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Being green is being competitive
manufacturing supply chain perspective

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Being Green is Being Competitive: Manufacturing Supply Chain Perspective

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Abstract

Lack of clarity and uniformity of the impact of GSCM implementation on performance and the competitiveness of the firm compromises attempts by manufacturing managers to optimise GSCM implementation. Although manufacturing practitioners have adopted green supply chain management implementation over the last three decades, there are concerns about whether these practices are being implemented because they lead to competitiveness and superior performance or by certain driving forces. Investigating the impact of green supply chain implementation on the competitiveness of the firm and achieving superior performance presents a relatively unexplored frontier in supply chain management. This research aims at investigating the key green supply chain management practices being implemented by manufacturing firms, e.g., green purchasing, eco-design, green marketing, investment recovery, customer cooperation, and reverse logistics.

To achieve these objectives, the research questions were addressed by analysing firm-informed data from 375 UK manufacturing companies. To confirm the validity, reliability and fit of the data collected, a rigorous statistical analysis was employed. In order to test the hypotheses linking the four research frameworks, structural equation modelling (SEM) was adopted. The results from the empirical analysis indicated that both internal and external enablers successfully influence manufacturers to adopt and implement GSCM practices. In addition, the findings on the relationship between individual GSCM practices and the triple bottom line came with mixed results. That is, for instance, customer cooperation did not show positive relationship with social, environmental, and economic performance.

This thesis contributes to GSCM knowledge by recognising that management commitment, information and knowledge sharing successfully influence manufacturers to adopt and implement GSCM practices. The research findings also showed that customer pressure successfully influence manufacturing firms to implement GSCM practices especially when the customers are conscious about the environmental impact of the product they buy.

These findings provide useful insight to manufacturers to identify which green initiatives result in maximum performance and competitive advantage. The significance of this recommendation is that, not all GSCM practices result in improved performance and competitive advantage. These findings clearly set out the outcome of GSCM implementation on performance, since individual green practices were linked with individual performance outcomes. For example, green purchasing was found to have positive correlation with social, economic, and environmental performances. In contrast to customer cooperation, eco design was found to have positive relationship with social, economic, and environmental performances in this study. Lastly, these results provide significant information to the manufacturer regarding which green initiatives require more efforts to be implemented in order to ensure positive outcomes.

One key recommendation of this thesis is that environmental collaboration with customers' needs to be strengthened to improve performance, because the empirical results showed negative relationship between customer cooperation and performance outcomes. The reason for this closer collaboration is that suggestion by customers towards environmental protection could help manufacturers plan their production strategies including product packaging and delivery. On managerial level, this study has shown that collaboration between inter and intra firm players through information and knowledge sharing is crucial in enhancing GSCM implementation. For policy makers, this study has confirmed that not only stringent regulations promote green implementation, but also provision of incentives to firms could significantly serve as a motivational factor for GSCM adoption.

Keywords: Green supply chain management; sustainability performance, enablers, competitive advantage; structural equation modelling (SEM), Manufacturing firm.

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Dedication

With all humility and love, I dedicate this project to my wife Mrs Hilda Gyimah for conceiving this idea and my lovely children (Clifford, Raphael, Jude, and Alison), whose abiding love and honest moral support has brought me this far.

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LIST OF ABBREVIATIONS

CFA: Confirmatory Factor Analysis

CC: Customer Cooperation

CE: Critical Enablers

CFI: Comparative Fit Index

CA: Cost Advantage

CDM: Clean Development Mechanism

CMV: Common Method Variance

DA: Dependability Advantage

ED: Eco Design

EFA: Exploratory Factor Analysis

ENV: Environmental Performance

ECO: Economic Performance

EU: European Union

FAME: Financial Analysis Made

FA: Flexibility Advantage

GOF: Goodness-of-Fit

GSCM: Green Supply Chain Management

GD: Green Distribution

GM: Green Marketing

GP: Green Purchasing

IFI: Incremental Fit Index

ISO: International Organisation for Standardisation

IR: Investment Recovery

LCA: Life Cycle Analysis

NFI: Normed Fit Index

NNFI: Non-Normed Fit Index

RMSEA: Root Mean Square Error of Approximation

RL: Reverse Logistics

SC: Supply Chain

SCM: Supply Chain Management

SP: Social Performance

SSCM: Sustainable Supply Chain Management

SPSS: Statistical Package for the Social Science

TBL: Triple Bottom Line

TLI: Tacker Lewis Index

VIF: Variance Inflation Factor

WCED: World Commission on Environment and Development

WEEE: Waste Electrical and Electronic Equipment

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CHAPTER 1: INTRODUCTION

1.1 Introduction

This chapter provides an overview of the research background detailing the motivation or the problem statement of the study in section (1.2), the scope of the study (1.3), the research questions (1.4), the research objectives (1.5), the sectorial perspective of the research (1.6), the significance of the study (1.7), covering academic and practical. Furthermore, this chapter deals with the methodology of the research (1.8), covering philosophical and methodological stances. The final part of this chapter deals with the overall organisation of the research (1.9), and finally the summary of this chapter (1.10).

1.2 Research background

The past four decades have witnessed an unprecedented rise in the development of supply chain management (SCM) literature, due to the significant role SCM plays in manufacturing (Carter and Ellram, 2003: Giunipero et al., 2008). However, the most significant reason attributed to the growth of SCM is the growing concern about the level of environmental degradation regarding waste generation, greenhouse gas emissions, and excessive use of natural resources (Jabbour et al., 2013). Supply chain activities such as production, distribution, and purchasing are connected with ecological problems (Cankaya and Sezen, 2018). Hence, business organisations are being encouraged to employ efficient environmental management strategies to green their operations and the entire supply chain (Walker et al. 2008).

“Creating business and building a better world have symbiotic goals which together are an essential component for long-term success” (William Clay Ford Jr. Executive Chairman, Ford Motors, 2012). Therefore, the supply chain has a vital role in building a better world by minimising environmental pollution (Carter and Rogers, 2008). Greenhouse gas emission, air and water pollution, waste generation and excessive consumption of natural resource are the main driving force underlying the effort of stakeholders, suppliers, and government institutions to demand a proactive process from firms to combat the increasing rate of environmental degradation associated with their supply chain-related activities (Walker et al., 2008). Consequently, many manufacturing firms make environmental management practices an integral part of their strategic planning to ensure sustainability (Montabon et al., 2007; Nath and Ramanathan, 2016).

Moreover, in response to these pressures and demands, manufacturing firms are integrating environmental practices into their traditional supply chain management in order to produce goods and services that are environmentally friendly (Sarkis 2010; Esfahbodi et al. 2016). Due to environmental concerns, firms are integrating green practices into their traditional supply chain to attract and retain more customers. This interest by firms in green practices is mirrored by the growing interest in the environment and climate change by stakeholders and firms' attempt to minimise their impact on the natural environment (Laosirihongthong et al., 2013). To this effect, manufacturing firms have begun to be more proactive in implementing green practices to produce goods and services that emit less toxic waste (Green et al., 2012; Taylor and Taylor, 2013; Esfahbodi, 2016).

Furthermore, manufacturing firms are implementing green initiatives such as green purchasing (Eltayeb and Zailani, 2010), sustainable procurement (Zsidisan and Siferd, 2001; Esfahbodi et al., 2016), sustainable production (Seuring and Gold, 2013) reverse logistics (Laosirihongthong et al., 2013, internal environmental management (Zhu and Sarkis, 2004; Green et al., 2012), sustainable distribution (Esfahbodi et al., 2016) and investment recovery (Zhu and Sarkis, 2007) to bring about sustainability. The successful implementation of these green practices is the responsibility of all supply chain players to work together to achieve the objective of the supply chain management (Green et al., 2012). With competition among supply chain reaching the highest level, it is necessary to identify which green initiative results in competitive advantage and in turn results in superior performance (Green et al., 2008). It is based on this notion that; this study is seeking to investigate the impact of implementing GSCM practices on the triple bottom line and competitive advantage. The study is also seeking to examine whether achieving sustainability performance (social, economic, and environmental) will bring about competitive advantage.

GSCM implementation requires that manufacturing firms work in collaboration with customers and suppliers to promote environmental sustainability, with the intended motive to improve environmental performance through reduction of air pollution, greenhouse gas emission, wastewater, and excessive consumption of natural resources (Green et al., 2012). Despite the growing attention of GSCM practices, there is concern about whether GSCM implementation will lead to superior economic performance and competitive advantage (Zhu and Sarkis, 2004). Ultimately, it is the responsibility of the manufacturing managers to ensure the success of the supply chain activities through taking decisions that support the supply chain (SC) and the organisation, respectively. Green et al (2012) posit that managers must “globalise to localise”. This indicates that the overall success of the supply chain affects the organisation in general (Chopra and Meindl, 2004). Stakeholders, customers, and government agencies are demanding that process, product, and services are free from any toxic substances hence, managers of manufacturing firm must integrate sustainability thinking at each level of the supply chain up to management of end of life of the product (Srivastava, 2007). Previous studies such as Klassen (1993) and Preuss (2002) support the integration of environmental practices into the mainstream supply chain. Handfield et al (1997) argue that environmental sustainability practices must be integrated throughout the entire supply chain to help protect the natural environment. The disputation that being green really pays has been investigated widely, with inconsistency in findings and conclusions (King and Lenox, 2001; Rao and Holt, 2005; Zhu and Sarkis, 2004). Other studies have also questioned whether going green will result in win-win situation or bring about trade-off among social, economic, and environmental performances and competitiveness of the firm (Seuring, 2004). Though, there is extensive literature on GSCM implementation and the impact on performance and competitiveness of the firm, there is still lack of consistency with the findings and lack of clarity with these relationships (Green et al 2012). Again, the influence of critical enablers on GSCM implementation leading to competitiveness of the firm has been under-researched within SCM literature (Dubey et al 2016).

The inconclusive findings of existing literature on the impact of GSCM implementation on firm performance and competitive advantage, and under-researched nature of the impact of critical enablers on GSCM implementation are the gaps that this research is seeking to close. Though this study believes that there is extensive research study investigating GSCM practices, sustainability performance and competitive advantage, many of these studies are in isolation which makes overarching understanding of GSCM and performance related outcomes difficult (Jabbour et al 2015). Furthermore, there is lack of consistency of the results of the impact of GSCM practices on performance related outcomes such as environmental, economic, social, and competitive advantage (Li et al 2006; Green et al 20012; Geng et al 2017). Again, the absence of strong relationship existing between GSCM adoption and improved triple bottom line, has become an obstacle for manufacturing firms to fully rationalise the adoption and implementation of GSCM (Zhu et al., 2012a; Jabbour et al 2015). Study by Zhu et al. (2012b) concludes that, an overarching study on GSCM should analysis the link between individual GSCM practices and individual sustainability performance factors as well as competitive advantage principles to be able to inform practitioners which GSCM practice requires reinforcement in their implementation and those that seek to yield stronger performance outcomes and competitiveness. Azevedo et al (2011) on the other hand, have also posit that previous studies have not strongly considered the impact of individual GSCM or the link between individual green initiatives and performance metrics. In this vain, considering the significance of exploring the relationship between GSCM implementation and sustainability performance of manufacturing firms, and the fact that these relationships must be addressed individually between various GSCM practices, sustainability performance and competitive advantage metrics, the aim of this study is to examine whether there are any relationships prevailing between individual GSCM practices and social, economic, environmental performances as well as competitive advantage metrics (cost, quality, flexibility, dependability). In furtherance, this study intends to close the knowledge gap using empirical evidence from 375 manufacturing firms in UK to ascertain whether it is beneficial to engage in green.

According to Diabat et al (2013) GSCM is new and evolving concept and therefore, with this in mind both small, medium, and large manufacturing firms in UK were selected for this study considering the area of operations. Moreover, according to ONS (2019), UK is one of the most important players economically in EU contributing about (£13billion) to EU budget in 2018. Hence, this study will contribute to GSCM literature by recounting how each GSCM practice can be applied to achieve the maximum environmental, social, and economic performance. It will further explore how each GSCM practice will lead to low-cost advantage, quality advantage, flexibility advantage and dependability advantage. This study argues that despite the growth in research on GSCM, there is the need for empirical investigation to establish the impact of individual GSCM initiatives on the three performance outcomes and competitive advantage taking into consideration the influence of critical enablers on GSCM implementation. Thus, this study intends to address the holistic and integrated nature of GSCM literature, thereby expanding the scope and frontiers of the existing knowledge of GSCM.

1.3 Research scope

After discussing the background of this study, this section deals with the research scope. Considering the research gap identified in the previous section, the aims of this research are put into three categories:

1. Explore the role of critical enablers in influencing implementation of GSCM practices.
2. Investigate the outcomes of GSCM implementation on social, economic, and environmental performance as well as the competitiveness of the firm.
3. Investigate the impact of achieving sustainability performance on competitive advantage.

Generally, this study intends to investigate the influence of critical enablers on adoption and implementation of GSCM practices. Furthermore, the study aims at examining the relationship between individual GSCM practices and social, economic, and environmental performances, then the relationship between these performance outcomes and competitive advantage variables, cost, quality, flexibility, and dependability. Figure 1.1 demonstrates the scope of this study. The purpose is to understand the theoretical linkages between the research constructs, enablers' → GSCM implementation → sustainability performance →competitive advantage.

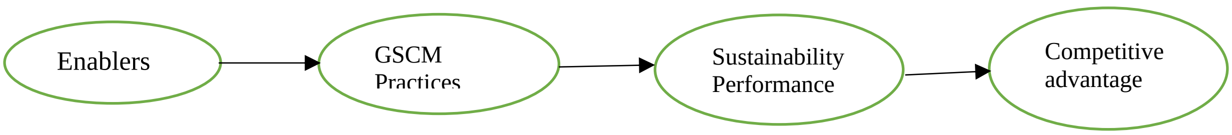


Figure 1.1 Scope of the research

1.4 Research question

Green supply chain management (GSCM) phenomenon has received massive attention in literature, yet there appear to be significant number of inconsistencies with respect to findings and conclusions regarding impact of GSCM practices on performance outcomes and competitiveness of the firms. Based on this, the main questions of this research are framed as follows:

RQ1: Which enablers need to be present to influence implementation of GSCM practices?

RQ2: What impact does implementation of GSCM practice have on social, economic, and environmental performances?

RQ3: What impact does implementation of GSCM have on competitive advantage?

RQ4: What impact does sustainability performance have on competitive advantage?

1.5 Research Objectives

To answer the research questions the following objectives are very vital:

- To identify the essential critical enablers that influence their implementation.
- To explore the significant relationship between enablers and GSCM practices.
- To explore the relationship between GSCM implementation and social, environmental, and economic performances and competitive advantage.
- To explore how achieving social, economic, and environmental performance may lead to competitive advantage.
- To develop validated and reflective scales to measure all the research constructs.
- To conceptualise a comprehensive enablers-GSCM-performance-competitive advantage mode.

1.6 The sectorial perspective of the research

This sub-section deals with the sector (manufacturing) of analysis of this study.

This thesis focuses on analysing the sustainability stance of manufacturing firms in UK. The reason for selecting manufacturing sector is that manufacturing firms play an integral role in UK economy. The manufacturing sector in the UK employs 2.6 million of the total work forces (Zaczkiewicz, 2013) and accounted for £154bn in gross added value (GVA) to the economy in 2011 (ONS, 2012). In addition, UK manufacturing contributed 17.41% to the Gross Domestic

Product (ONS, 2019). Given the significant contributions of the sector to the UK economy, it is crucial that it can address appropriately the environmental challenges that confront the sector (ONS, 2012). Despite these significant contributions of manufacturing sector to the UK economy, there are quite substantial environmental issues associated with their operations. For example, in 2011 the UK emitted 186 MtCO2e, of which 1/3 came from manufacturing sector (Committee on Climate Change, 2012). The table 1.1 below further shows the contribution of the greenhouse gas emission from some selected UK manufacturing subsectors in 2007.

Table 1.1 Greenhouse gas emission from UK manufacturing

Manufacturing sector	**Emission value in %**
Chemicals	19%
Metal and Steel	26%
Food and beverage	6%
Paper	6%
Textile	3%
Motor	3%
Others (Including Electricals and computers, Metallic, Pharmaceuticals)	19%

Sources: Adapted from (Griffen et al., 2016)

The table 1.1 shows that although individually the amount of greenhouse gas emissions contributed by the various firms might be low, when they are aggregated, contribute a large amount to climate change. Furthermore, manufacturing firms are associated with high consumption of materials (Yu and Feng, 2014). The manufacturing sector's contribution to environmental protection is particularly important because manufacturing supply chain is linked with environmental degradation and high energy usage (Zhu and Sarkis, 2004). Again, manufacturing firms have been largely considered major polluters of the environment through their supply chain operations (Inman et al., 2011: Esfahbodi, 2016).

The manufacturing sector was generally selected as a point of discussion to examine whether manufacturing firms are adopting initiatives that restore sustainability to the environment, while at the same time connecting their potential to improve their financial and social performances. Furthermore, manufacturing sector became a target because, previous studies on sustainability supply chain have argued that manufacturing firms cannot be immune from the devastating conditions of the natural environment (Preuss, 2001; Taylor and Taylor, 2013). For these reasons, manufacturing sector is considered as the right sector for this investigation. Generally, manufacturing is a wide sector with different industries, and they approach their supply chain differently. It is therefore important to assess how each industry manages its supply chain and the impacts on the natural environment.

Therefore, in order to generalise the findings of this study to cover a wide spectrum of manufacturing firms, different industries within the sector have been selected, since their collective contributions massively affect the environment negatively (Zhu and Sarkis, 2004: Green et al., 2012). According to Geng et al. (2017), manufacturing firms are characterised by high consumption of raw materials, high consumption of energy, emission of high greenhouse gas, high level of water pollution, and generation of high level of waste. As a result of these features, manufacturing firms have come under intense scrutiny to adopt a more proactive environmental management systems to restore sustainability to the natural environment (Chin et al., 2015).In consequence, a broad-based manufacturing industry have been included in this study such as paper making, food and beverage, chemical, automotive, electrical, and metal**.**

The geographical space of this study is United Kingdom. Manufacturing firms in UK have been engaging in environmental management practices over some time due to their membership of European Union (EU) Esfahbodi, (2016). The selection of UK for this study was informed by the role of UK in EU environmental protocols and the rapid growth of UK manufacturing firms (Taylor and Taylor, 2013; Esfahbodi, 2016). There is consensus that resources are scarce, and for that reason, it is important manufacturing firms in UK apply reasonable amount of circumspection to protect the resources for future generations. Considering the above-mentioned arguments and the fact that UK manufacturing in 2009 was the third largest sector in the economy (ONS, 2018), it is relevant that such study is conducted to access impact of their supply chain activities on the natural environment.

1.7 Significance of the study

This section presents the academic and practical significance of the study.

1.7.1 Academic significance

Extant literature has explored the impact of GSCM implementation on sustainability performance (Zhu and Sarkis, 2004; Rao and Holt, 2005; Green and Iman, 2005; Esty and Winston, 2006; Li et al 2006). However recently published empirical studies have contradicted the outcome of some of the previous studies linking green supply chain management (GSCM) practices with performance outcomes and competitive advantage. Instead, recent studies on impact of GSCM implementation on performance have produced mixed findings (Walker and Jones, 2012). Again, previous studies have failed to consciously investigate GSCM implementation at each level of the traditional supply chain such as purchasing of raw material stage, designing of product stage, production stage, storage stage, marketing stage distribution stage and end of life of the product stage (Zhu and Sarkis, 2004). It is also argued that there is lack of consistency in describing the variables that constitute green supply chain initiatives, leading to researchers using different constructs to represent GSCM practices (Green et al., 2012). Moreover, it is argued that there is lack of clarity and certainty within the current knowledge of GSCM literature due to inconsistency in research findings regarding the impact of GSCM implementation on performance outcomes.

The lack of clarity and consistencies within previous studies have necessitated further empirical investigation into this phenomenon. Furthermore, recent studies have not thoroughly emphasised the role of critical enablers in influencing the successful implementation of GSCM practices by manufacturing firms (Diabet et al., 2015). In addition, current studies have neglected to investigate in an integrated manner the impact of GSCM practices on social, economic, environmental, and competitive advantage at the same time in one study to give a comprehensive overview of GSCM practices and performance model. Hence, the prominent non-appearance of studies investigating the impact of GSCM practices on performance outcomes and competitive advantage while considering the effect of critical enablers encouraged this study to undertake further empirical examination into this phenomenon.

Previous studies have linked GSCM practices to either environmental performance or economic performance or in some instance both (Zhu and Sarkis, 2004; green et al 2012; Esfahbodi, 2016). Generally, the study of GSCM practices with focus on performance and competitiveness of the firm is relatively under researched (Feng et al., 2017), especially among various manufacturing firms. Study such as Esfahbodi et al (2016), explored the impact of SSCM on environment and cost within UK automotive industries, Eltayeb et al (2011) explored the impact of eco design, green purchasing and reverse logistics on environmental, economic, operational and intangible within Malaysia companies , Luthra et al (2016), explored the impact of critical success factors on economic social environmental and operational performance on Indian automobile industries These studies are of great importance as they link sustainability to performance, giving further evidence on this phenomenon. This research makes significant academic contribution to GSCM phenomenon by linking critical enablers towards GSCM implementation, GSCM practices and performance as well as competitive advantage.

1.7.2 Practical significance

Considering the uncertainty and complexity surrounding the GSCM implementation and firm performance outcomes, this thesis offers novel understanding of GSCM agenda. GSCM phenomenon is increasingly expected to support the sustainability commitment within the supply chain management. In this respect, this study provides managers the opportunity to identify which green initiatives generate superior performance and lead to competitive advantage (Nath and Ramanathan, 2016). Moreover, policy makers and government agencies are provided with insight into how manufacturing managers could be motivated to adopt GSCM practices. The ability of manufacturing managers to identify which green initiative promotes competitiveness is significant towards GSCM implementation (Govindan et al. (2015).

Furthermore, this study provides managers the opportunity to effectively organise their green supply chain management relative to allocation of resources to their operations. The study also provides managers with insight as to the link between GSCM implementation, sustainability performance and competitive advantage. This study presents a set of green initiatives to be adopted from both (upstream and downstream) and assesses the impact of each of these green practices on supply chain performances outcomes. In addition, the study provides managers with knowledge and directions regarding integration of green initiatives at each level of the traditional supply chain. Finally, managers could use the GSCM implementation as a benchmark and continuous improvement strategy to manage their environmental management systems.

1.8 Research Methodology

1.8.1 Research purpose and research philosophy

This study is classified as an explanatory research considering the main research variables used to address the research phenomenon, which form the background of the research model. Explanatory research generally is considered useful in addressing research phenomenon investigating; ‘what is happening?’ Or ‘what is the effect?’ and looking to clarify the causal consequences between several research constructs (Bryman and Bell, 2015). This research examines the causal relationships of the four main research constructs: critical enablers, GSCM practices, sustainability performance and competitive advantage. This study adopts a positivist approach based on the deductive logic, which has become a very important perspective within the social science and operations and supply chain management (Saunders et al 2009; Soni and Kodali, 2012; Esfahbodi, 2016). The positivism paradigm is employed in this research because it adopts similar research procedure for empirical investigation as in physical science research. Therefore, this research is underpinned by positivist paradigm with a singular quantitative method.

1.8.2. Research method and research approach

Considering the main research objective of formulating and testing hypotheses of the research constructs, the quantitative method of survey questionnaire was considered appropriate and employed since it helps in empirical investigation of the overall research model. This thesis did not use qualitative method because it was not intention of this project to examine in-depth knowledge of phenomenon (Bryman and Bell, 2015). This study also adopted deductive reasoning strategy that formulates hypotheses existing in extent literature and test them using empirical method (Saunders et al, 2009). Based on this approach, the causal consequences were developed for this study through review of existing literature concerning GSCM phenomenon. Moreover, an internet-informed survey of research constructs was employed to secure relevant information to build data to test the suggested hypotheses in the study. Data obtained from the survey questionnaire was empirically analysed by means of structural equation modelling (Hair et al, 2010). Furthermore, individual hypotheses were tested to establish the causal relationship between various research constructs through AMOS software version 25.

1.9 Organisation of the Research

This thesis is structured into seven chapters. Chapter one (introduction) of the research provides background of the research by identifying the gaps within exiting literature. The chapter goes further to deal with the scope of the research, objective of the research, research questions, the sector of analysis of the research, significance of the research including academic and practical.

This chapter continues and concludes with methodology of the research including research philosophy and research approach.

Chapter two of the research deals with the literature review of the main research framework. This chapter begins with theoretical background of the research and the green dimensions used in this research. The next sub section is supply chain sustainability. This sub section deals with the three dimensions of the sustainability namely, social economic and environment. The chapter continues with theoretical understanding of GSCM practices. The GSCM enablers and GSCM practices used in this study followed subsequently. The last part of the research framework of the research model representing competitive advantage and the link between GSCM implementation and performance outcomes followed the next subsection.

Chapter three expounds the conceptual framework and hypotheses development of the research. This chapter further addresses the theoretical lens of the study by considering the most widely used GSCM theories namely, institutional theory, resource based-view, resource dependency theory and stakeholders' theory. This is followed by hypotheses development with emphasis on the independent and dependent variables and their causal relationships. The main conceptual model of critical enablers → GSCM practices → performance outcomes → competitive advantage was presented.

In Chapter four, the methodology used in this research was presented. This chapter includes presentation of research philosophy, sample frame and sample size determination, measurement items of the various research constructs, method of data collection and ethical consideration. This chapter further discusses the use of questionnaire and the reason of employing primary data collection strategy.

Chapter five (results and analysis) presents the results of the data using structural equation modelling strategy. This includes descriptive analysis of the data, determination of reliability of the data using Cronbach's alpha, confirmatory factor analysis (CFA). This chapter also discusses data quality strategies such as missing data, discriminant validity, and multi-collinearity. This chapter continues with discussion on determination of common method bias, and the measurement scale of the confirmatory analysis results. This chapter is concluded with the results of the structural model that presents the causal relationship between the dependent and independent variables.

In Chapter six (Discussion), the findings of the research are presented. This subsection deals with the outcomes of the individual relationships in the framework. The section also elaborates on the hypothesised relationships in line with what is prevailing in current literature. It also discusses in-depth, the reasons for some of the hypothesised relationships and linked them to previous studies. This sections also discusses the overall findings of the research and linked them to the conceptual framework of this study. In Chapter seven (Conclusion), the overview of the research, including the research objectives and research questions are discussed. The chapter further discussed the significance of the research both theoretical and practical. This chapter was concluded with research limitations and suggestion for future research directions.

1.10 Summary of the chapter

This section provides an overview of the research context, the gap found in the literature, key research questions, scope, main objectives, and the research significance. In addition, the initial conceptual model, the philosophical and methodological stances that were adopted to investigate this model were illustrated. Lastly, the chapter demonstrated the organisation of the study covering the various chapters covered in the research. Overall, the introductory chapter has highlighted the significant gaps in literature that this study is seeking to bridge. It is clear from this chapter that although GSCM practices have received substantial research work, conclusions, and results of whether GSCM implementation leads to competitive advantage and superior firm performance have not been clearly stated and consistent.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter seeks a theoretical understanding of the research phenomenon associated with green supply chain management implementation and the influence of these practices on firm performance and competitive advantage. Chapter Two begins with supply chain management (SCM) looking at the theoretical antecedent (2.2). Section 2.3 provides special focus on the shift of SCM to GSCM. Section 2.4 discusses the sustainable supply chain management. Section 2.5 discusses GSCM practices and how this study selected seven green initiatives. Section 2.6 deals with the key components of supply chain management including eco design, green purchasing, green distribution, green marketing, customer cooperation, investment recovery and reverse logistics. Section 2.7 provides insight into the critical enablers that serve as antecedent of GSCM implementation.

Section 2.8 focuses on GSCM practices used in previous studies. Section 2.9 describes selected performance outcomes as a result of implementing GSCM practices. Section 2.10 describes the overview of triple bottom line approach. Supply chain management performance measures are described in section 2.11. The concept of competitive advantage is provided in section 2.12 and the source of competitive advantage is provided in section 2.13. section 2.14 focuses on measurements of competitive advantage. Section 2.15 describes the link between GSCM and performance outcomes. Section 2.16 completes the chapter with the summary of the chapter content.

2.2 Supply chain management (SCM) theoretical background

Prior to discussing the main research framework that forms the theoretical phenomenon, a concise background discussion of supply chain management, which is the foundation of this research phenomenon will be presented. Supply chain management can be referred to as a combined and interdisciplinary field of study that has evolved over the years (Carter and

Ellram, 2003). According to Van Weele (2010), supply chain represents the technique in which supply procedures are managed and planned. It includes the means by which outward materials planning are processed. In other words, supply chain relates to the procedure where finished products are channelled to a company's end users (Cooper and Ellram, 1993). Supply chain management has been defined severally within extant literature however, this study will resort to those that have been widely used in supply chain (SC) literature. According to Hervani et al. (2005, p 331).

"Supply chain management is the coordination and management of a complex network of activities involved in delivering a finished product to the end- user or customer".

In principle, SCM can be termed as total integration and harmonisation of all business activities and processes with the aim of meeting the needs of the end-users in a more effective and efficient manner (Green et al 2008). These integrated activities and process include information systems, purchasing, manufacturing, marketing, logistics, distribution, and delivery to end-users (Cooper and Ellram, 1993). The definition above was incorporated into this study because it looks at supply chain management holistically and deals with every level of the SC activities, which is hardly available in previous studies. Generally, SCM seeks to counterbalance any shortfalls within the focal organisations activities by concentrating on actions and process by which customers can be better served.

The supply chain management activities include managing the link that exits between various stakeholders such as the focal firm, suppliers, and customers in other to build a strategic alliance for efficiency and cost effectiveness (Croxton et al., 2001). The emphasis on the paradigm of SC activities is based on four functional activates namely, production, purchasing, distribution and finance. All these activities are integrated and either directly or indirectly associated with the stakeholders to ensure efficiency and ultimately bring about success to the entire supply chain (Delfmann and Albers 2000).

Moreover, the overall success of the supply chain is underpinned by the effectiveness and efficiency of managing these integrated activities (Storey et al., 2006). As shown in figure 2.1 the activities of the SC from the perspective of a manufacturing firm puts the manufacturing at the centre of the of the supply chain (Croxton et al., 2006; Esfahbodi, 2016). In this study the term, focal firm refers to the manufacturing firm (Zhu et al., 2010; Esfahbodi, 2016).

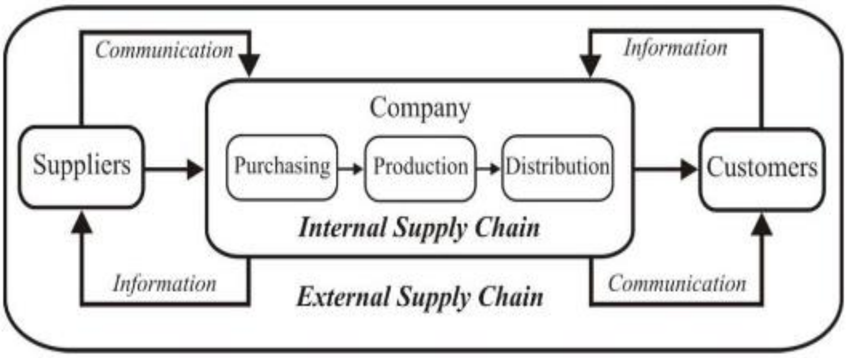


Figure 2.1 Activities of SCM (sources: Adopted from Bratic, 2011)

Referring to figure 2.1, purchasing function refers to procuring inventories that will meet the expectation of the focal firm (Handfield et al 2002). Purchasing function is vital to the manufacturer since efficient purchasing reflects on the firm's bottom line and ultimately leads to competitive advantage (Storey et al., 2006). In addition, it is vital that the purchasing department has an in-depth knowledge of their market niche to spend on product that will meet customer's requirement. The production function on the other hand is responsible for converting raw materials into finished product. This is achieved through combination of men, materials, money, machines, methods, and market with the goal of satisfying the end-user (Slack et al 2010).

The purpose of the production function is to produce goods and service at the right quantity, quality, at the right time with limited cost (Lambert et al., 1998). The distribution function refers to the process of making goods and services available at the right time and right quantity to the end user either directly or indirectly. In other words, distribution function is related to overall material flows to the production point through to storage and to the end user with the finished product (Van Weele, 2010). In order to reduce cost and enhance profitability, distribution function must be tackled in a manner where optimisation of storage space becomes the strategic imperative of the focal firm (Cooper and Ellram, 1993).

Even though supply, chain management concept has received extensive research attention, the shift to green supply chain and its implication on performance and competitiveness of the firm remained under-studied (Geng et al 2017). This is evidenced by the current trend and state of environmental degradation attributed to manufacturing firms. The pressure being brought on manufacturing firms by consumers, regulatory bodies and governments indicates the need for a paradigm shift in manufacturing philosophy. That is, there must be a conscious effort to adopt a fundamental shift in the way manufacturing firms operate (Beamon, 1999). In essence, the area to which this research is seeking to investigate and contribute to existing knowledge.

2.3 The Green shift in supply chain management

Section 2.2 sets the tone for this study by looking at the theoretical foundation of SCM, which is largely the foundation for this study. This section moves on to discuss how the concept of SCM has evolved over the years and shifted its focus to green, thereby giving birth to the concept green supply chain management. Supply chain has traditionally been a process of integrated manufacturing method, where raw materials are transformed into finished product. Considering this description, SCM involves activities associated with manufacturing, beginning with raw material acquisition to final product distribution (Beamon, 1999). However, due to the changing environmental obligations pertaining to manufacturing activities, collective consideration is given to implementing environmental management strategies for the traditional supply chain management. This comprehensive acceptance of environmental strategy into the traditional supply chain incorporates social, economic, and environmental concerns in the operations of the manufacturing firms (Sarkis, 1999; Zhu and

Sarkis, 2004; Carter and Easton, 2011). The sudden change of manufacturing paradigm is attributed to multiplicity of critical enablers that serve as influencing factors for implementing proactive environmental initiatives (Diabet and Govindan, 2011). Figure 2.2 below demonstrates the evolution of the supply chain into green supply chain management (GSCM)

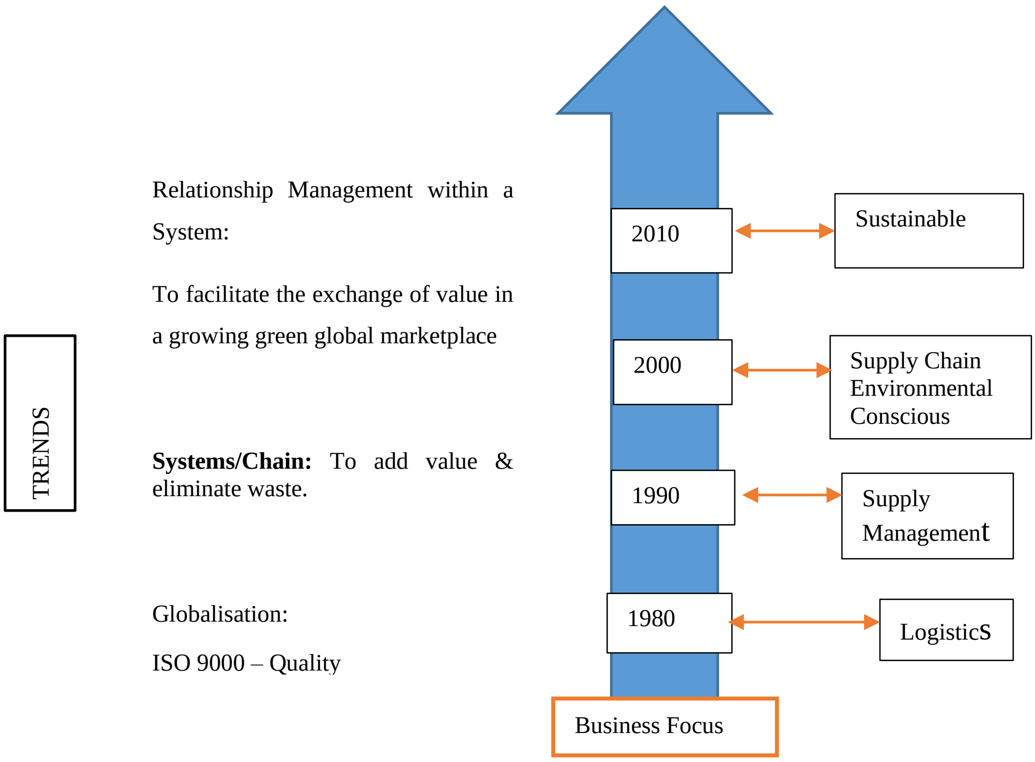


Figure 2.2: Evolution of the supply chain into green supply chain (Adapted from: Gilbert, 2001).

According to Beamon (1999), the concept of environmental quality was not given serious attention by manufacturing firms in United States in the 1980s. However, gradually manufacturing firms in USA came to embrace cleaner air and water in the 1990s. But in recent years the concept of cleaner air and water has evolved to "safe food, no-toxic product, pollution free communities, and safe waste management (Council on environmental Quality, 1996). Simultaneously there has been increasing stakeholder's interest in overall state of the natural environment. This growing interest is largely as a result of media attention and their attribution of environmental degradation to the activities of manufacturing firms (Fiksel, 1996). Manufacturing firms have been perceived to be very unfriendly to the environment through their production process and procedures which directly or indirectly harm the natural environment by way of excessive use of energy, pollution both air and water, ecosystem disturbances and depletion of limited natural resources (Fiksel, 1996)

Indeed, the deplorable state of the natural environment primarily is attributed to manufacturing firms, therefore, the current form and trend of manufacturing operations require a strategic change in manufacturing philosophy (Srivastava, 2007). There must be a conscious effort to move away from the practice of “take, use, and dump”, to a more radical reuse and recycle of materials. The first attempt in achieving this objective is to embrace the extension of the current one-way supply chain structure into a more integrated closed loop, that involves supply chain activities designed to encompass end-of-life product, recovery of packaging, recycling, and remanufacturing (Beamon, 1999).

The current environmental era poses a serious challenge to manufacturing and the entire production enterprise globally. This challenge is to develop strategies for which industrial activities and environmental protection can symbiotically coexist to bring about win-win situation for the environment and the supply chain. (Guide et al., 1997a). In other to achieve this, it is contended that the whole activities of manufacturing supply chain must be redefined to integrate and embrace environmental consciousness associated with minimisation of the use of natural resource (Beamon, 1998). Elkington (1994) intimated that to deal with the issue of environmental degradation, the traditional supply chain must be extended to accommodate the total and overall consideration of environmental impact on product and process.

The idea of embracing the concept of product and product stewardship is that the environmental impact on organisation includes the negative impact on product, process, and the final disposal (Lamming and Hampson, 1996). However, in response to the overwhelming pressure by regulators and customers pertaining to manufacturing operations, firms are generally shifting from traditional method of solving environmental problems to fully integrated environmental strategy to invigorate the sustainability agenda in their supply chain

(Seuring and Muller, 2008). For example, one of the obvious first attempt to integrate environmental objective within the manufacturing supply chain is to choose most environmentally oriented suppliers. Here, the manufacturer impresses upon the supplier to abide by its (manufacturer's) environmental requirements (IGEL, 2012). This control is underpinned by resources dependency theory which is discussed in chapter three in this study. Manufacturing firms who wield power use dominant control to influence their smaller upstream suppliers to accept their environmental policies (Sarkis et al 2011)

There is no doubt that considering the interest and trend in academic work relating to green supply chain management (GSCM), the concept is worth researching into (Sarkis et al., 2010: Green et al., 2012; Esfahbodi et al., 2016). Nevertheless, there are serious impediments in the way of manufacturing firms to wholly embrace GSCM practices including, lack of capital and human resources to undertake various forms of green initiatives (Luthra et al., 2011). Whereas serious efforts have been made by practitioners as well as academics to deal with these barriers, in-depth study into the green initiative is required, (Walker et al., 2008; Govindan et al., 2014), and this is what this research is seeking to achieve by examining the impact of GSCM implementation on competitiveness as well as performance of the firm.

2.4 Sustainable Supply chain management (SSCM)

This section examines the concept of sustainability and discusses the generic principles of sustainable development. Sustainability has attracted much attention among practitioners and academics due to its importance in promoting growth, survival, and development of business (Vinogh and Girubha, 2012; Ahi and Searcy, 2012). The term sustainable supply chain management emanates from the concept of sustainable development and encompasses three generic principles including social, economic, and environmental matters. In the context of this study, the term sustainability performance represents outcomes either positive or negative resulting from GSCM practices implementation. These impacts are not limited to only the effects on the natural environment but include social and economic consequences (Rogers et al., 2008).

Therefore, sustainability in supply chain context is to integrate social, economic, and environmental consciousness into the traditional supply chain. The concept of sustainable development has seen more than 300 definitions after Brundtland definition in 1987 (Dobson, 1996). However, in this study, the generally acceptable definition of sustainable development is adopted. Sustainable development has been defined as "*using resources to meet the needs of the present without compromising the ability of the future generation to meet their own needs"* (World Commission on Environment and development (WCED) 1987). Sustainability, based on the definition by WCED is a complicated and multidimensional issue that develops collaboration of efficiency, inter and intra generational equity on environmental, social, and economic perspectives (Ahi and Searcy, 2015).

Given the necessity for dealing with issues of climate change, biodiversity loss, decreasing natural resources, excessive consumption of energy, sustainability has become a strategic imperative for governments and policy makers (Vinodh and Girubha, 2012). In addition, the concept of sustainability has attracted global attention due to its role in enhancing business growth, survival, and development in global competitive market. One important concept that has helped to propel the operationalisation of sustainability is the concept of triple bottom line approach, where supply chain performance is assessed based on social economic and environmental performances.

Environmental sustainability is the approach where SC decisions are taken with the focus on reducing the negative impact of production activities on the natural environment (Blewitt, 2015). In other words, environmental sustainability activity is driven by the desire to protect the environment using renewable energy, reduction of energy consumption, reduction in waste generation and reduction of greenhouse gas emission. This approach is engineered towards preserving the natural resources to enable future generations to meet their needs (Ahi and Searcy, 2015). Environmental performance in the context of supply chain (SC) is linked with the process of ensuring limited use of natural resources, pollution reduction, prevention of emissions and biodiversity (Carter and Rogers, 2008).

In addition, social performance pertains to the ethical and social values embedded in a focal company's operations. It focuses on enhancing a company's product and image in a positive light in the eyes of the general public through their social responsibility credentials. Social sustainability is measured in a large extent by the ability of a company to seek its employee's health and safety and promote customer loyalty and satisfaction (Zailani et al., 2012b; Ashby et al., 2012). Social sustainability is very crucial for the growth of every organisation because it directly affects the welfare of external stakeholders of the company as well as the internal employees (Gimenez et al., 2012). Engaging in social sustainability by a firm helps to enhance its image and increase customer loyalty thereby promoting its social performance (Mani et al 2015). In effect, social sustainability in SC in a broader extent measures health and safety, wages, and labour right, education, and housing needs (Geng et al., 2017).

Economic sustainability is all about how the focal firm functions in other to be profitable. In other words, economic sustainability relates to the ability of the firm to cut its operational cost using environmentally friendly strategies with no trade-offs with other performance outcomes (Rogers et al., 2007). Thus, economic sustainability involves operational strategies that ensures maximisation of the limited resources available to the firm in a manner that brings prosperity to the firm while conserving the environment and protecting the safety and wellbeing of the external stakeholders and internal employees. In effect, economic sustainability ascribes the firm's ability to maintain long-term profitability (Esfahbodi, 2016, p 54). Consequently, sustainability performance in this study is described as the summation of environmental, economic, and social performances.

Many studies examining sustainability performance outcomes either discuss economic sustainability or environmental sustainability. In some cases, literature focuses both economic and environmental sustainability outcomes (Geng et al., 2017). Social performance outcome has not received equal level of research attention as other two performance outcomes. This study distinguishes from previous studies that have examined performance outcomes as a result of implementing GSCM initiatives. In this sense, this research seeks to examine the impact of individual green supply chain management practices on social, economic, and environmental performance at the same time. Figure 2.3 below describes the sustainability performance principles comprising social, economic, and environmental performance, which otherwise is termed triple bottom line (Geng et al., 2017)

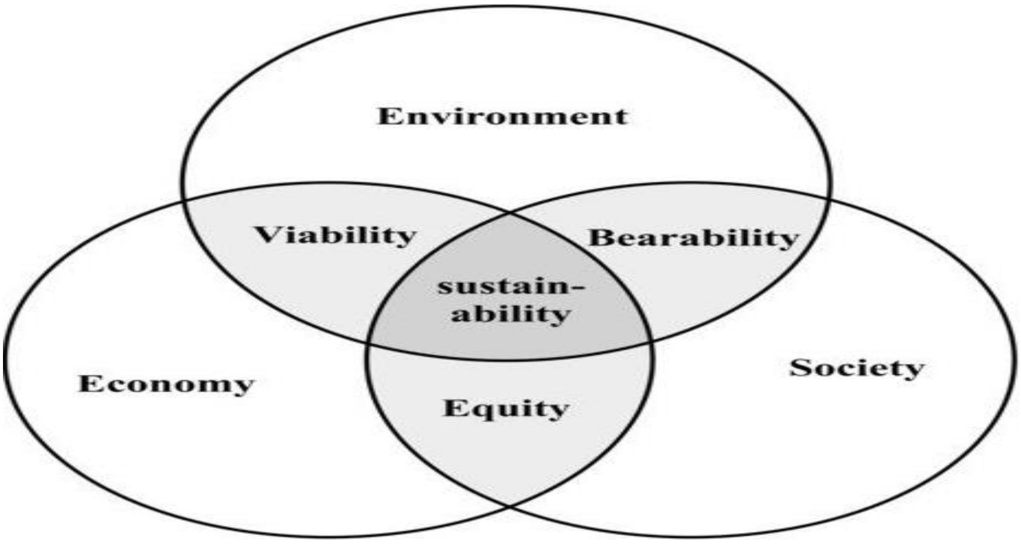


Figure 2.3 conceptualisation of sustainability performance (Carter and Rogers, 2008)

This study embraced this conceptualisation because it forms the foundations for the study of sustainable development pertaining to supply chain management (SCM). The conceptualisation considers the overlapping between social, environmental, and economic dimensions, which falls in line with the concept of triple bottom line espoused by Elkington (1998, 2004). The extremely critical part of this model is the intersection between social, environmental, and economic which otherwise represents “sustainability” in the general sense of supply chain (Elkington, 2004).

