship in Ghana. While this research is for academic purposes, it also seeks to generate practical insights to help manufacturing firms to improve their production activities in a way that preserve the environment.

For confidentiality reasons, kindly do not indicate your name to us. Only reflect on your personal GSCP and KMC to respond to the statements/questions in the questionnaire. We assure you that your responses will be anonymized and used only for statistical and academic purposes.

The questionnaire has specific instructions to follow and scales to use to indicate your responses. Every statement/question included in the questionnaire is relevant, and although some appear quite similar, they are also unique in many ways, so **kindly do well to respond to each**. The questionnaire will take about **20 minutes** to complete. All questions and concerns about the research can be directed to **Pwadam Claude (Tel: 0248115149)**, a postgraduate researcher leading the fieldwork.

As a token of appreciation for participating in the study, you will receive a summary report of the study's key findings and recommendations. Please provide your email address here (in case you are interested in this package):

Thank you in advance for participating; your cooperation is much appreciated. By continuing, you are consenting to participate.

Yours sincerely

Name

Pwadam Claude 0248115149

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SECTION A

This section presents different scales for evaluating different sets of statements. Using the respective scales, kindly tick/circle a number that represents your opinion on each statement.

Kindly use the following scale to evaluate the statements in the subsequent table:

Extremely Negative	Negative	Somehow Negative	Neither Positive nor Negative	Somehow Positive	Positive	Extremely Positive
1	2	3	4	5	6	7

Please indicate the most appropriate number that describes your business position on the scale. Just give your opinion about your business	<i>Extremely Negative</i>							<i>Extremely Positive</i>
Environmental Performance (Laosirihongthong et al., 2013)								
Our organization improved compliance with environmental standards	1	2	3	4	5	6	7	
Our organization reduces air emissions	1	2	3	4	5	6	7	
Our organization reduces energy consumption	1	2	3	4	5	6	7	
Our organization reduces material usage	1	2	3	4	5	6	7	
Our organization reduces the consumption of hazardous materials	1	2	3	4	5	6	7	

Kindly use the following scale to evaluate the statements in the subsequent tables:

Extremely Negative	Negative	Somehow Negative	Neither Positive nor Negative	Somehow Positive	Positive	Extremely Positive
1	2	3	4	5	6	7

Please indicate the most appropriate number that describes your business position on the scale. Just give your opinion about your business	<i>Extremely Negative</i>							<i>Extremely Positive</i>
Knowledge management capability								
Our organization members use technology to cooperate with other persons inside the organization	1	2	3	4	5	6	7	
Our organization members use technology to search for new knowledge	1	2	3	4	5	6	7	
Our organization members use technology to retrieve knowledge about its products and processes	1	2	3	4	5	6	7	
Our organization members use technology to retrieve knowledge about their markets and competition	1	2	3	4	5	6	7	
Our organization structure facilitates the discovery of new knowledge	1	2	3	4	5	6	7	
Our organization structure facilitates the creation of new knowledge	1	2	3	4	5	6	7	
Our organization has a reward system for sharing knowledge								

Kindly use the following scale to evaluate the statements in the subsequent tables:

Extremely Negative	Negative	Somehow Negative	Neither Positive nor Negative	Somehow Positive	Positive	Extremely Positive
1	2	3	4	5	6	7

Please indicate the most appropriate number that describes your business position on the scale. Just give your opinion about your business	<i>Extremely Negative</i>	<i>Extremely Positive</i>
GSCMP		
Green Purchasing		

Suppliers take back their packaging.	1	2	3	4	5	6	7
Our products are eco-labeled	1	2	3	4	5	6	7
Environmental or safety information of product content using green seals and indicators of relative environmental impact are disclosed.	1	2	3	4	5	6	7
suppliers are audited to evaluate compliance with environmental requirement	1	2	3	4	5	6	7
	1	2	3	4	5	6	7
Eco-design							
Our firm provides waste water recycling	1	2	3	4	5	6	7
Our firm consideration for energy efficient lighting system	1	2	3	4	5	6	7
Our firm makes consideration for materials with high recycled content and low embodied energy	1	2	3	4	5	6	7
Our firm makes provision for the use of prefabricated components	1	2	3	4	5	6	7
Customer Collaboration							
Working with customers to develop a mutual understanding of responsibilities regarding environmental performance	1	2	3	4	5	6	7
Conducting joint planning sessions, workshops and knowledge-sharing activities with suppliers	1	2	3	4	5	6	7
Providing suppliers with written environmental requirements for purchased items	1	2	3	4	5	6	7
Inventory Recovery							
Our company sells excess inventory	1	2	3	4	5	6	7
Our company sells waste and excess fixed assets	1	2	3	4	5	6	7

SECTION B

This section collects profile information about you and your company.

>> Your Gender? ☐ Male

☐ Female

>>Kindly provide your age group. ☐ 18-25 ☐ 26-35 ☐ 36-45 ☐ 46-60 ☐ >60

>> Years of operation ☐ 5 years or less ☐ 6-10 years ☐ 11-15 years ☐ More than 15 years

>>Business sector? ☐ Manufacturing ☐ Commerce ☐ Service ☐ Construction ☐ Others

>> Education ☐ No formal education ☐ High School and Diploma ☐ University graduate ☐ Others

To what extent do you disagree or agree with the following statements?							Strongly disagree	Strongly agree
The questionnaire deals with issues I am very knowledgeable about	1	2	3				5	6 7
The questionnaire deals with issues that I am very interested in	1	2	3	4			5	6 7
I am completely confident about my answers to the questions	1	2	3				5	6 7
I am confident that my answers reflect the organization's situation	1	2	3	4			5	6 7
Minor setbacks tend to irritate me too much	1	2	3				5	6 7
Often, I get irritated at little annoyances				4			5	6 7
There are days when I am "on edge" all of the time	1	2	3	4			5	6 7
I am capable of recalling past events accurately	1	2	3				5	6 7
I am able to present critical details of my past experiences quickly	1	2	3	4			5	6 7
I can give accurate accounts of the most memorable events I had during my childhood days	1	2	3	4			5	6 7

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