Based on figure 2.3, the intersection between social and environmental is termed "bearability", which does not take into consideration economic dimension. It has been proposed that for a manufacturing firm to reduce consumption of energy, it is prudent to shut down production plant that is not in use (Colby et al (1995). It is contended that manufacturing firms should approach social and environmental initiatives with general consideration of financial implications (Rogers et al., 2007). That is, firms must approach environmental and social initiatives in a more equitable manner such that financial performance is not affected negatively. According to Porter and Linde (1995), implementation of social and environmental initiatives can lead to long-term financial enhancement. In effect, the intersection of these three generic principles and their subsections collectively forms sustainability. Therefore, it is argued that the interplay of these principles seeks to achieve sustainability within the supply chain context. Consequently, the interplay between bearability, viability, and equity results in win-win situation for social, environmental, and economic dimensions (Zhu et al., 2013).

Furthermore, it has been argued that social dimension of the sustainability development in relation to GSCM lacks in-depth discussion because of complication of its measurement and conceptualisation (Pagell and Wu, 2009). As a result of lack of equitable research on the social dimension of sustainability, this study focuses on social, economic, and environmental dimensions of sustainability in order to bring equity in sustainability literature. This approach is consistent with Eltayeb et al (2011) and Geng et al (2017) who examined impact of GSCM implementation on social, economic, and environmental performances.

2.5 Green Supply Chain Management (GSCM)

The concept of green supply chain management (GSCM) has received substantial review over the last four decades due to the importance of the concept in managing the natural environment (Canioto et al., 2011; Diabat et al., 2014). In addition, the recent rise in GSCM implementation by practitioners is due to the various enablers influencing their adoption and implementation such as management commitment to sustainability issues, sharing of regular information pertaining to environmental protection among departments, customer pressure on manufacturing firms and government regulations (Grzybowska, 2012).

The rising development of GSCM is underpinned by the rapid deterioration of the natural environment, which in many cases have been attributed to manufacturing firms, e.g., increase use of natural resource, overflowing of waste, increase in pollution of air and water (Srivastava, 2007). GSCM implementation is not limited to environmental protection but serves as a good business driver that yields financial benefit rather than cost centre (Wilkerson, 2005). Moreover, government regulation, customer pressure management commitment ISO 14001-certification serve as GSCM enablers, hence, the prospect of GSCM has shifted from reactive approach of environmental management systems to a more proactive initiatives implementation (Zhang et al., 1997). Furthermore, GSCM implementation may enhance the competitiveness of the focal firm through the impact on cost, quality, flexibility, and dependability (Lopez-Gamero and Molina-Azorine, 2015). In recent times, more and more consumers and buyers are demanding from manufacturing firms to produce products that contain no hazardous substance and consume less energy in order to reduce the effect of the final product on the environment (Chiou et al 2011). According to Bowen et al (2001), the main driving force for implementing GSCM practices lies in the eyes of financial benefit. However, Zhu and Sarkis (2004) and Luzzini et al (2015) believe that for GSCM practices to improve performance and enhance competitiveness of the firm, it must be operationalised across every stage of the traditional supply chain. Therefore, the focus of GSCM practice is to differentiate a company's product from competitors, improve quality and reduce cost while maintaining the sustainability of the natural environment (Shrivastava, 1995). Conceptually, GSCM encompasses human activities that consider application of technology, process, and product with substantial impact on environment and human beings (Subramania and Gunasekaran, 2015). Generally, GSCM involves suppliers' selection based on environmental consideration, such as reduction in greenhouse gas emission, ISO certification and environmental management strategies in their production and distribution.

GSCM also involves increased in health and safety of employees at work, equal prospect for social justice, and reduction of toxic substance in product and process (Canioto et al., 2012; Kuehne and Mclntre, 2014). Many terminologies have been used to describe GSCM, e.g., Seuring and Muller (2008) used sustainability supply chain and cleaner SCM, Subraimanian and Gunasekaran, (2015) used environmental management practices, Montabo et al (2007), Jabbour et al (2015),used environmental SC and socially responsible management (Hoejmose et al., 2013).

With the growing level of research pertaining to GSCM, many scholars have come up with their own definition of the concept. Since the concept is new and lies in the middle of supply chain management and environmental strategy, it is not surprising that different definitions exist in GSCM literature (Seuring and Muller, 2008). According to Ahi and Searcy (2013), there are over 22 definitions for GSCM and 12 definitions for sustainable supply chain management. This study will apply the most widely used definition of GSCM existing in current literature. According to Handfield et al., (1997), green supply chain management is "application of environmental management ideologies to the overall activities across the whole customer order cycle, involving, design, procurement, manufacturing and assembly, packaging, logistics, and distribution".

Srivastava (2007) describes GSCM as "integration of environmental thinking into supply chain management, including product design, material sourcing and selection, manufacturing, processes, delivery of the final product to the consumers as well as end-of-life management of the product after its useful life".

Penfield (2008) defines GSCM as “the process of using environmentally friendly inputs and transforming these inputs through change agents whose by-products can improve or be recycled within the existing environment”. This process develops outputs that can be reclaimed and reused at the end of their life cycle thus, creating a sustainable supply chain. Sarkis et al., (2012) defines GSCM as “integrating environmental concerns into the inter-organisational practices of SCM including reverse logistics”. Andic et al., (2012) define GSCM as “minimizing and preferably eliminating the negative effects of the supply chain on the environment”.

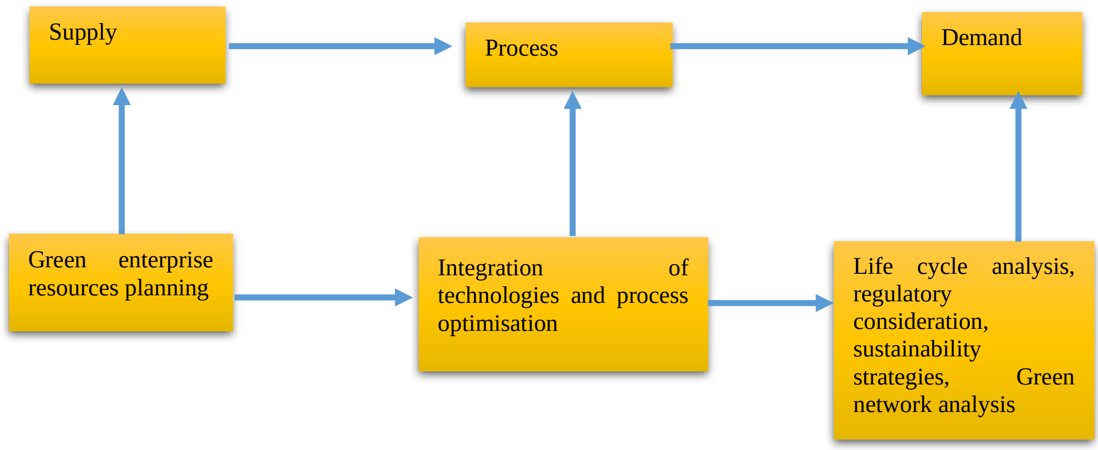


Figure 2.4 definition of green supply chain management Sources (Adapted from Lam et al 2015)

According to Lam et al (2015), the traditional supply chain management (SCM) interest and technique have been prolonged with several green technologies to involve:

- Integration of green technologies
- Green network analysis and synthesis
- Life cycle analysis (LCA)
- Green enterprise resources planning
- Regulatory consideration and sustainability strategies

Based on figure 2.4 above it is seen that green supply chain involves the planning stage through to process and production stage to the afterlife of the product. That is, GSCM is a determined approach across the supply chain, and it is more than protecting the natural ecology, but instead a comprehensive approach for ensuring total environmental and business performance (Zhu et al., 2007).

2.6 Key component of green supply chain management (GSCM)

The literature review of previous papers has confirmed that authors have used GSCM practices based on their role along the supply chain (Geng et al., 2017). For example, Rao (2006), only focused on green purchasing, Murphy and Poist (2003) used only green logistics, Beamon (1999) focused only on reverse logistics, Carter and Carter (1998) examined only green purchasing, Hervani, Helms and Sarkis (2005) focused on Green design, green procurement, green distribution, and reverse logistics, Zhu, Sarkis & Lai (2007) used Green purchasing, eco-design and customer cooperation, Bowen et al. (2001a,b) focused on Green purchasing, supplier environmental collaboration. The above multidimensional use of GSCM practices indicates that there is wide array of green practices that can be implemented. This has invariably resulted in inconsistencies and disagreement among scholars what constitute green supply chain management practices (Eltayeb and Zailani, 2009). However, in order to reach a consensus, many authors are adopting the guidelines developed by Zhu, Sarkis and Geng (2005). According to Eltayeb and Zailani (2009) 25 papers out of 50 reviewed papers that examined GSCM practices used the guidelines of Zhu, Sarkis and Geng (2005). This guideline by Zhu et al (2005) is that GSCM practices were categorised into internal environmental management, external GSCM including green purchasing and corporation with customers, including environmental requirement, investment recovery and eco design practices when they examined Chinese manufacturing firm’s GSCM: pressures, practices, and performance. Accordingly, this study used Zhu et al (2005) as a guideline which happens to be the most cited literature on the implementation of GSCM practices. However, in this study in order to reflect on the manufacturing firms' direct and indirect appreciation of different resources and their voluntary implementation of GSCM practices, this study classified GSCM practices into seven categories. This procedure is similar to Geng et al (2017), where although they adopted Zhu et al (2005) guideline, they went further to reflect the "focal companies" direct participation by investigating different resources as well as to have deeper understanding of the voluntary adoption of GSCM practices. Therefore, in this study, in order to reflect on the manufacturing firms' direct and indirect participation and examine their different resources to better appreciate their voluntary attitude towards GSCM implementation, this study categorised GSCM initiatives into seven. This practice helps to extend the previous knowledge of GSCM literature by going a step further to examine not only the most widely used GSCM initiatives, but to include those that are not widely used such as green marketing. This distinguishes this study from all previous studies examining GSCM implementation by combining less widely used GSCM initiative and more widely used GSCM initiative in one study namely.

(1) Eco design
(2) Green purchasing
(3) Investment recovery
(4) Green distribution
(5) Green marketing
(6) Customer cooperation
(7) Reverse logistics.

The major components of GSCM initiatives used in this study are explained below.

2.6.1 Green purchasing

Green purchasing (GP) is any environmentally motivated purchasing practice that prioritises reduction of hazardous substance in purchased materials, considers recycling and reuse of materials, and reduction of use of raw materials (Eltayeb and Zailani, 2010). In other words, green purchasing involves purchasing activities that influence suppliers, sub-suppliers, and manufacturers to produce raw materials and products that are environmentally friendly and do not impact the natural environment negatively. In essence, green purchasing is the practice where items are bought with desirable environmental features including recyclability, re-usability, less energy consumption, and non- hazardous substance (Handfield et al., 2002; Luthra et al., 2016). The increasing concern about environmental issues have encouraged manufacturers to re-evaluate their purchasing strategy to integrate environmental consciousness in their supply chain (Min and Galle, 2001; Hu and Hsu, 2010; Govindan et al., 2015). According to EU commission (2016), Government expenditure on goods and services amounts to 14% of EU GDP, accounting for approximately EUR 18 trillion yearly. By applying their purchasing strategies to select goods and services with a minimal environmental impact, an important contribution is made towards sustainability agenda. Hence, green purchasing can serve as a major boast towards innovation, providing industry with actual incentives for manufacturing green products and services (EU Commission, 2016)

This process encourages firms to deal with their existing purchasing strategy to tackle ecological concerns that may arise during purchasing activities. Within the supply chain network, green purchasing is always found in-between the focal company and the supplier (Eltayeb and Zailani, 2010). This enables the two partners of the supply chain to design a strategy that helps to produce raw materials and product that have positive environmental impact (Carter and Carter, 1998). This collaboration between focal firm and suppliers encourages good relationship leading to implementing environmentally friendly initiatives (Paulrag et al., 2008). Notably, focal firms must declare their environmental objectives to the suppliers so that they will produce raw materials that conforms to the environmental requirements of the focal firm, which is to minimise negative environmental effect (Cartel et al., 1998). The environmental objectives of a manufacturing firm in dealing with suppliers may include ISO 14001 certification of suppliers, environmental auditing of suppliers, and supplier's database (Klassen, 2008). According to Hamner (2006) green purchasing, consists of seven activities including:

- Product content requirement: This is the process where focal firms make it clear to suppliers that purchased materials and products must possess green attributes, e.g., reuse and recycle of materials.
- Product content restriction: This is a process where manufacturers specify to suppliers that materials and products must not contain any form of hazardous substance such as lead and plastic foams.
- Product content disclosure or labelling: This is the process where manufacturing firms demand from suppliers environmental and safety attributes. These disclosures were to be made clear for customers to read and understand.
- Supplier questionnaires: this is a process where manufacturing firms demand suppliers through questionnaire to provide their own environmental objectives and activities.
- Supplier environmental management systems: this is a strategy where manufacturing firms demand from suppliers to develop environmental management systems (EMS).
- Suppliers' certification: This is where manufacturing firms require suppliers to have environmental management systems (EMS) that fully follow and meet international standards such as ISO 14001 certification from the international organisation for standardisation (ISO).
- Supplier compliance auditing: This is the stage where the focal firm audits suppliers to regulate the extent of their environmental position.

Apart from these requirements expected from suppliers for green purchasing, manufacturing firms and other supply chain players engage in green procurement due to certain drivers. According to Dubey et al (2013) and Yang and Zhang (2012), these drivers for green purchasing implementation are:

- market pressure
- regulatory pressure
- Social responsibility
- quality management

Similarly, International Institute for Sustainable Development (2013) has also outlined certain requirements needed to be followed when engaging in green purchasing. These requirements include:

- Organizational support: Implementing a green procurement program requires that the focal firm and its supply chain partners adopt novel policies and procedures. This means that for green purchasing strategy to be successful it demands the total commitment and support of management.
- Self-assessment: One major first step to take towards implementing green purchasing is to assess the current purchasing practices of the focal company. In this way, it becomes easy to clarify what is purchased, in what amounts, from what sources and the price. This assessment serves as the starting point, to measure future achievement.

These activities when properly harmonise result in environmentally sound purchasing. This green initiative was included in this study because, the decision to buy raw materials for production plays greater role in dealing with environmentally related purchasing function (Hammer, 2006). The focus of this research is to integrate environmentally related activities to every level of the supply chain function and purchasing function is one major stage of the supply chain (Green et al 2012).

2.6.2 Eco design

Eco design refers to the process where manufacturers design products with the aim to reduce environmental impact such as minimisation of materials consumption, less use of energy, recycle of materials, reuse of materials and avoidance of hazardous substance (Zhu et al., 2008a). The environmental impact of any product is determined at the design stage where the features of the product are developed and incorporated in the production process (Green et al 2012). Eco-design (ED) is the process of integrating environmental attributes in the development and designing stage of the final product (Eltayeb et al, 2011). Thus, this is the stage where a decision is taken during product development stage aim at minimising negative environmental impact of the product during its life cycle (Zhu and Sarkis 2004).

This stage is unique and essential, since environmental impact of the total life cycle of the product is defined by the decision taking at this stage (Handfield et al., 2001). This is the phase of the SCM where the amount of chemical and other toxic materials that must be incorporated in the product is determined. This decision also comprises the energy that is required to produce them and the amount of energy which will be consumed by the final product (Eltayeb et al., 2011). The contribution of eco design, also known as design for environment (DfE) towards sustainability of the manufacturing has escalated during the last three decades (Sanyé-Mengual et al., 2015). Designing a product plays a critical role and forms an integral part of the product life cycle and the impact on the natural environment. It is estimated that about 80% of environmental impact of the product is determined at this stage (Tischner et al. 2000). Many institutions and governments such as EU have instituted directives on eco design e.g., Energy-used product (EuPs) contained in EU directive 2005/32/EC is focused on auditing manufacturing firm’s environmental management systems (European Council 1996). The main motivation of such Directive is to reduce energy consumption and promote product efficiency and stimulate saving of energy (European Council 2009). The activities of eco design vary from company to company and product to product. However, generally, Eltayeb et al (2011) developed activities that must be incorporated in eco design:

- Design product to reduce environmentally hazardous materials including led, mercury chromium and cadmium.
- Design product for recycling: design product that encourages reuse of the product or any part without less treatment of the used product.
- Design for remanufacturing: This is a design process that ensures repair, rework, and refurbishment actions which focusing on restoring new life into the product.
- Design for efficient use of resource including excess use of materials and energy use. Design stage also encourages the use of renewable resources and energy.

Based on the above activities, eco design provides significant benefit to manufacturing firms in the perspective of environmental, economic, and social (Boks 2006, Borchardt et al. 2011, Brezet and van Hemel 2007, Clarimón et al. 2009). Moreover, eco design implementation strategies promote adoption of environmental management systems with the focus to protect the natural environment (Knight and Jenkins 2008). Furthermore, eco design contributes to the enactment of global sustainability frameworks such as ISO 14006. This framework ensures efficient production systems which in turn contributes to reduction in cost of production through less demand for raw materials and energy (Sanyé-Mengual et al., 2015). Eco design gives opportunity to manufacturing firms to differentiate their operations from competitors thereby paving the way for them to enter a new market as a result of expansion (Van and Cramer, 2002). Finally, eco design implementation enhances the image of the product especially when the environmental features are incorporated in the design (Eltayeb et al., 2011). Other studies such as (Cser and István 1996; Seliger et al. 1999, Oyasato et al. 2001; Hoffmann et al 2001; Borchardt et al. 2011, Okumura et al. 2011, Pigosso et al. 2010) developed activities that must be incorporated in eco design implementation.

- Design for remanufacture: This is where existing products are re-designed to extend their life span.
- Design for disassembly: This process is expected to.
- the lifecycle of the product through substitution and reparation
- Design for recycling: Enhances the product recyclability by avoiding end-of-life treatments with higher impact.

In effect, eco design is a major component of GSCM initiatives which, to a large extent promotes sustainability development and encourages growth.

2.6.3 Investment recovery

Investment recovery is described as a business practice where unused materials or excess inventories are reused or sold to extend their life cycle. This practice involves the sale of surplus inventories, scrap, and surplus capital equipment (Zhu et al., 2008a). The key objective of investment recovery is to obtain the highest value possible from obsolete materials (Ayres et al., 1997). In order words, investment recovery is utilisation of abandoned materials in order to put value and perpetuate their life span (Cankaya and Sezen, 2019). Investment recovery (IR) according to Aslam et al (2019) is one of the most un-explored green initiatives in GSCM literature.

It represents the traditional business strategy of selling and disposing of materials and inventories that have otherwise become obsolete. In order to reap maximum value, excess materials, and excess inventories, are either sold or reused instead of taking them to the landfills (Susanty et al., 2018; Aslam et al., 2019). In an organisation where sustainability is strategic imperative, managers very often integrate excess inventories and scrap into reverse logistics activities to recover some value from them (Yildiz et al., 2019). Due to pressure on manufacturing firms to reduce impact of their operations on the natural environment especially through waste disposal and the fact that firms face increasing financial obligation in waste disposal, investment recovery through remanufacturing, resale and recycling have become a business imperative (Aslam et al., 2019). Investment recovery as a green initiative was selected in this study because, the main objective of manufacturing firms engaging GSCM practices is to cut cost and enhance profitability. Therefore, any activity that seeks to reduce cost of operation such as reduction in waste generation, and high cost of waste disposal is seen as very pertinent to the firm's operation strategy (Aslam et al 20190). According to EPIQ (2019), there are several important requirements for effective implementation of investment recovery activity. These include.

- Identification of Idle Assets: one major step in implementing investment recovery is to identify assets that are lying idle. Very often substantial amount of cost is associated with keeping idle assets, and in order to avoid such cost is to send it to where they would much be optimised. In addition, unused assets or inventory depreciate in real value and results in losing the actual value of the item.
- Asset redeployment: This is a process where assets are sent to other part of the organisation or to other organisation where their actual use could be optimised. In situation where the assets are of no use in the organisation internally new organisation could be identified where the assets could be of significant use.
- Asset divestment: In the case where an excess inventory or assets cannot be redeployed to any other department of the organisation, the best option is to immediately sell, scrap it or recycled it to add value to it**.**

2.6.4 Green distribution

Green distribution (GD) is described as the process where goods and services move from the point of production to the final point of consumption with the aim to reduce the negative impact on the natural environment (Chin et al., 2015). It highlights optimisation of storage space to ensure efficiency, minimization of damages caused to the product in transit and to the environment (Vachon, 2007). Green distribution mainly entails storage of finished goods, warehousing, packaging, labelling and delivery to the final user. The key component and factors in distribution are means of transportation, fuel, and infrastructure in transportation. The main focus of green distribution is to incorporate environmental practices into the traditional distribution process with the aim to: (1) economise packaging, (2) use environmentally friendly packaging materials, (3) encourage recycling and reuse of materials, (4) enhance the adoption of returnable packaging materials (5) reduce material time to pack and unpack finished goods (Ninlawan et al., 2010).

Generally, green distribution activities include packaging and logistics (Ninlawan et al., 2010). The packaging activity feature includes size, shape and materials used, and their direct effects on the overall distribution method of the product and the environment (Emmet and Sood, 2010). The activity of packaging involves rearranging the goods to ensure optimisation of loading space which in turn helps to reduce the number of trips that vehicles move to deliver goods and saves warehouse space (Esfahbodi, 2016). The logistics aspect of green distribution refers to integrated activities required to transport goods and services through the supply chain with the aim of distributing goods in a more environmentally friendly manner (Sbihi and Eglese, 2010; Eltayeb et al., 2016).

When addressing issues about logistics in green distribution, certain vital considerations must be identified. These include warehousing, distribution system, direct shipping or central distribution centres and the use of third party. It is argued that efficient integration of these decisions helps to save logistics cost and improve the relationship with customers while mitigating environmental problems. In addition, decisions such as direct route to place of consumption, reducing the mileage of transporting goods, optimisation of loading space, full loading criteria and less handling promote green distribution (Grant et al., 2013). Generally, all these activities are targeted to influence operations, economic and environmental performance of the supply chain. However, to achieve the objective of green distribution requires the cooperation of customers regarding designing of the packaging and use of less fuel or alternative fuel for transportation of goods and services (Luthra et al., 2016).

2.6.5 Customer cooperation

One key component of GSCM initiatives is customer cooperation (CC). Closer cooperation with customer for ecological design of product has a wide range of advantages (Zhu et al., 2010). Firstly, it provides for reduction of service costs. This is possible because it is cheaper to retain old customers than to attract new ones (Ratajczak-Mrozek and Malys, 2012). Secondly, closer customer cooperation allows customers to be involved in product conception and development process, thereby allowing them to suggest their preferences as far as the functionality of the product is concerned. In this case, customers can identify the feature of the product that can have negative impact on the environment (Hollensen, 2003).

Customer cooperation can also foster closer relationship that results in customer loyalty. Although this benefit is not causally linked with environmental improvement, it can enhance the reputation and the image of the focal firm. (Hollensen, 2003). Furthermore, customer cooperation can lead to cleaner production (Zhu et al., 2010). This approach brings customers to contribute their opinion during production process and make suggestion concerning the size of product, packaging of the product and more importantly the content of hazardous substance in the product. This action contributes to designing a product that has less harmful effect on the environment (Ratajczak-Mrozek and Malys, 2012)

2.6.6 Reverse logistics

Reverse logistics (RL) is defined as the process of taking back products and materials from the point of consumption or end user to the production or manufacturing point, for the purpose of reuse, remanufacturing, and recycling (Carter and Ellram, 1998; Alvarez-Gil et al., 2007; Eltayeb et al., 2011). Reverse logistics includes management of inventory and transport where goods and services are taken from the point of consumption to the point of production (Golssby and Stank, 2000; Mollenkopf and Closs; 2005; Eltayeb et al., 2011). According to Beamon (1999), used product or product at the end of its life may be returned to the forward supply chain based on three key major purposes.

- For reuse: This is the method where products are collected for reuse without enhancing the original value. Here the value of the product is not enhanced through additional processing.
- Remanufacturing: This is the method where used product is collected and part of the product which is identified as defective is replaced in order to refurbish the product and prolong its life cycle.
- Recycling: This process involves collecting of product, and assembling them based on material category, for the purpose of reprocessing them into materials component parts or recycled product. In this process, the original function of the product may be changed.

In essence, reverse logistics is a set of integrated logistics activities with the focus to rehabilitate, recycle, reuse, and remanufacture products that could be used once again either in the same form and functionality or different form and functionality (Kim et al 2006; Eltayeb et al., 2011).

2.6.7 Green marketing

Green marketing (GM) initiative is the process by which manufacturers publicise their product with environmental features (Polonsky, 1994; Luthra et al., 2016). Green marketing encompasses activities that are to meet human requirements with no negative effects on the natural environment (Singh and Pandy, 2012). Issues about environmental degradation have attracted enormous attention among governments and business globally. Due to this concern, manufacturing firms are employing various strategies to proactively tackle the day-to-day deterioration of the natural environment (Polonsky, 1994). Consequently, manufacturing firms have employed green marketing strategy to promote their product by declaring the environmental attributes, process, and functionality of the product. According to Luthra et al (2016) green marketing encompasses practices that are used to stimulate and publicise product's main environmental features.

Green marketing approach involves traditional marketing mix including product, price, promotion, and place (Polonsky, 1994). Many scholars have given different descriptions of green marketing focusing on key components of green marketing. According to Chaudhary et al (2011), green marketing entails various business activities targeted at satisfying customers' needs as well as reducing the negative effects on the natural environment. Green marketing also involves organisational activities that promote product with ecological concerns (Sarkar, 2012). According to Peattie and Charter (2003), green marketing includes overall promotional strategies which highlight environmental ethics as business imperative which in effect generate competitive advantage. Green marketing initiatives may improve business profitability, competitiveness, and enhances corporate image of the firm if it is adopted as business imperative (Ko et al, 2013). Seven GSCM practices used in this study were sourced from different studies where they have been used in isolation and validated through empirical analysis. In this regard, this study did not develop new measurement items for the green constructs, since they have already been validated and reviewed in previous studies. Table 2.1 below detailed the frequency at which these green practices have appeared in previous studies with their associated performance outcomes. Generally, the seven green practices used in this study were selected because they appeared to have been used extensively and have been measured and validated.

Table 2.1 GSCM practices used in previous studies and associated performance outcomes.

Authors	GSCM practices	Performance outcomes
Zhu and Sarkis (2004)	Internal environmental management, External GSCM practices, Investment recovery, Eco-design	Environmental performance, Positive economic performance, Negative economic performance.
Klassen and McLaughlin (1996)	Environmental Management, Functional strategies	Environmental performance, Economic performance
Zhu et al (2010)	Internal environmental management, green purchasing, Customer cooperation with environmental moderation, Eco-design, Investment recovery.	Environmental performance, financial performance,
Luthra et al (2016)	Green design, green purchasing, green production, green management, green marketing, green logistics	Economic performance, social performance, environmental performance, operational performance.
Wang et al (2015)	Lean, Green, Social responsibility	Social, Economic, Environmental.
Vachon and Klassen	Environmental collaboration	Environmental performance, quality, cost, dependability
Geng et al (2017)	Intra-organisational management, supplier integration, Eco-design, Reverse logistics	Economic performance, environmental performance, social performance, operational performance.
Jabbour et al (2015)	Internal environmental management, green purchasing, Eco-design, environmental cooperation with customers	Environmental performance, Economic performance Operational performance.
Esfahbodi et al (2016)	Sustainable procurement, sustainable distribution, sustainable design, Investment recovery	Environmental performance, cost performance.

Azevedo et al. (2011)	Environmental collaboration with supplier, green procurement, Environmental monitoring, Internal environmental management, Reverse logistics, Environmental packaging	Operational performance, Economic performance, Environmental performance
Zhu et al (2007)	Internal environmental management, green purchasing, customer cooperation, Investment recovery, Eco-design.	Environmental performance, Positive economic performance, Negative economic performance, Operational performance.
Zhu et al (2008)	Internal environmental management, green purchasing, customer cooperation, Investment recovery	Economic performance
Tachizawa et al (2015)	Monitoring, Collaboration	Environmental performance
Dubey et al (2015)	Supplier relationship management, Total quality management	Environmental performance
Younis et al (2015)	Eco-design, Green purchasing, environmental collaboration with customer and supplier, Reverse logistics	Environmental performance, Economic performance
Eltayeb et al (2011)	Green purchasing, Eco-design, Reverse logistics,	Economic performance, Environmental performance, Operational performance, Intangible outcomes
Rehman et al (2016)	Green design, green purchasing and marketing, organisational capabilities, technology innovation, Green standard adaptation, green disposal initiative, Reverse logistics, Supplier management	Financial performance, Operational performance, Competitive advantage, Continues improvement, Stakeholder’s enrichment

Montabon et al (2007)	Recycling, Proactive waste reduction, Reactive waste reduction, Remanufacturing, Surveillance of market, Specific design target	Product innovation, Process innovation, Return on investment, sales growth, redundancy indices.
Hervani et al (2005)	Green purchasing, green manufacturing, green distribution, green marketing, Reverse logistics	Environmental performance, Operational performance, Management performance.
Chin et al. (2015)	Green procurement, green manufacturing, green distribution, green logistics	Economic performance, Environmental performance, social performance
Green et al (2012)	Internal environmental management, green purchasing, green information, Cooperation with customer, Eco-design, Investment recovery,	Environmental performance, Economic performance, Operational performance, Organisational performance.
Yang et al 2013	Internal green practices, External green collaboration	Green performance, Firm competitiveness
Chan et al (2016)	Environmental regulations, green product innovation,	Cost efficiency, Firm profitability, Environmental dynamism
Chiou et al (2011)	Greening supplier, product innovation, process innovation, managerial Innovation	Environmental performance, Competitive advantage
Mitra and Datta (2013)	Collaborative relationship with suppliers, sustainable product design and logistics,	Economic performance, competitiveness.
Li et al (2006)	Strategic supplier partnership, Customer relationship, level of information sharing, quality of information, postponement.	Market performance, financial performance, cost advantage, quality advantage, Delivery dependability, Product innovation, Time to market
Govindan et al 2015	Reverse logistics, green design, green purchasing, Carbon	Environmental performance, Economic performance

	management, Supplier environmental collaboration, customer environmental collaboration, ISO 14001 certification, Internal management support	
Vanalle and Santos (2013)	Eco-design, Internal management practices, Customer cooperation, External pressure, green purchasing,	Operational performance, Economic performance
Luzzini et al (2015)	Inter-firm collaborative capabilities, Commitment to sustainability	Environmental performance and social performance, Cost performance
Jabbour et al (2017)	Green purchasing, Cooperation with customers, External GSCM practices	Environmental performance
Jabbour et al (2014)	Quality management, Environmental management, green purchasing, Customer collaboration	Environmental performance
Jabbour et al (2013)	Environmental management practices	Operations performance
Shang et al (2010)	Green manufacturing and packaging, environmental participation, green marketing, green supplier, green stock, Eco-design	Corporate image improvement, Profit, Market share, Sales, Customer satisfaction, Customer loyalty
Chardine-Baumann and Botta-Genoulaz (2014)	Management practices	Economic performance, Environmental performance, social performance.
Tippayawong et al (2015)	Green manufacturing, green logistics, green sourcing	Financial performance
Laari et al (2016)	Internal GSCM, Environmental collaboration with suppliers, Environmental monitoring of	Environmental performance, Economic performance

	suppliers, Environmental collaboration with customers, Environmental monitoring by customers	
Kafa et al (2013	Reverse logistics, green distribution, green manufacturing, Eco design, green purchasing	Environmental performance, social performance, Economic performance.
Laosirihongthong et al (2013)	Green purchasing, Eco-design, Packaging related eco-design, Reverse logistics, Legislation, and regulations	Environmental performance, Economic performance, Intangible performance
Miroshnychenko et al (2017)	Internal pollution prevention, green supply chain management index, green product index, ISO 14001	Financial performance
Walton et al. (1998)	Design for the environment, green purchasing	Environmental performance, Economic performance
Ravi et al. (2005)	Reverse logistics	Economic performance
Tomar and Oza (2015)	Green purchasing, green design, green manufacturing, Investment recovery, and Internal environment management	competitive measures, and company image
Lambert et al (2011)	Reverse logistics	Strategic, Tactical and Operational
Rasit et al (2019)	Eco design, green purchasing, environmental cooperation with customer, Reverse logistics	Sustainability performance
Qorri et al (2018)	Upstream Supplier Facing, Eco-Design, Green manufacturing, Downstream Consumer Facing	Environmental performance, social performance, Economic performance, Operational performance.
Liu and Chang (2016)	Green practices, Closed-loop orientation	Environmental, positive economic performance,

		negative economic performance

2.7 Critical Enablers

Critical enablers variables, contrary to standard moderating variables in meta-analysis are often derived from control variables when conducting empirical studies (Golicic and Smith, 2013; Geng et al 2017). Hence, critical enablers refer to antecedent variables that affects the first order independent variables (GSCM practices) and indirectly affect dependent variables (Hunter and Schmidt, 2004). Previous studies have examined several variables that play the role of enablers in GSCM implementation such as firm size and industry type (Zhu et al., 2008a; Liu et al., 2012; Chan et al., 2012; Zhu et al., 2013a; Abdulrahman et al., 2014), total quality management, supplier relationship management, top management commitment profitability customer relationship management (Dubey et al 2015), Government regulations (Zhu et al 2006), Community economic welfare (Gabzdylova et al 2009), ISO 14001, size of firm, management (Geng et al 2017). This multidimensional use of critical enablers clearly explains that authors are not consistent with what constitute critical enablers (Faisal 2010). Therefore, according to Faisal (2010) enablers influencing GSCM implementation have been selected and investigated in previous studies based on countries and type of industry perspective. For example, Faisal (2010) studied 16 enablers for SSCM implementation within Qatar manufacturing sector; Hussain (2011) in his study on Canadian manufacturing sector identified 21 enablers; Walker and Jones (2012) when investigating UK manufacturing firms identified 7 enablers (internal and external); government regulation/policy, customer support, supplier support, Investors, NGOs, Top management commitment, strategic issues including sharing of information and knowledge and purchasing functions. According to Hervani et al., 2005; Walker et al., 2008) firms are confronted with critical enablers which can either be internal or external in GSCM implementation. However, what is lacking in previous literature is whether certain type of firms experience high internal enablers or high external enablers in implementing GSCM (Walker and Jones, 2012). In this regard, this study aims to examine whether firms are strongly motivated by either internal or external enablers to implement GSCM.

Geng et al (2017) in selecting enablers (moderators) for their study, adopted the coding method where the coding was done based on the difference of relevant samples on the relationship of adoption of GSCM practices and economic, environmental, operational, and social performance. In this regard, Geng, Mansour and Aktas (2017) adopted firm size, ISO certification, export orientation and industry type as critical enablers influencing GSCM implementation. In combining the guidelines of Geng et al (2017) and Walker and Jones (2012) the study selected 6 enablers comprising government regulation, top management commitment, ISO 14001 certification, sharing of information and knowledge, customer support and supplier support. These enablers are made up of both internal and external enablers, which also fall under monitoring and collaboration enablers. This study delved deeper into whether the antecedent for GSCM lies within or outside a firm.

Firms differ in what causes them to engage in GSCM, with some firms being driven strongly from inside by their top management, and others relying on outside influences such as stakeholder pressures or customer requirements. The rapid rate at which the natural environment is being depleted and raw materials being consumed has called for action by stakeholders, government agencies, customers, and other environmentalist groups to call for paradigm shift to restore sustainability to the environment (Zhu et al., 2013). These groups have realised that considering the extent to which raw materials are being consumed, and the environment suffering serious degradation, doing business as usual especially by manufacturing industries would destroy the environment (Miller et al., 2012). Therefore, the expectations of these groups have influenced manufacturing firms to reconsider their operational strategy by integrating environmentally conscious objectives into their supply chain operations (Carter and Rogers, 2008).

However, to be able to adopt and implement GSCM, manufacturing firms need motivational actions to influence successful implementation (Diabat et al., 2014). According to Grzybowska (2012) critical enabler is any action that enables manufacturing firms to achieve a specific objective. In order words, enabler refers to variables or a group of variables that motivate and influence successful achievement of GSCM practices objectives. Generally, bundles of enablers do not equally ensure adoption and implementation of GSCM practices by manufacturing firms. It is therefore important manufacturers identify which enabler has greatest influence in implementing GSCM (Santos, et al., 2013).

Table 2.2: Enablers used in previous studies.

Enablers	**Authors**
Government policy/regulations	Carter and Ellram (1998), Min Galle (2001), Preuss, (2005), Zhu et al (2005), Zhu et al (2013) Zailani et al (2012), Esfahbodi et al (2016)
ISO 14001 certification	Geng et al (2017), Rao and Holt (2005), Ann et al (2006), Kuei et al (2013), Laosirihongthong et al., (2013), Lee et al. (2013), Govindan et al (2015
Top Management commitment	Dashore and Sohani (2013), Walker et al. (2008), Zhu and Sarkis (2007) Gandhi et al (2015) Huang et al (2015), Chu et al (2017), Guimaraes and Igbaria (1997), Min et al (2001), Walton et al (1998), Yeung et al (2007), Govindan et al (2015)
Customer pressure	Saeed and Kersten (2019), Hall (2001), Handifield et al (1997), Walton et al (1997), Seuring and Muller (2008b), Diabet and Govindan (2011), Luthra et al (2014),Hsu et al (2013), Esfahbodi et al (2016), Tate et al (2010), Walker et al (2008), Alblas et al (2014),

	Giunipero et al (2012), Carter and Dresner, (2001), Govindan et al (2015)
Supplier pressure	Zhu and Sarkis (2005), Walker et al (2008), Gualandris and Kalchschmidt (2014), Alblas et al (2014), Bai et al (2015), Huang and Kung (2010) Govindan et al (2015)
Sharing of information and knowledge	Meachem et al (2013), Liu et al (2018), Melville (2010), Butler (2011), Huang et al (2013), Diabat and Govindan (2011), Seuring and Muller (2008)

Therefore, in this study, the group of enablers that influence GSCM adoption and implementation include top management commitment, customer pressure, sharing of information and knowledge, ISO 14001 certification, suppliers' pressure, and government legislation. Considering bundles of critical enablers, this study highlights on institutional theory and stakeholder's theory to give meaning to the emphasis of critical enablers in this research study.

2.7.1 Top management commitment

The role of top management is very crucial to manufacturing firms and their supply chain partners who desire to implement green supply chain management practices (Liang et al., 2007; Gattiker and Carter, 2010; Foerstl et al., 2015). Hence, the significance of top management has been identified in previous studies. (Abdulrahman et al., 2014; Bag and Anand, 2014; Jabbour and Jabbour, 2015). Thus, top management approval is necessary for a firm to adopt cleaner and green technology in achieving sustainability. Hence, top management must be more proactive instead of reactive when confronting with sustainability issues. Previous studies have also emphasised the significant role top management plays in GSCM implementation (Despeisse et al. 2012; Law and Gunasekaran, 2012; al.2012; Dues et al. 2013; Hoof and Lyon 2013; Dubey et al. 2015). Generally, manufacturing firm's top management influences decision on competitors, technology and to cope with changes (Gattiker and Carter, 2010). In addition, top management also takes decision on strategic business model such as allocation of resources, engaging in advance technology and recruiting qualified people (Dubet et al., 2015). Top management also plays important role in dealing with environmental related issues by forming management board solely dedicated to tackling environmental management assessment of the firm (Zhu et al., 2008). Hence, it is contended that top management commitment is more likely to influence the manufacturing firm to implement green related initiatives.

2.7.2 Customer pressure

One key objective of manufacturing supply chain operations is to produce goods and services to meet customer's needs. In this sense, customers play pivotal role and are important players within the supply chain structure (Sharma and Henriques, 2005). The growing level of environmental agitation and education within our society has led to consumers becoming more educated and conscious about the environmental impact of the product they buy (Diabat et al (2014). Customer pressure in many instances results in needs and requirements of customers of business organisation being met with limited negative effect on the environment (Ateş et al., 2011; Ehrgott et al., 2011). In many situations, customers may want to know whether the final disposal and decomposition of the product would not negatively impact the environment. In recent times, customers all over the world have become environmentally sensitive and therefore companies that trade internationally must adhere to the green practices to be able to meet the requirements of customers.

Previous studies exploring the effect of customer cooperation has found out that the interaction of manufacturers and their customers provides significant inputs, which influence manufacturers to implement GSCM practices (Seuring et al., 2004; Diabat et al., 2014). Zhu et al (2008) discuss the capability of GSCM implementation by Chinese manufacturing firms and found out that customer pressure has led to adoption of GSCM practices. This therefore calls for further empirical investigation to understand whether this consideration applies to UK manufacturing in the framework of sustainability.

2.7.3 Information and knowledge sharing

To be able to implement GSCM successfully, manufacturing supply chain players need to have basic knowledge and share information on environmental related issues (Schrettle et al., 2014). Particularly if the firm wants to embark on new sustainability endeavour, it is important that the firm builds a knowledge base and share vital information about the project. This is crucial because a manufacturing firm and its supply chain players work in an integrated manner and need to collaborate by sharing important information such as environmental regulations and CO_2 emissions (Schrettle et al., 2014). Information is described as "knowledge that can be transmitted without losing its integrity once it is received and interpreted" (Kogut and Zander, 1992).

Both intra and inter organisational knowledge sharing in green practice includes activities targeted at transferring green knowledge both upstream and downstream the supply chain with the purpose to build their capacity to effectively tackle any sustainability issues. For instance, to be able to derive benefit from inter-organisational knowledge and information sharing, there must exit closer collaboration between supply chain partners (Dyer and Singh, 1998). This closer collaboration enhances the foundation of jointly acceptable knowledge established and maintained through information sharing (Larsson et al., 1998).

Therefore, with effective knowledge and information sharing the strategic intent of supply chain partners towards sustainability can be achieved. (Madhok and Tallman, 1998). It is contended that inter-organisational knowledge sharing through cooperation has the capacity to enhance each partner's knowledge base and thus, help to achieve competitive advantage since knowledge pertaining to green implementation is a source of competitive advantage. The resources dependency theory supports the notion that knowledge and information sharing is crucial in getting GSCM implemented successfully (Loebecke et al., 1999). While the issue of information sharing acting as critical enabler exits in literature, little research has focused on how it is related to GSCM implantation (Cheng et al., 2014). To address this gap this study has developed a new research model that considers knowledge and information sharing as antecedent towards GSCM implementation.

2.7.4 Government regulations

Manufacturing supply chain has come under intense scrutiny because of their impact on the natural environment and the fact that they need to take responsibility of environmental and social consequences of their actions (Zailani et al., 2012). Due to environmental degradation attributed to manufacturing supply chain, governments across the globe are enacting laws compelling manufacturing firms to adopt more proactive environmental related initiatives in their operations and supply chain (Zhu et al., 2013) Government departments have the power to enact regulations to control the operations of manufacturing firms and in some instances punish them for non- compliance. This argument is supported by institutional theory that emphasises that, external players influence manufacturing firms to undertake proactive environmental initiative to protect the natural environment (Dubey et al., 2015). The theory further argues that manufacturing firms are not only profit-making ventures but must take into consideration the prospect of achieving social acceptability.

Thus, the action of the manufacturing firms must be seen to have positive effect on health and safety of individuals (Scott, 2008). Consequently, government regulations play critical role in regulating the activities of the supply chain to ensure sustainability. For example, UK government has set emission norms to monitor emission limits by automotive industries to prevent emission of excess carbon dioxide into the atmosphere (Taylor and Taylor, 2013; Esfahbodi, 2016). Furthermore, emission reduction commitments in the UK are overseen by the European Commission, which has powers to take action to enforce compliance (DEFRA, 2016). In this regard, institutions such as European Union (EU) and United Nations (UN) have set up legislations including applicability of Waste of Electronics Equipment (WEEE), Kyoto protocol on Clean Development Mechanism (CDM), Climate Change Act (UK Government), American Clean Energy Bill and Restriction of Hazardous Substance (RoHS) are all aim at regulating activities of manufacturing firms whose activities cause climate change (Laosirihongtong et al., 2013).

Due to some of these regulations, manufacturing firms have institutionalised GSCM practices with the aim to engage in environmental protection (Narasimhan and Carter, 1998). Therefore, when manufacturing firms identify legitimate concern and the society expresses similar concern, it ensures rapid deployment of GSCM practices to tackle the concern. Many research studies have been carried out that support the notion that government regulations facilitate and influence manufacturing firms to implement GSCM practices. Zhu and Sakis (2007) and Sarkis et al. (2011) have come out with several studies that are in favour of government regulations influencing adoption of GSCM practices. In this sense, government regulations are a key enabler influencing adoption and implementation of GSCM by manufacturing firms. For example, UK new clean air legislation enabled the transport secretary to compel automotive industries to recall vehicles for failure in their emission control systems and to take active action against tampering with vehicle emissions control systems (DERFA, 2019).

2.7.5 ISO 14001 certification

Many studies have emphasized the highly connected relationship between the GSCM practices and firm performance for companies that are ISO 14001 certified (e.g., Rao and Holt, 2005; Ann, Zailani, and Wahid, 2006; Kuei et al., 2013; Laosirihongthong et al., 2013). For instance, Lee et al. (2013) established stronger relationship between greening the supplier and environmental performance among the ISO 14001 certified manufacturing firms in Malaysia. However, the high cost of securing ISO 14001 has resulted in many manufacturing firms redirecting their resources away from environmentally friendly initiatives. (Ann et al., 2006). Therefore, to code this, this study assessed the samples from companies that are ISO 14001 certified and those whose ISO certifications are not clearly known.

Stakeholders very often hold manufacturing firms responsible for their operational impact on the environment (Friedman and Miles, 2001). ISO 14001 is an internationally acceptable standard that explores the principles of environmental management systems. ISO encourages manufacturing firm to improve their environmental performance though efficient and effective application of resources that helps to reduce waste (ISO 2015). It involves methodological process to minimise the effect of a firm's operations on the natural environment (Azevedo et al., 2011). The cost of certification is perceived by organisation as environmental cost. However, it promotes the reduction of resources usage and waste reduction and contributes to quality improvement (Nawrocka et al., 2009).

Although it is easier for organisation in environmentally conscious market to adopt ISO 14001, because of their better economic performance, they may also require that their domestic and foreign suppliers also adopt this standard in the global supply chain. Therefore, suppliers wishing to access environmentally conscious markets can obtain important advantages with ISO 14001 certification (Nishitani, 2010). Hence, this study adopted ISO 14001 certification as one of the variables acting as antecedent for GSCM implementation.

2.7.6 Supplier pressure

Suppliers are essential partners of the supply chain network. They represent the partners that feed the manufacturing firms with raw materials, parts, services, and goods either directly or indirectly to the manufacturing firm (Russell & Taylor, 2009; Slack et al., 2010: Hameed et al., 2017:2019). It is essential that a manufacturing firm that want to develop and grow must pay attention to the environmental objectives of the supplying company's environmental objectives. The reason behind this concern is that the environmental performance of a product could be traced to its raw materials. Hence, the pressure on manufacturing firms by their suppliers to implement environmental green initiatives that reduce consumption of materials (Dubey and Gunasekaran 2015). To be able to achieve this, suppliers must constantly update and educate manufacturing firms about the impact of their raw materials on the natural environment. Bigger supplier firms use coercive powers to force smaller manufacturing firms who depend on then for their raw materials needs to abide by the supplying firm's environmental objectives.

Bai and Sarkis (2010), Ku et al. (2010), Testa and Iraldo (2010), Kumar et al (2014), Vachon and Klassen (2006) posit the significance of collaboration with suppliers and manufacturing firms in smooth implementation of GSCM practices. These studies further indicated that inter-collaboration including supplier pressure on manufacturing firms contributes to successful GSCM implementation (Dubey et al 2015). Supplier's contribution to GSCM implementation is important because, supplier focuses on implementation of environmental practices in terms of material management and processes and purchasing strategies (Rao & Holt, 2005). Suppliers also use their power to monitor manufacturing firm's environmental performance by ensuring that the materials and equipment supplied have been subjected to environmentally friendly process (Rao & Holt, 2005). Previous studies (Vachon & Klasson, 2006; Vachon, 2007) have also shown that supplier integration is positively associated with organizational performance.

2.8 GSCM practices

Having examined the enablers that influence GSCM practices implementation, this section focuses on developing a research framework GSCM practice that contains the essential GSCM initiatives needed to achieve sustainability. Based on this aim, this section investigates and explores the various GSCM practices and further examines the outcomes of these GSCM practices. To be able to identify the essential GSCM practices for this study, an extensive review of literature was adopted to discover the GSCM practices applicable to every stage of the supply chain needed to effectively achieve sustainability performance and competitive advantage. In addition, the extensive literature review helped to discover the frontiers of GSCM practices and identified those that resulted in improved performance. It also helped to identify what green initiatives various scholars have adopted in their study.

The systematic literature review adopted in this study replicates what exists in previous studies, thereby confirming similarity of previous studies. The identification of the essential GSCM practices largely informed the development of the theoretical framework of GSCM framework of this study. Moreover, systematic literature review confirmed the claim that various scholars adopt different GSCM practices in their study, hence the notion that there is inconsistency in the variables that represent GSCM practices (Zhu and Sarkis, 2004). One key benefit of undertaking systematic literature review is to confirm whether the identified GSCM practices in this study conform to previous study.

To be able to identify the essential GSCM practices, a systematic review of literature was conducted on top-tier operations and supply chain management journal covering 29 years period (1990-2019). The time period selected was significant and consistent with previous studies since it is contended that high profile studies on GSCM have been published after 1990s (Giunipero et al., 2008; Esfahbodi, 2016).

2.8.1 Fundamental GSCM dimensions

Having discussed the essential GSCM practices, this section focuses on developing core GSCM practices that represent the conceptual framework of GSCM practices in this study. In line with this, 40 green practices were identified which later helped to conceptualise the seven green initiatives used in this study. In this study, GSCM practices were categorised into seven initiatives with the aim to cover every stage of the supply chain. The selection of this seven was done by adopting the guidelines of Zhu et al (2005). In essence, GSCM practices used in this study include green purchasing eco design, investment recovery, green marketing, green distribution, customer cooperation and reverse logistics. In addition, the relevant GSCM practices were grouped based on their role and function on the supply chain and those that have been validated by numerous scholars. Each of these GSCM practices were grouped into separate dimensions with their associated measuring items. Table 2.3 below demonstrates the identified GSCM practices and their associated measuring items.

Table 2.3 Demission of GSCM practices including associated measuring items.

GSCM practices	Measuring items	References
Green purchasing	• Design specification to suppliers that include environmental requirements for purchased items. • Selects suppliers using environmental criteria (suppliers ISO certification). • Requires suppliers to use environmental packaging (degradable and non-hazardous) • Audits its supplier's internal environmental management systems. • Evaluates the environmentally friendly practices of second-tier suppliers	(Zhu et al., 2007a ; Younis et al., 2015)
Eco design	• Design's product to reduce consumption of raw materials. • Designs product for reuse, recycle, and recovery of materials and components. • Design's product to avoid or reduce use of hazardous products or materials. • Designs product for reduced consumption of energy. • Collaborates with suppliers to design product to reduce packaging cost.	(Zhu et al., 2008 ; Younis et al., 2015)
Investment recovery	• Engages in sale of excess inventories or materials. • Engages in sale of scrap and used materials. • Engages in the sale of the company's capital equipment to prolong their life span. • Adds value to unused materials to recapture their values	(Zhu et al., 2007 ; Green et al., 2012)

Green marketing	• Uses environmentally friendly labelling of product. • Engages in providing regular voluntary information about environmental management to customers and other stakeholders. • Provides customers with environmentally friendly service information to customers. • Provides customers with information about disposal of unused product. • Attracts customers with green initiatives and eco-services.	Polonsky, 1994; Luthra et al.,2016)
Green Distribution	• Engages in vehicle optimisation during distribution of product to customers. • Plans distribution schedules to reduce inventory (just in time). • Considers the use of renewable energy during product transportation. • Uses qualified third-party Logistics Company for transportation of product to customers	(Sarkis, 2003; Green et al., 2012)
Reverse Logistics	• Engages in product recovery through reuse and recycle of materials. • Engages in the use of returnable packaging materials (pallets). • Accepts returned product from customers. • Waste collection department to collect waste from customers	(Zhu et al., 2005; Geng et al 2015)
Customer cooperation	• Cooperates with customers for eco design of product. • Cooperates with customers for cleaner production. • Cooperates with customers for green packaging. • Cooperates with customers for using less energy during product transportation	(Zhu et al., 2007a ; Green et al., 2012)

As can be seen from table 2.3 the first dimension of the GSCM is green purchasing. This dimension is measured by designing specification for suppliers that includes environmental requirements. In addition, this includes selecting suppliers based on environmental criteria (Zhu et al., 2007). Furthermore, eco design dimension was measured by designing a product to reduce consumption of materials. It also ensures designing of product for recycling, reuse, and remanufacturing. Moreover, a set of practices that deal with sale of excess materials and excess equipment represent investment recovery. To measure customer cooperation, the identified practices include cooperation with customers for eco design, cooperation with customers for greener production and cooperating with customer for green packaging.

Measuring items that deal with using environmentally friendly labelling and providing information to customers pertaining to proper disposal of waste were linked to green marketing dimension. Green distribution dimension was measured by the applying vehicle optimisation approach and adopting 'just in time' method for delivery of product. Furthermore, product. Furthermore, measurement items dealing with product recovery reuse, remanufacture and the use of returnable packaging were linked with reverse logistics.

These seven GSCM dimensions were developed following systematic literature review and were found to represent the key activities of supply chain management. It should be noted that these seven dimensions might not denote all GSCM activities, however, all these seven green dimensions appear in isolation in previous studies representing GSCM practices (Zhu et al., 2008; Green et al., 2012; Luthra et al., 2014; Esfahbodi, 2016). These dimensions assist this research to conceptualise the green supply chain management (GSCM) practices and link them to performance outcomes and competitive advantage framework to achieve the objective of this research.

Furthermore, these seven practices were selected because they represent both the upstream and downstream activities of the supply chain. In furtherance, these seven practices appeared prominently in many of the previous studies on GSCM practices as shown in table 2.1 above. Again, these practices which are otherwise referred to in this study as constructs have been measured and validated in previous studies such as Zhu and Sarkis 2004; Zhu et al., 2007; Zhu et al., 2008; Holt and Ghobadian, 2009; Eltayeb et al 2011; Green et al 2012; Jabbour et al 2012; Younis et al, 2015; Esfahbodi et al, 2016; Geng et al, 2017). In several previous studies there are less than seven green initiatives used to conceptualise GSCM practices which makes it difficult to assess the actual benefit GSCM can bring to manufacturing firms. This research seeks to assess these potential GSCM initiatives which provide better and comprehensive understanding of the GSCM practices and link them to the triple bottom line and competitive advantage at the same time.

2.9 Sustainability performance

The previous section has discussed the critical enablers that influence manufacturing firms to implement GSCM practices and again the essential GSCM practices were also discussed. Theoretical frameworks of critical enabler and GSCM practices with their measuring items have been developed. The fundamental effort for sustainability metrics for the measurement of sustainability performance in manufacturing industry is underpinned by the notion that sustainable performance demands overarching approach towards sustainability, to include all its interrelated dimensions. In addition, by integrating the sustainability principles to the manufacturing firm’s strategic decision making ensures the industry would overcome any existing and unforeseen inherent sustainability difficulties associated with operational environment (Husgafvel et al., 2016). This means that the in undertaking any green initiative the manufacturing firms must recognise the balanced sustainability index including social, environmental, and economic. It is contended that considering all the three-generic principle of sustainability outcome in a firm’s environmental initiatives is a key to future success (Husgafvel et al., 2016). Hence, sustainability performance requires emphasis on all the demission’s sustainability encompassing the link between sustainable industrial broader environmental goals associated with social and economic outcomes (Graedel and Allenby

2010). The present indicators of sustainability performance often favour the primary needs of the organisation (Husgafvel et al., 2016). In general, global sustainability performance principles tend to highlight one sustainability performance dimension over another thereby ignoring the overall sustainability performance agenda (UNDP 2010). In this sense a more balanced research of sustainability index is required to cover economic environmental and social performance (Singh et al. 2012). The focus of this section is to develop the performance framework which represents the third part of the conceptual framework of the study. This part is very crucial since it seeks to answer one of the research questions involving the performance outcome of implementing GSCM practices. Before the performance outcomes are tackled individually, the study will look at triple bottom line as a concept that lays the foundation for sustainability performance cluster of this research.

2.10 Triple bottom line (TBL)

This section discusses the concept of triple bottom line and the impact as an outcome of GSCM implementation. The study builds theoretical foundation of sustainability performance by first exploring the concept of triple bottom line. Elkington (1998) developed the concept of triple bottom line. According to Elkington (1998), organisational performance falls under three key generic principles; social, environmental, and economic. The concept requires business organisation to integrate social, environmental, and economic issues simultaneously in their operational activities (Carter and Rogers, 2008). Theoretical understanding of TBL is that organisational operational performance must not only be assessed on its financial performance but environmental and social issues (Gimenez et al., 2012).

Thus, business organisation cannot be described as successful when it has not improved on its social and environmental performance (Elkington, 1998). It is believed that for real environmental performance to be achieved, business organisations must address social and economic dimension of the triple bottom line in an integrated manner (Elkington, 1998). Triple bottom line can also be described as the connection of social, economic, and environmental performance. Hence, it denotes all activities that are targeted to effect positively on society, environment, while seeking the long-term financial benefit of the firm (Carter and Easton, 2011). The generic principle of sustainability, which comprises social, environmental, and economic serves as the bases of sustainability performance cluster of this study. Figure 2.5 below depicts TBL framework with associated key performance principles.

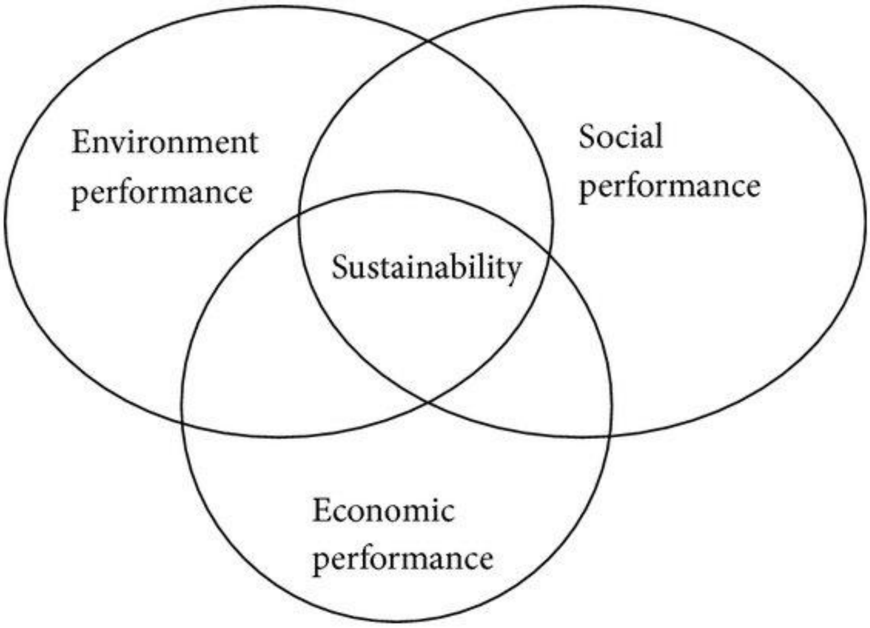


Figure 2.5 triple bottom line (TBL) framework (adapted from Elkington, 1994)

According to Elkington (1998) business organisation that measures all the three generic principles of sustainability is likely to measure the total cost of its operational activities. The essence in doing this is to inform and educate employees to pay attention and subsequently change their attitude. Therefore, in order to meet the sustainability development concept, this study seeks to link operational activities of manufacturing firm with social, environmental, and economic performances and ascertain whether it is beneficial in terms of outcomes. This linkage clearly helps to meet one of the objectives of this research and answers the major question of this research which is, linking green implementation to competitive advantage.

2.11 Sustainability performance measures

This section of the study deals with the outcome of implementing GSCM practices. Many studies in exploring sustainability development as an outcome of GSCM implementation focus on either environmental, financial or both, while social performance is neglected (Givandan et al., 2014; Geng et al., 2017). In this study, the TBL concept is adopted where the three generic principles of sustainability are explored. This makes the study unique from others who limit the sustainability performance outcomes to only economic and environment. The subsequent sections explore and present the three performance outcomes related to GSCM practices.

2.11.1 Environmental performance

Previous studies have tried to link GSCM practices with performance outcomes including environmental performance. According to Green et al (2012), environmental performance denotes the ability of business organisation to minimise air pollution, liquid and solid waste generation and ability to minimise the consumption of hazardous substances. Geng et al. (2017) posit that environmental performance is largely involved with adopting environmental management practices that help to reduce emission, waste generation, decrease consumption of materials and hazardous substances. Extant literature indicates that adoption of environmentally related initiatives along the supply chain network helps to improve the firm's environmental performance (Zhu and Sarkis, 2004). For instance, Rosangela et al. (2013), argue that there is significant relationship between cooperation with customers on eco design of product and environmental performance. They insist that practices involving customers on environmental related issues have the capacity to improve the firm's environmental performance.

Similarly, Govindan et al. (2015) argue that purchasing items that possess environmental features, including reusability, recyclability and non-hazardous substance improve the environment. Even though most recent studies have established positive relationship between green related initiatives and environmental performance, early research found little or no positive outcome (Levy, 1995). This indicates inconsistency in GSCM implementation on environmental performance. However, there is a strong bundle of literature supporting positive impact of GSCM practices on environmental performance (Green et al., 2012).

In this study, environmental performance describes actions targeted at conserving energy and minimising waste generation, pollution, and greenhouse gas emissions. However, in relating supply chain activities with manufacturing operations, the environmental performance involves reduction of air pollution, minimising wastewater, reducing solid waste generation and reduction in consumption of raw (Zhu, et al., 2005; Geng et al., 2017). Manufacturing operations along the supply chain network has been identified as one key contributor of environmental degradation (Eltayeb et al 2011). There is however intense pressure on manufacturing firms to adopt more proactive environmental related activities to improve their environmental performance (Diabat et al 2016). Many studies have operationalised performance outcomes of green supply chain initiatives on the environment through minimisation of solid and liquid waste, reduction of emission, resources reduction, minimisation of consumption of toxic materials (Eltayeb et al., 2011). It is noted that with these measurements of environmental performance, literature tends to support the notion that green supply chain management practices impact environmental performance positively. For example, Frosch (1994), concludes that inter-firm collaboration influenced by proximity enhances environmental performance. This research adopted the measurement items of environmental performance from previous studies such as (Zhu and Sarkis 2004; Geng et al., 2017). These are studies that have been peered reviewed and published in high class journals and have been highly cited in literature.

2.11.2 Economic performance

Firm's economic performance relates to the capacity to minimize costs associated with energy consumption, purchased materials, waste treatment, fines for environmental accident and waste discharge (Zhu et al., 2008; Zailani et al., 2012). Previous studies have examined the relationship between GSCM practices and performance including economic performance. Previous research has presented in depth review on pattern of supply chain impact on economic performance (Florida, 1996; Florida and Davison, 2001; Geffen and Rothenberg, 2000; Green et al., 1996). Although there is mixed reaction pertaining to the impact of GSCM practices on economic performance, however, studies supporting positive relationship appear stronger. For example, Green et al (2012) argued that investment in efficiency in operational resources and marketing of positive product features lead to financial benefit. According to Eltayeb (2011), economic performance is financial inflows into the company resulting from GSCM implementation.

Furthermore, Alvarez et al. (2001) posit that GSCM practices have a positive relationship with economic performance. Similarly, Dodgson (2000), Dyer and Singh (1998), Von Hippel (1988) argue that inter-firm collaborations provide formal and informal strategies that encourage trust, minimise risk and in turn improve financial performance. However, early studies such as Bowen et al. (2001) argue that economic performance is hardly achieved in short-term and therefore, financial performance is compromised. Mollenkopf and Close (2005), posit that reverse logistics contributes to financial performance by reducing cost of goods sold and minimising cost of operations. They further posit that improved management of returns inventory can increase asset turnover. Generally, studies on the economic performance have developed different scales for measuring economic performance. Key indicators used in measuring economic performance within extant literature include sales, profit, cost reduction, return on investment and market share Geng et al (2017). Nevertheless, literature on economic performance has suggested cost reduction as the appropriate method to achieve financial performance when implementing GSCM practices (Zhu et al., 2008). In line with previous study, this research measured economic performance through cost reduction approaches.

2.11.3 Social performance

Literature has explored sustainability performance and investigated the relationships between GSCM implementation and sustainability performance outcomes including environmental and economic performance (Zhu and Sarkis 2004). However, understanding the three generic principles of sustainability such as social, environmental, and economic and their associated relationship with green supply chain implementation is important (Elkington, 1999). There are several research studies on sustainability performance outcomes resulting from GSCM implementation, however, the social dimension of the sustainability performance outcomes has not received much attention especially when related to GSCM implementation (Ashby et al., 2012; Seuring and Muller;2008), Mani et al., 2016). In order words, there is lack of balanced research covering the three sustainability performance outcomes where economic and environmental outcomes have dominated numerous academic studies. To help enrich the literature on sustainability and expand the scope of the concept, this study seeks to explore the three-generic principle of sustainability and assess their relationship with environmentally related supply chain practices.

It is argued that the lack of overarching study linking all the sustainability principles with GSCM implementation is due to the difficulty in measuring social performance (Mani et al., 2016). Social performance, according to Geng et al (2017), is described as the measurement outcome of green supply chain practices regarding the image of the company, employee's health, and safety, safeguarding customer loyalty and satisfaction. Zailani et al (2012b). In essence, social performance indicates the enhancement and maintenance of quality of life of people especially employees without negatively affecting the environment Yusuf et al. (2013).

With GSCM implementation, social sustainability addresses issues relating to suppliers, manufacturers, customers, and society (Krause, 1999). Several studies have operationalised social performance by a few validated indicators (Carter and Jenning, 2002; Mani et al., 2016). Measuring items of social sustainability differ from country to country, however majority of studies have measured social performance using safety, wages, labour practices, loyalty of customers, image of the company, non-discrimination, and ethical issues (Carter and Jennings, 2002;Ahi and Searcy, 2015; Silvestre, 2015a). This study also adopted similar indicators to operationalised social performance to access the impact GSCM practices. This linkage helps this research to bridge the knowledge gap exiting in SCM literature by linking GSCM implementation with all the three principles of sustainability (social, economic, and environmental performance). It is due to this gap that this research is assessing the comprehensive understanding of green initiatives and linking them to social, economic, and environmental performance to determine whether being green will lead to positive performance outcomes in order to achieve one of the objectives of this research. The table 2.4 below demonstrate the sustainability performance metrics and their associated measurement items.

Table 2.4 Sustainability performance metrics and associated measurement items

Performance outcomes	**Measurement items**	**Reference**
Social performance	• Enhancing the firm's corporate image through quality standards. • Increasing customer satisfaction through environmentally friendly production process • Preserving the environment during production process. • Enhancing health and safety at workplace. Improving quality of life of employees	(Govindan et al., 2014 ; Luthra et al., 2016)
Environmental performance	• Reducing air pollution during production process. • Reducing wastewater during production.	(Govindan et al 2014; Eltayeb et al., 2011)

	• Decreasing solid waste generation in manufacturing operations. • Decreasing consumption of toxic/harmful materials during production process • Reducing the frequency of environmental accident and penalty	
Economic performance	• Decreasing the cost of energy consumption. • Decreasing cost of raw material purchasing. • Decreasing fees for waste discharge. • Decreasing fees for waste treatment. • Increasing return on investment	Zhu et al., 2007; Govindan et al., 2014)

According to Seuring and Muller (2008), in determining the outcome of sustainability practices all the three performance outcomes must be linked with the green initiatives in order to achieve sustainable development. Since this study is seeking to examine the relationship between GSCM implementation and sustainability performance, this study adopted the guidelines by Seuring and Muller (2008) to select the performance outcomes principles (social, economic, and environmental). Out of 191 previous studies linking the relationship between sustainable practices with sustainability development 140 linked the green initiatives with environmental performance, 191 linked the green initiatives with economic and 20 linked green initiatives with social (Seuring and Muller, 2008). Seuring and Muller further confirmed that numbers of previous papers on social aspect of sustainable development have been erratic and indicated that, Sarkis (2001) was the first paper to have integrated all the three sustainable developments in one study. This clearly confirms that there is unbalanced research on sustainability development against social performance hence, the reason this study is seeking to examine the relationship between individual green initiatives and social performance. So, this paper intends to close this gap by integrating all the three principles in one study, since according to Seuring and Muller (2008) this represent a deficit in supply chain management literature on social issues.

2.12 Competitive advantage

Strategy plays a critical role in business survival plan. Porter (1980) describes competitive approach a method used by firms to compete, what measures need to be put in place to achieve end goals and what goals should be achieved at the end of the strategy. Porter (1987) categorises competitive strategy into two: overall company corporate strategy and competitive strategy. While business strategy describes what type of business to engage in, competitive strategy on the other hand, describes how the business can be competitive amidst turbulent competitive environment at each level of the business operations. In this study the focus is on competitive strategy otherwise referred to as competitiveness of the firm or competitive advantage. The competitive strategy is seen as a business model made up of a group of related activities aimed at seeking a protective position for the firm in the competitive market (Laari, 2016). However, recent understanding of competitive strategy supported by theoretical perspective such as resource-based view put firms as set of unique resources owned and controlled by the firm (Spanos & Lioukas 2001; Laari, 2016).

Most recent studies on competitive advantage are the extension of Porter's (1980) work on competitive advantage. In his study, Porter categorised competitive strategy into two generic principles namely cost leadership and differentiations. Furthermore, Porter (1980) suggests a focus strategy, which aims at serving a particular customer group or a segment with either cost leadership or differentiation. It is contented that firms must strive to achieve both strategies in order to secure competitive position in the turbulent competitive market. However, taking the size of many manufacturing firms into consideration, majority of the small and medium manufacturing firms may choose to emphases one or two of these competitive strategy in order to serve their chosen market because of lack of adequate resources (Laari, 2016).

Due to difficulties for most firms to achieve both generic principles in Porter's (1980) competitive strategy, recent authors have extended Porter's proposition of competitive advantage strategies (e.g., Hill 1988; Wright et al. 1991; Beal & Yasai-Ardekani 2000; Pertusa-Ortega et al. 2009; Leitner & Güldenberg 2010; Salavou 2015). In addition, recent literature on competitive strategy has extended Porter's (1980) proposition of competitive strategy to include cost, quality, flexibility, and dependability dimensions, which firms can use as a source of competitive strategy (Stock et al. 1998; Ferdows & De Meyer 1990; Corbett & van Wassenhove 1993; Li et al., 2006; Laari, 2016). Competitive advantage principles are mechanisms by which firms can adopt to improve in order to satisfy their customer's requirement (Stock et al. 1998). However, Porter (1980), posit that firms may face serious challenges meeting all these generic principles and that the possibility of trade-off is obvious. In contrast to Porter's (1980) propositions of competitive advantage strategies, other authors have argued there should be no such thing as trade-off of competitive advantage principles, and that firms must strive to achieve all the principles cumulatively Meyer (1990). Byer and Lewis (2002) believes that competitive advantage principles complement each other and as such, are not mutually exclusive. Therefore, in this study competitive advantage is categorised into cost, quality, flexibility, and dependability. This study seeks to examine whether GSCM implementation will lead to manufacturing firms securing low-cost leadership, quality advantage, flexibility advantage and dependability advantage. The idea of competitive priorities is closely related to generic competitive advantage. Cost as a competitive advantage would correspond to cost leadership, while flexibility, quality and delivery correspond to differentiation (Stock et al. 1998; Shavarini et al. 2013).

Barney (1991) described competitive advantage as being resources possessed by a firm that are scarce, valuable and can generate competitiveness especially if the resources cannot be imitated, duplicated, and substituted. As result of the inclusion of competitive advantage in the research framework, resources-based view is considered as one of the theoretical perspectives underlining this research.

2.13 Sources of competitive advantage

2.13.1 Technology and innovation for competitive advantage

The term innovation can be used in different context far from scientific research. Innovation from the perspective of economic development refers to the process where firms commercialise the outcome of the research through value creation (Wen-Cheng et al., 2011). Innovation comprises both product, services, and process. Product innovation refers to product that has just been developed by a producer, while process innovation represents a new approach of producing a product that ensures minimisation of cost of production or ensures development of virgin product (Harmsen, Grunert, and Declerck, 2000). In this sense, innovation plays a crucial role in a firm's development and growth (Dasgupta, Sahay, and Gupta, 2009) as they strive to discover new ways of doing things or for a new product. This is achieved through continuous advancement of their internal capacity, resources, and dynamics (Wen-Cheng et al., 2011). The more innovative a firm is, the greater and stronger that firm gains competitive advantage. Additionally, innovation generates high productivity and efficient application of its resources (Knight, 2007).

2.13.2 Human resources for competitive advantage

Human resource has been described as individuals or groups that constitute the work force of an organisation (Wen-Cheng et al., 2011). Human resource can serve as competitive advantage when value is added to the personnel, which is not possible for any competitor to imitate (Jackson and Schuler, 1995). Generally, sources of competitive advantage including financial and natural resource, technology, and economics of scales are major approachs to create value. However, natural resource-based theory indicates that these resources are imitable by competitors (Wen-Cheng et al., 2011).

It is contended that these sources of competitive advantage may be less significant as compared to strong organisation structure with competent human resources. In this regard, many firms are using their strategic human resources structure as source of sustained competitive advantage (Jackson and Schular, 1995). Ulrich and Yeung 1998) argue that if a firm human resource management (HRM) department can build the core competence of their human resource it results in competitive advantage.

2.13.3 Organizational structure for competitive advantage

Organisation comprises a cluster of separate entities with common objective. There are different forms that an organisation can be structured depending on the objectives (Wen-Cheng et al., 2011). The operational strategy and method of operationalising this strategy is informed by the structure of the organisation (Petison and Johri, 2000). Efficient allocation of resource for successful operations depends entirely on the structure of the firm. The structure of the firm comes with responsibility; hence, the ability to allocate responsibility and resource if the structure of the firm is well specified leads to efficiency (Wen-Cheng et al., 2011). According to (Petison and Johri, 2006) effective organisation structure and clearly specified responsibility reinforces competitiveness of the firm.

Hence, it is contended that a well-structured organisation with allocated responsibility is a source of competitive advantage (Petison and Johri, 2006). Well-specified organisational structure with associated job responsibility enables collaborations among the various departments of the organisation and this enhances efficiency leading to competitive advantage (Wen-Cheng et al., 2011). In addition, the firm structure must have control mechanism that evaluates the operations of each department. The mix of this control and monitoring schemes help to take corrective actions during production process and this ensures production of quality product with less waste generation. Organization shall retain a set of orders and controls to enable monitoring of processes (Jackson and Schuler, 1995).

2.14 Measurements of Competitive Advantage

Having discussed the source of competitive advantage in the previous section, this section highlights the theoretical understanding of the measurement of competitive advantage. There are high profile studies on the measurements of competitive advantage in relation to GSCM implementation (Mugera, 2012). Different research studies have operationalised the measurement of competitive advantage from different approaches and different terminologies have been used to describe competitive advantage such as operational performance (Geng et al 2017). In order words, competitive advantage has been analysed using performance indicators such as market share, productivity, and cost of production (Frohberg and Hartmann, 1997). Michael Porter who can be described as the proponent of the competitive advantage theory, measured competitive advantage using cost differentiation and market differentiation (Porter 1990). Farole et al. (2010), for instance conceptualised competitive advantage using market share, and productivity. Kortelainen and Karkkairen (2011), measured competitive advantage using cost of production, gross margin, returns on assets, net income, and ratio of unit cost. Li et al (2006) when linking competitive advantage to supply chain, measured competitive advantage using cost, quality, flexibility, dependability. Unlike traditional economics that measures the productivity and market share, competitive advantage is employed as a management paradigm to add value to customer needs and to satisfy them by producing high quality product at a cheaper cost (Voulgaris et al., 2013). However, to achieve the benefit of competitive advantage the firm must continuously be strategically efficient, operate at cheaper cost, produce high quality product than competitors and must deliver on time to meet all the requirements of customers at all times.

Therefore, it is contended that using one indicator to measure competitive advantage might not be sufficient, hence, the motive behind measuring competitive advantage using four indicators (Depperu and Cerrato, 2005; Li et al 2006). Competitive advantage has been described as multi-faceted research construct and therefore must be measured by several related observed variables that truly represent the construct. In this study, competitive advantage is operationalised using cost, quality, flexibility, and dependability. Depperuy and Cerrato, (2005), posit that when measuring competitive advantage, cost, profitability, market share, must be taken into consideration because the measuring items of competitive advantage are similar to operational performance indicators. Each of the measuring items used in this study is briefly explained below.

2.14.1 Cost advantage

Competitive advantage in cost is described as a strategy where a company can utilize its skilled workforce, inexpensive raw materials, controlled costs, and efficient operations to create value to consumers. Many large-scale manufacturing firms use the cost advantage strategy by providing large selection of goods at a low price via their strength and size Li et al (2006). Competitive advantage in cost can be achieved in so many ways. Some companies, like Nissan, have years of experience producing cars in a very cost-effective manner. Other companies use offshore manufacturing to keep the costs of their products down. The current trend is for companies to cut down on the extras they offer to customers. For example, the airline company Ryanair is removing two of its three toilets in each airplane to increase the number of seats and drive down ticket costs. This might be an extreme way of cost cutting, but companies need to survive in a recession. Companies may also receive government subsidies, which help to pass on low costs on to their customers (Schitra, 2016)

There are other important ways that costs can be kept lower for a company to enjoy low-cost competitive advantage. Companies such as BMW, Lexus, and Boeing use product design and reengineering to create efficient cost-effective products. Product design is important to companies that use modern and sophisticated technology (Lomardo 2012). Intel can keep microchip processor prices down by continually improving product design that utilizes advancements in the field. Reengineering is used by companies that can cut costs by redesigning and creating improvements to their products, such as Apple. A company that finds ways to make its technology better and more affordable will find success. Finally, some companies create a new delivery method for their product or service, resulting in large cost savings that they can share with their customers (Schitra, 2016). According to Li et al. (2006), cost advantage is measured by low prices of product, offer competitive price to customers and producing at extremely cheaper cost.

2.14.2 Quality advantage

Due to high level of competition and global nature of business environment, firm cannot rely only on low cost of production to achieve competitive advantage (McGinnis and Vallopra, 1999). Other measures such as quality, flexibility and dependability must be present to achieve overall competitiveness. Quality advantage is a process of measuring the standard of the product (Markley and Davis, 2007). Previous studies on measures of competitive advantage have indicated that quality competitive advantage measure is the most dominant metric of measuring GSCM implementation (Hossein et al., 2018). Quality has been described as what the customer requires. In other words, a product is said to be of high quality when it meets the requirements of the end user.

Firms must work towards building strong customer perception about the quality of their product to be able to gain competitive advantage. If customers hold superior perception of quality of a product, it helps to guarantee loyalty, which in turn results in high turnover (Thijs and Staes, 2008). According to Gounaris et al. (2003) superior product quality brings high sales volume because high quality products are those that perform the task for which they have been manufactured to perform, in order words they are reliable and durable.

Sachitra (2016) measured quality product as a product with high reliability, durability and possesses all the attributes that customers expect. When customer perceives that attribute regarding the performance, sustainability, form, and design, of a product is rated high as compared to competitive product, then customer would classify such product to be of high quality. A firm's competitive advantage can be evaluated by comparing the quality of its product to that of rival firm (Straub et al., 2004).

2.14.3 Flexibility advantage

Flexibility competitive advantage is the capacity of a manufacturing firm to adopt to changing circumstance and respond to them appropriately. In other words, it describes the extent to which manufacturing firm introduces new product and features considering the requirements of the customer (Koufteros et al., 2002). The demand dynamics of customers are not static and therefore manufacturing firm must learn to be innovative to be able to meet unremitting changing demands and requirements of the customer (Liu, et al.,2019). Flexibility is intricately linked with innovation since meeting the changing demands of the customer requires the manufacturing firm to vary their process at every stage of the product development (Koufteros et al., 2002). Flexibility epitomises the capability of a manufacturing firm's supply chain to implement agile and appropriate changes to satisfy customer desires (Liu et al 2019). Flexibility serves as competitive advantage if a firm develops the capacity to implement decision-making strategies to deal with dynamic changing phenomenon, since this is exceedingly difficult to be imitated (Sanchez, 1995). That is, empirically previous studies have asserted that flexibility in manufacturing supply chain enhances superior competitive advantage and performance (Liu et al., 2019).

A firm can achieve superior performance if it is able to develop a capacity to adapt strategic flexibility. Due to changing demands of customers, innovativeness is required to be able to match customers' requirements. According to Li et al. (2006), flexibility is measured by developing a customised product to meet customer requirement, modify the product features to meet the needs of the customer and respond quickly if customers place order for improved features. It is contended that flexibility improves dependability since flexibility is associated with innovations. This ensures that firms can produce new product quickly to meet customers' needs. In other words, flexibility comes with change in process where customer's requirement can easily be met thereby improving dependability (Koufterous et al., 2002).

Flexibility has been described to possess multiple dimensions (Sethi and Sethi, 1990). To gain competitive advantage through flexibility, many studies have categorised flexibility into different dimensions (Corrêa, 1990). Hence, to be able to comprehensively address the demands of the customer, different dimensions of flexibility must be dealt with to achieve the desire competitiveness. According to Narian et al. (2000), flexibility can take different form. Product flexibility is the ability of the manufacturing firm to vary the product easily. In addition, volume flexibility is the capacity of the manufacturing firm to meet the demands requirement of the customer.

These categories of flexibility ensure dependability since at all times customers can be provided with what they require Thus, customers, from time-to-time demand extra volume of product and a manufacturing firm seeking to gain competitive advantage must vary the total volume of production to meet the demands of customers (Koufteros et al., 2002). It can be concluded that if the various categories of flexibility are properly integrated and implemented, the firm would achieve superior competitive advantage (Palanisamy and Sushil, 2003).

2.14.4 Dependability advantage

Dependability competitive advantage is a situation where an organisation develops the capacity to provide goods and services on time, at the right quantity and at right place (Li et al 2006). Koufteros et al (2002), describes dependability as the degree to which manufacturing company develops capability to satisfy customer delivery needs. Dependability as a competitive principle is crucial because the wish of customers is to meet their needs at the right time in right quantity. Hall et al. (1991) described dependability as consistently meeting customers' delivery time. Maskell (1991) indicated that delivery is especially important because customers will look for alternative when the manufacturer is unable to provide them with the goods they require at a particular time.

Many previous studies have explored the dependability as a competitive priority as a means of competitive differentiation (Bowersox et al., 1997). Dependability competence has gained popularity due to the growth of global market and the principle of Just-In-Time (JIT), which supports delivery of goods and services at the right time and place (Koufteros et al., 2002). The role of delivery in supply chain is undoubtedly particularly important. Major manufacturing firms rely on uninterrupted delivery to meet their production obligations (Fawcett et al., 1997). Therefore, the success of any supply chain depends largely on efficient and effective delivery of raw materials for production (Fawcett et al., 1997). This assumption is consistent with a study by Fawcett et al. (1997), which concluded that dependability has a significant and positive impact on sustainability performance. Li et al. (2006) measured delivery dependability as delivering the specification of customers without default, delivering customers product on specific dates agreed and ensuring that customers get access to the entire product they order immediately. This research therefore seeks to develop a model to link GSCM implementation with competitive advantage to determine whether being green will lead to competitive advantage**.**

2.15 Linking GSCM to sustainability performance and competitive advantage.

This section briefly explores the link between GSCM implementation and performance outcomes. It is contended that GSCM practices positively impact performance outcomes (Geng et al., 2017). Manufacturing firms adopt GSCM practices for multiple reasons, but the key amongst them is to gain economic benefit (Lee et al., 2012; Zhu and Sarkis, 2004). As far as economic benefit is concerned there has been mixed reaction pertaining to the outcome of GSCM practices.

Earlier research on the relationship between GSCM implementation and economic performance did not establish any positive link (Zhu and Sarkis, 2004; Rao and Holt, 2005). They argued that investment in green implementation requires injection of extra capital, which affects the profitability of the business because of increase in cost of operations. However, recent studies on the impact of green implementation on financial performance have strongly argued and established positive relationship between green initiative and economic performance (Green et al., 2012; Geng et al., 2017). The literature has also shown that GSCM implementation impact environmental performance positively. In this regard, Zhu et al. (2013), posit that significant environmental benefit is achieved through waste reduction. According to Maria et al. (2013), design of product to prevent hazardous substance and reduce consumption of material promotes environmental performance. In addition, Chiou et al. (2011) explored the relationship between green product innovation, green process innovation, green managerial innovation, and environmental performance. The result of their study concluded that these three green supply chain management initiatives have positive relationship with environmental performance.

Moreover, the study by Mitra and Datta (2014), on the impact of reverse logistics on environmental performance concluded that manufacturing firms have not proactively adopted reverse logistics and hence, found a negative relationship between reverse logistics and environmental performance. Regarding social performance, Ann et al. (2006) and Geng et al. (2017), established that inter-firm collaboration on environmental systems such as ISO 14001 certification could enhance the reputation of the firm thereby increasing its social performance. Luthra et al (2016) found out that the adoption of internal environmental management systems, which reduce hazardous material during production process, helps to protect employees' health, and therefore improves the social performance of the firm.

Previous studies examining the link between GSCM, and competitive advantage have shown significant relationship between GSCM implementation and competitive advantage (e.g., Chiou et al 2011; Luzzini et al., 2015; Asevedo et al., 2011). It is contended that implementation of GSCM increases product quality through reduction of hazardous substance and reduce operational cost as a result of the use of less raw material. GSCM implementation also results in recycling, waste reduction on time delivery and innovation (Lee et al., 2012). Furthermore, Lee et al. (2013) argues that GSCM implementation can increase efficiency, which gives the firm the opportunity to make savings on scrap, ensures quick delivery of all specification of customers, thereby enhancing competitiveness of the firm. Many of these studies failed to examine the impact of GSCM implementation on performance as well as competitive advantage at the same time. This research looks at multifaceted performance outcomes by examining the impact of GSCM practices on sustainability performance and competitive advantage. The bridging of this huge gap in extant literature will help extend the debate on GSCM and performance outcomes as well as contributing to new knowledge on the concept of SCM.

2.16 Summary of the chapter

This chapter generally explored the major research clusters, which serve the theoretical foundation of this research. It started with the theoretical background of supply chain management and the green dimension of the traditional supply chain. Sustainable supply chain management (SSCM) which explores the intersection of the principles of the triple bottom line follows afterwards. The concept of GSCM, which is the second research cluster, was explored. This section focused on the various definition in previous studies and a graphical description of the concept. This was followed by the key component of GSCM practices. This section systematically examined the seven green initiatives used in this study representing GSCM practices. The GSCM enabler which serves as the first cluster of the research cluster was examined. Here the various enablers that influence GSCM implementation were discussed. The concept of the triple bottom line was discussed taking into consideration the three sustainability development principles (social, environmental, and economic). The fourth research cluster, competitive advantage was examined. The four components measuring competitive advantage developed by Li et al (2006) were discussed. That is cost; quality flexibility and dependability were individual examined. This entire chapter (Literature review) sort to build the theoretical foundation of the research model bringing together all the integrated clusters. This foundation informed the basis of chapter three where the conceptual framework of the study was developed. Despite recent upsurge in GSCM literature, more empirical studies are required to establish the actual relationship between GSCM implementation, sustainability performance and competitive advantage at the same time considering the influence of critical enablers on GSCM implementation. The key aim of this study, therefore, is to empirically examine the causal relationship between GSCM implementation and competitive advantage as well as firm performance to support the overall aim of determining whether or not being green will lead to competitiveness of the firm.

CHAPTER 3: CONCEPTUAL DEVELOPMENT

3.1 Introduction

The focus of this chapter is to develop theoretical reasoning of the research phenomenon in relation with green supply management. The main aim of this chapter is to develop a theoretical model of critical enablers - GSCM practices - performance - competitive advantage, considering their causal relationship. This section begins with introduction of the theoretical background focusing on the various sections to be covered. Section 3. 2 focuses on the conceptual background of the four frameworks of the research, which include critical enablers, GSCM practices, sustainability performance and competitive advantage. This framework helps to develop a comprehensive new model of critical enablers, GSCM practices, sustainability performance and competitive advantage.

This novel model makes great contribution to knowledge of GSCM through the conceptualisation of the new model. Section 3.3 focuses on the theoretical lens of this study taking into consideration institutional theory, resource based-view, resource dependency theory and stakeholder theory. 3.4 focuses on development of hypotheses concerning the influence of critical enablers on adoption and implementation of GSCM practices which invariable impacts on performance and competitive advantage. Section 3.5 develops research conceptual model showing the various hypothetical relationships, which will further be investigated in subsequent section empirically. Section 3.5 completes the chapter with a summary of the chapter.

3.2 Conceptual background

This section focuses on the theoretical understanding of the conceptual framework of this study. Hence, it elaborates the conceptual reasoning underpinning the advancement of this research framework. It is argued that the interplay of internal and external enablers significantly influence implementation of GSCM (Zsidisin et al., 2005). It has been argued that the use of external enablers to a large extent influence GSCM adoption to a certain level and therefore requires the collaboration of other internal enablers to help achieve implementation of GSCM at different stages of the supply chain (Esfahbodi et al., 2016). This indicates that the collaboration of external enablers focusing on environmental sanctity and internal enablers forming support systems within the firm composed critical enablers that motivate manufacturing firms to implement GSCM. In this study, these set of influencing factors are grouped into both internal and external enablers that support implementation of GSCM by manufacturing firms, which in turn results in sustainability performance outcomes and competitiveness of the firm. The theoretical framework examining the impact of GSCM practices on sustainability performance and competitive advantage taking into consideration the influence of critical enablers has not been comprehensively articulated (Cantor et al 2012). Based on this assertion, this study develops theoretical framework that links critical enablers to GSCM implementation. In addition, it is contended that implementation of green supply chain initiatives at every level of the traditional supply chain leads to improvement in the triple bottom line of (social, economic, and environmental) and competitive advantage (Geng et al., 2017).

Therefore, the theoretical model of this study argues that there is causal relationship between green practices implementation, competitive advantage, and sustainability performance. Sustainability performance in this study is represented by social, economic, and environmental performances, while competitive advantage is represented by cost, quality, flexibility, and dependability. The linkage of GSCM to performance and competitive advantage forms the second phase of the model. Based on this assertion the study develops a theoretical causal linkage between the four frameworks to represent the conceptual framework of the study as shown in figure 3.1 This conceptual model is informed by the research questions, which seek to examine the influence of critical enablers on GSCM implementation and their impact on performance and competitive advantage and the impact of performance outcomes on competitiveness of the firm.

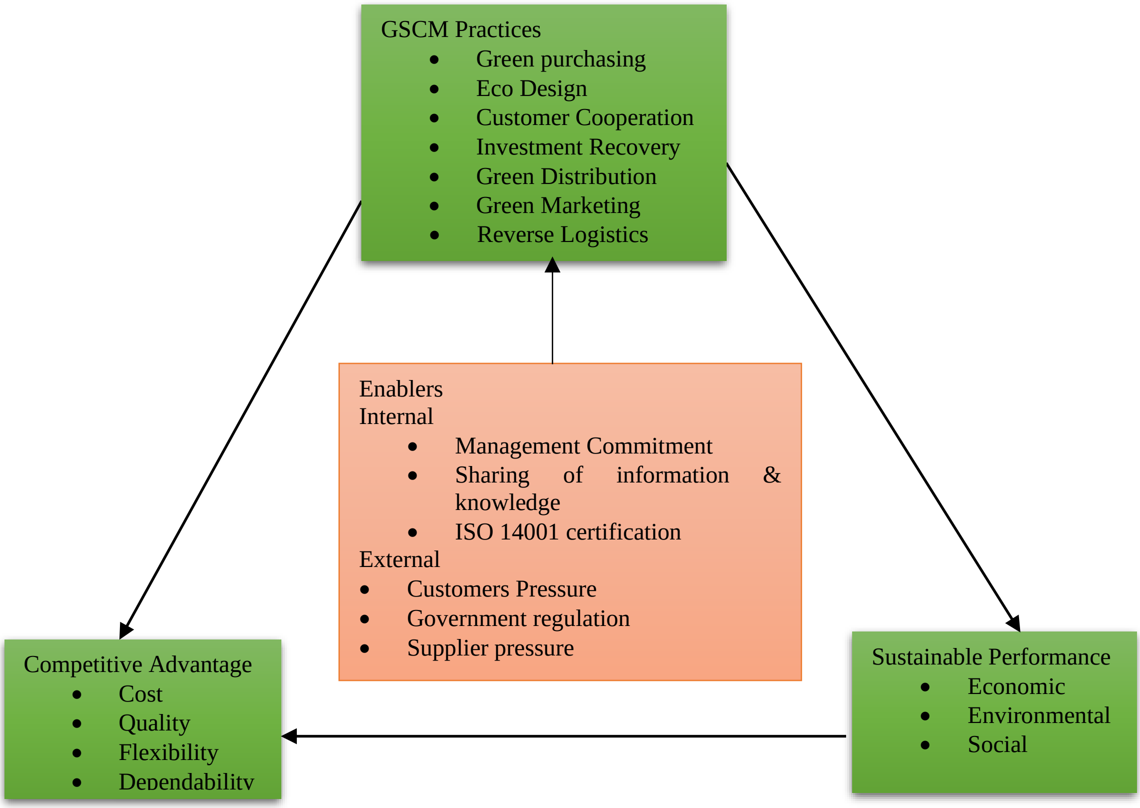


Figure 3.1 Initial Conceptual framework of the research

Existing empirical evidence indicates that the strength of the critical enablers determines the extent of influence on GSCM implementation (Diabet et al 2015). In other words, the power of the critical enabler plays a critical role in influencing the adoption and implementation of GSCM practices (Dubey et al 2015). This model is original in SCM literature and is of academic importance. It is one of the new trends of academic work that considers the influence of enablers associated with GSCM practices implementation and their impact on social, economic, and environmental performance as well as competitive advantage in the same study. This is refreshing, because it provides a comprehensive overview of antecedent of GSCM implementation, impact of GSCM implementation on the triple bottom line and competitive advantage all in one study.

This section further provides detailed discussion on the reasons behind the research model from holistic perspective and proceeds to discuss the four clusters of the research model. The study identified critical enablers to incorporate both internal and external variables that influence manufacturers to successfully implement GSCM practices (Diabet et al., 2016). To this effect, the critical enabler, which serves as antecedent, is proposed to have causal relationship with GSCM practices. Having discussed the critical enabler as an antecedent to GSCM implementation, the study moves on to talk about the cluster of variables representing green supply chain management (GSCM) practices.

The constructs that have been conceptualised to represent GSCM practices in this study include, eco design (ED), green purchasing (GP), green distribution (GD), green marketing (GM), investment recovery (IR), customer cooperation (CC) and reverse logistics (RL). These variables have been carefully selected based on systematic literature review to represent every level of the traditional supply chain management. Using seven green practices to represent GSCM in this study makes this research unique, because it tries to attach green initiative to every stage of the traditional supply chain management. According to Zhu and Sarkis (2004), previous studies have failed to align green initiative to each stage of the supply chain thereby causing the results of impact of GSCM on performance to be inconclusive and inconsistency. Hence, to bring consistency to the conclusion of the effect of GSCM practices on performance and competitiveness of the firm, this research has conceptualised GSCM practices with seven green initiatives. Again, the selection of the seven green practices was informed by literature review where widely used green initiatives have been combined with less widely used green initiatives in extant literature.

Out of 46 previous papers presented in (table 2.1) above, 19 papers focused on eco design, green purchasing appeared in 24 out of 46 papers, 6 papers focused on investment recovery customer cooperation made up of 15 out of 46 papers, 6 papers out of 46 focused on green distribution, green marketing has 4 papers out of 46 and reverse logistics has 16 papers out of 46. Contrary to the traditional environmental management practices the green supply chain undertakes full responsibility of manufacturing firm's activities from the extraction of raw materials, assembly, packaging, logistics, distribution final use and disposal (Handfield et al 1997; Zsidisin & Siferd, 2001). This implies that there is a bunch of green initiatives that can be implemented within green supply chain. Hence, there is a disagreement among scholars regarding what constitutes green supply chain practices. Table 2.1 above shows green supply chain initiatives that have been widely emphasised in literature (Hart, 1997; Eltayeb and Zailani, 2009). Table 2.1 indicates that green supply chain practices can be generally classified into:

(1) Eco-design or design for the environment

(2) Green purchasing

(3) Reverse logistics

(4) Customer cooperation or environmental collaboration with customer.

However, in this study, widely used green initiatives were combined with less widely used green initiatives to give balanced perspective of the various green initiatives.

Existing empirical evidence shows that the constructs representing GSCM practices lead to sustainability performance (triple bottom line) and competitive advantage (Geng et al., 2017). In other words, it is contended that the implementation of these constructs may result in reduction of waste, reduction of cost of material purchased, reduce the use of hazardous substance, reduce the cost of energy consumption, and enhance the corporate image of the firm (Eltayeb et al., 2011; Green et al., 2012; Geng et al., 2017). These GSCM practices implementations collectively measure the social, economic, and environmental performances (Eltayeb et al.; Li et al., 2006).

In principle, it is argued that these constructs when properly implemented lead not only to environmental protection but also enhance the reputation and image of the firm and result in reduction in cost of raw material purchased (Luthra et al., 2016). Empirical evidence available also shows that implementation of these green initiatives must not result in any form of trade-offs, but a win-win scenario for the focal firm (Grote et al., 2007). Therefore, based on the theoretical reasoning pertaining to impact of GSCM implementation on performance outcomes, it is proposed that GSCM implementation has positive relationship with the triple bottom line. The third framework of this study is the conceptualisation of the sustainability performance constructs. This study developed three constructs to represent sustainability performance namely, social performance, environmental performance, and economic performance. In this study, social performance is referred to as performance construct that ensures enhancement of the image of the product and the focal company. It also involves protecting the employees through health and safety education. Social performance also involves ensuring that customers always stay loyal to the company's product and services. (Zailani et al 2012b; Ashby et al., 2012).

Environmental performance on the other hand is referred to as performance construct that ensures saving of energy, reduction of waste, reduction of water and air pollution. It also includes reduction of liquid waste, and decrease in consumption of hazardous material (Zhu, et al., 2005; Rao, 2002; Zhu et al., 2005; Chiou et al., 2011; Lee et al., 2012). The last construct pertaining to performance cluster is economic. In this study, economic performance is measured by profit improvement in general. It involves increase in sales, profit, and market share (Chan et al., 2012; Lee et al., 2013; Kuei et al., 2013; Abdullah and Yaakub, 2014). One of the objectives of this study is to link the implementation of GSCM practices with these constructs and as exit in previous study, it is proposed in this research that GSCM implementation impacts on performance outcomes positively.

The final part of the research model is the link between GSCM practices and competitive advantage. In this study, competitive advantage is conceptualised into four generic principles namely cost, quality, flexibility, and dependability. This relates to efficiency with which the firm operates and puts itself in an advantageous position where no competitor can imitate. Collectively, the generic principles of competitive advantage are measured by reduction in scrap rate, efficient delivery time, and decrease in inventory cost and improved in capacity maximization (Zhu, et al., 2012; Wong et al., 2009; Lai et al., 2012; Dou et al., 2013).

Having discussed all the four frameworks of this research, the study went on to conceptualise GSCM practices into seven constructs, sustainability into three constructs and competitive advantage into four constructs, the second phase of the research model depicting the relationship between GSCM implementation, sustainability performance and competitive advantage including the influence of critical enabler was developed. Therefore, based on the proposed research framework, a new holistic model has been developed showing the link between GSCM enabler, GSCM practices, sustainability performance and competitive advantage.

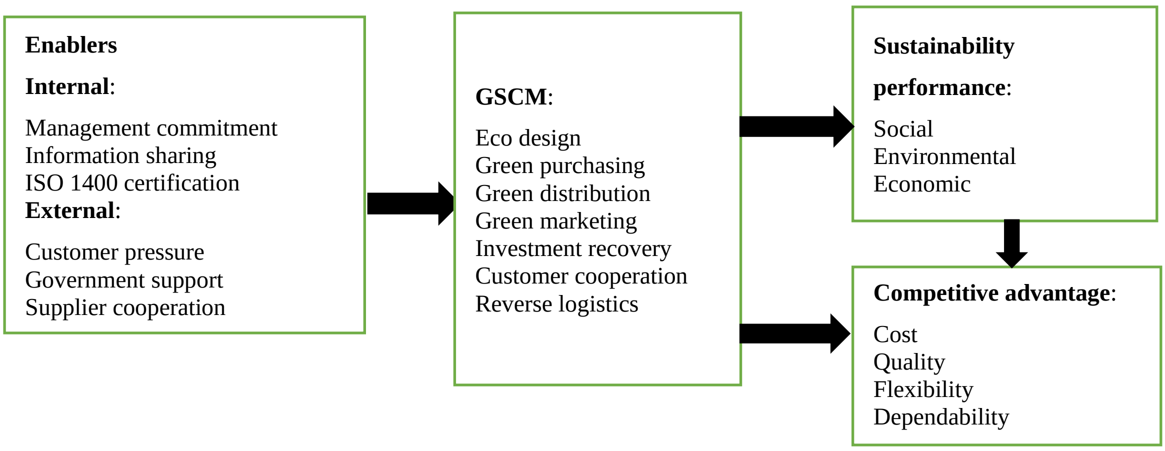


Figure 3.2 GSCM enabler - GSCM practices – performance - competitive advantage model.

Fundamentally, the model of this research was developed based on theoretical perceptive of GSCM implementation and the effect on performance and competitive advantage including the influence of GSCM enabler.

3.3 Theoretical lenses applied to green supply chain management.

Several organisational theories have been associated with green supply chain management (Sarkis et al. 2011). Nine theories have been identified to have association with GSCM namely, resource-based, stakeholder, institutional, social network, resource dependence, information, ecological modernisation, resources dependencies and transactional cost economies (Sarkis et al., 2011). For the purpose of this research study, four theories namely, resources-based view, institutional, stakeholder and resources dependence theory were selected to examine how theoretical understanding of these theories influence adoption of GSCM and the subsequent impact on performance and competitive advantage. The selection of these theories is guided by Geng et al (2017). The table 3.1 below shows several studies examining GSCM and the theoretical lens applied.

Table 3.1: Number of GSCM papers by theoretical lens

Theories	Number papers	Percentage
Institutional Theory	7	14
Contingency Theory	6	12
Resource Based View	6	12
Social Capital Theory	2	4
Resource Dependency Theory	2	4
Stakeholder Theory	2	4
Production Frontier Theory	1	2
Stage Theory	1	2
Transaction Cost Economics	1	2
Not Specified	21	42

Source: adopted from (Geng et al 2017)

The table above indicates that institutional theory is more dominant in GSCM literature especially studies that examined the pressures and enablers that influence GSCM practices. 21 papers did not specify the theoretical perspective of the studies. Resources based view and contingency theories came second highest in terms of papers addressing GSCM.

The four theories selected for this research seek to examine both internal and external oriented understanding that help to identify the elements for sustainability performance monitoring. These four theories complement each other, which aid the development of the multidimensional nature of GSCM. For instance, institutional theory proposes several competitive enablers (internal and external) that address both internal and external stakeholder's pressures. This brings in the role of stakeholder theory in addressing pressures brought to bear on manufacturing firms. The four theories identified in this research are explained below.

3.3.1 Institutional theory

Institutional theory describes how decisions in an organisation are influenced by external forces (Di Maggio & Powell 1983; Scott 1998; Sarkis et al., 2011). Organisational decisions are taken based on a set of acceptable traditional values, norms, and behavioural patterns. This indicates that institutional theory is used as a mechanism to understand the external forces that influence important organisational decisions (Saeed et al., 2018). Companies, as part of social system strive to conform to rules and regulations to legitimise their operations and survival. These rules and regulations within institutional theory take three forms of isomorphic pressures namely, coercive, normative, and mimetic (Di Maggio & Powell 1983; Sarkis et al 2011).

Coercive isomorphic occurs when the pressure on the company to take a decision is influenced by political power such as governments (Sarkis 2011). Mimetic isomorphic occurs when a company deliberately imitates the success story of other legitimate organisations. In order words, mimetic isomorphism emanates from typical response to uncertainty (Di Maggio & Powell 1983). Normative isomorphism is linked with professionalism and organisational norms (Di Maggio & Powell 1983). Generally, institutional theory is being used by companies to adopt and implement environmentally related practices as a result of external influence to meet social and legal expectation (Sarkis et al 2011).

This makes institutional theory a significant theoretical lens to understand environmentally related practices and the critical enablers that influence their implementation Coercive isomorphism occurs when government through its affiliated institutions use fines, penalty, and surcharge to influence the decision of organisations (Rivera, 2004). Consequently, the pressure from such state institutions is likely to dictate and influence a firm's environmental responsible approaches (Delmas & Toffel 2004). Environmentally related pressure with small suppliers who are far upstream from the consumer receive less incentive and as a result are likely to experience less pressure (Hall 2000; Lee et al. 2014)

Previous study on institutional theory posits that coercive pressure through strategic government institutions significantly influence companies to implement environmentally related practices (Sarkis et al 2011). UK as a member of European Union was under the coercive pressure of EU through its regulations and status to improve manufacturing activities. For example, the EU's directives on Waste Electrical and Electronic Equipment (WEEE) demand from manufacturing firms across EU countries to take back used products and materials or phase sanctions when (Yu et al 2006).

Normative pressure requires companies to adhere to acceptable standards of practices in order to legitimise their operations and to be seen in the eyes of society as being socially responsible. Normative pressure takes the form of industry standard, customer requirements, best practices, and pressure from regulatory enforcement bodies to a large extent influence manufacturer to implement green related environmental activities (Sarkis et al. 2011). According to Sarkis et al (2011), 80% of consumers in USA are prepared to pay more for products that have environmentally friendly features. Normative pressures are deemed to emanate from ethical values and ecological consciousness of both consumers and manufacturing firms (Ball and Craig, 2010; Sarkis et al., 2011).

Furthermore, many companies through mimic pressure are imitating the success stories of other companies to enhance their operations. This strategy where one company imitates the success story of another and strives to do the same is called competitive benchmarking (Sarkis et al., 2011). Copying the success story of other companies by focal firms is significant in influencing GSCM implementation in more advanced countries such as Germany and Canada. Green supply chain is a potentially effective mechanism to improve a firm's record on corporate social responsibility, to abate reputational risks, to reduce wastes and to increase the flexibility to respond to new environmental regulations (Simpson et al. 2007). Normative or mimetic isomorphism can become a reality if manufacturing firms are ready to derive first-mover advantages from GSCM implementation (Carbone & Moatti 2011). Institutional theory, therefore, posits that both internal and external enablers promote successful implementation of GSCM practices as it is being advocated by this study.

3.3.2 Resources based view.

The resources based-view theory was adopted in this study because of the inclusion of competitive advantage in the research framework. The resource-based view (RBV) was advanced by Wernerfelt (1984) who perceived a firm as involving an integrated set of resources that are inimitable. Sarkis et al (2011) posit that resources based-view theory of competitive advantage ensures the connection of the resources that are valuable, rare, imitable, and cannot be replaced. The resource of a company is described as all assets, abilities, organisational process, firms' attributes, and information at the disposal of a firm that informs the firm's strategic decision-taking with the aim to streamline its operations and bring about efficiency leading to competitiveness (Sarkis et al., 2011).

However, the significance of resource has long been highlighted by economist such as Edward Chamberlin and Joan Robinson (Fahy 2000). In furtherance, the model of resource-based view was developed by Edith Penrose (1959) who intimated that the internal resources of a firm have a reflective effect on the development and growth of the firm. A resource of a firm is reflected on its capabilities and improvement in various aspects of its operational performance. In other words, resource describes anything which could be thought of as a strength of a firm that enhances its operations and provide a source of competitive advantage (Barney 1991). Hence, firms are using their ability to produce quality product with flexibility operational strategy, coupled with exceptional delivery abilities to secure unparalleled position in the competitive market (Vachon and Lassen, 2006). Many companies are using green implementation to develop these capabilities to achieve competitive advantage.

The extension of the RBV to the natural-resource-based view (NRBV) across the supply chain is popularly used to describe why firms successfully adopt and implement GSCM (Laari, 2016). The NRBV suggests that competitive advantage can be achieved through abilities assisting environmentally sustainable economic activities (Hart 1995). According to Hart (1995) resource should be valuable, rare, inimitable and cannot be substituted. That is, resource must also not be confusing and socially intricate. In support of resources based-view, relational theory posits that firm’s abilities can be developed beyond the internal supply chain to include resources of external partners of the supply chain (Dyer & Singh 1998). Resources of a firm lead to competitive advantage if they are ambiguous and socially complex making them difficult for competing firms to imitate (Shi et al. 2012).

The collaboration of relational theory and natural resources-based view (e.g., Vachon & Klassen 2008; Shi et al. 2012) support that environmental management related practices within the supply chain create competitive advantage for the focal firm. Previous study has shown that closer collaboration among the players of the supply chain leads to sharing of information and knowledge, which enhances the capabilities of the supply chain players (Vachon & Klassen 2008). Potentially RBV has significantly been used to explain the motivation behind the adoption of GSCM practices. (Testa & Iraldo 2010). The development of resources and capabilities can be demonstrated through enhancements in all various performance principles (Sarkis et al. 2011). Previous research has shown that these resources at the disposal of the firms that influence them to adopt GSCM have improved.

- Quality, dependability, and flexibility advantages (Vachon & Klassen 2008)
- Cost performance (Chavez et al. 2014).
- Environmental performance (e.g. Rao & Holt 2005; De Giovanni & Esposito Vinzi 2012; Zhu et al. 2013),
- Financial performance (King & Lenox 2001a; Rao & Holt 2005; De Giovanni & Esposito Vinzi 2012; Zhu et al. 2013; Yang et al. 2013).

Furthermore, the development and improvement in image and reputation of the firm can be classified as a significant resource (Sarkis et al. 2011). However, Shi et al. (2012) posit that there is still inconsistency as to how the specific types of GSCM practices translate into a firm's strategic resources, which will eventually lead to competitive advantage and performance improvement.

3.3.3 Resources dependency theory

Resource dependency theory (RDT) indicates that, the players along the supply chain should not operate independently but collaborate and depend on each other to strive for superior performance outcomes (Sarkis et al., 2011). This theory posits that companies must seek to rely on capabilities and resources provided by other firms to develop and enhance their operational performance. For example, a focal firm may rely on the materials from suppliers to be able to produce goods to meet customers' requirements (Mani et al 2017). The call for dependency is under the assumption that, no one firm can be self-reliant on its own resources for growth and sustenance. They need to integrate capabilities and resources of other successful firms to ensure their sustenance (Sarkis et al 2011). According to resource-based view (Barney, 1991), collaboration between focal firm and suppliers enables the focal firm to build set of rare, inimitable, and valuable resources that are significant to achieving competitive advantage. As argue by Carter and Jennings (2004), it is evident that such collaborations bring valuable and intangible resources, including human resources and the exchange of ideas that come along while working together to improve the environment.

Furthermore, according to Sarkis et al (2011), eco-design, represents a significant organisational resource which can become effective tool for performance improvement when a focal firm establishes closer partnership or relationship with other players along the supply chain network. In resources dependency theory, it is always common to see the firm that possesses superior bargaining power exerting control over the weaker companies (Crook & Combs 2007; Nyaga et al. 2013). The emphasis on green practices in the supply chain can be expounded with reference to the control aspect of the RDT (Sarkis et al. 2011). Depending on their effort to manage resources and potential substitutes, firms possess alternative in securing access to environmental resources (Hollos et al. 2012). The focal firm's ability to influence suppliers to oblige to environmental collaboration is more often dependent on the supplier's level of dependent on the focal firm (Min & Galle 2001). Generally, large buyers who wield power more often demand from smaller suppliers to adopt and implement environmentally friendly practices suggested by such large companies (Hall 2000; Min & Galle 2001 Sarkis et al. 2011).

Companies with prevailing market controls can influence the environmental policies and strategies of other partners of the supply chain (Caniëls et al. 2013). In a study by Brockhaus et al. (2013), it was identified that companies with extreme powers and control are able to force small firms upstream supply chain to implement environmentally related policies imposed on them by these powerful and dominant companies. Moreover, smaller companies who lack the necessary resources are more likely to depend on others to acquire those resources (Sarkis et al. 2011). Small firms are forced to comply with these imposed policies because they lack the capital and human capital and also to be able to continuously access these resources from the larger firms (González et al. 2008). It is evident in previous study that, lack of capabilities and resources contributes to inability of many companies especially the smaller ones to implement GSCM practices, however due to the collaborative nature of resources dependency theory which has closer links with supply chain, many firms are beginning to adopt GSCM practices. This research, therefore, agrees with the notion that resources are difficult to come among the smaller firms, however with strategic collaboration and adherence to policies with those who have the resources, smaller firms can also implement GSCM practices.

3.3.4 Stakeholder theory

According to Sarkis et al (2011), a stakeholder is an individual or a group who may be affected by an action and fulfilment of and organisational objectives. The stakeholder theory posits that companies, through their operations produce negative stimulus that affects a group of people or individuals who are either with the organisations or outside the organisation. This negative stimulus influences these stakeholders to react in a way that exert pressure on the focal firm to reverse this negative stimulus. Firstly, from a stakeholder perspective, firms' operations can be perceived as a set of relationships among groups or individuals who have interest or stake in the operations and activities of the firm (Freeman, 1984; Jones, 1995; Walsh, 2005). It describes how these groups or individual such as, customers, suppliers, employees, financiers (stockholders, bondholders, banks, etc.), communities and managers co-operate to jointly meet the objectives of the business.

These internal and external stakeholders have different levels of interest as far as the operations of the business are concerned. It is therefore important that companies strive to meet the needs of all these stakeholders who are affected by the activities of the company at different levels. In order words, it is the top management responsibilities to manage and shape these relationships to create as much value as possible for stakeholders through minimisation of the negative stimulus (Freeman, 1994). In situation where top management interest conflict with stakeholders, it is a recipe for disaster and management must as a matter of urgency deal with such problems (Harrison, Bosse, & Phillips, 2010). From the perspective of supply chain, stakeholders can be seen from different aspect especially when the issue of environmental protection is very topical in the operation of the firm.

According to Sarkis et al (2011), stakeholder's investigation for GSCM implementation is very crucial since in their view not all GSCM implementation result in improved performance and generate competitiveness. Hence, the stakeholder theory is acting as an explanatory viewed from antecedent perspective that influence adoption of GSCM practices. Identifying and examining the roles of different stakeholders within the GSCM practices has been an application method by researchers using stakeholder theory as a basis for their theoretical understanding (De Brito et al 2008; Sarkis et al 2011). Many studies investigating GSCM practices have used stakeholder theory to understand certain fundamental environmental phenomenon (Sarkis et al 2010). On many occasions when implementing GSCM practices firms may encounter trade-offs. However, due to meeting the objectives of stakeholder theory, management must figure out how to meet the desire of all the stakeholders to improve the firm's performance (Freeman, Harrison, & Wicks, 2008). Due to the global nature of the firms supply chain activities, stakeholder theory is growing and expanding (Sarkis et al 2011).

3.4 Hypotheses development

The focus of this section is to develop the causal relationship between the conceptual constructs in the model. This section further discusses the conceptual framework, which is the basis for the theoretical reasoning of this study. The formulation of the conceptual framework and development of the hypotheses is an attempt to accomplish the core objective of this research. As a result, this section formulates hypotheses to reflect on the four frameworks of the research and to achieve the major aim of this research. In developing the hypotheses of this study, the concept of contingency perspective formed the fundamental grounds. With contingency perspective, the propositions are either accepted or rejected based on the outcome of the empirical analysis to determine the true or false of the proposition (Layder, 1998). This section concludes with developing the hypotheses to cover the research questions and the framework.

3.5 Critical enabler and GSCM

Critical enabler comprises a group of variables that collectively influence GSCM implementation. It is evidenced in literature that the collaboration of both exogenous and endogenous enablers influences manufacturing firms to successfully implement green supply chain management such as eco design, green production, green marketing, green distribution, investment recovery, customer cooperation and reverse logistics (Diabet and Govindan, 2015). In essence, manufacturing firms undertake GSCM initiative for various reasons, including pressure from stakeholders, management commitment to environmental protection and sharing of information and knowledge pertaining to sustainability among departments. In many instances, the external enablers have supreme power to influence manufacturers to trigger implementation of GSCM (Zailani et al 2012). It is also contended that not only does customer pressure functioning as external enabler influence GSCM implementation, but also the collective effort of internal enablers including management commitment and information and knowledge sharing do trigger GSCM implementation (Sarkis, et al., 2010). In view of this, the critical enabler representing antecedent of GSCM implementation comprises both external and internal enablers. Therefore, in this study, critical enabler serves as an antecedent towards green implementation leading to performance and competitive advantage.

Critical enablers have been defined as any variables or a group of variables that enable another to achieve an end. In other words, the term enablers refer to an action that; “make possible; to give power, means, competence, or ability” (Grzybowska, 2012; Diabat et al., 2014). Enablers are considered as factors that motivate and influence the implementation of GSCM practices. In this sense, enablers comprise of variables such as customer pressure, sharing of valuable information Knowledge and commitment of management towards sustainability (Diabat et al., 2014). The collective effort of these variables motivates manufacturers to implement green initiatives (Grzybowska, 2012).

Based on the theoretical reasoning above, and relying on empirical evidence contained in literature, this study supports the proposition that there is relationship between critical enablers and implementation of ED, GP, GD, GM, IR, CC and RL. Study by Luthra et al (2016), empirically analysed the impact of critical success factors (CSFs) for implementing GSCM towards sustainability performance in Indian automobile industries. Using data from 123 automobile organisations in India, their study used six critical success factors (internal management, customer management, regulatory, supplier management, social and competitiveness); six green supply chain management practices (Green design, green purchasing, green production, green management, green marketing, green logistics) and four expected sustainability performance outcomes (Economic performance, Social performance, Environmental performance and Operational performance).

Similarly, in this study critical enablers are expected to influence implementation of GSCM practices (Eco design, green purchasing, green distribution, green marketing, customer cooperation, reverse logistics and green production) in UK manufacturing industry. In agreement with this study, Green et al (2012) posit that, top management commitment to sustainability served as a critical enabler towards adoption of green implementation. This means that firms with high level of management commitment is likely to implement green supply chain. Furthermore, external stakeholders such as customer pressure has come to take leading role in influencing the implementation of GSCM. According to Green et al (2008), customers in US will not participate in a company whose environmental record is in doubt. In this regard, customer's pressure exerts much influence in the strategic decision by manufacturing firms (Luthra et al., 2016).

According to Cantor et al (2012), environmental education in addition with organisational learning collectively influence implementation of GSCM practices. Similarly, Walker et al (2008) indicate that environmental education and learning prepares the staff of the focal firm to become environmentally aware, which invariable prepares the grounds for GSCM implementation. Thus, for GSCM implementation to be successful, the focal company must have competent staff with environmental protection experience. This re-echoes the role of internal enabler of information sharing among the departments pertaining to environmental protection strategy. If there is efficient line of communication of vital information and sharing of knowledge on environmental protection, collaboration among departments ensures success of green implementation Dubey et al (2016). In addition, Zhu and Sarkis (2007) assert that incorporating total quality management strategy into a focal firm strategic plan serves as a motivation for GSCM practices implementation. Based on the above theoretical reasoning and empirical evidence from literature, enablers are assumed as powerful force to trigger implementation of GSCM practices. We therefore propose the following hypotheses:

H1a. Critical enabler is directly and positively associated with green purchasing.

H1b. Critical enabler is directly and positively associated with eco design.

H1c. Critical enabler is directly and positively associated with investment recovery.

H1d. Critical enabler is directly and positively associated with customer cooperation.

H1e. Critical enabler is directly and positively associated with green marketing.

H1f. Critical enabler is directly and positively associated with green distribution.

H1g. Critical enabler is directly and positively associated with reverse logistics.

3.6 Link between GSCM practices and sustainability performance

It is evident in literature that GSCM practices; GP, ED, GM, GD, IR, CC and RL are adopted as result of both internal and external enablers that influence manufacturers Diabet et al (2015). It is proposed that the collective implementation of these green initiatives must result in improved social, economic, and environmental performances (Green et al 2012; Feng et al 2017). This study applied seven green initiatives, which are eco-friendly, and by extension their implementation does not result in trade-off among any of the triple bottom line but win-win situation. Hence, if implementation of these initiative results in enhanced corporate image, health and safety of employees and reduction in inventory cost, then it is proposed that GSCM practices have a positive impact on social performance.

In addition, these green initiatives have within their character the potential to reduce the impact of manufacturing operations on the natural environment without creating any form of trade-offs with other sustainability performance dimensions. In this regard, Zhu et al (2013b) posit that a great deal of environmental performance could be achieved by waste reduction because of implementation of GSCM practices.

Chiou et al., (2011), contended that implementation of product innovation, process innovation and managerial innovation have positive relationship with environmental performance without any form of trade-off with the social and economic performance. Consequently, the collective implementation of these initiatives resulted in decreased in air and water pollution, decreased in waste generation and reduction of greenhouse gas emission (Chiou et al (2011). Therefore, this research proposed that implementation of GSCM practices impact on environment positively. Furthermore, pertaining to economic performance, GSCM practices (ED, GP, GM, GD, IR, CC, and RL) potentially result in increase in economic performance. Economic performance is said to be one of the major reasons for implementing GSCM practices by manufacturing firms (Green et al., 2012). This is achieved through reduction of raw materials purchased, reduction in inventory cost and decreased in cost of energy. It is therefore contented that implementation of GSCM impact on cost performance through cost reduction linked to saving of energy, reduction in penalty fees and reduction of inventory holding cost. Based on the above reasoning, this study develops hypotheses linking each of the GSCM practices with social, economic, and environmental performance individually. The theoretical reasoning behind this proposition is to empirically examine the impact of each green initiative on individual performance dimensions.

3.6.1 Green supply chain management practices and environmental performance.

Generally, GSCM practice has now become strategic imperative rather than business option due to stakeholders' pressure to produce goods and services devoid of hazardous substances and environmentally friendly (Chiou et al 2011). In this study, it is proposed that green initiatives of green purchasing (GP), eco design (ED), green marketing (GM), green distribution (GD), investment recovery (IR) customer cooperation (CC) and reverse logistics (RL) are in principle environmental protective initiative targeted at reducing negative impact on the natural environment.

Mclntyre et al., (1998), evaluated environmental outcomes of green initiatives using environmental matrix that assesses the overall impact of green initiatives at every stage of the supply chain. The results of this study showed positive relationship between the green initiatives and sustainability performance. Available evidence within literature posits that implementing GSCM will result in waste elimination, reduction of greenhouse gas emission, avoidance of penalty from government institutions, increase in focal company's image, reduction in inventory cost and less use of energy. In addition, many similar studies investigating the impact of green supply chain implementation have concluded a positive relationship between environment and financial performances (Zhu and Sarkis, 2004). Most available literatures in green supply chain management have produced positive evidence linking GSCM with environment within the manufacturing sector (Zhu and Sarkis, 2004; Lai and Wong, 2012; Lai et al., 2012; Dou et al., 2013; Zhu et al., 2013a). Hence, Zhu et al., (2013b) indicated that increasing environmental performance could be achieved when GSCM initiatives are implemented at every stage of the supply chain. Additionally, Chiou et al (2011) investigated three types of green initiatives including product innovation, process innovation and managerial innovation and concluded that, all the three initiatives have positive impact on environmental performance. Moreover, according to Rothenberg (2000), a closer collaboration with suppliers leads to substantial improvement in environmental performance.

The implementation of GSCM practices ensures efficiency in production processes and waste management, avoidance of environmental penalties, and waste removal costs (Lee et al., 2012). Accordingly, Lee et al. (2013) discovered that GSCM implementation could increase efficiency, permits the focal firm to make savings on scrap, time of delivery, and ultimately improves operational efficiency. Green et al., (1998), found that green purchasing implementation and supply policies potentially improves the environmental performance. Green et al (2012) found that eco design implementation results in enhancement of environmental performance, without any trade-off with other performance outcome dimensions. It is also argued that eco design focused on investment recovery will positively impact on environmental performance.

However, Mitra and Datta, 2014; Abdullah and Yaakub (2014) explored the impact of reverse logistics practices on performance, and the study discovered that practitioners have not fully integrated the concept of reverse logistics at the designing stage of the product development. Both studies further established a negative relationship between reverse logistics implementation and environmental performance. Although there seem to be inconsistency within literature, majority of the studies are in favour of positive relationship between GSCM implementation and environmental performance (seuring and muller, 2008a; Vachon and Klassen, 2008; Zhu et al., 2012). Based on the above arguments and findings, this study proposes the following hypotheses:

H2a. Green purchasing directly and positively impacts environmental performance.

H2b. Eco design directly and positively impacts environmental performance.

H2c. Investment recovery directly and positively impacts environmental performance.

H2d. Customer cooperation directly and positively impacts environmental performance.

H2e. Green marketing directly and positively impacts environmental performance.

H2f. Green distribution directly and positively impacts environmental performance.

H2g. Reverse logistics directly and positively impacts environmental performance.

3.6.2 Green supply chain management practices and economic performance.

The focus of green supply chain management is to eliminate waste linked to the environment and cut cost of production. For many manufacturing firms, the key reason for implementing GSCM is gaining financial benefit (Lee et al., 2012; Zhu and Sarkis, 2004). This practice of eliminating waste results in improved economic performance. According to Rao and Holt (2005), implementing GSCM practices leads to positive economic performance. For many of the early research studies the outcome of relationship between GSCM and economic performance resulted in negative outcome (Zhu and Sarkis, 2004; Zhu et al., 2005).

This was argued that the early stages of GSCM implementation requires extra investment, which in many cases increases the cost of production thereby affecting the economic fortune of the company. However most recent studies such as Hung et al. 2014; Kim et al. 2011; Liang et al. 2006; Geng et al 2017) have shown that there is significant positive relationship between GSCM practices and firm performance. We therefore propose that based on the theoretical reasoning from literature, the study proposes the following hypotheses:

H3a. Green purchasing directly and positively impacts economic performance.

H3b. Eco design directly and positively impacts economic performance.

H3c. Investment recovery directly and positively impacts economic performance.

H3d. Customer cooperation directly and positively impacts economic performance.

H3e. Green marketing directly and positively impacts economic performance.

H3f. Green distribution directly and positively impacts economic performance.

H3g. Reverse logistics directly and positively impacts economic performance.

3.6.3 Green supply chain management practices and social performance.

Linking GSCM practices with social performance has received limited attention within green supply chain management literature (Feng et al 2017). This lack of balanced research pertaining to social performance has called for more research to include social performance in the sustainability performance outcomes. In this study, social performance is considered as an approach to measure outcomes of GSCM practices about increasing product and company image, protecting employee health and safety, maintaining customer loyalty and approval (Zailani et al., 2012b; Ashby et al., 2012). Pertaining to social performance, study by Zailani, et al (2012) concluded that implementation of green purchasing and green packaging leads to positive social performance. The findings of Zailani et al. (2012) are consistent with Preuss (2000), who indicated that social activities targeted at protecting the environment could be shifted to the suppliers through purchasing functions.

This approach can cause a chain of positive effect within the supply chain resulting in substantial benefit and overall social performance (Geng et al 2017). In recent times, social issues, e.g., labour, health and safety matters have taken a significant turn within manufacturing supply chain giving rise to improvement in social performance (Gimenez and Tachizawa, 2012). It is argued that manufacturing process and production of goods and services leading to business growth and profit should not be achieved at the trade-off of employee's welfare. However, it is proposed that supply chain management activities should be tailored towards the wellbeing of the players of the supply chain and other stakeholders such as customers (Pagell and Shevchenko, 2013).

Based on the above submission, social performance is considered as an important component for achieving sustainability within the supply chain. Therefore, establishing this linkage can further enhance the theoretical knowledge of GSCM since this study is one of the trends of studies that have examined the relationship between GSCM implementation and social performance. Based on the above submission, the following hypotheses are proposed:

H4a. Green purchasing directly and positively impacts social performance.

H4b. Eco design directly and positively impacts social performance.

H4c. Investment recovery directly and positively impacts social performance.

H4d. Customer cooperation directly and positively impacts social performance.

H4e. Green marketing directly and positively impacts social performance.

H4f. Green distribution directly and positively impacts social performance.

H4g. Reverse logistics directly and positively impacts social performance.

3.7 Green supply chain management and competitive advantage.

Most of the previous studies pertaining to GSCM have found a positive relationship between GSCM practices and competitive advantage (e.g., Chiou et al.,2011; Dou et al., 2013; Zhu, Sarkis and Lai, 2011; and Zailani et al., 2012a; Lee et al., 2012; Lee et al.,2013). However, many of these studies failed to link the individual component of competitive advantage to various green initiatives. It is argued that implementing GSCM can ensure efficiency of production process and quality of the product. It further leads to increase recycling of wastes, prevention of environmental penalties from government institutions, and reduces disposal costs (Lee et al., 2012). Accordingly, Lee et al. (2013) posits that, GSCM implementation increases operational efficiency leading to reduction of delivery time, meeting all customers' requirements, and reducing inventory levels and holding cost.

In general, manufacturing firm can achieve competitive advantage by implementing GSCM (Chiou et al., 2011). Companies can enhance their business activity and achieve competitive advantage if GSCM is successfully implemented (Hansmann and Claudia, 2001). Furthermore, GSCM implementation leads to efficiency, which in turn promotes the competitiveness of the firm, (Rao and Holt, 2005). The corporate image of a manufacturing firm could be improved by adopting GSCM practices, which in turn enhances the competitiveness of the firm (Chen, 2008). Study by Vachon and Klassen (2008), established a link between GSCM initiatives and competitive advantage. In contrast to Vachon and Klassen (2008), Rao (2002) posits that there is no correlation between GSCM and competitive advantage.

This inconsistency in findings requires further studies using empirical analysis to extend the knowledge in the field of GSCM. This study, therefore, seeks to extend the research on the link between GSCM and competitive advantage. Therefore, the following hypotheses are proposed:

H5ai. Green purchasing directly and positively impacts cost.

H5aii. Green purchasing directly and positively impacts quality.

H5aiii. Green purchasing directly and positively impacts flexibility.

H5aiv. Green purchasing directly and positively impacts dependability.

H5bi. Eco design directly and positively impact cost.

H5bii. Eco design directly and positively impacts quality.

H5biii. Eco design directly and positively impacts flexibility.

H5biv. E co design directly and positively impacts dependability.

H5ci. Investment recovery directly and positively impacts cost.

H5cii. Investment recovery directly and positively impacts quality.

H5ciii. Investment recovery directly and positively impacts flexibility.

H5civ. Investment recovery directly and positively impacts dependability.

H5di. Customer cooperation directly and positively impacts cost.

H5dii. Customer cooperation directly and positively impacts quality.

H5diii. Customer cooperation directly and positively impacts flexibility.

H5div. Customer cooperation directly and positively impacts dependability.

H5ei. Green marketing directly and positively impact cost.

H5eii. Green marketing directly and positively impacts quality.

H5eiii. Green marketing directly and positively impacts flexibility.

H5eiv. Green marketing directly and positively impacts dependability.

H5fi. Green distribution directly and positively impacts cost.

H5fii. Green distribution directly and positively impacts quality.

H5fiii. Green distribution directly and positively impacts flexibility.

H5fiv. Green distribution directly and positively impacts dependability.

H5gi. Reverse logistics directly and positively impacts cost.

H5gii. Reverse logistics directly and positively impacts quality.

H5giii. Reverse logistics directly and positively impacts flexibility.

H5giv. Reverse logistics directly and positively impacts dependability.

3.8 Sustainability performance and competitive advantage

Results of previous studies have confirmed significant relationship between sustainability performance and competitive advantage. Contrary to above, Ann et al. (2006) argued that sustainability performance did not lead to improved dependability and quality. However, studies such as (Zhu et al., 2010; Zhu and Sarkis, 2004; Yu er al., 2014) posit that social, environmental, and economic performances lead to competitive advantage. Yang et al. (2010), Lai and Wong (2012) both discovered that implementing social, environmental, and economic performances activities could improve competitive advantage in terms of product quality and delivery. Pertaining to environmental performance leading to competitive advantage, Geng et al (2017) argued that environmental performance focuses on saving energy, reducing hazardous substance in finished product thereby leading to high quality and in turn achieve competitive advantage.

Regarding social performance, it is described as an outcome of the GSCM practices concerning enhancement of product and company image, protecting employee health and safety, safeguarding customer loyalty and satisfaction (Zailani et al., 2012b; Ashby et al., 2012). These measures help to improve product quality leading to competitiveness of the firm. This study therefore seeks to extend previous knowledge on the link between sustainability performance and competitive advantage by linking the effect of gaining sustainable performance and competitive advantage. Therefore, the following hypotheses are proposed:

H6ai. Social performance directly and positively impacts cost.

H6aii. Social performance directly and positively impacts quality.

H6aiii. Social performance directly and positively impacts flexibility.

H6aiii. Social performance directly and positively impacts dependability.

H6bi Environmental performance directly and positively impacts cost.

H6bii. Environmental performance directly and positively impacts quality.

H6biii. Environmental performance directly and positively impacts flexibility.

H6biv. Environmental performance directly and positively impacts dependability.

H6ci. Economic performance directly and positively impacts cost.

H6cii. Economic performance directly and positively impacts quality,

H6ciii. Economic performance directly and positively impacts flexibility.

H6civ. Economic performance directly and positively impacts dependability.

In all, four major propositions in this study have further been developed into 68 sub-hypotheses. These hypotheses have been developed to be tested empirically based on the research framework concerning critical enablers-GSCM practices-sustainability performance –competitive advantage. These hypotheses in general cover the overall research questions in this study**.**

3.9 Theoretical model

The previous section examined the conceptual framework leading to formulation of the research model and consequently, developed four major hypotheses with 68 sub-research hypotheses. This approach concludes the research attempt to develop a comprehensive theoretical model of critical enablers-GSCM practices-sustainability performance-competitive advantage, which forms the core of the research objective. In this regard, this section proceeds to address the research model, which in turn evaluates the relationship between GSCM implementation, sustainability performance and competitive advantage while recognising the influence of GSCM enablers. To achieve this objective, the study attempts to include the proposed hypotheses into the research model, to be able to advance individual causal relationship of the research constructs to generate the final theoretical model. The final model depicting the theoretical relationship among the latent variables is demonstrated in figure 3.4.

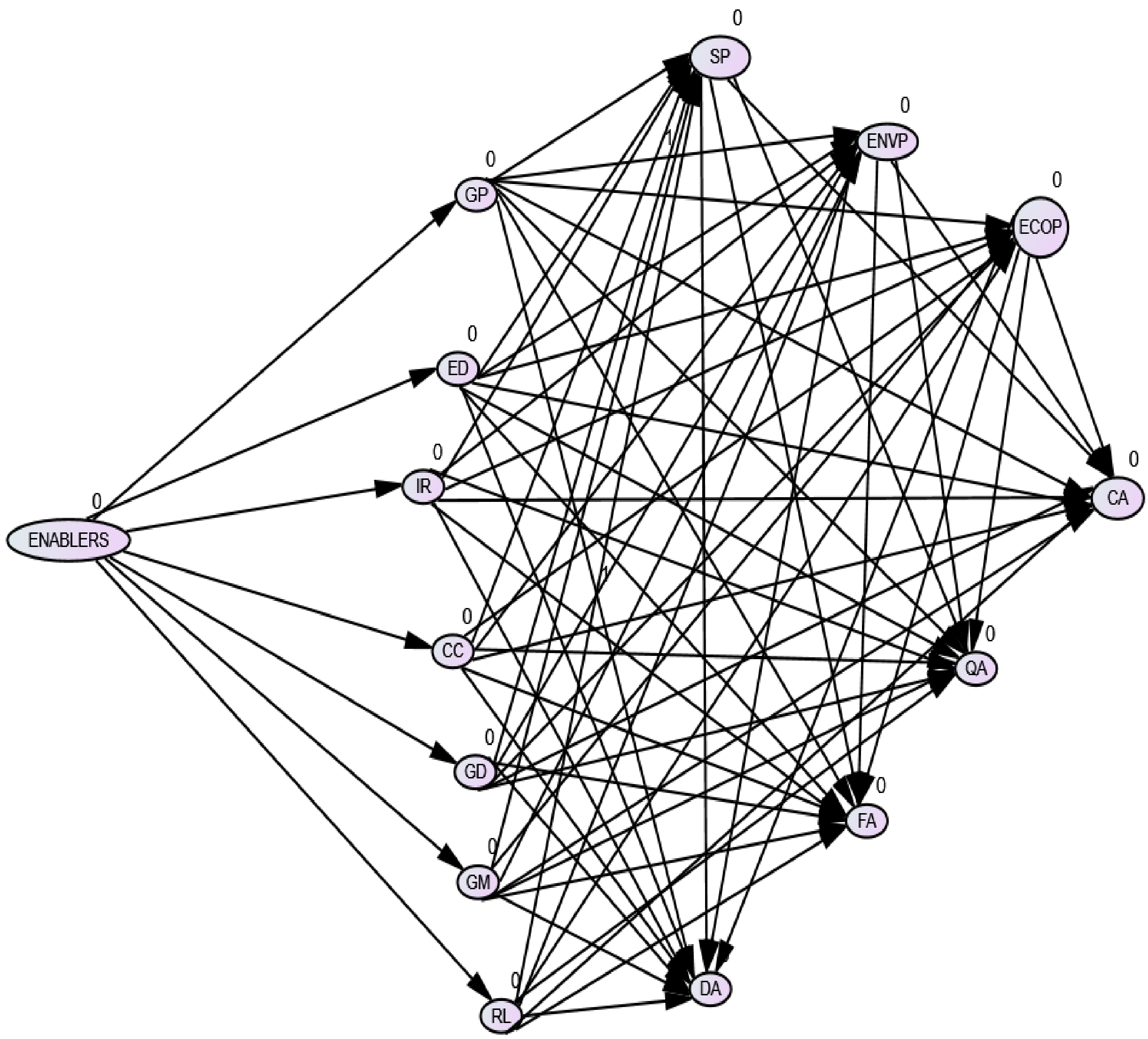


Figure 3.4: Model showing Enablers, GSCM Practices, Performance, Competitive advantage

The path diagram showing the theoretical model contains fifteen latent variables namely: critical enablers (CE), Green purchasing (GP), eco design (ED), investment recovery (IR), green marketing (GM), customer cooperation (CC), green distribution (GD), reverse logistics (RL), social performance (SP), economic performance (ECO), environmental performance (ENV), cost advantage (CA), quality advantage (QA), flexibility advantage (FA), and dependability advantage (DA). Each of the proposed hypothesised causal relationship is expected to be positively related.

In this study, critical enabler serves as the antecedent influencing the implementation of exogenous variables represented by green purchasing, eco design, investment recovery, green marketing, customer cooperation, green distribution, and reverse logistics. The endogenous constructs, which in other words serve as the outcome or consequences of the focal constructs, are social performance, economic performance, environmental performance, cost, quality, flexibility, and dependability. In this study, critical enabler serves as an influencing variable for GSCM practices implementation, which in turn results in improved firm performance and competitiveness of the firm. With these linkages in mind, it is argued that enabler has causal relationship with GSCM practices, where GSCM practices in turn impact performance outcomes and competitiveness of the firm.

In all, this study has developed a model linking enablers serving as antecedent to GSCM practices, performance outcomes and competitive advantage. The theoretical contribution of this study is developing an overarching model that could evaluate the impact of GSCM practices on performance and competitive advantage taking into consideration the influence of critical enablers serving as antecedent. This model is one of the trends of studies in GSCM to have holistically integrated four-research framework into a single model.

Furthermore, this study draws attention to how both internal and external enablers are collaborated to successfully influence implementation of GSCM practices. Finally, this study undertakes an empirical analysis of the research hypotheses in order to answer the key research questions: '*which enablers both internal and external must be available to a manufacturing firm before GSCM practices are implemented? 'What impact does implementation of GSCM have on sustainability performance (triple bottom line)? 'What impact does GSCM implementation have on competitive advantage? 'What impact does sustainability performance (triple bottom line) have on competitive advantage?* The empirical evaluation of the research model and its associated hypotheses is shown in chapter 5.

3.10 Summary of the chapter.

The purpose of this chapter was to develop the research model that directs this study to address the main research questions. In this respect, this chapter has delivered an imaginary thinking for developing the conceptual framework and afterward-initial model and hypothesis expansion to present theoretical model. This chapter commenced with hypothetical reasoning concerning the conceptual development by means of theoretical foundations offered in chapter two. At this point, the theoretical relationship between the four major clusters of the research phenomenon were recognised using the theoretical foundations of these combined clusters, and accordingly the study's, conceptual framework was advanced with the emphasis on antecedent and outcome consequence. Subsequently, in line with the study conceptual framework, the original research model was developed, with suggestions of cause- and- effect resulting in theoretical reasoning linking to the organisation performance and the relationship justification as well as the theoretical support of GSCM theory.

In addition, 68 individual hypotheses have been developed for further empirical tests among the entrenched constructs, based on the theoretical opinions concerning the main research framework of critical enablers, GSCM practices, sustainability performance and competitive advantage and empirical proof captured in literature. Finally, an inclusive GSCM enabler, GSCM practices, performance, competitive advantage model has been established which has the capacity to assess the impact of GSM implementation on the three bottom line and competitive advantage while recognising the influence of critical enabler on GSCM implementation. This model will help the study to achieve its fundamental objective of developing a rigorous conceptual model that considers enablers, GSCM practices, performance, and competitive advantage, which gives a direction to this study to answer the research questions.

CHAPTER 4: RESEARCH METHODOLOGY

4.1 Introduction

Having laid the foundation of this research in the previous three chapters, the methodological underpinning of the study can now be presented. This chapter is concerned with turning a typical theoretical phenomenon into a more acceptable practical research study that has a capacity to answer research questions. In this respect, the study helps to generate new information that could be used to investigate an unknown to solve a problem that may enhance advancement of knowledge (Bassey, 1999; Nassar 2011).

Management research is purely classified as an applied field because it is conducted by way of understanding the nature and how organisations operate, through tackling problems that may arise related to managerial phenomenon. However, there are different approaches in which research can be conducted to reflect on its philosophical practical position (Saunders et al 2009). Hence, this chapter presents the designing of philosophical and methodological consequences of this study and addresses the rationalisation of the choices applicable to them. This chapter is put into two sections; the first section comprises all the philosophical implications including the various philosophical assumptions adopted in this study, the paradigms explored, the research logic, and the approaches to the research.

The second section deals with other practical aspect such as questionnaire development, ethical consideration, data type, and pilot study, sampling method and data collection strategy. This chapter, right after introduction begins with section 4.2, which deals with the "research onion". Section 4.3 examines the philosophical position of this study. This is immediately followed by section 4.4 that talks about the research approach to this study and section 4.5 deals with research strategy. Sections 4.6, 4.7, and 4.8 deal with research method, research design and data collection strategy, respectively. Section 4.9 talks about data analysis approach while sections 4.10, 4.11, 4.12 and 4.13 deal with research questionnaire, data type and ethical consideration, respectively. Pilot study is captured in section 4.14 followed by 4.15 the main study. The last section of this chapter deals with the chapter summary in section 4.16.

4.2 Research Onion

Saunders et al (2009) have developed research approach which involves philosophical stance and methodological approach, which researchers need to adopt in order to effectively answer the research questions. The composition of the "research onion" involves all integrated rigorous components of social science approach. As shown in figure 4.1, there are two parts to the research onion; the outer part and the inner part (Saunders et al., 2009). The outer layer of the onion covers the philosophical stance of the research and includes the major philosophical assumptions, the models discovered, the research logic, and the key approaches. The second part of the onion, which forms the inner part, examines the practical considerations of the research. Researchers adopt this model in their study in order to justify the philosophical stance and methodological approaches employ by them Saunders et al (2009). Research onion has become a popular approach employ by many research studies especially those at PhD level to guide and give a clear guideline to achieve the research objectives (Saunders et al., 2009). The subsequent sections discuss the research onion and their significance in research study.

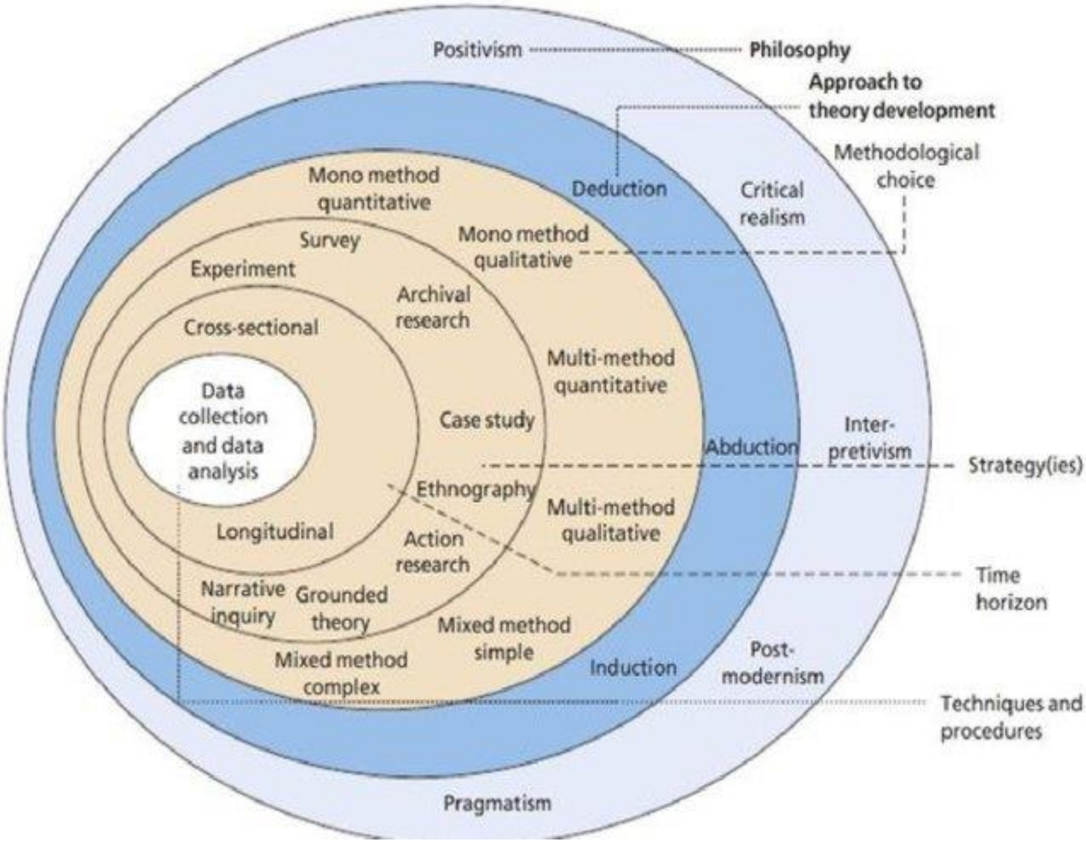


Figure 4.1: The research 'onion' (Adapted from Saunders et al., 2009)

4.3 Research philosophy

Research philosophy is mostly referred to as the central theme involving the development, assumption, and growth of research knowledge (Saunders et al., 2009). Research philosophy includes certain assumptions about how a researcher perceives the world. Saunders et al. (2009) argue that this research assumptions reinforce the factors of the main research methods and strategy. The term research philosophy refers to the classification of principles and assumptions relating to development of knowledge (Saunders et al., 2009). Research philosophy involves the procedure where data about a research phenomenon is gathered and analysed and interpreted (Burrell and Morgan, 2000).

Table 4.1 The four key research philosophies

	Positivism	Interpretivism	Realism	Pragmatism

Epistemology: This is the researcher's perception of what constitutes a satisfactory knowledge in the field of study	This approach adopts philosophical stance like natural science, where observable phenomenon generates law-like generalisations	This approach advocates that social world is realistic. However, it is understood from the perspective of individual, making it subjective.	The phenomenon under investigation provides facts and truth. Emphasises that objects exist separately and independently from human.	Focus on practical knowledge in specific phenomenon. It also focuses on problem solving
Ontology: This focuses on research perception of nature and reality.	The phenomenon under investigation is independent of the social actor	Knowledge is complex. Socially constructed by culture.	Objective exit independent of social actor	Complex. Exit external. Experience and practice forms part of what is been investigated.
Axiology: This is the researcher's perception the of role of values	Research is free from researcher's manipulation. Value-free, Researcher is disconnected, and neutral.	Researcher puts himself into the research through his interpretation. The researcher and what are being researched are not separated.	The research phenomenon is value laden. Researcher is biased by worldviews, cultural experience	Research is value focussed. Research influenced by researcher's doubts and beliefs.
Data collection strategy	Research method is highly structured with large samples. Typically, quantitative but can apply qualitative methods.	Typically, qualitative with small sample and in-depth investigation	Researchers must ensure the method selected fits the research phenomenon (qualitative or quantitative	Adopts mixed, multiple, quantitative, and qualitative depending on research problem

Sources: (Saunders et al., 2009)

Saunders et al (2009) posit that each of these philosophical stances performs different function in research and no philosophy can be said to be superior to the other. The choice of philosophy by researchers is determined primarily by the research objectives and the research questions that the researcher is seeking answer. The above key research philosophies shown in table 4.1 summarise the research philosophies common among social science research and particularly supply chain management research. The next section will present the various research philosophies applied in supply chain management (SCM) and the philosophical stance for this thesis.

According to Mangan et al (2004), Golicic and Davies (2012), positivism and interpretivism are the two common research philosophies applied in supply chain and operations management research. These two philosophical stances have been used extensively in SCM research due to the overarching nature of their approach (Esfahbodi, 2016).

4.3.1 Positivism approach

Different scholars have described the doctrine of positivism in various ways. This means there is no single definite description to this approach (Bryman and Bell, 2015). Despite this position of positivism, it is one of the popular philosophies in research. Positivism is a position where natural science method is applied in social science research, which focuses on discovering causal laws, empirical observation, and value free research (Bryman & Bell, 2007; Neuman, 2006). Positivism research involves investigating social science research like natural science where facts are generated from empirical analysis. The ontological assumption of positivism is that truth of positivist research is independent on the researcher.

This indicates that with positivist research, the reality is out there, and the researcher must investigate it based on objective position to gather facts and information. Most supply chain management research is to investigate the causal relation between variables to establish fact. In this sense, positivism has become most popular philosophical stance use in SCM research because of its ability to establish facts of experience using similar method as natural science (Carter and Ellram, 2003). The result of such research imitates law-like generalisation, since the method of carrying out the research is like physical science (Remenyi et al., 1998). Positivism research very often adopts quantitative approach based on development of measurement of facts. In addition, SCM research is underpinned by development of knowledge based on generalisation of fact and theory (Saunders et al., 2009). This position is in line with positivist approach, which ascribes to model development through testing of hypotheses using empirical data. This leads to either confirming or refuting the hypotheses leading to discovery of new model and development of theory, which will need to be tested using further research. The key focus of positivism is purely scientific empirical test developed to generate facts independent of human manipulations and interpretations (Crotty 1998). If a research is underpinned by positivist paradigm, you envisage organisations and other social players as real in the same manner as natural science (Crotty, 1998). With positivism paradigm, the focus of the research is to establish causal relationship between variables in your research data to produce law-like generalisation like using natural science methodology (Gill and Johnson 2010). Based on this assumption, positivist stance employed in this research is justified.

4.3.2 Interpretivism

Anti-positivist researchers argue that the social world and business environment is too complex to be investigated like natural science. If your research position takes this form, then the research is likely to take interpretivism approach. In this sense, interpretivisn assets that the social world cannot be investigated like natural science since social science is complex and cannot be studied through theory and scientific generalisation (Saunders et al., 2009). Interpretivism is an epistemology that advocates that social world can only be understood and interpreted through the perception of the researcher (Bryman and Bell, 2015).

This approach underlines the modification of research investigation among people rather than objects. In theoretical perspective, social actors are themselves part of what is been investigated since their interpretation of the research phenomenon forms integral part of the research findings (Saunders et al., 2009). Thus, researchers act according to their role and the meaning they assign to the research phenomenon that interprets the social world. Furthermore, interpretivism approach ascribes to interpreting social roles of others based on researchers own sets of opinion and perception (Saunders et al., 2009). The most common method of research associated with intrepretivism is qualitative research. SCM research has been promoted immensely by intrepretivism approach through provision of rich information and in-depth research based on empirical findings (Mangan et al., 2004). The resolve of interpretivism is to generate new, rich, and meaningful interpretations of social realm and circumstances. Within SCM research, this refers to understanding organisation from the perspective of different people, management and institutions and their diverse opinion and reasoning towards workplace realities (Saunders et al., 2009).

4.4 Research logic.

The key logic associated with business management research can be categorised as deductive, inductive, or adductive. Table 4.2 portrays the major characteristics that can be used to show the difference between the main logic.

Table 4.2 The major characteristics of research logic

Research logic	Starting point	Objective	Findings
Deductive	Research starts with theoretical framework	Theory testing	Deductive drawn through confirming or falsifying prior hypotheses constitute findings; -statistical generalisability
Inductive	Empirical observations	Developing theory	Inductively drawn based on empirical observation constituting findings; -Analytical generalisability
Abductive	May start with real-life observation and/or with pre-perceptions	Developing theory through developing an understanding of	Abductively drawn through suggesting hypotheses and the application of these hypotheses to the empirical research constitutes findings:

		a new phenomenon	

Source: adapted from (Kavacs and Spens, 2005)

Drawing on table 4.2, deductive research very often begins with developing theoretical framework leading to generation of hypothesis to be tested using empirical approach. Thus, if the research begins with development of theory, often developed from extensive literature review, and the focus of the study is to design a research strategy to test the theory, the research approach can be described as deductive approach (Saunders et al., 2009). Prior to developing the theory, systematic literature review is conducted to gain logical understanding of the theory. The deductive approach usually ends up with either confirming or falsifying the proposed hypothesis. This results in the logical sequence of the research moving from rules to theory and to results. Deductive research is more inclined to positivism since it focuses on causal relationship (Danermark, 2001). On the other hand, inductive research begins with observations of social world leading to proposing hypothesis for the purposes of developing theoretical framework (Danermark, 2001).

Inductive is more associated with intrepretivism, since it highlights on exploring new phenomenon through in-depth investigation (Saunders et al., 2009). Abductive research involves the mixture of deductive and inductive research logic. The abductive research follows the sequence of rule development to achieving results and formulating a case study (Danermark, 2001). Having examined the various research logic in social science research this study can go ahead to determine the appropriate research logic for this thesis.

The research logic of this thesis falls in line with deductive approach. Available evidence indicates that many studies in supply chain that adopted quantitative method employed deductive approach. The key aim of this study is to examine the causality between research construct using hypotheses and that is what deductive approach represents. Deductive approach also entails development of theoretical framework based on extensive literature review before developing and testing hypotheses empirically. This research does not deviate from this process, and therefore makes this study more aligned with deductive approach. Figure 4.2 shows the pattern of research process using deductive and inductive approaches.

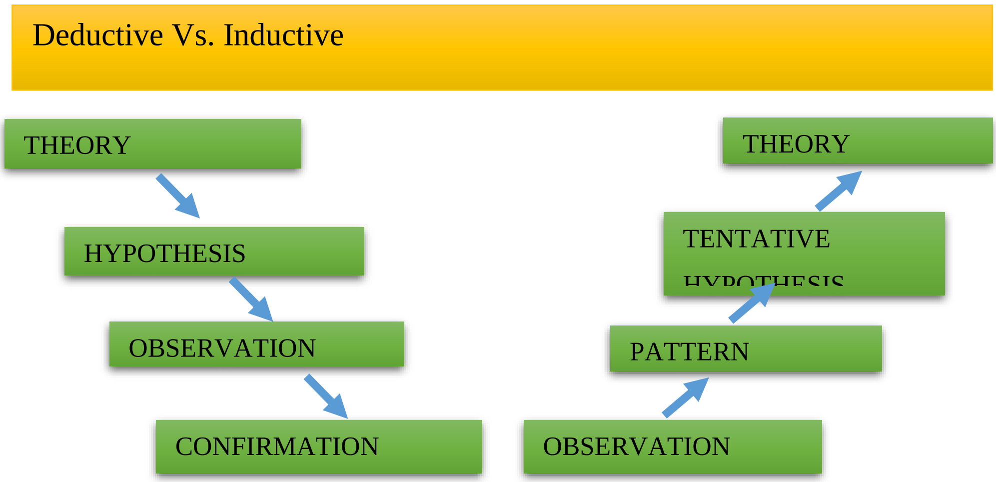


Figure 4.2 process of deduction and induction (adapted from Bryman, 2006)

Following the pattern of deductive approach, this research began with extensive literature review on SCM to develop logical understanding of the theory of GSCM practices, sustainability performance and competitive advantage. Having completed literature review, proposed hypotheses were developed. The conceptual framework showing the causal relationships between the research constructs was developed to be tested using empirical method. According to Chalmers (1990), when using deductive approach, the research is concluded with either confirmation or falsification of the research hypotheses.

4.5 Research strategy

In this section, the research strategy informing this thesis is considered. Generally, research strategy is the process of plan of action that directs the research to achieve its ultimate goals (Saunders et al., 2009). Therefore, research strategy may be described as an approach adopted to enable the researcher answers the research questions. Research strategy serves as a link between the research philosophy and the method of data collection and analysis. (Denzin and Lincoln 2011). Seven key research strategies have been identified with operations and business management. These strategies include experiment, survey, case study, action research, grounded theory, ethnography, and archival research. These strategies are applied depending on the purpose of the research, such as exploratory descriptive or explanatory (Yin, 2003).

Different research strategies have been identified to be associated with SCM due to the multi-disciplinary nature of supply chain management. According to (Mentzer and Kahn, 1995; Giunipero et al., 2008; Sachan and Subhash, 2005), there are different forms of research strategies used in supply chain over the years. The table 4.3 below compares the various research strategies that have been used in supply chain management. This comparison will serve as the bases of selecting the right research strategy for this thesis.

Table 4.3 Types of methodology associated with SCM.

Research strategies	**Mentzer and Kahn (1995)**	**Sahan and Datta (2005)**	**Giunepero et al (2008)**	**Chicksand et al (2012)**
Survey	47.3%	34.6%	56%	40.3%
Case study	15.8%	21.1%	19%	31.6%
Simulation	12.4%	5.0%	9.0%	4.3%
Interviews	10.6%	6.8%	4.0%	4.8%
Archival studies	9.6%	15.8%	N/A	N/A
Mathematical modelling	4.3%	10.4%	N/A	3.8%
Conceptual model	N/A	6.3%	9.0%	12.8%
Literature review	N/A	N/A	3.0%	2.4%
Note: N/A: Not Applicable				

Sources: adapted from (Esfahbodi, 2016)

Based on the table 4.3, survey research is seen as the popular methodology among supply chain management field followed closely by case study (Esfahbodi, 2016). It is also evident from the table that ethnography and action research are no longer popular with SCM research. Based on this review, it will not be out of place for this research to adopt survey research.

According to Bryman (2001), the selection of a research strategy is influenced by the research questions. However, Saunders et al (2009), posit the key reasons for selecting research strategy type as follows:

- Capacity to address the research questions.
- Capacity to fulfil the research objectives.
- The strategy should be in tone with the research philosophy.
- Availability of resources (time, money and personal)

Considering the following reasons as the basis of selecting the appropriate research strategy, this thesis adopts survey for the purpose of gathering data. Survey research is more associated with deductive reasoning which in turn embraces the adoption of empirical investigation of the research theory (Saunders et al., 2009). One major focus of this research is establishing causal relationship between constructs, which is consistent with explanatory research. Explanatory research seeks to establish cause -and -effect relationship and determines to answer 'what is the impact' question, this makes explanatory research more inclined with survey research (Bryman, 2001). In addition, explanatory research may be referred to as causal research (Zikmund, 2000), logical research (Brewer, 2007), or hypotheses testing study (Sekaran, 2003). Explanatory seeks to highlight on the phenomenon in order to clarify the cause-and-effect relationships between research constructs (Saunders et al., 2007).

The outcome of explanatory research might confirm or falsify the proposed hypotheses. Explanatory research is conducted through surveys. This thesis did not ascribe to case study approach because it does not seem to fall in line with the objectives and research questions of this thesis. Case study answers questions such as 'why' and more inclined with theory building instead of theory testing (Saunders et al., 2009). Case study is associated with in-depth consideration of research phenomenon (Yin, 2003). However, case study approach is more expensive and time consuming. Therefore, based on the above argument it is evident that survey research is the most appropriate research strategy for this thesis in order to satisfy the objectives and answer the research questions.

4.5.1 Research method

Having discussed the research strategy for this thesis, this section focuses on the appropriate research method to be adopted by this study. There are two major data collection strategies associated with management research namely, quantitative, and qualitative techniques. One distinguishing feature between qualitative and quantitative technique is that qualitative research relies on non-numeric data (e.g., words, images, videos, and clip), while quantitative technique relies on numeric data (numbers) Saunders et al (2009).

Hence, quantitative research is associated with survey while qualitative is associated with interviews (Creswell, 2003). At this point, it is up to the researcher to determine whether to adopt a single method of data collection or more than one data collection technique. A quantitative study is normally associated with a particular data collection technique, for example, questionnaire, and its associated quantitative analysis technique. This can be referred to as a (mono) method. On the other hand, quantitative research may adopt multiple techniques in data collection and that is referred to as multi-method and its corresponding quantitative analysis procedure (Saunders et al., 2009).

That is, research might choose to collect quantitative data using both questionnaires and interviews and analysing the data using quantitative statistics procedure. Multi-method is a data collection technique where either more than on quantitative technique is used or more than one qualitative technique is used (Saunders et al., 2009). However, mixed method is the process where the researcher combines both qualitative and quantitative in the same study (Creswell, 2003). The use of multi-method has been recommended in business management research;

because they help to deal with any weakness, a single method may pose (Bryman (2006). Table 4.4 Demonstrates types of research method and their associated fundamental criterial considering philosophy, approach, and role in theory development.

Table 4.4 Difference between quantitative and qualitative research

	Quantitative	Qualitative
Philosophical stance	Takes the form of physical science and mainly positivist in nature	Interpretivism approach
Research approach (Logic of research)	Deductive	Inductive
Role of theory in research	Theory testing	Generation of theory

Source: adapted from (Saunders et al, 2009)

This thesis adopted mono method and for that matter questionnaire survey, because the mixed method comes with limitations that will not help the cause of this study. Therefore, based on the argument above, this thesis adopts quantitative mono technique and survey questionnaire as the ideal data collection method for this study.

4.5.2 Time horizon

One important component of research is the determination of the timelines within which the research should be conducted. According to Saunders et al (2009), determining whether the research should be "snapshot" (cross sectional) which is taken at a specific time or cover "diary" times (longitudinal) should be addressed by the researcher. However, the selection of the time horizon will depend on your research questions (Saunders et al., 2009). Since every research design is associated with time horizon, research question can incorporate timelines at different stages of the research (Neuman, 2006). It has been indicated that every research study falls in line with either cross sectional or longitudinal depending on the research questions. Cross sectional involves dealing with single point of time in the research (snapshot) whilst the longitudinal research covers multiple timelines (Saunders et al., 2009). Cross-sectional research very often is associated with survey strategy. They seek to describe or explain relationships between constructs. However, cross sectional research may also be applied to qualitative or mixed methods research strategies (Bryman, 2001). For instance, many research studies have been conducted using case study, and interview which are conducted over short period. Cross sectional has been described as the cheapest and simplest option. In addition, cross sectional can be applied to all forms of research such as exploratory, explanatory, descriptive, and predictive (Saunders et al., 2009). On the other hand, longitudinal research is characterised by individuals or groups of analyses at multiple time. It involves undertaking research more than one single point in time. Though longitudinal research is powerful in collecting in-depth rich information, it can be costly, time consuming and complicated. Longitudinal research is mostly associated with interpretivism philosophical stance (Saunders et al., 2009). Hence, considering the above arguments cross-sectional approach is considered appropriate option for this research.

4.6 Survey

This section examines the method appropriate for collecting data for this thesis. As indicated in the previous section, this study adopts questionnaire as the main strategy for collecting data since it is the popular strategy within survey method and among supply chain and operations management research (Forza, 2002; Esfahbodi, 2016). In this thesis questionnaire is described as a technique to collect data where each respondent is asked the same set of questions (Saunders et al., 2009). Questionnaire is more associated with explanatory research, which seeks to establish cause and effect relationship between variables (Saunders et al., 2009).

This process is consistent with the aim of this research, which is intending to establish the relationship between GSCM practices, sustainability performance and competitive advantage. Many scholars have indicated that the selection of data collection is dependent on resources (e.g., money, time, and personnel) (Bryman and Bell, 2015). Based on the above discussions, survey questionnaire is selected as the appropriate method for data collection, since it is comparatively cheaper, efficient, and quicker to reach respondents (Forza, 2002). Other research methods such as observation, semi-structured interviews and structured interviews were evaluated, but survey questionnaire was selected because it is the most appropriate option. Questionnaire research can easily support in obtaining the necessary information on GSCM practices, sustainability performance and competitive advantage. More details of the questionnaire administration will be discussed in the subsequent section.

4.6.1 Structural equation modelling

In line with the explanatory research, and in consistent with Hair et al (2010), this study adopts multiple regression and structural equation modelling (SEM), which are the major components of multivariate analysis.

According to Hair et al (2010), SEM is combination of factor analysis and multiple regression that helps the researcher to simultaneously investigate a sequence of interconnected dependence relationship between different variables employed in a study. In determining the analysis type for this study, the objectives, research questions and research framework were taken into consideration. Based on the research model in chapter 3, multiple interrelationships between independent and dependent variables makes SEM the appropriate method for analysis. Therefore, the adoption of SEM over other analysis technique in this thesis is because SEM can estimate separate interdependent multiple analysis at the same time in one study (Hair et al., 2010).

Another significant benefit of SEM is that it can explore the relationship between dependent and independent variables while determining the impact or effect of each variable on another (Kline, 2011). SEM has the capacity to transform these relationships into structural model which is s similar to regression equations for all dependent variables. SEM also could incorporate latent variables into the analysis. Latent variables are the hypothesised unobserved variables that can only be represented by measuring items (Hair et al., 2010). When SEM is used to analyse data, it helps prevent bias since all measurements are done in one go (Kaplan, 2000). SEM has proven to be extremely popular among supply chain and operations scholars. For instance, Green et al (2012) examined the impact of GSCM on environment and economic performance using SEM as analysis method; Sarkis et al. (2010) investigated the relationship between stakeholder pressure and implementation of environmental practices used SEM to analysis their data; Esfahbodi et al (2016) examined the relationship between sustainable supply chain practices and environmental and cost performance among UK automotive industry using SEM as analysis method. Largely, the capacity of SEM to analysis series of causal relationship is greater than other multivariate techniques such as multiple regression, which can analysis single relationship at a time. This characteristic of SEM is relevant to this study since it is seeking to estimate various causal relationships between different dependent variables and independent variables at the same time (Hair et al., 2010). In addition, unlike other multivariate analysis techniques, SEM can estimate the degree of measurement error. For instance, when respondents are asked about their household income, the possibility of some respondents either overstating or under stating their income is high. The answers from respondents may contain element of error and that affect the value of their real income. Structural equation modelling has provided a technique to estimate the element of error in such situation (Hair et al., 2010). It is also important to recognise that unlike other multivariate analysis techniques, SEM can test a set of relationships that forms multiple equations. This requires the measurement of fit of the overall model in the structural relationship not a single relationship. SEM can determine the overall fit of the model and informs the researcher whether to accept the model or reject the model if the fit is not acceptable (Kline 2011). SEM, in addition, has the capacity to identify new relationship in the structural model and suggests new potential relationship that the researcher failed to identify through modification indices.

Furthermore, SEM can detect any new relationship that defines the overall model and helps to develop new hypothesis that might have been overlooked by the researcher (Hair et al., 2010). The incorporation of latent variables in the analysis is one strongest ability of the use of SEM. Latent variables are variables that cannot be measured direct but through measurement items (observed variables). SEM can measure latent variable by employing measuring items, which are collected through, for example survey. This approach according to Hair et al. (2010) helps to improve the statistical estimation of the structural relationships between the variables in the model. Secondly, it helps to represent constructs using various measurement item.

Notwithstanding these significance benefits of SEM, the concept has some underlying limitations. According to Hair et al., (2010), SEM requires many calculations, which demands in-depth understanding of the basic concept of the technique. For example, the use of SEM software and how they are managed requires some level of statistical expertise on the part of the researcher. The second key limitation of the use of SEM is the requirement of sample size. SEM, unlike other multivariate techniques is sensitive to sample size because it is the basis for estimating sample error. Proposition for sample size has varied among scholars, however, Hair et al (2010), suggested that determination of sample size should take into consideration; multivariate normality of the data, estimation technique, model complexity, amount of missing data and errors associated with the reflective indicators.

Based on these suggestions, it has been proposed that the sample size required for SEM analysis should range from 150-400 (Kline, 2011). With the benefits demonstrated above and the objectives of this thesis, SEM is selected as the appropriate analysis technique. This thesis is seeking to examine the relationship between GSCM implementation and sustainability performance as well as competitive advantage, taking into consideration the role of critical enabler in GSCM implementation. Considering the multiplicity of relationships that are being estimated at the same time SEM overrides other multivariate techniques as far as this thesis is concerned. To deal with the limitation of SEM, this study is using a sample size of 375, which is above the minimum requirement for SEM analysis.

Generally, structural equation modelling (SEM) can be performed in two approaches; covariance based (CB-SEM) and partial least square (PLS-SEM). The key difference between these two techniques is the objective of the research. If the objective of the research is to test theory, the appropriate technique to use is covariance based (CB-SEM). On the other hand, if the objective of the research is to develop or build a new theory, the appropriate technique to use is partial least square (PLS-SEM) (Hair et al., 2010). In essence, partial least square is associated with exploratory research where the intention of the researcher is to develop new theory while CB-SEM is associated with explanatory research, which seeks to test and confirm theory. Furthermore, the selection of either PLS-SEM or CB-SEM is also determined by whether the constructs are reflective or formative. In tackling this scenario, the researcher may adopt one these strategies taking into consideration the conceptualisation of the principal latent variables.

Here the researcher can assume that the unobserved construct is giving rise to the observed variables (Fornell and Bookstein, 1982), or assume that the observed variables are characteristics of the main constructs (Rossiter, 2002). In this scenario the former is classified as reflective construct while the latter is described as formative construct (Diamantopoulos and Winklhofer, 2001). With reflective construct there should be an extraordinarily strong inter-correlation among the measuring items. Furthermore, an attempt to substitute a reflective indicator measurement item as having formative measurement items may likely lead to discarding some items with low item –to-total correlation. This strategy will pose a serious problem for the model since internal consistency reliability is not an appropriate standard for measuring formative indicators (Bollen and Lennox 1991). In fact, it is generally possible to have formative indicators not having stronger correlation (Jarvis et al., 2012). Reflective constructs require extraordinarily strong inter-correlation among the indicators, which on many occasions result in multi collinearity of the model (Diamantopoulos and Siguaw, 2006). In this situation, removing items that do not correlate positively and strongly with other items is likely to result in omitting critical parts of the construct domain, hence terminating a set of measures that is deficient. Therefore, in this study the constructs used take the form of formative and are more inclined with CB-SEM. With formative construct the elimination of an indicator variable will not have a serious impact on the unobserved variable or change it meaning (Hulland, 1999). Hence, the use of CB-SEM is due to the fact that the constructs are formative and that the observed variables are characteristics of the unobserved variable ((Fornell and Bookstein, 1982). While CB-SEM is associated with goodness of fit of the structural model, partial least square has no capacity to test the model fit and as such unable to confirm whether the data fit the model (Kline, 2011). Based on the above argument, CB-SEM is deemed as the appropriate analysis technique for this thesis.

4.6.2 Instrument

Questionnaire has proven to be the most popular method of data collection instrument within business and management research (Saunders et al., 2009). However, researchers are advised to adopt the method that appropriately answers the research questions and fulfils the research objectives. For instance, according to Saunders et al. (2009), questionnaire is not appropriate for exploratory research, which requires a huge number of open-ended questions. In essence, questionnaires fit well with research that has standardised questions and requires similar interpretation by all respondents (Robson, 2002). Therefore, since this thesis takes the form of explanatory research because it is seeking to explore relationships between variables, questionnaire is the most appropriate method for data collection. Questionnaire can be put into two types for the purpose of data collection within management research. The first type is self-administered questionnaire, where the presence of the researcher is not required to administer the questions, and this includes postal, internet-mediated and delivery and collection. The second type is interviewed administered questionnaire where the presence of the researcher is required to administer the questionnaire such as semi-structured interview and structured interview (Robson, 2002). The diagram below demonstrates the various types of questionnaires applied in business and management research.

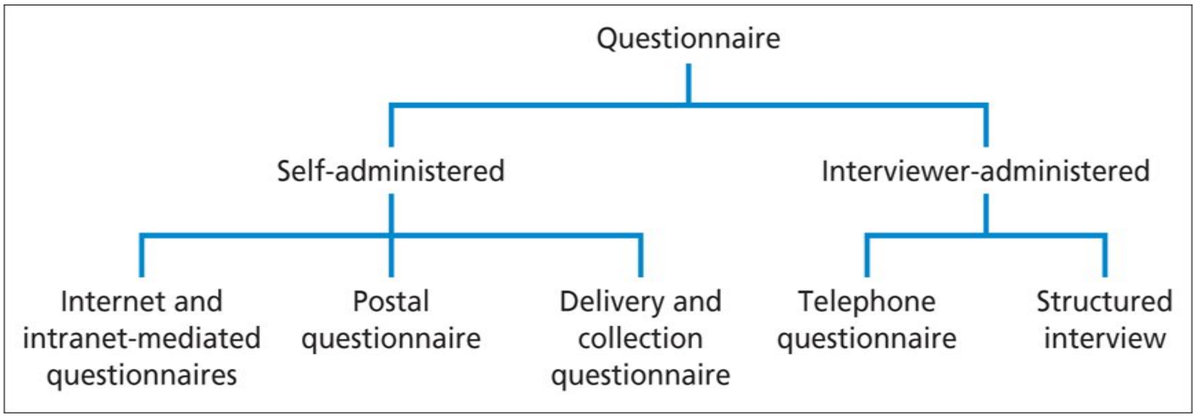


Figure 4.3 Types of questionnaires: Adopted from (Saunders et al., 2009)

According to Saunders et al (2009), the choice of questionnaire is dependent on factors relating to the research questions and objectives such as the following:

- The financial position to undertake field study.
- Type of respondents from whom you wish to collect answers to the questions.
- The need to target specific group of people.
- The need of responses not being contaminated or biased.
- Determination of sample size for the data analysis, considering the rate of response.
- Nature and type of questions to respondents.
- Total number of questions required for the data.

In addition, to be convinced that the person to whom you addressed the questionnaire would be the one answering is determined by the questionnaire method you employ (Witmer et al. 1999). For example, if you employ postal questionnaire and address the company’s manager by name, you can never determine that the person named on the questionnaire will possible be the one to answer the questions (Saunders et al., 2009). Hence, in many instances, assistants of managers whom the questionnaires are addressed complete the questionnaire on behalf of the substantive managers. On the other hand, internet mediated questionnaire that employs email provides maximum control, which is that most email users respond to their emails themselves either on their computers or smart phone (Witmer et al. 1999). The delivery and collection methods also ensure that you can know who answered the questionnaire at the point of collection.

In contrast to self-administered and postal questionnaire, interview-administered questionnaires enable you to ensure that the respondent is whom you want to answer the questions (Saunders et al., 2009). Based on the research questions, objectives and above all the factors raised above, this research adopted self-administered questionnaire for collecting data for this study. Other methods such as interview-administered questionnaire was ignored in this study because it focuses on in-depth assessment of the research phenomenon and associated with ‘’why’’ type of questions that are not applicable in this study (Saunders et al., 2009). More importantly, interview mediated questionnaire was not employed in this study because the analysis method used in this study requires a large sample size which interview mediated questionnaire is unable to achieve (Robson, 2002). Among the types of self-administered questionnaire, internet-mediated was selected for this study because it is cheaper to administer, easy to administer, can reach wider respondents, automating the data is easy to undertake and capable to reach out to specific respondents who have technical knowledge about the research phenomenon (Saunders et al., 2009). It is also noted that in a geographical situation where the respondents are sparsely located the appropriate method is internet-mediated questionnaire (Robson, 2002). Table 4.5 demonstrates the various types of self-administered questionnaire and their attributes.

Table 4.5 Key features of self-administered questionnaire

Attributes	Internet-mediated	Mail survey (Postal)
Main features	Computers know how is required for flexible design	Anonymity is very paramount
Necessary resources	Using mail and professionally designed web page or software	Postage stamps for inward and outward mails
Characteristics of respondents	People with computer knowledge and possess email account are contacted through internet or intranet	Knowledgeable people who can be reached by mail; are chosen by name, household, institutions.
Confidence that the response is coming from the target audience	High when using email survey.	Low unless researcher collects questionnaires in person.
Probability of distortion in responses	May be distorted if consulting with others	Low
Data	Very often automated	Closed questions can be designed so that response may be entered using optical mark readers after questionnaire has been returned
Time taken to complete collection of responses	Varies according to sample size; the average is 2-6 weeks from distribution	Depends on sample size; the average is 4-8 weeks from distribution
Financial resources	Cost is linked to web site design using online expert or software providers	Cost on postage stamps both inward and outward
Type of questions	Closed questions, complicated sequencing may be available	Closed questions with simple sequencing only
Sample size	Large and can be locally and internationally dispersed	Large, but locally focused due to cost

Source : (Saunders et al., 2009, p. 364)

Based on table 4.5, the reason for adopting internet-mediated questionnaire is the fact that it is cheaper in terms of cost and time effective. While confidentiality is remarkably high when email is adopted the chance of the intended person answering the research question is highly assured (Saunders et al., 2009). In addition, internet-mediated questionnaire gives the researcher the opportunity to reach out to large target audience and above all, it is convenient on the part of the participants to approach the questionnaire on their own available time. Furthermore, internet mediated can target large number of specialised practitioners of manufacturing firm. The use of specialised web-based design helps to deal with missing data through application of specialised techniques (Saunders et al., 2009). Based on the above advantages of internet-mediated questionnaire, it is considered the appropriate technique for this thesis.

4.6.3 Measurement scale

According to Hair et al (2010) measurement scale of any research construct could be adopted from previous literature or new scale developed by the researcher. In this study the measurement scales were not developed but adopted from existing literature. Hence, the measurement of enablers, GSCM practices, sustainability performance and competitive advantage were adopted from previous studies (e.g., Zhu and Sarkis, 2004; Zhu et al, 2008; Azevedo et al., 2011; Luthra et al., 2016; Govindan et al., 2014; Walker and Jones, 2012; Diabat et al., 2014). The GSCM practices measurement scales developed by Zhu and Sarkis (2004) have been enhanced over the years by studies such as Green et al (2012), Younis et al (2015) and Eltayeb et al (2011) Zhu et al (2012). This conceptualisation is not limited to GSCM practices but also environmental and economic performance. The measurements of enablers in this study were directly adopted from Walker and Jones, 2012; Govindan et al 2014 and Diabat et al., 2014; Dubey et al 2015). The competitive advantage measurement items incorporated in this study were adopted from Li et al (2006; Govindan et al 2015; Geng et al 2017).

The adopted items of GSCM practices and performance have been used in many high-profile journals in operations and supply chain management such as (Younis et al (2015), Luthra et al. (2016), Green et al. (2012) and Esfahbodi et al (2016). Generally, the measurement items used in this study have been widely used in published journals therefore, validity of the measurement items is strongly assured. Table 4.6 below shows the measurement items of all the constructs in this study.

Table 4.6 Measurement scales

Eco design (Zhu et al., 2007a; Younis et al., 2015)
Please indicate the extent to which you perceive that your company is implementing each of the following. (On five-point Likert scale, where 1 = strongly disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; 5 = strongly agree)
ED1. Our Company designs product to reduce consumption of raw materials.
ED2. Our Company designs product for reuse, recycle, and recovery of materials and components.
ED3. Our Company designs product to avoid or reduce use of hazardous products or materials.
ED4. Our Company designs product for reduced consumption of energy.
ED5. Our Company collaborates with suppliers to design product to reduce packaging cost.

Green Purchasing (Green et al 2012; Geng et al., 2017)
Please indicate the extent to which you perceive that your company is implementing each of the following. (On five-point Likert scale, where 1 = strongly disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; 5 = strongly agree)
GP1. Our Company provides design specification to suppliers that include environmental requirements for purchased items.
GP2. Our Company selects suppliers using environmental criteria (suppliers ISO certification).
GP3. Our Company requires suppliers to use environmentally packaging (degradable and non-hazardous)
GP4. Our Company audits its supplier's internal environmental management systems.
GP5. Our Company evaluates the environmentally friendly practices of second-tier suppliers.

Investment Recovery (Zhu et al., 2008a)
Please indicate the extent to which you perceive that your company is implementing each of the following. (On five-point Likert scale, where 1 = strongly disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; 5 = strongly agree)
IR1. Our Company engages in sale of excess inventories or materials.
IR2. Our Company engages in sale of scrap and used materials.
IR3. Our Company engages in the sale of the company's capital equipment to prolong their life span.
IR4. Our Company adds value to unused materials to recapture their values.

Customer Cooperation (Zhu et al., 2007a; Green et al., 2012)

Please indicate the extent to which you perceive that your company is implementing each of the following. (On 5-point Likert scale, where 1 = strongly disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; 5 = strongly agree)

CC1. Our Company cooperates with customers for eco design of product.

CC2. Our Company cooperates with customers for cleaner production.

CC3. Our Company cooperates with customers for green packaging.

CC4. Our Company cooperates with customers for using less energy during product transportation.

Green Marketing (Polonsky, 1994; Luthra et al2016)

Please indicate the extent to which you perceive that your company is implementing each of the following. (On five-point Likert scale, where 1 = strongly disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; 5 = strongly agree)

GM1. Our Company uses environmentally friendly labelling of product.

GM2. Our Company engages in providing regular voluntary information about environmental management to customers and other stakeholders.

GM3. Our Company provides customers with environmentally friendly services to customers.

GM4. Our Company provides customers with information about disposal of unused product.

GM5. Our Company attracts customers with green initiatives and eco-services.

Green Distribution (Sarkis, 2003; Green et al., 2012).

Please indicate the extent to which you perceive that your company is implementing each of the following. (On five-point Likert scale, where 1 = strongly disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; 5 = strongly agree)

GD1. Our Company engages in vehicle optimisation during distribution of product to customers.

GD2. Our Company plans distribution schedules to reduce inventory (just in time).

GD3. Our Company considers the use of renewable energy during product transportation.

GD4. Our Company uses qualified third-party Logistics Company for transportation of product to customers.

Reverse Logistics (Zhu et al., 2005; Geng et al 2015)

Please indicate the extent to which you perceive that your company is implementing each of the following. (On five-point Likert scale, where 1 = strongly disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; 5 = strongly agree)

RL1. Our Company engages in product recovery through reuse and recycle of materials.

RL2. Our Company engages in the use of returnable packaging materials (pallets).

RL3. Our Company accepts returned product from customers.

RL4. Our Company has waste collection department to collect waste from customers.

Social Performance (Govindan et al., 2014 ; Luthra et al., 2016)

Please indicate the extent to which you perceive that your company has achieved the following performance outcomes. (On five-point Likert scale, where 1 = strongly disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; 5 = strongly agree).

SP1. Our Company has enhanced its corporate image through its quality standards.

SP2. Our Company has increased its customer satisfaction through its environmentally friendly production process.

SP3. Our Company takes steps to preserve the environment during production process.

SP4. Our Company has enhanced health and safety at workplace.

SP5. Our Company is committed to improving quality of life of its employees.

Environnemental Performance (Govindan et al 2014 ; Eltayeb et al., 2011)

Please indicate the extent to which you perceive that your company has achieved the following performance outcomes. (On five-point Likert scale, where 1 = strongly disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; 5 = strongly agree).

ENV.P1. Our Company has reduced air pollution during production process.

ENV.P2. Our Company has reduced wastewater during production.

ENV.P3. Our Company has decreased solid waste generation in its operations.

ENV.P4. Our Company has decreased consumption of toxic/harmful materials.

ENV.P5. Our Company has reduced frequency of environmental accidents.

Economic Performance (Zhu et al., 2007; Govindan et al., 2014)

Please indicate the extent to which you perceive that your company has achieved the following performance outcomes. (On five-point Likert scale, where 1 = strongly disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; 5 = strongly agree).

EP1. Our Company has decreased the cost of energy consumption.

EP2. Our Company has decreased cost of raw material purchasing.

EP3. Our Company has decreased fees for waste discharge.

EP4. Our Company has decreased cost of energy consumption.

Cost Advantage (Tracey et al., 1999; Li et al., 2006)

Please indicate the extent to which you perceive that your company has achieved the following competitive advantage over competitors. (On five-point Likert scale, where 1 = strongly disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; 5 = strongly agree).

CA1. Our Company offers competitive price to its customers.

CA2. Our Company offers prices lower than competitors.

CA3. Our Company has decreased cost of holding inventory level.

CA4. Our Company has decreased cost of production.

Quality Advantage (Tracey et al., 1999; Li et al., 2006)

Please indicate the extent to which you perceive that your company has achieved the following competitive advantage over competitors. (On 5-point Likert scale, where 1 = strongly disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; 5 = strongly agree).

QA1. Our Company has improved quality of production process.

QA2. Our Company offers products that are durable.

QA3. Our Company offers product that are reliable.

QA4. Our Company has reduced the number of rejected products by customers.

Flexibility Advantage (Tracey et al., 1999; Li et al., 2006).

Please indicate the extent to which you perceive that your company has achieved the following competitive advantage over competitors. (On five-point Likert scale, where 1 = strongly disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; 5 = strongly agree).

FA1. Our Company provides customised product to meet customer’s satisfaction.

FA2. Our Company alters product offering to meet clients’ needs.

FA3 Our Company responds to customers request for new features better than competitors do.

FA4.Our Company can change output volumes to meet customers’ demands.

Dependability Advantage (Tracey et al., 1999; Li et al., 2006)

Please indicate the extent to which you perceive that your company has achieved the following competitive advantage over competitors. (On five-point Likert scale, where 1 = strongly disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; 5 = strongly agree).

DA1.Our Company provides dependable delivery to customers.

DA2. Our company delivers customers’ orders on time.

DA3. Our company delivers product to the market quicker than competitors do.

DA4. Our Company can produce different variety of product to meet customer’s requirement.

Enabler (Diabat et al., 2014 ; Dubey et al., 2015)

Please indicate the extent to which the following enablers successfully influence implementation of GSCM practices. (On five-point Likert scale; where 1 = strongly disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; 5 =strongly agree)

ENABLER1. Management commitment to sustainability

ENABLER2. Sharing of information knowledge within the firm

ENABLER3. ISO 14001 certification of the company.

ENABLER4. Pressure from customers towards sustainability development.

ENABLER5. Pressure from suppliers towards sustainability development.

ENABLER6. Influence from government legislation.

It is to be noted that these measurement scales and the identification of the major constructs were derived through systematic literature review of over 70 key GSCM journals. The systematic literature review (as captured in appendix 9.1) helped to inform the researcher those constructs that have been used consistently in previous studies and their measurement items. This approach provides an in-depth understanding of the frontiers of GSCM practices.

It also provided the opportunity to ascertain whether the measurement items truly represent the constructs they purported to define. In line with systematic literature review, the thesis relied on the core dimension of GSCM practices but went further to include other practices that have not seen much attention in previous studies such as green marketing, social performance and antecedent of enabler that influence adoption and implementation of GSCM practices. The extension of the GSCM practices to include green marketing and customer cooperation was to make sure every level of the traditional supply chain has been covered as posit by (Zhu and Sarkis, 2004).

4.7 Sampling

4.7.1 The population

This research seeks to examine the impact of GSCM practices on performance and competitive advantage among UK manufacturing firms, therefore, in order to gather the necessary information to answer the research question and fulfil the research objectives, it is appropriate to appeal to UK based manufacturing firms. With respect to this, the target population of this study is UK manufacturing managers. This target population is deemed appropriate because it gives the researcher the opportunity to reach out to people who have competence and experience in manufacturing supply chain and sustainability and will be able to provide information consistent with the data required for this study. With the help of financial analysis made easy (FAME) website, potential manufacturing firms with their registered address and management contacts were derived. FAME databased is a website that contains names and registered address, names of managers of over 2.6 million manufacturing firms both private and public. Access to FAME website was made available to the researcher due to his status as a research student at the Coventry University. In addition, the UK Standard of Industrial Classification (UK SIC) was used to identify and select the manufacturing firms. This process helps to limit the search to only manufacturing firms in UK. Consequently, 6,018 UK based manufacturing firms were identified as the population for this study. According to Esfahbodi et al (2016), many academic papers published in top class journal adopted FAME database to generate list of respondents therefore, making use of the FAME database in this study is appropriate.

Sampling is a key component of conducting empirical research and is associated with selecting the preferred individual, group, or events from whom information is generated. In many businesses management research, it is practically impossible to collect data from almost every possible case, individual or group irrespective of your research questions and objectives due to time constraint and financial difficulties (Saunders et al., 2009). In view of this, various sampling techniques are employed by researchers to reduce the amount of data they must gather to carry out their study by considering controllable subgroup within the larger population who may be key to the research (Saunders et al., 2009). In this case, if the sampling technique was properly done, it helps to generalise the findings to cover the entire population that the subgroup represented (Bryman, 2001). According to Bryman and Bell (2015), there are five key steps in sampling process:

- Select the appropriate sampling technique.
- Identify the target population.
- Determine the appropriate sample size.

- Determining the sample frame
- Executing the sampling process

The above five steps were adopted in this research and are discussed below. Sampling technique can be categorised into two types (Saunders et al., 2009): probability sampling (representative sampling) and non-probability sampling (judgemental sampling). With probability sample, the possibility of each case being selected from the population is equal for all cases. In this sense, each member of the population has equal chance of being selected by the researcher to represent the total population. This process gives the researcher the opportunity to statistically estimate the features of the population from the sample (Saunders et al., 2009).

Probability sampling is often connected with survey research, quantitative research, and experimental strategy (Bryman and Bell, 2015). Non-probability sample on the other hand, has no known or fixed probability of each case within the population being selected. This makes it impossible for the researcher to answer research questions or to fulfil research objectives that demand making statistical inferences about the unique features of the population (Saunders et al., 2009). Results from analysis using non-probability sampling can be generalised. Non-probability sampling is largely associated with qualitative research, where the research is expected to collect a case that could provide in-depth information about research phenomenon (Creswell, 2003).

Table 4.7 Forms of sampling techniques

Sample type	**Procedure**	**Characteristics**	**Evaluation**
Simple random sample: All elements in the population are considered and each of them has the same	Sample: - All elements in the population are considered and each of them has the same chance of being selected as a subject.	Accurate and easily accessible sampling frame required; - Sample size is better with over a few hundred; - Wide	Advantage: Generalisability of findings is high. Downside: - Lack of efficiency compared to stratified sample; -

chance of being selected as a subject	- Creating a sampling frame for all the population's elements, and then selecting subjects using a purely random process such as random number table or computer program.	coverage of many geographical areas, unless face-to-face contact is required	High cost with large sample size; - Not frequently used in practice
Systematic random sample: A systematic selection process selects the first element randomly from the sampling frame and then every nth number on the list is selected.	Creating a sampling frame, - Calculating sampling intervals7, - Choosing a random starting point and then drawing subject at every interval	Require accurate and easily accessible sampling frame with no periodic patterns; - Suitable for all sample sizes; - Wide coverage of many geographical areas, unless face-to-face contact is required	Advantage: Easy to use with availability of sample frame; - Relatively moderate cost; Moderately used. Downside: - Possibility of systematic biases
Stratified sample: - A probability sampling procedure in which sub-samples are drawn from samples within different subgroups or strata that have some equal characteristics	Creating a sampling frame for each of several categories of elements, drawing a random sample from each category, and then combining all sample categories	Clear logic beyond adopting stratified sample; - Required accurate, easily accessible sampling frame that can be divided in relevant strata; - Suitable for all sample sizes; Concentrated if face-to-face contact required, otherwise it has wide geographical coverage	Advantage: - Most efficient compared to all probability samples; - Better representation of relative population allowing more accurate findings; - Low cost if the sample frames are available. -Moderately used. -Allowing deeper view in data analysis Downside. Time consuming, -Required sampling frame for each stratum
Cluster sample: - An economically efficient	Creating a sampling frame for larger cluster	Geographically based clusters: - Required	Advantage: - Low cost of data collection if

sampling technique in which the population is divided into discrete groups or clusters prior to sampling that can be based on any naturally occurring grouping, e.g., geographical areas and manufacturing firms.	units, - drawing a random sample of the cluster units, - creating a sampling frame for cases within each selected cluster	accurate, easily accessible sampling frame that relates to relevant clusters; - Sample size is as large as practicable;	sampling frames are available; - Frequently used. Downside: - The least efficient and reliable sampling technique

Source: Adapted from (Saunders et al., 2009; Sekeran, 200; Zikmund, 2000)

Drawing on table 4.7 it is evident that simple random sampling is the appropriate type of sampling for this study since this study does not apply face-to-face and do not use strata population. It is also relatively cheaper in terms of cost of undertaking the study and less time consuming. This research is in line with simple random sampling, because of the analysis type (structural equation modelling). Simple random sampling is highly linked with SEM because the estimation technique of maximum likelihood associated with SEM requires that data generated must be done according to simple random sampling method (Kaplan, 2000).

4.7.2 Sample size

Since this study is relying on probability sample, it is expected that the larger the sample size the less error is anticipated for a more valid and reliable outcome. However, in many instances this cannot bring about exactitude of findings (Bryman & Bell, 2007). Sekeran (2013) and Saunders et al (2009), have postulated key step that must guide a researcher when determining a sample size in a study. These include,

- The type of data analysis technique the researcher intends to use.
- The acceptable percentage of margin of error required for accuracy and precision.
- The total population from which the sample is taking from.
- The number of variabilities examined simultaneously in the data.

- The number of questions (the number of questions asked will determine the sample size to use, i.e., many questions require large sample size).

However, in addition to the above factors, sample size is also influenced by availability of resources, time, and other resources Saunders et al (2009). In view of the above argument, the researcher attempted to determine the sample for this study based on the selected analysis method (SEM).

Considering other factors including the complexity of the model and the number of variables in the research, Hair et al. (2010), Kline, (2011), suggested a range of 140-400 as a required sample size when using structural equation modelling (SEM). In their study, they recommended using a minimum of five sample per observed variable when the researcher is using SEM as an analysis method. Conceptual model of this study has fifteen (15) theoretical constructs with sixty-eight (68) observed variables. This indicates that the study requires a minimum of 340 samples to be able to run SEM analysis. This is calculated by multiplying the minimum sample of five per observed variable by the total number of observed variables (5x68) = 340. Considering this number, the study targeted a minimum of 350 in order to meet the safe threshold figure. Again, this minimum sample is also in line with the requirement of SEM analysis as suggested by Kline (2011). Therefore, in this study the sample size of 375 is in line and above the minimum threshold for using SEM analysis.

4.7.3 Sample frame

Having determined the sample size for this study, this section focuses on determining the sample frame. The sampling frame for any study is the total list of all the elements within the population where the sample is drawn. This consists of the number of the unit of the population whose opinion matters for the study (Saunders et al., 2009). So, for example in this study, the major objective is to examine green supply chain and performance outcomes, the sample frame of this study will, therefore, be operations and supply chain practitioners within the manufacturing firm. Generally, the sample size determination largely depends on the sample frame (Bryman and Bell, 2015). According to Klassen and Jacobs (2001), the projected response rate for online survey in business management research is within the range of 5-11%. Therefore, in order to achieve the sample size of 375, (sample size used in this study) a sample frame of 3410 out of the population of 6,018 is required. Thus (3410∗ (11/100) = 375). However, the sample frame of the actual sample size of 340 was to be (3100).

Based on this calculation the study sets a target of 3410 as a sample frame for this study. To determine the sample frame from the population the researcher used the date of establishment. The researcher used 5 years in operations strategy to select the sample of 3410 from the total population. The number of years in operation was used to give the researcher manufacturing firms who have been practicing supply chain over the years and have matured supply chain. Subsequently, the researcher further used ISO certification manufacturing firms to finally select the sample frame. The sample frame of 3410 were randomly selected based on the years of service and ISO certification. This process is in line with Saunders et al (2009), where they argue that where no list exists, it is the responsibility to create their own sample frame and also ensure that the sample frame is as complete as possible, precise, and up to date (Saunders et al., 2009).

4.7.4 Unit of analysis for the study

According to Slack et al. (2010) and Nassar (2011), the unit of analysis when undertaking research in supply chain management includes persons, firms, groups, or project who are the key stakeholders in the research. This implies that the research questions play a critical role in determining the unit of analysis of your study (Saunders et al., 2009). In this study, the unit of analysis is all managers of various manufacturing firms operating in UK as the key respondents. This determination is due to the phenomenon this research is seeking to investigate (green supply chain management and performance outcomes within manufacturing industries).

Therefore, in this study mid-level managers and all the other senior members of the organisation including plant managers, supply chain managers, operations managers, health and safety managers, logistics managers’ sales managers qualify to be contacted.

These categories of manages are being targeted because their role largely, falls within the spectrum of this research and are competent to provide valid and accurate responses to the questions. It is also expected that these calibres of managers have the necessary knowledge and experience in supply chain operations. Studies such as Zhu and Sarkis (2004), Zhu et al (2013), Green et al (2012) and Esafahbodi et al (2016) relied on these categories of managers for their published studies.

4.8 Data and procedure

4.8.1 Pilot study

Before mounting the full research, the questionnaire was pre-tested to ascertain the level of participant understanding and to determine whether more items needed to be added to the questions to enable the questionnaire to meet the research objectives. As shown in figure 4.4 pre-testing the questionnaire is one of the significant steps of research design because it helps to identify any problem through the preliminary results (Malhotra and Grover, 1998). Forza (2002) has proposed guidelines as to how pilot study should be carried out. He suggested that to pilot test a study, the questionnaire should be checked by industrial expert or academicians who are knowledgeable about the research phenomenon. This study, therefore, adopted the same procedure to undertake the pilot study. The first step of the pilot study was to contact five academics from Coventry University to pilot test the research questionnaire.

Before meeting them, the researcher mailed the questionnaire of the study including the purpose of the study, the conceptual framework, and the developed proposition. This gave them enough time to understand and review the research framework. The selected academics were significantly knowledgeable in GSCM with some of them having published extensively in

GSCM field. The five academics selected were interviewed individually for around 25 minutes each in September 2017. The interview process granted the researcher the opportunity to notice the demeanour of the participants. Among some of the issues raised during the interview included the wording of the questions and the measurement items. Those that seemed ambiguous were deleted from the study and the five-point Likert scale used in this study was confirmed.

The study adopted a five-point Likert scale for all the sections of the research framework to prevent any confusion on the part of the respondents. Respondents have the option to select "1 strongly disagree; 2 disagree; 3 neither agree nor disagree; 4 agree; 5 strongly agree". The categorisation of the companies used in this study adopted UK industrial classification standard (UK SIC). Another key aspect of the pilot study is to validate the content of the questionnaire. The purpose is to determine whether the contents represent the constructs, they are representing (Hair et al., 2010). The pilot study did not only help to correct ambiguity in the questionnaire but also the content validity helped to reaffirm the measurement scale which were selected from existing study that have been verified.

The second stage of the pilot study was the interview with managers of manufacturing firms in UK. The researcher attended the two-day Intralogistics conference in Coventry Ricoh Arena on 26th and 27th February 2018. The conference, which is held on yearly basis, brings together mangers and practitioners of manufacturing firms in UK to exhibit their product and services and to deliberate on issues pertaining to operations, supply chain and Logistics management. The interview with these managers gave the researcher the opportunity to improve and amend the questionnaire to enhance the standard of the questionnaire and to delete those questions that seemed vague and difficult to understand.

Similarly, following stage one procedure cover letter explaining the purpose of the research and a hard copy of the questionnaires were distributed to the managers at the conference on the first day and on the second day, those who gave their consent were interviewed. In total, 15 manufacturing managers gave their consent to be interviewed ranging from operations managers, supply chain managers, sales managers, health and safety managers and logistics managers. At the end of the interview, the researcher modified and deleted words that seemed difficult to understand. Finally, the questionnaires were developed based on the suggestions from the academicians and industrial experts and the measurement items at the end represented the constructs they purported to represent. The measurement items for GSCM enablers, GSCM practices, sustainability performance and competitive advantage were confirmed and adopted by the researcher.

The third stage of the pilot study saw an updated version of the questionnaire emailed to potential participant of UK manufacturing managers. The idea behind this procedure was to check whether the conceptualisation of the research constructs match with the knowledge of the manufacturing managers (Malhotra and Glover, 1998; Geng et al., 2017). The selection of the manufacturing companies and the managers was done using UK Financial Analysis Made Easy (FAME). This database contains names and address of registered manufacturing firms. According to Saunders et al (2009), pilot study does not require vigorous sampling approach therefore, no rigorous sampling procedure was used in the pilot study. In all 40 manufacturing managers ranging from health and safety, logistics supply chain, sales and operations managers were selected randomly from FAME website and contacted through emails. Respondents for the pilot study were provided a space to make comments regarding the questionnaire and where it needs improvement. They were also reminded of the fact that the research has reached an advanced stage and that; their quick response would be much appreciated. Their suggestions helped to modify some of the questions and especially the introductory section was advised to be shortened. Based on these suggestions and onwards modification, the final version of the questionnaire was drafted. In essence, the pilot study was helpful since it improved the quality of the questionnaire as well as reliability of the collected data. The feedback from the pilot study also helped to attract many responses since many changes were made to the content of the questionnaire and the cover letter.

4.8.2 Online Survey

Having completed the pilot study, this section focuses on how the main data is collected from the respondents. The data collection was conducted by relying on FAME database where the research retrieved the contact details of the 3410 manufacturing firms. Due to the difficulty in accessing some of these details, FAME can be said to be the most convenient way to access information of this nature. As far as the main survey is concerned, the researcher uploaded the final version of the research questionnaire onto an online web-survey service of Qualtrics. Qualtrics is an online web-based survey services that enables researchers to send their questionnaires to potential respondents using their emails. This service makes it easier to undertake statistical analysis of the data by exporting the data from Qualtrics web-based software to any statistical software such as SPSS-AMOS.

In developing the online survey, the researcher avoided the use of abbreviations, jargons, and vague questions. The questionnaires included a few demographic questions such as type of manufacturing firm, number of years of services of respondents and position in the organisation. These questions helped to eliminate any form of bias responses and to access the level of competence and experience of the respondents (Forza, 2001). One key difficulty associated with online survey is respondents giving answers to favour their organisation otherwise known as social desirability bias (Creswell, 2003). This problem was dealt with in this study by assuring the respondents of their confidentiality and anonymity. This at least allows the respondents to be rest assured that their anonymity and confidentiality is assured when certain genuine answers are given.

In addition, simple and unambiguous instructions were provided prior to answering the questions so that the respondents can follow the orderly arrangement of the questionnaires in their response. The questionnaire was also limited to selecting one choice at any giving question to avoid confusion. Five-point Likert scale was used to deal with common method variance (Field, 2009) Again, multiple questions on one-page strategy was used so that respondents would not have to flip pages over and over again to prevent fatigue. Furthermore, to prevent missing data, the Qualtrics software has the capacity to prevent respondents moving to another question while the first one remains unanswered. The survey questionnaire has a space where the respondent's participation is appreciated and then asked to provide name, telephone number and address should they desire to have copy of the research results.

Questionnaires were sent to respondents via Qualtrics software to their emails. The Qualtrics software has a column where the respondents' emails are placed and then the questionnaires are sent. The link to the questionnaire is inserted in the email giving the respondents easy access to the questionnaires. This process provides the researcher an easy way to administer and analyse the data. The email accompanying the questionnaire was designed such that respondents were made aware the research is a collaborative work between the researcher and Coventry University. This gave the questionnaire some credence, since many respondents may feel reluctant to answer questionnaire emanating from an unknown entity or individual. The invitation to participate in the survey also highlighted on the purpose of the study (Academic), the anonymity of the respondents and above all the confidentiality of their responses emphasised.

This process helped to motivate and influence more respondents to participate in the study. Furthermore, the invitation letter was short, concise, and indicated what time (10-15 minutes) respondents will take to complete the questionnaire since this serves as a motivation to participate (Sue and Ritter, 2007). Lastly, to motivate encourage participants to complete the survey, participants were promised copies of the results of the research. The main study was conducted within a period of 12 weeks from March 2018 to June 2018. The first batch of the questionnaire was launched on Monday 19th March by sending invitation letter to 3410 respondents within the sample frame. In order to motivate the respondents and increase the rate of response, a follow up email was sent to all the members within the sample frame two weeks (2nd April 2018) after sending the first batch of the questionnaire.

In order not to offend those who have responded to the first invitation, the follow up email has a section that categorically stated that "respondents should disregard this email if they have already responded to the questionnaire". All the completed questionnaires were automatically sent to Qualtrics software online portal. Access to this online portal was made possible because Coventry University has a legal license to use the software hence, access to this portal by the researcher who is a post graduate student at Coventry University. In all, a total of 3410 firms were contacted through email and 427 responses were returned. It must be noted that each response came from individual firms. Furthermore, 100 firms categorically stated their inability to complete the questionnaire due to operational reasons.

The analysis of the response is shown in figure 4.5 below. Out of the 427 responses that were returned, 20 questionnaires were completed by non-managers and therefore were taken out. "Other managers", whose categorisation did not meet the requirement of this study also completed 32 questionnaires. These 32 questionnaires were not included in the data, because the questionnaires were assumed to have been completed by individuals who have no in-depth knowledge about GSCM. This process assured reliability and credibility of the data used in the study. In all, 375 fully completed questionnaires from manufacturing managers were incorporated into the dataset and subsequently used as the approved dataset for this study. The actual response rate based on the returned questionnaire was 12.5% (427/3410)$*(100)$. Again, 2.9% represented firms who categorically stated that they could not take part due to operational challenges. Subsequently, 84.6% manufacturing firms did not take part in the study at all. According to Klassen and Jacobs (2001), the response rate of operations and SCM research is 11%. Therefore, the raw response rate of 12.5% for this study is perfectly consistent with this recommendation.

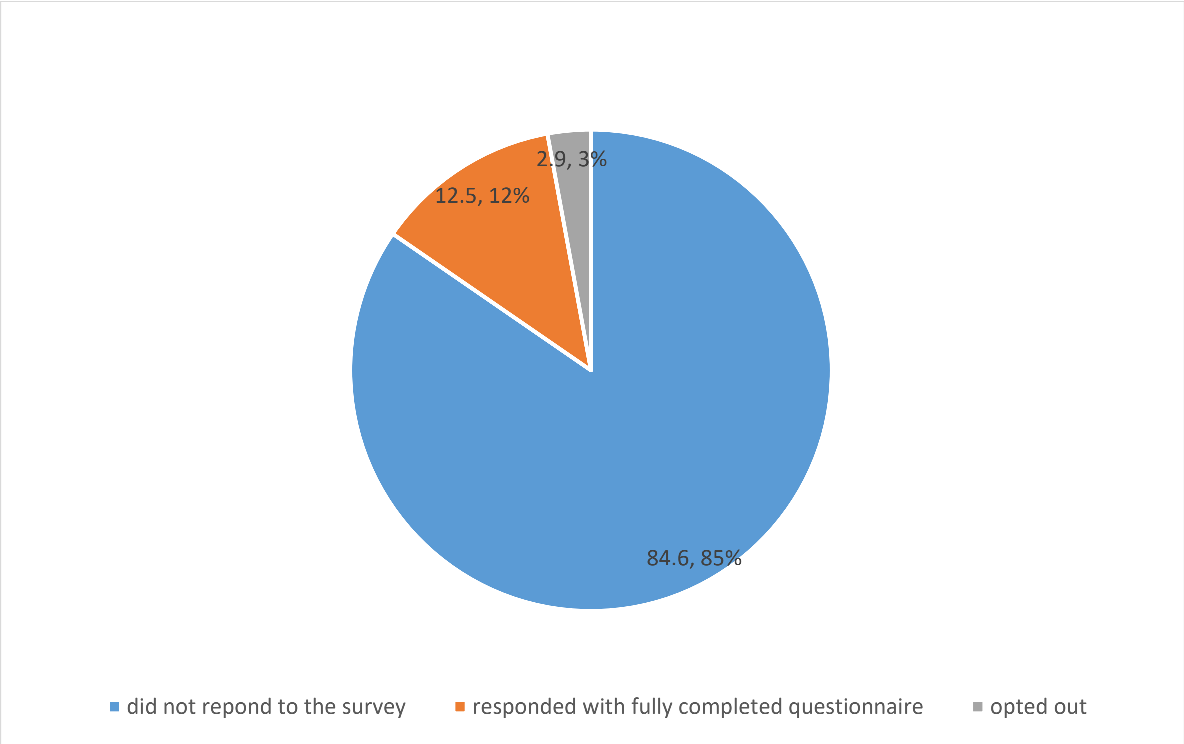


Figure 4.5 Analysis of survey responses

Sample characteristics provide a comprehensive background of the firms that participated in the study and therefore informed the results of the study. The significance of these characteristics cannot be underestimated, since they largely inform some of the specific conclusions that may be derived from this study. According to Forza (2002), industry size, type, and respondent type largely represent the main characteristics of the firm in operations and supply chain research.

4.8.3 Sample profile

Number of various manufacturing firms represents the sample of this research across UK. For the purpose of statistics, these firms are grouped according to what they produce. All the firms are into manufacturing of goods within UK. Hence, they all fall in line with the requirements of the research.

Table 4.8 Industry type

Respondents' industry	**Number of firms/Respondents (1 respondent per firm)**	**Percentage (%)**
Food and Beverage	43	11.5%
Clothing and Textile	31	8.3%
Wood and related Product	25	6.7%
Petroleum and Gas	25	6.7%
Chemicals	22	5.9%
Pharmaceutical	30	8.0%
Rubber and Plastics	25	6.7%
Minerals and Non-Metallic	20	5.3%
Metal and Steel	22	5.9%
Manufacture of computers	33	8.8%
Manufacture of electrical	40	10.7%
Motor vehicle and auto parts	15	4.0
Paper	44	11.7%
Total	375	100%

The firm size in this study was measured using the number of employees derived from one of the demographic questions. According to Gimenez et al (2012), EU classified firms as large when it employs 251 or more people. Table 4. 9 below depicts 44.3% of the sample are small manufacturing firms employing 1-50 employees. In addition, 39.5% representing 148 manufacturing firms are medium manufacturing firms employing 50 to 250 employees. Lastly, 16.3% representing 61 sample are large manufacturing firms.

Table 4.9 Firms' size

Firm's size (employees' number)	Frequency	Percentages (%)
Small	166	44.3%
Medium	148	39.5%
Large	61	16.3%
Total	375	100%

The respondents' characteristic is described by the job role of the respondents. According to Li and Lin, (2006), respondents' knowledge and experience are determined by their job roles, number of years in services and their position. In this study, respondents' characteristic is determined by their job positions. Table 4.10 depicts the position of the samples used in this study.

Table 4.10: Respondents' job title

Job title	Frequency	Percentage (%)
Plant manager	88	23.5%
Operations manager	75	20.0%
Logistics manager	59	15.7%
Sales manager	53	14.1%
Supply chain manager	72	19.2%
Other specify (Health and safety) manager	28	7.5%
Total	375	100

Drawing on table 4.10, all the respondents fall within senior management position ranging from plant managers through to health and safety managers. About 23.5% of the respondents hold plant manager's position representing 88 managers, 75 managers hold operations managers position representing 20% and 72 managers hold supply chain manager's position represents 19.2 %. The rest of the respondents are health and safety, logistics and sales managers. This table indicates that individuals who responded to the questionnaire can be classified to be knowledgeable and experienced in their firm's GSCM related practices. These diverse of managers brought with them extensive level of experience, hence ensuring the credibility and reliability of the responses (Nasser, 2011).

4.8.4 non-response bias

Within social science research, bias refers to the process where organized error is detected in the design, data collection, and data analysis. Non-response bias and response bias are often confused. The presence of non-response bias influences the validity and reliability and credibility of survey data (Sedgwick, 2014). Non-response bias occurs where there is systematic difference in the characteristics of two groups i.e., respondents and non-respondents (Lambert and Harrington, 1990). Therefore, in this research we assessed non-response bias by categorising the responses into two, early wave of responses and late wave of responses. The responses received within the first two weeks were classified as early wave (255 responses) and the late wave of responses arrived after following up emails (120) responses.

To determine whether there was presence of non-responses bias, the mean values of each construct were compared between the two groups using the two-tailed t-test, which is most popular approach to determine non-response bias (Kaplan 2004). The analysis resulted in non-significant difference between the two groups at 0.05 ($p < 0.05$), this result indicated that non-response bias did not pose any threat to the data, because the outcome showed non-significant difference among the variables. This in essence, signifies that there was no sharp difference in the characteristics of the first wave of respondents and the late wave of respondents and that absence of non-response bias in the dataset (Lambert and Harrington, 1990; Nassar, 2011).

4.9 Ethical considerations

Ethical consideration is significant component of management research. It is referred to as the appropriate behaviour of the stakeholders involved in the research project including the researcher (Saunders et al., 2009). Issues on ethics such as risk, informed consent, harm, confidentiality, voluntary participation, and plagiarism must be giving a priority when undertaking any research project (Bryman and Bell, 2015). Every university in UK has its own standard of ethical consideration when conducting any form of research study. However, research at PhD level follows strict ethical procedures (Philip and Pugh, 2005; Esfahbodi, 2016).

Based on these guidelines, the author of this thesis followed the strict ethical procedure of Coventry University, which comprises seeking the voluntary participation of the participant, assessing the risk involved in carrying the study, informed consent of the participant, providing cover letter to explain the purpose of this study and data storage procedure of Coventry University. Before data collection resumed the researcher submitted ethical application, and it was reviewed and approved by the ethics committee of Coventry University with reference number P52341.

4.10 Summary of the chapter

This chapter has comprehensively examined step by step procedures for conducting this study. Firstly, the section discussed the philosophical stance of this study where positivism approach was employed as the appropriate approach for the study. This further informed the research choice of deductive approach as the theoretical reasoning of this study. In terms of research strategy, quantitative method was used as the sole strategy for data analysis, which then informed the time horizon and data collection approach of the study. Furthermore, the research adopted SEM as the data analysis technique based on the theoretical model and the general research objectives. In addition, other methodological subsections were discussed such as questionnaire development, pilot study, pre-testing, and ethical considerations.

The pilot study, couple with pre-testing resulted in modification of the final survey questionnaire. Issues about sampling and sample frame were also discussed. Data collection through an online survey powered by Qualtrics online portal software was used to distribute the survey to respondent's emails. The administration of the survey resulted in 375 fully completed questionnaire returned by the respondents. Lastly, issues of potential non-response bias and missing data were tackled using systematic and quantitative approach. Tables demonstrating the demographic information about the sample firms were presented.

CHAPTER 5: ANALYSIS AND RESULTS

5.1 Introduction

The key aim of this chapter is to analyse the results from the data using the appropriate statistical methodology. With respect to this, the study adopts Structural Equation Model (SEM) supported by SPSS powered by AMOS software to analysis the data. As chapters 3 and 4 focused on the designing the research model based on the research questions and the methodology used to gather the data respectively, the next stage of the research is the analysis of the data collected from respondents and to report the findings. This section is divided into two major parts, the first one looks at all the validation steps to ensure the reliability and validity of the data. The second part looks at testing the hypothesis to confirm the causal relationships between the research constructs. The remainder of the chapter is structured as follows; section 5.2 discusses the data preparation and administration. Section 5.3 deals with statistical distribution of the data. This is followed by section 5.4 that checks data entry. Section 5.5 discusses common method variance while section 5.6 deals with SEM. The summary of the chapter is captured in section 5.6.

5.2 Data preparation and examination

Data preparation and examination is significant in any multivariate data analysis since it helps to address quality issues about the data. The quality of any research outcome is subjected to initial data preparation and examination to avoid errors in research outcomes (Hair et al., 2010). However, data preparation and examination stage of research study has been overlooked by new researchers due to the fact that it is time-consuming, but necessary initial step in data analysis (Hair et al., 2010). Consequently, avoiding this stage may result in poor quality of research outcomes Tabachnick and Fidell, (2007). Tabachnick and Fidell (2007) are of the opinion that the main method of examining data is through proofreading the original data prior to computer informed analysis.

Similar to dataset of this research, large dataset is difficult to adopt proofreading to screen the data, thereby necessitating the need to use descriptive statistics (Hair et al., 2010). According to Hair et al (2010), adopting computer mediated software to screen a data helps to identify hidden errors which otherwise may be difficult to be detected by other methods. Based on this assumption and reasoning, this research employed computer mediated data examination method to identify errors in the data before beginning the analysis of the data. Therefore, in this study, data examination involved screening for normality of the data using graphical evidence produced by computer mediated software (AMOS), examining for missing data and examining for outliers. Later in this chapter, the study discussed multi-collinearity, response bias and discriminant validity.

The use of internet assisted online survey was adopted to obtain appropriate responses from the targeted population. This method did not only offer speed in gathering the data but also offered the opportunity to accurately enter the data using Qualtrics software. After the data collection was done, the Qualtrics portal was accessed, and data retrieved. The retrieved dataset from 375 manufacturing managers was downloaded and exported to SPSS dataset for onward analysis. The issue of assessing the normality of the dataset was dealt with through conducting descriptive statistics, which is presented in subsequent sections.

According to Mishra et al (2019), there are two main methods of assessing normality of a dataset: Graphical and numerical (including statistical tests). Statistical tests have the advantage of making an objective conclusion of normality but have the disadvantage of sometimes not being sensitive enough at low sample sizes or overly sensitive to large sample sizes (Mishra et al., 2019). Graphical interpretation has the advantage of permitting good judgment to assess normality in situations when numerical tests might be over or under sensitive. Although normality assessment using graphical method needs a great deal of experience to avoid the wrong interpretations it is common method of assessing normality of a dataset (Mishra et al., 2019). Based on the above assertion and reasoning, graphical method was used to determine the normality of the dataset.

There are various methods available to test the normality of a continuous data. Out of these methods, the most popular methods are Shapiro–Wilk test, Kolmogorov–Smirnov test, skewness, kurtosis, histogram, box plot, P–P Plot, Q–Q Plot, and mean with SD (Bland, 2015). Normality tests in this dataset was conducted using the statistical software "SPSS"; (e.g., analyse → descriptive statistics → explore → plots → normality plots with tests). In determining the normality of dataset in this study, QQ plot was used. QQ plot of all the variables were provided to show the normality of the data. This method was used because other methods such as Shapiro-Wilk statistical test and Kolmogorov-Smirnov test are sensitive to sample size. That is, if the sample size is sufficiently large, this test may discover even minimal departures from the null hypothesis, (i.e., although there may be some statistically significant effect, it may be too small to be of any practical significance).

According to Park (2006), additional investigation of the effect size is significantly necessary e.g., the use of shapes to depict the normality of the distribution of the data is required (Park, 2006). QQ plot is a scatterplot formed by plotting two sets of quantiles against one another. If both sets of quantiles came from the same distribution, we should see the points forming a line that is straight. Here, we compare the quantiles of our empirical data with the ideal data. In this case, we compare our stock real data with the theoretically ideal normal distribution (Bland, 2015). Looking at the QQ plots there are the upper part and lower part, which the dots fall a little apart from the straight line, and this is common with QQ plot. Although the closer the dots are to the straight line justifies normality of the data, the points on the extreme ends cannot be used as a justification to say they are not normally distributed. In many cases the concern is about the middle part and the number of dots around it (Ford, 2015). Hence, the computer mediated QQ plots of the research framework (independent and dependent variables; GSCM practices, sustainability performance and competitive advantage) are shown in figures below. All the figures shown indicate that all the research frameworks met the normality of the data.

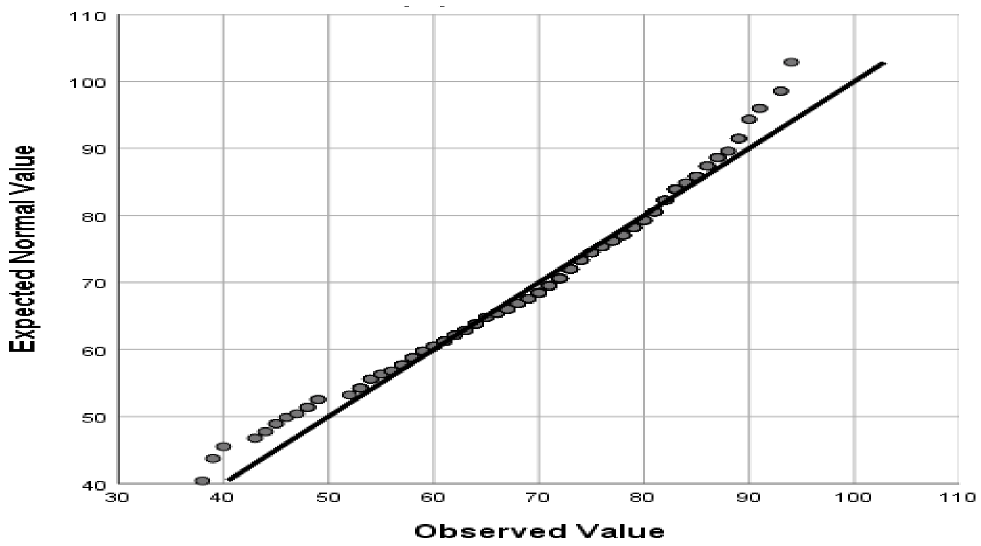


Figure 5.1 QQ plot of GSCM practices

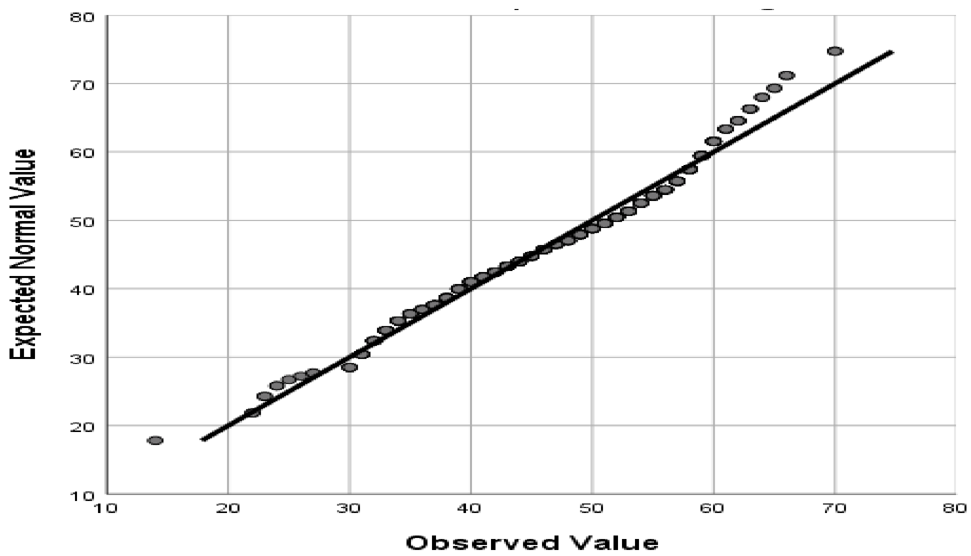


Figure 5.2: QQ plot of competitive advantage

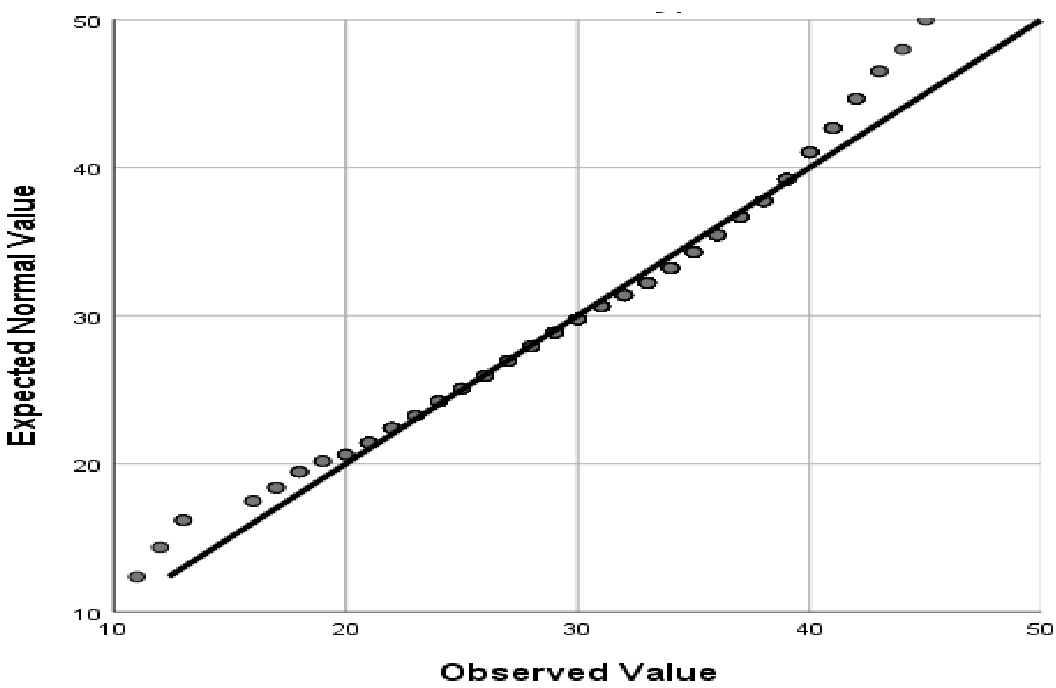


Figure 5.4 QQ plot of sustainability performance

5.2.1 Missing data

Missing data pose threat serve as a nuisance to any research study. It appears as a result of data collection errors, or data entry due to omission of responses from respondents. The problem of missing data is a common phenomenon whether using parametric data or non-parametric data, especially with respect to survey research (Tsikriktsis, 2005). Missing data pose a serious problem to empirical research when it exits in any dataset (Field, 2005). It may also lead to biased estimates related to measures of central tendency, measures of dispersion, and correlation coefficient (Tsikriktsis, 2005). The following section examines the extent and patterns of missing data in this research.

Before performing statistical data analysis, issue of missing data must be taken into consideration. According to Field (2009), missing data appear central and critical before any vigorous data analysis could be done. Missing data, whether parametric or non-parametric, pose critical problem in survey research as usually a large sample is needed (Tsikriktsis, 2005). For instance, missing data can lead to bias estimate of the descriptive statistics such as mean, median and standard deviation. (Field, 2005: Tsikriktsis, 2005). There are no firm rules for how much missing data can be contained for a sample of a given data (Tabachnick & Fidell, 2007, p. 63). Cohen and Cohen (1983) posit that missing data of 5% or 10% is not considered large. Tabachnick and Fidell (2007) argue that the form of missing data is more significant than the volume of missing data.

Less serious problems are expected from missing values distributed randomly through a data set. There are two key strategies applied when treating missing data, and these include deletion approach using only valid cases (listwise option on SPSS) or all available cases (pairwise option on SPSS) and substitution approach based on mean substitution, regression imputation, or expectation maximisation (Tabachnick & Fidell, 2007). However, in order to deal with missing data in this study, Qualtrics software has a mechanism to compel respondents to complete all questions before submitting the survey. With this method, respondents cannot leave a question unanswered before submitting the questionnaire. The strategy to prevent missing data has become popular in recent years within academic research and more particularly quantitative research (Sue and Ritter, 2007 and Esfahbodi, 2016). However, the use of Qualtrics software in collecting data from the respondents helped to prevent any missing data. Hence, in this research no missing data was recorded.

5.2.2 Outliers

When examining multivariate statistics, an outlier is a score that is particularly different from the rest of the data (Field, 2005, p.74). When dealing with continuous variables, detecting outliers is based on whether data are put into categorise (Field, 2005). With Ungrouped data, where data is analysed using factor analysis, regression, and structural equation modelling, univariate and multivariate outliers are required in all cases at once. With grouped data, which is analysed using MANOVA, discriminant analysis, and logistic regression, outliers are detected separately within each group (Nassar, 2011). In this study, outliers have been checked using scatterplots and no significant outliers have been identified. Outliers have a negative impact on the precision of regression model and the outcome may result in biased estimation (Field, 2005). To examine outliers, a scatterplot of standardised residuals is used. The scatterplots in (Figures; 5.5 to 5.7) show standardised residuals plotted against associated independent and dependent variables. The scatter plot shows that, outliers are cases with standardised residuals of more than +3 or less than -3 (Field, 2005). Based on the residual plot on figure 5.5 to 5.7, all residuals fall between 3 and -3; therefore, no outliers were detected.

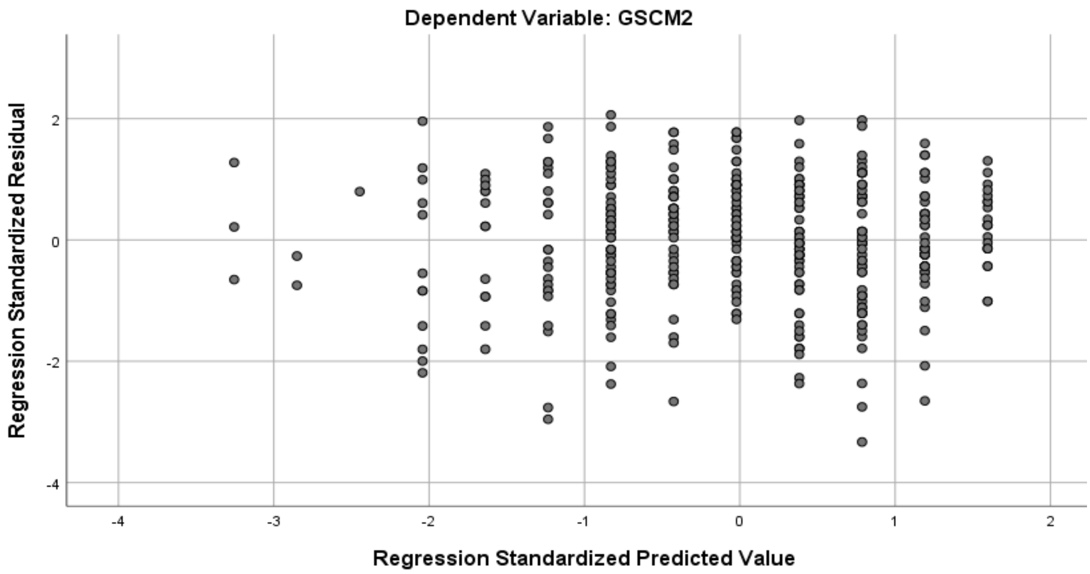


Figure 5.5 scatter plots of GSCM practices

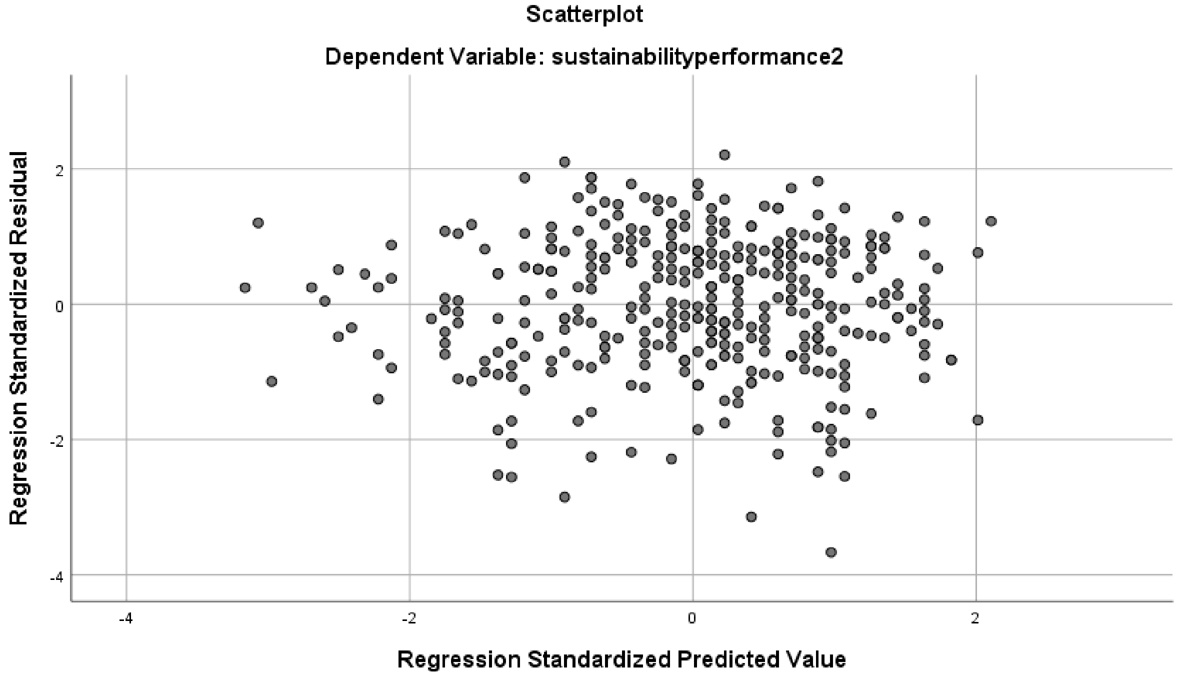


Figure 5.6 Scatter plots of performance outcomes

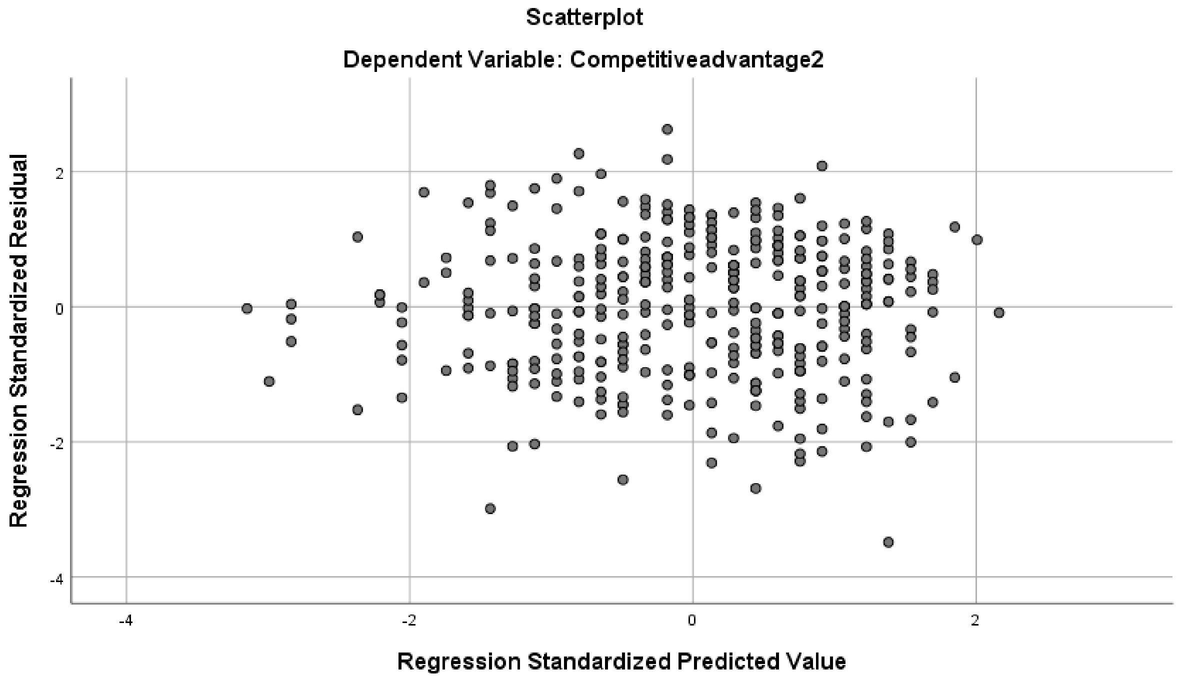


Figure 5.7 Scatter plots of competitive advantage

5.3 Statistical distribution of the data

In order to examine the appropriateness and normality of the data the following procedures were followed. The data collected through questionnaire were transferred to an SPSS file powered by IBM SPSS statistical package version 25.00. First of all, the value of each of the research construct was determined by the summation of measurement items of each research construct for all sample, e.g. (ED1+ED2+ED3+ED4+ED5)/5→ED (Eco Design) or (GP1+GP2+GP3+GP4+GP5)/5→GP (green purchasing). All the average values of the constructs were used to compute for the descriptive statistics. The values of skewness and kurtosis were also determined to ascertain the statistical appropriateness of the data with respect to normality of the data (Field 2009; Esfahbodi, 2016). The table 5.1 below shows the descriptive statistics of the dataset produced by the SPSS output.

Table 5.1: Descriptive statistics

Variables	N	minimum	maximum	Mean	Std. Deviation	Skewness	Kurtosis
G P	375	1	5	3.744	1.704	-0.843	-.0192
E D	375	1	5	3.712	1.238	-0.829	-0.206
CC	375	1	5	3.765	1.161	-0.83	-0.061
IR	375	1	5	2.622	1.008	-0.2826	-0.689
GM	375	1	5	3.928	1.077	-1.014	0.558
GD	375	1	5	3.735	1.180	-0.776	-0.175
RL	375	1	5	3.775	1.139	-0.8065	-0.074
SP	375	1	5	3.788	1.119	-0.883	0.190
ENV	375	1	5	3.832	1.132	-0.944	0.286
ECO	375	1	5	3.680	1.173	-0.782	-0.125
CA	375	1	5	3.665	1.120	-0.668	-0.167

QA	375	1	5	3.657	1.152	-0.699	-0.233
FA	375	1	5	3.635	1.178	-0.772	-0.132
DA	375	1	5	3.715	1.128	-0.757	-0.092
CE	375	1	5	3.928	0.946	-0.861	0.761
Valid No.	375						

Field (2009) posits that the recommended value for skewness and kurtosis coefficients that describe normality of a data is within the range of -2.00 and + 2.00. Descriptive statistics presented in table 5.1 above shows that all variables are sufficiently and normally distributed with skewness and kurtosis coefficient within the range of -2.00 and + 2.00 (Green et al, 2012). Similar to Esfahbodi et al (2016) where two statistical approaches were used to determine the normality of the dataset (skewness, kurtosis, and Histogram), this study used QQ-plot, skewness, and kurtosis to determine normality of the dataset.

5.4 Data quality

Having determined the appropriateness of the data regarding both missing data and the normality of the distribution of the data, another critical step is to determine the quality of the data before conducting statistical analysis. There is wide perception that quality of data is dependent only on its accuracy, and do not involve other significant dimensions for achieving higher quality (Hair et al., 2010). Undeniably, data quality is more than considering one dimension, so the issue of dimensions dependencies is vital to enhance process quality. Without knowing the existing relations between data quality dimensions, knowledge detection cannot be effective and inclusive for decision-making (Sidi et al., 2013). According to Saunders et al, (2009) data quality is understood from two perspective, which is validity and reliability.

In principle, validity refers to the extent to which a study accurately replicates the specific concept that the researcher is attempting to measure (Howell et al., 2005). It is concerned with the assessment of scales to ensure that the scale conforms to what it is supposed to measure. In this vein, Haron (2002) posits that validity is the extent to which a measure captures the construct it was designed to measure. In other words, validity is seen as an instrument to determine whether the measurement item truly measures that which it was intended to measure or how accurate the research findings are. In other words, does the research instrument allow the researcher to hit “the bull’s eye” of your research (Joppe, 2000; El-Gohary and Hateem, 2018)? In this research, the focus is on the validity of the measuring instrument (questionnaire), where a set of questions are expected to meet the objectives of the research (Saunders et al., 2009). There are three main aspects of research validity in quantitative studies: criterion-related validity, content validity and construct validity (see table 5.2).

Table 5.2Types of Validity measurement

Validity type	**concept**	**Implication to this research**
Content validity	It refers to the extent to which a scale has sampled from the intended universe. It measures that the questionnaire includes enough set of items that tap the concept.	It is certain that the measurement items were adopted from extant literature This refers to literature review conducted in chapter 2.
Construct validity	This involves testing a scale with respect to theoretically developed hypothesis in terms of the underlying variables. This validity measures how well the results obtained from the use of the scale or measure fit with the theory around which the test is designed	It is attained through investigating the relationship with other constructs, both related convergent validity and discriminant validity
Criterion-Related	This validity measures the relationship between scale scores and certain specific measurable criterion.	It is assured through testing the power of the measure to differentiate individuals who are known to be different

Convergent validity (Sub-type of construct validity)	This measures the extent to which two measures of the same concept correlated. High correlation indicates that the scale is measuring its intended concept.	This validity is measured using exploratory factor analysis (EFA& CFA)
Discriminant validity (subtype of construct)	This measures the extent to which two conceptually similar concepts are different. Here the empirical test is the correlation among measures, but here the summated scale is correlated with a similar but conceptually distinct measure.	This validity is tested using confirmatory factor analysis (CFA)

Source: Adopted from (Hair at al., 2010; Abubakar, 2014).

These forms of validity tests focus on measuring the ability of measuring items to measure what they are designed for. In validity, the research questionnaire should be able to measure the concept under consideration. Hence, validity tests measure how well the results obtained from the scale or measure fit with the theory around which the test is designed (Hair et al., 2010; Abubakar, 2014). These validity tests are conducted to enhance and address the integrity of the study's findings. In this research, validity is assured in the sense that all the scales were adopted from previous studies. Example of some of the studies used for the scales were (Zhu and Sarkis 2004; Green at al., 2012; Li et al., 2006; Esfahbodi et al 2016; Zhu and Sarkis, 2004, zhu et al 2012; Li et al 2006).

The second aspect was proposing a guiding conceptual framework based on which the research variables were specified. The third aspect was that the completed questionnaires were scrutinised using comprehensive pilot test where a pre-test was conducted among practitioners and academics who are expert in operations and supply chain management. It is certain in the research that, both content validity and criterion related validity were assured and achieved. In other to test construct validity of the scales used in this research, confirmatory factor analysis

(CFA) was carried out. Another important concept that helps to determine the quality of a construct is reliability. Since the data for this study was obtained from scaled responses, it is important to go through reliability test (Tracey et al., 2005). Reliability analysis is the process of measuring the internal consistency of a set of indicators of latent construct. In other words, reliability refers to degree to which all indicators measure the same thing (Hair et al., 2010). To describe a data as reliable, the instrument measuring the concept should be correlated; hence, the findings of such a data should yield consistent results (Saunders, 2009).

Reliability is inversely related to measurement error, hence as reliability goes up, the relationship between a construct and the indicators are greater, which indicates that the construct explains more of the variance in each indicator, this means there is minimal measurement error (Hair et al., 2010). Reliability is a test of how stable and consistent a measuring instrument taps the variables, models, or theory it is intended to measure. This means that whether two or more observers or the same observer on separate occasions observes an event the results must be the same (Sekaran and Bougie, 2013; Abubakar, 2014). Reliability concerns with the degree to which, without bias (error free) the measurement achieves consistency across time and across various items (Pallant, 2010).

In quantitative studies, reliability is measured using the Cronbach's Alpha (α). Cronbach's alpha is the most used statistical method to determine the reliability of a set of data. It is used to measure the internal consistency of a set of data (Flynn et al., 1990; Pallant 2010; Sekaran and Bougie, 2013). Cronbach's alpha (α) in essence is employed as an estimate of the reliability, which determines how closely a set of measuring indicators are related to each other (Hair et al., 2010). According to Hair et al (2010), the most acceptable value of Cronbach's alpha (α) is 0.60 or in most cases preferably 0.70, this means the closer the Cronbach's alpha value is to 1, the greater internal consistency. In this research, SPSS software package is used to empirically analysis the reliability of each research construct. To determine the Cronbach's alpha value for each construct, we selected all the measuring items of each construct and carried out reliability test individually for all constructs. For example, to determine the Cronbach's alpha value for eco design (ED) we added all the measuring items and divided them by the number of measuring items. (e.g., ED1 + ED2 + ED3 +ED4 + ED5) / 5 = ED. The results of the internal reliability analysis are presented in table 5.3.

Table 5.3: Cronbach's alpha coefficient Reliability statistics

Variables	Cronbach's Alpha	Number of measuring items
GP	0.772	5
ED	0.794	5
CC	0.781	4
IR	0.753	4
GM	0.750	5
GD	0.733	4
RL	0.649	4
SP	0.835	5
ENV	0.824	5
ECO	0.844	5
CA	0.780	4
QA	0.807	4
FA	0.837	4
DA	0.821	4
CE	0.661	6
Entire variables	0.917	73

The table above shows the reliability coefficient (Cronbach's alpha values) of the entire variables in the research and the individual variables. The Cronbach's alpha value of the entire variables in the study is 0.917 consisting of 15 variables with the overall measuring items consisting of 74 items. Based on the empirical analysis in table 5.3, the reliability coefficients (Cronbach's alpha values) for the variables; Green purchasing (GP); Eco design (ED); Customer cooperation (CC); Investment recovery (IR); Green marketing (GM); Green distribution (GD); Social performance (SP); Environmental performance (ENV); Economic performance (ECO); Cost advantage (CA); Quality advantage (QA); Flexibility advantage (FA), and Dependability advantage (DA) exceeded the recommended value of 0.70 level indicating high construct reliability. The Cronbach's alpha values for RL, CE also exceeded the minimum value of 0.60 level, indicating satisfactory construct reliability (Hair et al., 2010). These results portray that scale instruments of this research are reasonable reliable. It further suggests that the measurement items of each construct consistently represent the same latent variable (Kaplan, 2004; Hair et al., 2010; Esfahbodi, 2016).

5.5 Common Method Variance (CMV)

Prior to conducting SEM analysis, one important issue that must be addressed as far as the dataset is concerned is common method variance. Many researchers believe that common method variance (i.e., measurement ascribed to the measurement method rather than the construct the measurements represent) is a critical problem in behavioural research (Podsakof et al 2003). Common method variance is seen as a problem in research because it forms part of the sources of measurement error and therefore, threatens the validity of the conclusion of the relationship between two measures (Bagozzi & Yi, 1991; Spector, 1987). Measuring numerous variables using the same multiple-item scales presented in a survey may result in false results and thereby leading to inaccurate conclusions (Kamakura, 2010; Esfahbodi, 2016). According to Bagozzi and Yi, (1991), Nunnally, (1978), there are two types of measurement error that may be recognised to affect the validity of any research conclusion, that is random and systematic component errors. These two measurement errors pose dangerous problem to research conclusion. However, systematic measurement error is particularly more serious because it provides alternative explanation for observed relationships between measures of different construct that is separate from the one hypothesised (Podsakof et al., 2003). Bagozzi & Yi, (1991), posit that one of the main sources of systematic measurement errors is the common method variance that may be caused by content of specific item, scale type, response format and the general context. It is further noted that, in a more abstract situation common method effect might be interpreted in terms of responses bias such as halo effects, social desirability and lenience effects.

It is, therefore, vital that the issue of common method variance (CMV) is addressed before any statistical analysis is carried out to ensure that CMV is not a problem. In this study, several factors were employed when developing the questionnaire to avoid the likelihood of CMV. The two most common cause of common method variance (CMV) are item characteristics and common ratter effects (Podsakof et al., 2003; Esfahbodi, 2016). Common ratter effect refers to any simulated covariance between the predictor and criterion variable produced by the fact that the respondent providing the measure of these variables is the same (Podsakof et al., 2003).

Item characteristics effects on the other hand, refers to any simulated covariance resulting from the influence or interpretation that a respondent might attribute to an item solely because of specific properties or features the item possesses (Podsakof et al., 2003). In order to mitigate the item characteristic effect, the researcher conducted extensive questionnaire pre-test that resulted in major modification in the questionnaire rendering it easy to be understood. To deal with problem of common ratter effect, which is linked to issues of socially desirable responses, the researcher assured the respondents of their anonymity and confidentiality. Other measures such as obtaining the predictor and criterion variables from different sources and adopting the measures from existing published studies helped to improve the quality of the scales. According to Podaskof et al (2003), it is prudent for researchers to do everything possible to remedy the issue of CMV in research study, through implementing procedural strategy relating to the questionnaire design (e.g., eliminate item ambiguity, demand characteristic, social desirability).

This study utilised the procedural mitigation based on the study of Podsakoff et al. (2003), where respondents were assured of their anonymity and confidentiality. Respondents were made to understand that there were no wrong or right answers, hence, they should answer as honestly as possible. Moreover, 85% of the respondents have been working in their respective manufacturing firms for more than 10 years making them more qualified to provide the information the study requires. Accordingly, substantial amounts of common method variance problems do not seem to be present in this study.

5.6 Structural Equation Modelling (SEM)

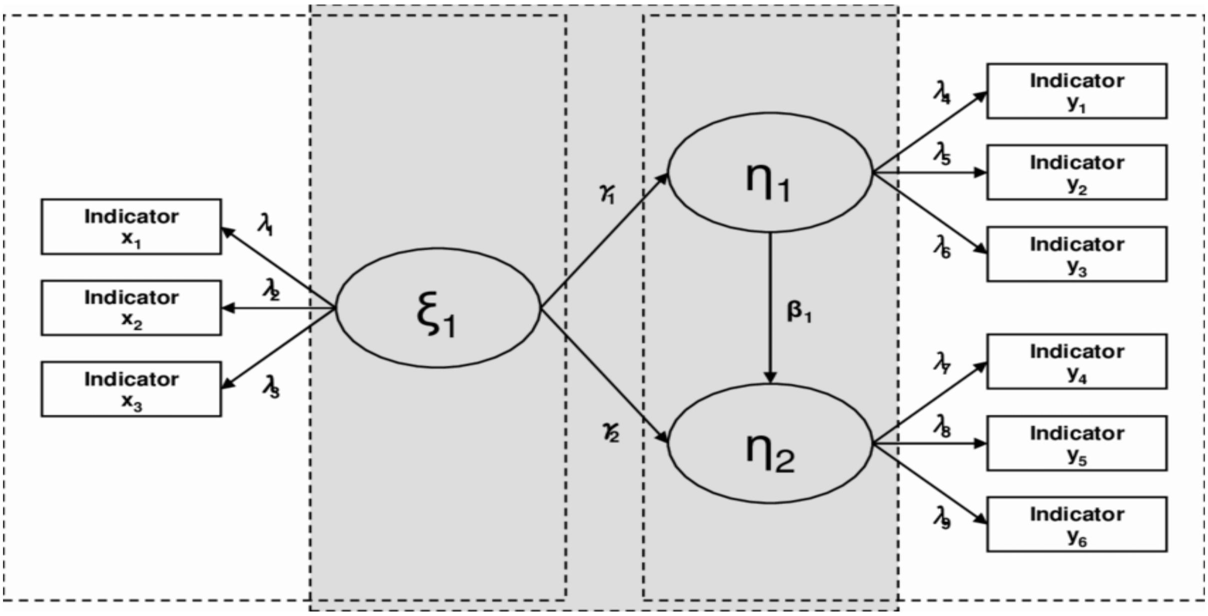
5.6.1 Introduction of Structural Equation Modelling (SEM)

Structural equation modelling (SEM) has gained popularity in recent times among the multivariate research approach family. Researchers are interested to use SEM because it provides a theoretically appealing way to test and analyse data. SEM is a statistical technique for simultaneously testing and estimating casual relationships among multiple independent and dependent constructs (Gefen et al., 2000; Hair et al 2010). Many research studies that apply SEM method usually follow positivist epistemological belief. According to research studies of Orlikowski and Baroudi (1991) and Urbach (2010), a set of characteristics are used to classify research as positivist. Ontologically positivist research adopts an objective, physical, and social world that exists independently of humans. The researcher plays a passive neutral role and does not intervene in the phenomenon of interest.

Epistemologically, the positivist perspective is concerned with the empirical testability of the theory (Urbach, 2010). In other words, these theories are either confirmed or rejected. They are premised on the existence of a priori fixed relationships within phenomenon that can be identified and tested through a hypothetic-deductive logic and analysis (Dube and Pare, 2003; Urbach, 2010). The major purpose of this research study is to analyse causal relationships between variables. SEM is known to be a perfect statistical technique for testing and estimating causal relationship based on statistical data, hence, this study is perfectly in line when it adopts SEM as an analysis method. In contrast with other multivariate analysis, SEM analysis allows researchers to simultaneously consider relationships between several independent and dependent construct (Hair et al., 2010).

Structural equation model consists of two main parts. The structural model (inner model) comprises the relationship between the latent variables (LVs), which must be derived from theoretical consideration. For each of the latent variables (LVs) within the structural equation, the measurement model (outer model) must be identified. The measurement model denotes the relationship between the empirically observable indicator variables and the LVs. The measurement model in essence should be based on existing theory (Edwards and Bagozzi, 2000; Urbach, 2010). Citing Edwards and Bagozzi (2000) and Urbach (2010), "without this existing theory, mapping of theoretic constructs into empirical phenomenon is ambiguous, and theories cannot be empirically tested".

The mixture of measurement model and structural model together form complete structural equation model. Figure 5.5 below is an example of a simple structural equation modelling. It comprises one exogenous (ε_1) variable and two endogenous variables (η_1). The latent variables are operationalised through the measurables indicators x^i and y^i. The relationship between the variables is computed by path coefficient. The determination of the path coefficient in the measurement model is by either weights (formative) or loadings (reflective). The path coefficient between the latent endogenous variables is labelled β^i, whereas path coefficient between endogenous and exogenous variables are labelled as γ^i.



Measurement model of measurement model of the exogenous variables endogenous variables

Figure 5.8: Example of a structural equation model (Adopted from Urbach, 2010).

One of the basic problems of analysing structural equation model is the estimation of the model's parameters and the determination of the model's goodness of fit of the total sample data on all the measured variables (Bentler, 1980; Urbach, 2010). Generally, the analysis of SEM is based on three approaches; first approach consists of the measurement models, where each set of the measurement item for a construct acts collectively to describe the construct. The second approach consists of the structural model, where all constructs are related to one another in correlational and dependence relationships. The third approach consists of the combination of the measurement model and the structural model in a single analysis (McQuitty, 2004; Hair et al 2010). In this study, the research model indicates and simultaneously strives to combine both measurement and structural model. This research followed the six stages approach posit by Hair et al (2010) to analysis the SEM. Many studies relied on these six stages approach in their quest to analysis the SEM approach. For exemple, Li et al (2006), Yang et al. (2013), Green et al. (2012), Mitra and Ditta (2014), Esfahbodi et al (2016).

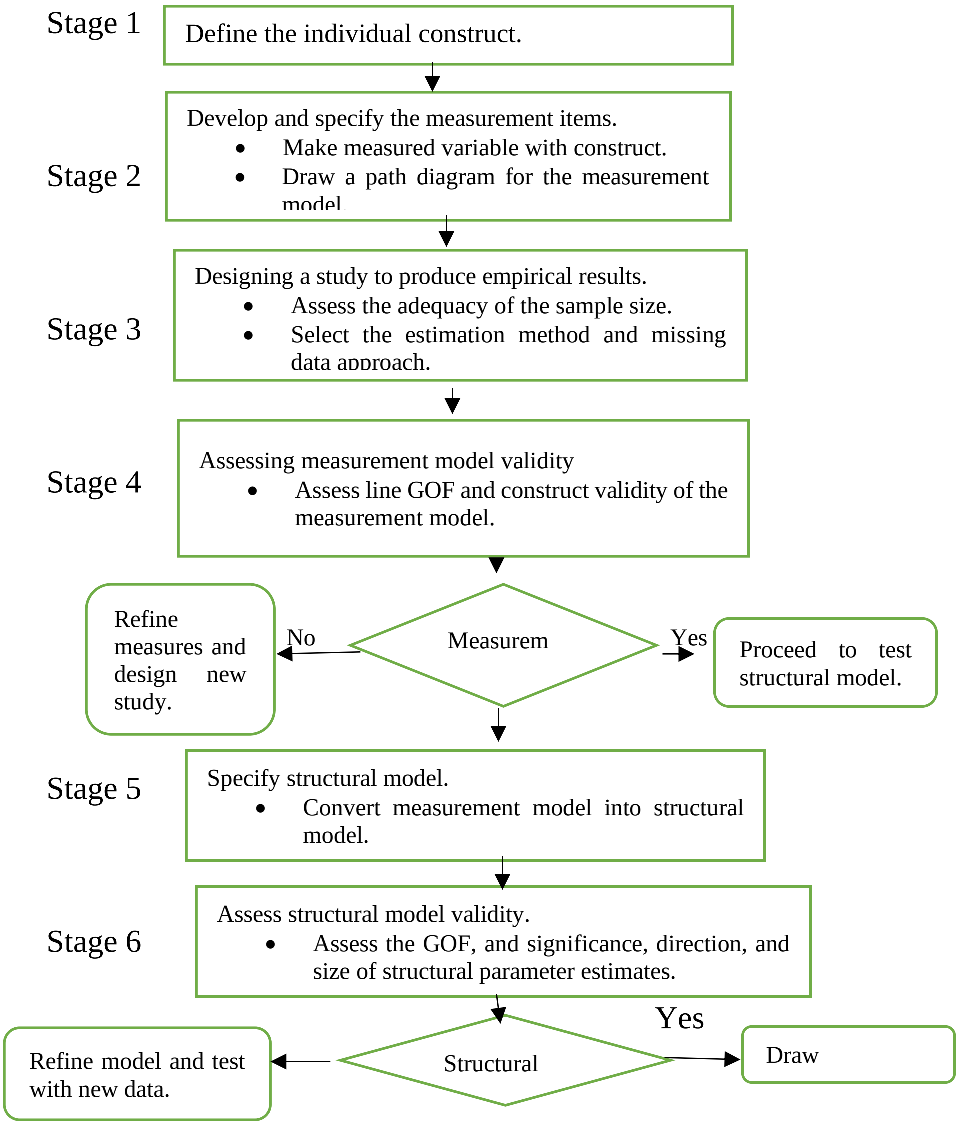


Figure 5.9 six-stage process for structural equation modelling (SEM) (source; Hair et al., 2010)

In order to satisfy stage one of this process, this study adopted measurement items from existing literature. Extensive literature review was conducted on each of the individual construct to pick scales that performed well (Hair et al. 2010). However, the measurement scales were adopted from previous studies and pre-test of the scales were conducted. Having specified the research scales, the research measurement model was specified in stage two. At this stage, each latent construct to be used in the research and their measurement variables were specified. When determining the scales for the latent constructs this study took into consideration the number of indicators to be applied to each construct and the indicators should also portray to represent the construct (Hair et al 2010). Stage three deals with the research design, impact of missing data and issues involving sample size and estimation method. This stage of SEM has been discussed in this chapter and subsequent chapters. Furthermore, following the specification of the measurement model, sufficient data available, and important decisions such as estimation technique and sample size are taking at this stage. Stage four of SEM deals with testing of the measurement model to ascertain whether they are all valid.

To determine the validity of the data set depends largely on the establishment of the acceptable level of goodness of fit (GOF) and looking for evidence of construct validity (Hair et al., 2010). This stage is often conducted using confirmatory factor analysis (CFA), which forms part of the structural equation model (SEM). Stage five involves specifying the structural model by assigning relationships from one construct to another based on the proposed hypothetical relationship in the model. This stage further deals with causal relationship between latent variables (Byrne, 2001) Structural model specification focuses on adding single-headed directional arrows to represents structural hypothesis in the researcher's model. In other words, the researcher identifies the dependence relationships that are hypothesized that exist among the constructs (Hair et al., 2010).

The final stage of this model is assessing the structural model validity. The stage is involved with attempt to test the validity of the structural model and its corresponding hypothesized theoretical relationship. In order to carry out stages 5 and 6, several software programs have been identified for SEM analysis such as Amos, LISREL, Mplus, and Stata etc. All these software programs come with their own unique advantages and disadvantages. However as far as this study is concerned, the researcher used AMOS 25.0 which is one of the common and popular SEM software programs to perform CFA test to evaluate the measurement model and the structural model while producing the necessary model fit for this study (Loehlin, 1992; Hair et al., 2010).

5.6.2 Confirmatory Factor Analysis (CFA)

To proceed with the measurement of the model fit, there are some statistical techniques usually adopted to analyse data. At this level, confirmatory factor analysis was performed to test whether the measurement model statistically fit the data under consideration and assesses the validity of the constructs within the model. With CFA, the researcher must identify both the number of factors that exist for a set of variables, and which factor each variable will load on before results can be calculated (Hair et al 2010). Hence, the statistical technique does not assign variables to factors. Rather, the researcher makes this assignment based on the theory being tested before any results can be achieved. CFA is applied to test the degree to which a researcher's prior theoretical patterns of factor loading on pre-specified construct represents on the actual data. Unlike EFA, CFA statistics tell us how well our theoretical specification of factors matches reality (the actual data). In essence, CFA is a strategy that ensures either confirmation or rejection of researchers predetermined theory (Hair et al., 2010). Therefore, CFA is used to provide a confirmatory assessment of research measurement theory. In other words, research measurement theory stipulates a set of relationships that suggest how measured variables define a latent construct that cannot be measured directly (Hair et al., 2010).

Consequently, the measurement theory is then joined with a structural theory to completely specify a SEM model (Kaplan, 2000). Throughout the process of SEM estimation, there are several assessment criteria of model fit also referred to as goodness of fit (GOF) indices that are used to evaluate whether a proposed model is fit for the data. In other words, goodness of fit (GOF) stipulates how well specified model truly reproduces the observed covariance matrix among the indicator items (Hair et al., 2010). In essence, a few alternative goodness of fit (GOF) measures are available to researchers. Each goodness of fit indices is unique, and these measures are classified in to three groups (Holmes-Smith et al., 2004). The basic types are as follows:

- Absolute fit indices
- Incremental fit or comparative fit indices, and
- Indices of model parsimony

These fit indices come with different level of rule of thumb regarding the acceptable minimum level of value for good fit (Byrne, 2001). However, it is evident that some of these fit indices have problems regarding evaluations process (Kline, 2005), because different researchers have reported different fit indices, whereas different reviewers of the same manuscript describe the indices that they prefer (Maruyama, 1998, Saleh, 2014). For instance, Kenny and McCoach (2003) maintain that there is no constant standard of evaluating an acceptable model and they emphasised CFI, TLI, and RMSEA as most popular fit indices. Steenkamp et al., (2003), emphasised on Chi-square (x^2), CFI, and TLI as fit measures to test moderating effect of their research model. Knight and Cavusgil (2004) reported CFI, NNFI (TLI) DELTA2 (IFI), RNI, and RMSEA in LISREL8 as a fit measure. Further, McQuitty (2004) produced goodness-of-fit statistics, which are less sensitive to sample size. These indices are TLI, IFI, TLI, CFI suggested by Bentler (1990). RMSEA CFI, and TLI, suggested by Fan et al. (1999). Byrane, (1998), Kaplan (2000), Hair et al, (2010) and Kline (2011) presented 5 most popular fit indices which are adopted and reported in this study. These fit indices are shown in the table 5.4 below.

Table 5.4 SEM fit Indices reported in this study.

Level of model fit	**Overall model fit**				
Fit measures	CMIN/DF(Chi-Square)	RMSEA	IFI	TLI	CFI
Acceptable for good fit	< 3	< 0.08	≥ 0.09	≥ 0.09	≥ 0.09

Source: Adopted from (Byrne, 2001; Holmes-Smith et al. 2004; Kline,2005)

Table 5.5description of the fit indices reported in this study.

Fit indices	Description	Acceptable fit
Absolute fit indices		
Relative Chi-square (x^2/degree of freedom)	Chi-square value is the traditional measure for assessing overall model fit and assesses the magnitude of inconsistency between the sample and fitted covariance matrices. A good model fit should provide an insignificant result at a 0.05 threshold; thus, the Chi-square statistic is often referred to as either a badness of fit or a lack of fit measure. Although chi-square test is popular as a fit statistic, chi-square assumes multivariate normality and severe deviations from normality may results in model rejections. Secondly, because the chi-square statistics is in essence a statistical significance test it is sensitive to sample size which means that the chi-square statistics lacks power, and this may not discriminate between good fitting models and poor fitting models	< 3
Root mean square error of approximation (RMSEA)	RMSEA tells us how well the model, with unknown but optimally chosen parameter estimate would fit the population's covariance matrix. RMSEA favours parsimony, in that it will choose the model with the lesser number of parameters. It explicitly tries to correct for both model complexity and sample size by including each in its computation and lower RMSEA values indicate fit.	$< .80$
Incremental fit indices		
Incremental fit indices (IFI)	IFI assess how well the estimated model fits relative to some alternative baseline model. IFI is also known as comparative or relative	$\geq .90$

	fit indices that compares the chi-square value to a baseline model.	
Comparative fit indices (CFI)	CFI is the revised form of NFI, which takes into consideration sample size. It performs well even if the sample size is small. CFI assumes that all latent variables are uncorrelated and compares the sample covariance matrix with this null model. CFI is most widely reported indices and values above .90 are usually associated with good fit.	≥ .90
Tucker Lewis Index (TLI)	TLI is conceptually like the Normed fit index but varies in that it is a comparison of the normed chi-square values for the null and specified model, which to some extent considers model complexity.	≥ .09

Sources: adopted from (Hair et al., 2010; Kline, 2011, Hooper et al., 2008; Byrne, 1998)

Considering sample sensitivity and model complexity, this study will consider Chi-square, IFI, TLI, CFI, and RMSEA for evaluating fit indices since these have been described as most popular fit indices reported in literature (Hair et al., 2010)

5.6.3 Measurement Model fit and modification.

This section of the thesis focuses on the outcome of the entire measurement model fit along with confirmatory factor analysis (CFA). CFA incorporates the assessment of the uni-dimensionality and estimates the data by confirming the fundamental structures based on theoretical stands (Mueller, 1996; Saleh, 2004). This process involves simplification, modification, and other refinement strategies to ensure the good fit of the model and for the purposes of testing theories. Model identification is a requirement of CFA, modification, and standardised loadings (standardised regression weights) in AMOS output are the options to determine model fit.

Modification indices (MI) are made up of variance, Covariance, and regression weights. These indices were examined during evaluation of model fit to get the direction of modification, for example, whether freeing or incorporating parameters either between or among unobserved variables if required in obtaining better model fit. Anderson and Gerbing (1988), Saleh, (2004) indicated that under unacceptable but converged and proper solutions relating or deleting the indicator from the model are the preferred basic ways to re-specify the model.

This shows that item deletion and adding a new path indicator are the perfect ways to get a better fitting model. Any changes or deletion of items in this iterative process results in change in the parameters and model fit statistics. Generally, when CFA is performed, the AMOS software produces a number of modification indices to add covariance between measuring items. At this stage, the chi-square is seen decreasing while the model fit is improved (Byrne, 1998; Hair et al., 2010). A number of modifications indices to co-vary some of the measurement items representing the same construct which produced greater modification indices values. Hence, with this process in mind, the measurement models for all the constructs were put through CFA and are discussed and shown in the tables below.

Having been convinced of absence of missing data and achieving normality of the data, CFA was performed using AMOS software. To do this, the data set was loaded on SPSS AMOS software and the research constructs were developed. The relationship between the construct and their measuring items together with error terms for constructs and measuring items. This strategy is captured in SEM process stage 2 (see figure 5.9) which involves specification and development of measuring model. After the measurement model has been specified, the CFA results were then generated from the AMOS output. The initial results did not show good model fit as shown by the AMOS output.

The following model fit indices were generated after the initial measurement model estimation, chi-square value. (3112.509), df (1920) and RMSEA (.043). The results above indicate that the initial chi-square value of the entire measurement model exceeded the recommended maximum value of <.3 (Kline, 2011). The RMSEA of .043 was within the acceptable level of <.8 (Kline, 2011). In addition, the output generated by the AMOS software produced incremental fit indices of IFI (.850), CFI (.847), and TLI (.834), all these values were below the recommended 0.90 level raising serious concerns about model fit (Byrne, 2010). However, these results are not strange in social science research, as it is not always positive to develop a theoretical model that would fit the data collected through survey questionnaire (Kaplan, 2011; Esfahbodi, 2016). In such situation where model fit is not achieved after initial measurement model estimation, researchers are advised to undertake adjustment of the model in order to achieve the good model fit (Lomax, 2010, Kaplan, 2011)

As mentioned earlier on, the best method of achieving model fit is deletion of low standardised coefficient. According to Anderson and Gerbing (1988), Saleh, (2004), under unacceptable but converged and proper solutions relating or deleting the indicator from the model is the preferred basic way to re-specify the model. This shows that item deletion and adding a new path indicator are the perfect ways to get a better fitting model. Any changes or deletion of items in this iterative process results in change in the parameters and model fit statistics. The measuring items that produced low standardised coefficient below recommended value of 0.50 (Hair et al 2010) were deleted. Again, in performing CFA, the AMOS software suggests some modification indices to add covariance between measuring items that could results in decrease in chi-square resulting in good model fit (Inman et al., 2011; Esfahbodi, 2016). In view of this, measuring items with low loading factors were deleted and these items are listed below.

GM1; CC1; IR1; GD4; RL 1&4; ED 3,4 and 5, SOC 4&5; ENV 1&2; ECO 4&5; COST 1; QUALITY 1; ENABLERS 3, 5 & 6, and GP5. In addition to this deletion, the AMOS software also suggested co-varying of measuring items 73 and 74. Having deleted the above measuring items and co-varied measuring items 73 & 74, the model was modified to achieve good model fit. After the deletion and co-varying the measuring items, the CFA was re-specified and re-estimated, and the output produced by AMOS software is shown in the diagram captured in

(**Appendix D**). As shown in table 5.6 below, the chi square value after the modification is now (1236.124; df, 893), which is well below the recommended maximum level of 3.00 (Kline, 2011) and RMSEA value of .032 falls within the recommended maximum value of ≤ 0.08 (Hair et al., 2010; Schumacker and Lomas, 2010).

Furthermore, the IFI (0.936), TLI (0.927), CFI (0.937) all exceeded the recommended value of 0.90 after model modification (Byrne, 2010). Based on the results from the AMOS output, as reported on goodness of fit indices, it is clear that the measurement model supports the claim of goodness of fit model. This generally implies that the research model perfectly fits with the data collected from the survey. Table 5.6 shows the summary and results of the confirmatory factor analysis (CFA) as produced by the AMOS software version 25.0. Table 5.6 summarises the standardised coefficient of the measuring items alongside their representative t-values.

Table 5.6 Measurement model results

Measuring items	**Standardised coefficient**	**t-values**
Green purchasing		
GP1	.699	10.158
GP2	.679	10.258
GP3	.667	10.145
GP4	.589	9.252
Eco Design		
ED1	.629	4.761
ED2	.621	4.826
Green Marketing		
GM2	.672	11.246
GM3	.868	11.478
GM4	.699	11.239
Customer Cooperation		
CC2	.696	11.535
CC3	.892	11.838
CC4	.618	10.603
Investment Recovery		
IR2	.596	8.460

IR3	.752	9.482
IR4	.749	9.480
Green Distribution		
GD1	.656	9.320
GD2	.780	9.657
GD3	.684	9.700
Reverse Logistics		
RL2	.607	4.127
RL3	.769	4.622
Social Performance		
SP1	.657	10.820
SP2	.910	11.660
SP3	.696	11.4429
Environnemental Performance		
ENV3	.714	11.660
ENV4	.832	13.050
ENV5	.769	12.750
Economic Performance		
ECO1	.642	9.817
ECO2	.837	10.600
ECO3	.656	9.976
Cost Advantage		
CA2	.608	8.971
CA3	.809	10.114
CA4	.722	9.961
Quality Advantage		
QA2	.635	10.872
QA3	.833	11.297
QA4	.758	11.108
Flexibility Advantage		
FA1	.613	11.123
FA2	.794	11.581
FA3	.820	11.783
FA4	.767	11.351
Dependability Advantage		
DA1	.624	9.587

DA2	.737	13.597
DA3	.812	10.469
DA4	.662	9.707
Critical Enablers		
C E1	.594	6.921
C E2	.586	6.691
C E4	.558	6.589

(Fit Indicators: Chi-square= 1236.124; df=893; RMSEA=.032; IFI=0.93; TLI=0.92; CFI=0.93)

Based on table 5.6, the model now showed relatively good fit after all the adjustments were made. As indicated in (table 5.6) the relative chi-square value of (1236.124) is below the recommended maximum value of 3.00 (Kline 2011), RMSEA value of .032 is perfectly within the recommended range of .030 to .080 (Bryne, 2009). Furthermore, the AMOS output produced incremental fit indices falling above the recommended minimum value of (0.90). IFI (0.93), TLI (0.92), and CFI (0.93). All the values of the incremental fit indices exceeded the recommended value of (0.90) after the model has been adjusted (Bryne, 2009).

Based on the goodness-of- fit indices results from the AMOS output the model can be described to be of good fit and support the claim of model fit. Table 5.6 summarises the results of the confirmatory factor analysis (CFA) produced by the AMOS output that specified the standardised coefficient of each measuring item and associated t-values. In AMOS output, t-values are represented by the CR values in the regression weights parts (Byrne, 2009). The final measurement items in (table 5.6) is made of 46 measuring items after some measuring items have been deleted due to problems those items posed to achieving model fit. Although these deleted items were important to measure their respective constructs, and showed relatively reasonable loadings, they affected the dimensionality of the construct. As far as convergent validity is concerned, the CFA results confirmed convergent validity of all the constructs with standardised loadings displayed in (table 5.6) exceeding the recommended minimum value of 0.50 (Hair et al., 2010). Another method of verifying that convergent validity has been achieved is using the t-values (Byrne, 1998; Esfahbodi, 2016). According to Byrne, (2011) and Esfahbodi et al (2016), if the t-values of factor loadings are greater than 2.575, it shows practical importance of the derived factor at a 0.01 level with a 99% confidence level. Since all the t-values were higher than the recommended value of 2.575, ranging from 4.127 to 13.597 as shown in table (5.6), convergent validity is said to have been achieved.

All the factor loadings are significant at 0.01 level, and this further confirmed that convergent validity has been achieved. Furthermore, in conducting CFA, (a) the structural part of the full SEM includes relations among only latent variables, and (b) the primary concern in working with a full SEM model is to assess the extent to which these relations are valid. It is, therefore, crucial that the measurement of each latent variable is psychometrically complete. Thus, an important initial phase in the analysis of full latent variables models is to test first, for the validity of the measurement model before attempting to evaluate the structural model. Accordingly, CFA procedures are used in testing the validity of the indicator variables. Once it is ascertained that measurement model is operating adequately, one can then have more confidence in the findings related to the assessment of the hypothesized structural model (Byrne, 2009).

5.7 Reliability statistics after deletion and modification of measuring items

The estimation of confirmatory factor analysis (CFA) resulted in deletion of some measuring items that posed problematic to achieving good model fit. This process is to ensure that the remaining measuring items thoroughly represent their associated latent variables (Hair et al., 2010). This deletion prior to performing structural model considerable improves the model fit. According to Hair et al (2010), this deletion does not only improve construct validity but also improves reliability. Reliability analysis of the refined measuring items was performed. The results of reliability analysis of the refined measuring items are presented in the table (5.7)

Table 5.7 Reliability statistics

variables	No of items	Cronbach's Alpha
Green purchasing (GP)	4	.757
Eco design (ED)	2	.656
Investment recovery (IR)	3	.743
Customer cooperation	3	.773
Green marketing (GM)	3	.789
Green distribution (GD)	3	.748
Reverse logistics (RL)	2	.635
Social performance (SP)	3	.794
Environmental performance (ENV)	3	.816
Economic performance (ECO)	3	.751
Cost Advantage (CA)	3	.750
Quality Advantage (QA)	3	.781
Flexibility Advantage (FA)	4	.834
Dependability Advantage (DA)	4	.821
Critical Enablers (CE)	3	.649

As shown in table 5.7, the reliability coefficient values (Cronbach's alpha) of all the variables except critical enablers', Reverse logistics and eco design exceeded the recommended value of 0.70 level, which indicates high reliability of the construct. The results from the refined reliability test suggests that Cronbach alpha of enablers, reverse logistics and eco design exceeded the minimum level of 0.60, indicating sufficient reliability test (Field, 2009; Hair et al 2010). These results indicate that the overall reliability of the variables in this study is considered sufficient and satisfactory with average reliability of .753. The satisfactory level of the reliability levels of the constructs depicts that internal consistency exits among the research construct, hence all the measurement items truly represent their correspondent latent variables (Kaplan, 2009; Hair et al., 2010)

5.8 Discriminant Validity

Furthermore, in attempt to assess construct validity, confirmatory factor analysis (CFA) was used to examine discriminant validity. Discriminant validity assumes that items should highly correlate among them rather than correlate with other items from other constructs. Testing for discriminant validity can be done using one of the following methods: O-sorting, chi-square difference test and the average variance extracted analysis (Zait and Bertea, 2011). In this study, the chi-square difference test was used to test the discriminant validity. According to Gerbing and Anderson (1988), the discriminant validity test can be conducted using the CFA through chi-square difference comparison. Segars (1997) posits that the use of chi-square difference test allows the researcher to compare two models, one in which the constructs are correlated and one in which they are not. Discriminant validity is met when difference between the fixed and the unconstrained model produces significant values (Garver and Mentzer, 1999; Esfahbodi, 2016).

With discriminant validity in mind, test was conducted separately for each construct using Amos software, which involved pairing all the available combinations of the construct. According to Driscoll (2000), discriminant validity is when the same method is used to measure different constructs and the results that are produced do not correlate. The constructs were picked from the correlation part of the AMOS output. In order to test for discriminant validity, we followed Segars (1997) recommendations:

- Create a model in which the two constructs do not correlate and perform CFA.
- Calculate the chi-square difference where initial correlation pairing of two constructs is put at a value of 1.0 and then re-estimating the fixed model, test and if the result is significant then discriminant validity has been met.

Discriminant validity was performed on the entire construct suggested by the SPSS AMOS output, and this is captured in (**Appendix E**). The correlation of these construct was extracted from the AMOS output after CFA has been performed on the constructs.

5.9 Multi- collinearity (Collinearity)

In regression analysis, there are many assumptions about the model, namely, multi-collinearity, non-consistent variance (non-homogeneity), linearity, and autocorrelation. If one or more assumption is disrupted, then it changes the reliability of the model and becomes unacceptable in estimating the population parameters (Daoud, 2009). In this study, we focus on multi-collinearity as a violation of one of the basic assumptions for successful regression model. Multi-collinearity is present when two or more research variables in the regression model are correlated (Field, 2009). A little bit of multi-collinearity sometimes will cause big problem but when it is moderate to high then it will be a problem to be solved (Daoud, 2009).

The most popular statistical measure of assessing the presence of multi-collinearity in research model is the use of variance inflation factor (VIF) Hair et al., (2010). When correlation exists among predictors the standard error of predictors coefficients will increase and therefore the variance of predictor's coefficients is inflated. The VIF is a means to measure and quantify how much the variance is inflated. VIF is calculated by the SPSS software as part of regression analysis and will appear in VIF column as part of the output (Daoud, 2009). In this study, multi-collinearity was tested by calculating the VIF values of the entire variables' regression coefficient using SPSS software 25.0. The values of all the VIF for the variables as shown in table (5.9) were less than 3.00 far below the recommended maximum threshold value of 10.00 (Field, 2010). This suggests strongly that multi-collinearity does not pose a problem for this model. Multi-collinearity can be resolved by combining the highly correlated variables through principal component analysis or omitting a variable from the analysis that are highly associated with other variable(s).

Table 5.8 Table showing variance inflation factor (VIF)

variables	VIF Coefficient
Green purchasing (GP)	1.521
Eco design (ED)	1.537
Investment recovery (IR)	2.119
Customer cooperation (CC)	2.235
Green marketing (GM)	2.070
Green distribution (GD)	1.794
Reverse logistics (RL)	1.500
Social performance (SP)	2.218
Environmental performance (ENV)	2.222
Economic performance (ECO)	2.132
Cost Advantage (CA)	2.023
Quality Advantage (QA)	2.262
Flexibility Advantage (FA)	2.395
Dependability Advantage (DA)	2.265
Critical ENABLERS (CE)	1.471

5.10 Structural equation modelling (SEM) results

Having completed all the validation process by attaining discriminant, convergent and construct validity as well as ascertaining the absence of common method bias, and multi-collinearity, the model was then ready to examine the causal relationship as theorised in the research model using SEM method powered by SPSS AMOS software. This section will therefore report the results of the proposed research hypotheses to ascertain whether the data collected support the theorised research hypotheses. By stipulating the measurement model and satisfying its validity, the structural model is identified to satisfy the (level 5 in figure 5.3) and then examination is carried to ascertain structural estimate and model validity satisfying (level 6 in figure 5.3). To perform SEM structural analysis, all the measurement models in the AMOS output were converted into structural model where relationships among research constructs were drawn. This process helped to assess the significance, direction, and size of structural estimates.

Unlike the CFA, when performing structural model analysis to test the structural relationship, a clear distinction should be drawn between the dependent variables and independent variables (Hair et al., 2010; Esfahbodi, 2016). In structural model, independent variables have no arrows running to them while dependent variables are predicted by other variables and have arrows entering them as shown by a single headed arrow running to them (Hair et al 2010; Kline, 2011). However according to Hair et al (2010) there are instances where an independent variable turns into dependent variable. Such approach could only be calculated when using SEM rather than any multi-variate analysis method .One of the most distinctive features of SEM is that it gives room for estimation of series of separate causal relationship in the same model by treating one model independent and other dependent variables (Hair et al., 2010).

In this regard, all the variables shown in figure 5.10 below were assumed as both dependent variables (GSCM practices, sustainability performance and competitive advantage) and independent variables (critical enablers) (Kaplan, 2000). In other causal relationship within the same model, the focal variables (GSCM) practices served as independent variables predicting performance and competitive advantage, while at the same time sustainability performance served as independent variable predicting competitive advantage. According to Hair et al (2010), structural equation model has the features to allow these series of causal relationship to be estimated unlike other multivariate models. The method of evaluating the validity of the structural model is not far distant from the process used to evaluate the validity of the measurement model (Hair et al., 2010).

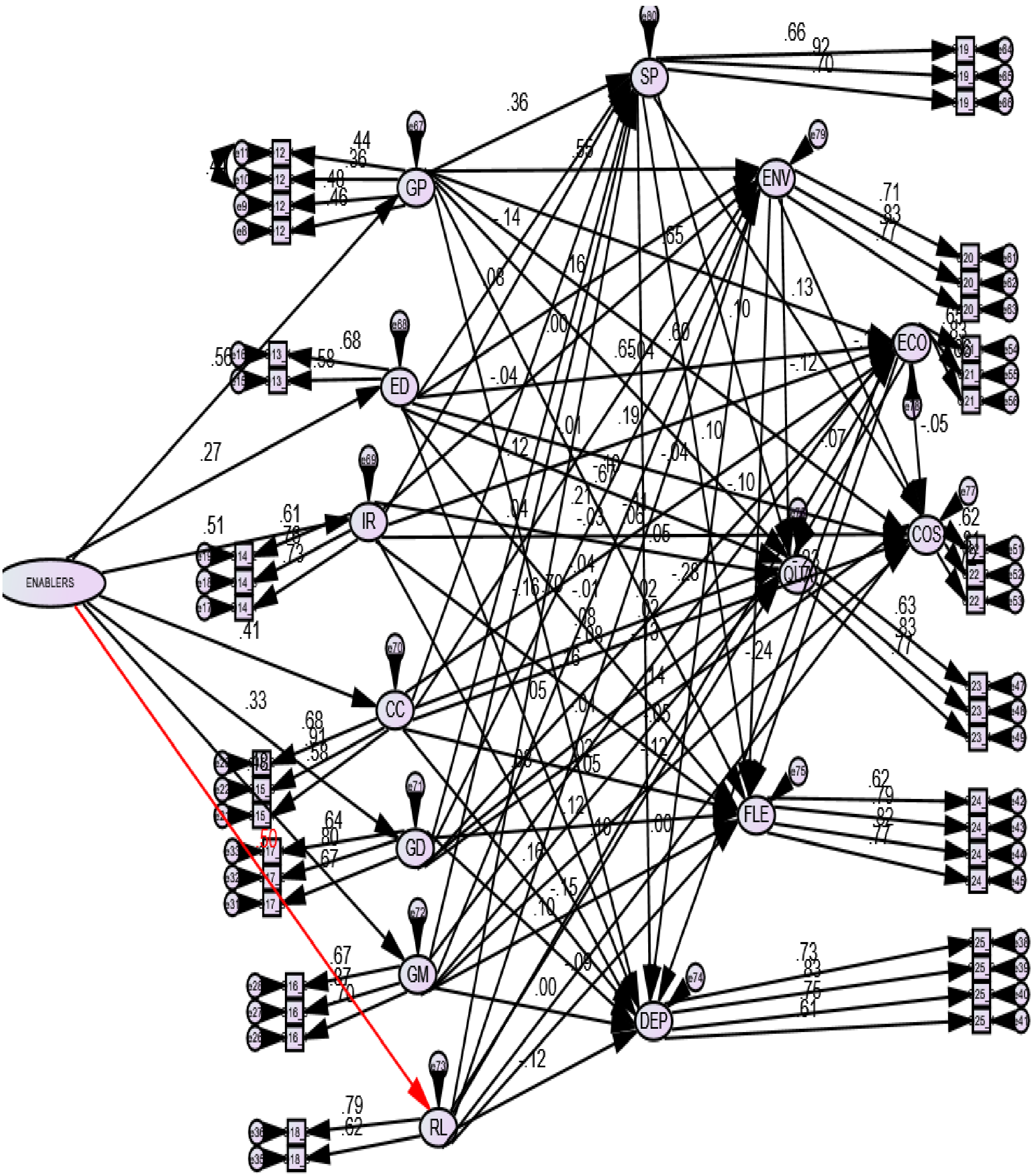


Figure 5.10 Structural model (Chi-square = 1248.970; df = 795; RMSEA= .039; IFI = 0.916; TLI = 0.902; CFI = 0.914)

Based on the AMOS output of the structural model depicted by figure 5.10, the relative chi-square value of 1.571 (1248.970/795) is far below the maximum value of 3.00 recommended by Kline (2011), the RMSEA value of .039 falls within the acceptable value of ≤ 0.08 (Byrne, 2009). Furthermore, with regards to the goodness of fit indices, IFI (0.916), TLI (0.902) and

CFI (0.914) all exceeded the recommended value of 0.90 (Bryne, 2009). The results of the goodness of fit indices indicate that the model has a satisfactory good fit. Hence based on the acceptable guidelines on goodness of fit indices values, the results of the goodness of fit indices generally support the claim of goodness of fit of the model.

AMOS has a feature of suggesting modification in the construct in order to improve model fit or adding more relationships. Interestingly in the model shown in figure 5.10, the AMOS output suggested only one modification where error variances of measurement items GP1 and GP2 were co-varied (GP1↔GP2). Now that the structural model has supported the claim of good model fit, the results of the hypothesis can be reported (Hair et al., 2010). Furthermore, the study incorporated the results of the structural model taking into consideration those causal relationships that turned out to be both positive and significant and negative. This new model significantly provides a comprehensive outlook of the investigation and the results produced by AMOS. Figure 5.10 demonstrate GSCM enablers-GSCM practices-performance-competitive advantage model showing those relationships that turned out to be either positive or negative and the level of their significance. Table 5.9 below summarises the results of the causal relationship showing both positive or negative outcome and their level of significance.

Table 5.9 Overview of structural model results

Hypotheses	***Path***	***Standardised Coefficient (β)***	***p-values***	***Results***
H1a. *Critical enablers positively influence green purchasing implementation*	*CE→GP*	*.557*	****	*Supported*
H1b*. Critical enablers positively influence eco design implementation*	*CE → ED*	*.267*	*.016**	*Supported*
H1c. *Critical enablers positively influence green marketing*	*CE → GM*	*.179*	*.029**	*Supported*

H1d. *Critical enablers positively influence customer cooperation implementation*	*CE → CC*	*.409*	***	*Supported*
H1e. *Critical enablers positively influence investment recovery implementation*	*CE → IR*	*.509*	***	*Supported*
H1f. *Critical enablers positively influence green distribution implementation*	*CE → GD*	*.325*	*.022**	*Supported*
H1g. *Critical enablers positively influence reverse logistics implementation*	*CE → RL*	*.495*	*.015**	*Supported*
H2ai. *Green purchasing is positively related to social performance*	*GP → SP*	*.359*	***	*Supported*
H2bii. *Green purchasing is positively related to environmental performance*	*GP → ENV*	*.549*	***	*Supported*
H2biii. *Green purchasing is positively related to economic performance*	*GP → ECO*	*.645*	***	*Supported*
H2ci. *Eco design is positively related to social performance*	*ED → SP*	*.080*	***	*Supported*
H2cii. *Eco design is positively related to environmental performance*	*ED → ENV*	*.649*	***	*Supported*
H2ciii. *Eco design is positively related to economic performance*	*ED → ECO*	*.645*	***	*Supported*
H2di. *Green marketing is positively related to social performance*	*GM → SP*	*.075*	***	*Supported*
H2dii. *Green marketing is positively related to environmental performance*	*GM → ENV*	*.080*	***	*Supported*
***H2dii**i. Green marketing is positively related to economic performance*	*GM → ECO*	*.065*	***	*Supported*
H2ei.*Customer cooperation is positively related to social performance*	*CC → SP*	*-.040*	*.797ns*	*Not supported*
H2eii. *Customer cooperation is positively related to environmental performance*	*CC → ENV*	*. -035*	*.776ns*	*Not supported*

H2eiii. *Customer cooperation is positively related to economic performance*	*CC → ECO*	-.099	.653ns	*Not supported*
H2fi. *Investment recovery is positively related to social performance*	*IR → SP*	.155	025*	*Supported*
***H2fii**. Investment recovery is positively related to environmental performance*	*IR → ENV*	.055	016*	*Supported*
***H2fii**i. Investment recovery is positively related to economic performance*	*IR → ECO*	.095	***	*Supported*
***H2gi**. Green distribution is positively related to social performance*	*GD → SP*	.095	***	*Supported*
H2gii. *Green distribution is positively related to environmental performance*	*GD → ENV*	.040	***	*Supported*
H2giii. *Green distribution is positively related to economic performance*	*GD → ECO*	.045	012*	*Supported*
H2hi. *Reverse logistics is positively related to social performance.*	*RL → SP*	.010	***	*Supported*
***H2hii**. Reverse logistics is positively related environmental performance*	*RL → ENV*	.035	***	*Supported*
***H2hiii**. Reverse logistics is positively related to economic performance*	*RL → ECO*	.065	***	*Supported*
H3bi. *Green purchasing is positively related to cost advantage*	*GP → CA*	.135	.011*	*Supported*
H3bii. *Green purchasing is positively related to quality advantage*	*GP → QA*	.185	***	*Supported*
H3biii. *Green purchasing is positively related to flexibility advantage*	*GP → FA*	.205	***	*Supported*
***H3biv**. Green purchasing is positively related to dependability advantage*	*GP → DA*	.119	***	*Supported*
H3ci. *Eco design is positively related cost advantage*	*ED → CA*	-.010	.558ns	*Not supported*
H3cii. *Eco design is positively related to quality advantage*	*ED → QA*	.090	***	*Supported*
H3ciii. *Eco design is positively related to flexibility advantage*	*ED → FA*	.075	***	*Supported*

***H3civ**. Eco design is positively related dependability*	*ED → DA*	*.119*	****	*Supported*
***H3di.** Green marketing is positively related to cost advantage*	*GM → CA*	*-.149*	*.564ns*	*Not supported*
***H3dii.** Green marketing is positively related to quality advantage*	*GM → QA*	*.115*	****	*Supported*
***H3diii.** Green marketing is positively related to flexibility advantage*	*GM → FA*	*.010*	****	*Supported*
***H3div.** Green marketing is positively related to dependability*	*GM → DA*	*.001*	****	*Supported*
***H3ei.** Customer cooperation is positively related to cost advantage*	*CC → CA*	*-.010*	*.907ns*	*Not supported*
***H3eii.** Customer cooperation is positively related to quality advantage*	*CC→ QA*	*.053*	*.842ns*	*Not supported*
***H3eiii.** Customer cooperation is positively related to flexibility advantage*	*CC → FA*	*-.050*	*.762ns*	*Not supported*
***H3eiv.** Customer cooperation is positively related to dependability*	*CC → DA*	*-.049*	*.257ns*	*Not supported*
***H3fi.** Investment Recovery is positively related to cost advantage*	*IR → CA*	*.045*	*.565ns*	*Not supported*
***H3fii**. Investment recovery is positively related to quality advantage*	*IR → QA*	*.039*	*.032**	*Supported*
***H3fiii.** Investment recovery is positively related to flexibility advantage*	*IR → FA*	*.050*	*.018**	*Supported*
***H3fiv.** Investment recovery is positively related to dependability performance*	*IR → DA*	*.159*	*.015**	*Supported*
***H3gi.** Green distribution is positively related to cost advantage*	*GD → CA*	*.050*	*.016**	*Supported*
***H3gii**. Green distribution is positively related quality advantage*	*GD → QA*	*.139*	****	*Supported*
***H3giii**. Green distribution is positively related to flexibility advantage*	*GD → FA*	*.010*	****	*Supported*
***H3giv.** Green distribution is positively related to dependability advantage*	*GD → DA*	*.095*	****	*Supported*

H3hi. *Reverse logistics is positively related to cost advantage*	*RL → CA*	-.119	.558ns	*Not supported*
H3hii. *Reverse logistics is positively related to quality advantage.* ***H3hiii.*** *Reverse logistics is positively related to flexibility advantage*	*RL → QA* *RL → FA*	.095 .010	*** .***	*Supported* *Supported*
H3hiv. *Reverse logistics is positively related to dependability advantage*	*RL → DA*	.119	***	*Supported*
H4ai: *social performance is positively related to cost advantage.*	*SP → CA*	.069	***	*Supported*
H4aii. *Social performance is positively related to quality advantage.*	*SP→QA*	.095	***	*Supported*
H4aiii: *social performance is positively related to flexibility advantage.*	*SP→FA*	.595	***	*Supported*
H4aiv: *social performance is positively related to dependability performance*	*SP→DA*	.059	***	*supported*
H4bi: *environmental performance is positively related to cost advantage*	*ENV→CA*	.129	.248ns	*Not supported*
H4bii: *environmental performance is positively related to quality advantage*	*ENV→QA*	.064	.036*	*Supported*
H4biii: *environmental performance is positively related to flexibility advantage*	*ENV→FA*	.095	.044*	*Supported*
H4biv: *environmental performance is positively related to dependability*	*ENV→DA*	.010	.026*	*Supported*
H4ci: *economic performance is positively related to cost advantage*	*ECO→CA*	.045	***	*Supported*
H4cii: *economic performance is positively related to quality advantage*	*ECO→QA*	.069	***	*Supported*
H4ciii: *economic performance is positively related to flexibility advantage*	*ECO→FA*	.229	***	*Supported*
H4civ: *economic performance is positively related to dependability advantage*	*ECO→DA*	.215	***	*Supported*

Notes: *** significant at the level 0.01; * significant at the level 0.05; ns = not significant. Chi-square ratio =1.571; RMSEA = .039; IFI =0.916; TLI =0.902; CFI =0.914. GP= Green Purchasing; ED= Eco Design; IR= Investment Recovery; GM= Green Marketing; GD= Green Distribution; RL=Reverse Logistics; SP=Social Performance; ENV= Environmental Performance; ECO= Economic performance; CA= Cost Advantage; QA= Quality Advantage; FA= Flexibility Advantage; DA= Dependability Advantage.

In all, the study produced 68 research hypotheses, 12 hypotheses are not supported, and 56 hypotheses are supported. Considering the robustness of the statistical analysis and the rigidity of the research process the integrity of the results are assured creating no room of doubt about the validity and reliability of the results. Hence, the results add valuable knowledge of existing literature in green supply chain management field. Comprehensive discussion of the results will be provided in subsequent chapter.

5.11 Summary of the chapter

Due to increasing awareness of environmental problems brought about as a result of manufacturing supply chain, firms are under pressure to adopt proactive environmental management practices to improve the natural environment. The aim of this thesis is to explore the causal relationship between GSCM practices, firm performance, and competitive advantage. Additionally, the thesis seeks to examine the critical enablers that influence GSCM practices. In order to encourage manufacturing firms to implement green initiatives, manufacturers need to ascertain whether these green implementations will lead to competitive advantage. This chapter provides analysis of the survey data to confirm whether "being green is being competitive" as espoused by this thesis.

This chapter presented the overall results of the research analysis. In the first instance, data preparation and administration has been addressed, which prepared the data for further empirical analysis. Thereafter, the chapter addressed data quality issues such as reliability, content validity, face validity, construct validity, convergent validity and discriminant validity helping to establish the credibility and truthfulness of the results. The reliability, content validity and face validity of the research constructs have been assessed in the earlier part of the chapter whereas convergent and discriminant validity have been assessed in the latter stage. Furthermore, the chapter has addressed common method variance (CMV) that dealt with issues of bias with the results indicating that the data did not suffer any common method bias.

The philosophical background of SEM has been presented along with the various stages of implementing structural equation modelling. In addition, confirmatory factor analysis CFA has been presented on the measurement model and the results validate the convergent and discriminant validity of the construct. This chapter also confirmed that multi-collinearity does not pose any problem in the research model. Lastly, the chapter discussed the SEM analysis to test the research hypotheses. The results of the SEM analysis testing the hypothesis confirmed the goodness of fit of the research construct. This indicated that the theorised model statistically fit with the real data collected from the survey. The outcome of the research hypotheses testing showed that out of the 68 hypotheses tested 56 supported theories while 12 hypotheses did not support offering novel research findings that will be discussed in the next chapter.

CHAPTER 6: DISCUSSION

6.1 Introduction

This chapter presents the findings of the survey study, which is informed by the main survey results and literature review. The survey focused on testing hypothesised relationships between critical enabler as an antecedent for GSCM implementation, green supply chain management implementation, firm performance, and competitive advantage. In addition, the results of this thesis are compared with extant literature to ascertain whether they are consistent.

This chapter begins with re-echoing the results of the hypotheses testing associated with the research model, which sorts to link enablers – GSCM – firm performance – competitive advantage. Section 6.2 looks at the theoretical model of enablers - GSCM practices - performance - competitive advantage outcomes. Section 6.3 deals with the causal relationship between enablers and GSCM practices, giving more details of the relationship between enablers and GSCM adoption and implementation. This section is immediately followed by section 6.4, which discusses the causal relationship between GSCM implementation and sustainability performance. In this section, individual GSCM practices are linked with individual performance outcomes to determine which GSCM practice has a superior impact on performance outcomes. Section 6.5 deals the link between GSCM practices and competitive advantage. In this section extensive discussion of the causal relationship between competitive advantage and sustainability performance is carried out, outlining some of the new discoveries that have emerged from this research. Section 6.6 discusses the causal relationship between performance outcomes and competitive advantage variables. This section seeks to determine whether achieving firm performance automatically leads to competitive advantage. Section 6.7 provides overall findings of the research and linking these finding with previous studies to determine any consistencies. Section 6.8 concludes the chapter.

6.2 Theoretical perspective of enablers-GSCM practices – sustainability performance – competitive advantage

This section focuses on the research findings in details. Based on the data analysis, it is evident that not all the proposed hypotheses were supported, the theoretical model seemed perfectly reasonable with respect to the fit of the structural model and statistically supports many of the hypotheses. The Chi-square value of the overall model was < 3.0, RMSEA values < 0.80, CFI value was > 0.90, ITL value > 0.90, and TLI value > 0.90. Based on these indices, it is assumed that the proposed model is a good exemplification of the theoretical relationships among the constructs that reflect the study main research model of; enablers, GSCM practices, performance, and competitive advantage outcomes.

6.3 Critical enablers and GSCM practices

The empirical evidence from the structural model output showing the relationship between critical enablers, measured by; management commitment, sharing of information and knowledge, and customer pressure confirmed positive and significant relationship with all the green supply chain management practices implementation among UK manufacturing industries. These practices include green purchasing, eco design, investment recovery, customer cooperation, green marketing, green distribution, and reverse logistics. The study has confirmed that critical enablers have proven to be a positive driving force behind implementation of green supply chain management practices.

This also indicates that both internal and external enablers' together play a major role in influencing the adoption and implementation of GSCM practices by UK manufacturing industries. The results further showed that, not only do environmental regulations influence implementation of GSCM, however, strong management commitment and pressure from customers towards sustainability and sharing of information and knowledge also drive and influence manufacturing industries to successfully adopt and implement GSCM practices. The closer collaboration of both internal and external enablers has proven to be efficient mechanism towards GSCM implementation based on the empirical results produced by this study.

The statistical results produced by structural model indicate that the external enabler namely customer pressure together with internal enablers management commitment and sharing of information and knowledge strongly influence implementation of GSCM practices.

These observations and findings are consistent with existing literature (Luthra et al., 2016; Diabet and Govindan, 2011) and can be explained by the fact that enablers wield stronger power to influence firms to adopt and implement GSCM. According to the findings of Luthra et al (2016), regulations and suppliers management exhibited the strongest and significant influence on green purchasing practice. However, in this study the results showed that critical enabler is strongly and significantly related to GSCM practices that possess external outlook to the focal firm such as green purchasing.

In this study, the empirical result shows that the focal company must use sharing of information and knowledge strongly to be able to get suppliers to understand and adopt the focal company's environmental objectives. Again, the result also indicates that the management of the focal company must use must turn their commitment to environmental sustainability into coercive powers to get their suppliers to conform to their (focal company's) environmental objective. This further supports the argument that GSCM practices that are externally oriented requires stronger critical enabler to influence their implementation. The results showed that the influence of critical enablers on green purchasing was stronger and found to sustain largest standardised coefficient value .557 with it corresponding significant value of (0.01). The reason for this significant and large coefficient is due to the fact that green practices that possess external outlook to the focal company require stronger influence to ensure their implementation. In many cases the effort to ensure their successfully implementation comes from outside the focal company. In essence, this implies that GSCM practice that lies outside the jurisdiction of the focal company internal practice will require powerful influencing factor to be adopted. Furthermore, investment recovery, reverse logistics and customer cooperation appeared second, third and fourth with highest standardised coefficient (β=.509 significant at level 0.01), (β=.495, significant at level .015*), (β= .409, significant at level 0.01) respectively. These observations show GSCM practices; customer cooperation and reverse logistics that have external outlook sustained stronger significant p-value of 0.01. This indicates that for reverse logistics and customer cooperation to achieve the objective to leverage the environmental sustainability they require stronger critical enablers influence to get them implemented. Eco design, green marketing, and green distribution follow with standardised coefficient of (β=.269, significant at level .016*), (β=.199, significant at level .029*), (β=.325, significant at level .022*) respectively. Eco designs are more internally oriented because they are practice that lies at the disposal of the focal company, and since sustainability is strategic imperative of these company their implementation comes naturally.

Especially manufacturing firms that are ISO 14001 certified will not very often require stronger influencing power to compel them to initiate environmental related practices. Previous studies have indicated that companies that are ISO-certified companies are more likely to adopt GSCM practices without pressure being put on them (Ann et al., 2006; Rao and Holt, 2005; Zailani et al., 2012a). This is the case because, ISO 14001 certification provides the certified company a great deal of environmental information and awareness which to a large extent prepares the certified firm to initiate environmentally oriented practices ((Ann et al., 2006; Geng et al 2017). It is however observed in this study that these GSCM practices that are internally inclined sustained less enabler influence to adopt and implement. However, the results of this study have shown that manufacturing firms in UK are more environmentally oriented irrespective of whether they are ISO 14001 certified. One possible reason is that manufacturing companies in UK also depend largely on overseas markets.

The reason behind this observation is that internally oriented practices do not demand strong external power to influence their implementation. These results are consistent with (Zhu and Sarkis 2007; Esfahbodi et al 2016), who posit that outbound supply chain management implementation requires external power to influence their implementation. Overall, the study found out that the collaborative effort of both internal and external critical enablers serves as a powerful means and motivation for manufacturing firms in UK to implement environmentally related practices. That is, critical enablers serve as necessary antecedent for implementation of green purchasing, eco design, investment recovery, green marketing, green distribution, customer cooperation and revers logistics. The next section discussed the impact of individual GSCM implementation on individual performance outcomes of social, economic, and environmental.

6.4 GSCM practices and Sustainability performance

The empirical evidence of this study showed that individual green practices impact on sustainability performance differently. Some GSCM practices do not have positive and significant relationship with the three principles of sustainability performance namely, social, economic, and environmental performance. This section discussed the individual GSCM practices and how they relate to sustainability performance.

6.4.1 Eco design implementation and sustainability performance

The empirical findings of this research depict that, eco design significantly and positively impacts on all the three sustainability performance outcomes namely, social, environmental, and economic performance with standardised coefficient of (ED →SP; β= .080, sig. at the level 0.01; ED→ENV, β=.649, significant at level 0.01; ED→ECO, β=.645, significant at level 0.01) respectively. The theoretical understanding from this observation is that while eco design implementation has led to improvement in environmental performance by UK manufacturing firms, this comes without a trade-off of economic and social performances.

This further reinforces the claim that the effort put in by manufacturing firms to improve environmental performance comes with win-win situation of all the sustainability principles; social and economic and environmental. Eco design implementation according to this observation can balance the capability of achieving positive outcomes for social and economic performance. The focus of implementing eco design is to reduce product's environmental impact without creating a negative trade off with other performance criteria (Grote et al 2007). This attempt to eliminate product related environmental impact results in high environmental performance by UK manufacturing firms, and consequently results in low cost of production thereby improving economic performance. This finding is contrary to the results of Green et al (2012), where no positive relationship was established between eco design and economic or cost performance. According to Geng et al (2017), the emphasis of eco design practices is to prevent product related environmental impact without any trade–off from the remaining sustainability outcomes. Without any trade-off of social and economic performances, eco design fully achieved its intended purpose of balancing positive impact on economic, social, and environmental performances in this study. The statistical results of this study indicate that eco design achieved highest impact on environment and economic performance with coefficient values of (.649 and .645) and significant values at 0.01, all at 95% confidence interval. This result shows high correlation among eco design implementation and environment as well as economic performance.

The results of this study are consistent with Yang et al (2013), Zhao et al (2011), Braunscheidel and Suresh (2009), Car and Kaynak (2007) who found positive relationship between eco design and environmental, social, and economic performance. It is argued that the reason for the negative eco design impact on economic performance is due to the fact that most eco design related activities require extra investment, which invariable inflates cost of production but do not yield short term returns (Green et al. 2012; Zhu et al., 2013; Esfahbodi, 2016). However, in this this study, it is observed that UK manufacturers can achieve a win-win situation in eco design implementation. Designing for environmental protection helps to reduce cost of packaging materials, reduce cost of raw material purchased and reduce hazardous substances in the product and finally, designing for environmental protection helps to reduce cost of energy usage. These strategies collectively help to protect health and safety of staff, enhance environmental protection, and reduce cost of production (Geng et al., 2017).

Therefore, in this study the focus of eco design is not restricted to protecting the environment, but also to reduce cost of production and enhancing the wellbeing of both employees and other stakeholders harnessing the potential to seek environmental protection and wellbeing of the stakeholders. These practices have also culminated in the high performance achieved by manufacturers in UK. It can also be said that the focus of eco design is to encourage reduction of raw material consumption, recycle and reuse of materials and components in production process (Zhu and Sarkis, 2004). In effect, this helps to enhance environmental performance while reducing cost of production and protecting the well-being of the society (Yang et al 2011). This observation throws light on the existing theoretical preposition of GSCM practices-performance within the existing knowledge in this field.

6.4.2 Green Purchasing implementation and sustainability performance.

The empirical results show that green purchasing (GP) positively and significantly impacts on all the three sustainability principles; social, economic, and environmental with standardised coefficient (GP →SP; β= .359, significant at the level 0.01, GP → ENV; β= .549, significant at the level 0.01, GP → ECO; β = .645, sig at the level 0.01) respectively. The theoretical underpinning of this observation is that implementing green purchasing has resulted in improved environmental performance, social performance, and better economic performance among UK manufacturing firms. The reason behind these findings lies with the fact that firms adopt green purchasing initiatives to guarantee a continuous supply of green inputs that enable them to produce green products specified by regulations (Eltayeb and Zailani, 2010).

Again, another reason for this positive relationship with all the three sustainability principles is that customers exert pressure on manufactures to adopt green initiatives and manufacturers on the other hand direct this pressure to suppliers to adopt similar initiatives. This process according to Eltayeb and Zailani (2010) is referred to as “multiplier effect” and is considered as an effective tool for diffusion of green initiatives. The idea of green multiplier effect ensures that customers demand suppliers to reduce the number of harmful substances included in raw materials that are used in the production of the product or subassembly (Preuss, 2001). One major reason for implementing green purchasing (GP) is to improve environmental performance, however, this study is in contrast with Green et al. (2012), who did not establish any relationship between GP and environmental performance. Zhu et al (2010) also did not find any significant relationship between GP and environmental performance. However, the finding in this study is consistent with many extant literature (Eltayeb and Zailani, 2010). Eltayeb and Zailani (2010), especially established positive and significant relationship between green purchasing and social, economic, and environmental performance. This justifies the position of the findings in this study. Concerning green purchasing and economic performance, Green et al (2012) posit that, green purchasing impact lies with the supplier rather than the manufacturer while still impacting economic performance positively.

This suggests that green purchasing comes with less cost to the manufacturer to implement rather than other green practices, because manufacturers require limited or no investment to implement green purchasing. One important reason for positive and significant relationship between green purchasing and social, economic, and environmental performance could be attributed to the fact that UK government in its quest to enhance environmental protection has instituted financial incentives schemes to suppliers who engage in practices that restore sustainability to the society (Esfahbodi et al 2016). This scheme to a larger extent encourages suppliers to produce raw materials devoid of hazardous substance, which in order words help to protect the natural environment and safety of employees as well as customers.

These incentives motivate most suppliers to produce less harmful raw materials to manufacturers at cheaper cost to enable them take advantage of such financial incentives. Invariably, these incentives compel suppliers who were not applying environmentally friendly practices to incorporate sustainability in their inputs so that manufacturers could produce product and services that are less harmful. This observation is consistent with the study of Eltayeb and Zailani (2010), Eltayeb et al (2011) and Geng et al (2017), which also discovered that adopting green purchasing initiatives results in improved environmental, economic, and social performance.

6.4.3 Investment Recovery implementation and sustainability performance.

The research findings show that investment recovery (IR) has a positive and significant relationship with social, economic, and environmental performances with standardised coefficient (IR → SP; β=.155, significant at the level 0.05, IR → ENV; β=.055, significant at the level 0.05, IR→ ECO; β=.095, sig. at the level 0.01). The theoretical understanding of this observation is that implementation of investment recovery leads to improved environmental performance, economic performance, and social performance of UK manufacturing. This positive and significant relationship with environmental performance is because investment recovery practice focuses on sale of scrap and used materials, sale of excess capital equipment and sales of excess inventories (Zhu et al., 2007). Consequently, once the company dispenses off its excess assets and inventory, all the toxic materials and substances associated with such products are eliminated alongside consumption of power. Increasing elimination of toxic substances associated with the scraped product and the avoidance of corresponding energy usage improves environmental performance.

On the other hand, investment recovery does not only affect environmental performance but also improves social performance of firms. Undertaking investment recovery that prevents the use of toxic substance in materials and final product protect the health and safety of both employees and customers. In this direction, the toxic and harmful product, which otherwise would have been consumed by customers is eliminated, which helps to establish better relationship with the society. The sale of toxic materials and its associated emission and waste substance prevents workers from being exposed to pollution and dangerous substance (Yildiz and Sezen, 2019). These findings could further be explained that UK manufacturing is more conformity oriented and thus responds positively to any changes towards environmental protection (Walker and Jones, 2012; Esfahbodi, 2016). This process effectively promotes health and safety of customers as well as employees thereby enhancing social performance of the firm.

Furthermore, investment recovery significantly impacts on economic performance in this study. Although Esfahbodi (2016), Green et al., (2012) did not find any relationship between investment recovery and economic performance, the empirical results of this study found significant positive relationship with economic performance. This study, therefore, is consistent with Zhu and Sarkis, (2007) where they generally found positive relation between investment recovery and economic performance for Chinese manufacturing under conditions of pressure and regulations. From economic point of view, the positive relationship between investment recovery and economic performance stern from the fact that investment recovery activities do not bring cost to the focal company but rather extra revenue in the form of sale of excess inventory and sale of scrap and excess capital equipment (Zhu and Sarkis, 2007). Again, since the focal company sells the excess inventory, scrap and capital equipment, the cost of recycling them or taking them to the dumping site is avoided and this helps to boost the bottom line of the focal company. Esfahbodi (2016) indicated that investment recovery may be at the early stages of its initiative among UK automotive industries, and hence, found no positive relationship with cost performance. The empirical findings from this study established significant positive impact of investment recovery initiative on economic performance. This further explains that investment recovery is gradually gaining its grounds among UK manufacturers and hence, the positive relationship found in this study.

6.4.4. Customer cooperation implementation and sustainability performance

The empirical analysis of the customer cooperation (CC) shows the following standardised coefficient (CC → SP; β= -040, not significant; CC→ ENV; β= .035, not significant; CC → ECO; β=.-099, not significant). The theoretical understanding of this observation is that implementation of customer cooperation has no relation with social performance, environmental performance, and economic performance among UK manufacturing firms. From the environmental performance perspective, customer cooperation has extremely low and positive standardised coefficient, which indicates that the relationship between CC and environmental performance is very weak. In addition to this, the relationship comes out insignificant, which means theoretically, there is no relationship between customer cooperation and environmental performance. Although Green et al (2012), found relationship between customer cooperation and environmental performance among USA manufacturing firms, Zhu and Sarki (2007) did not find any relationship between customer cooperation and environmental performance among Chinese manufacturing. Geng et al (2017) in investigating Malaysia manufacturing firms also found low but positive relationship between customer cooperation and environmental performance, the significant of the relationship was negative. This means that although there was relationship, theoretically the relationship was not strong to bring in meaningful environmental impact. The findings of this study are therefore consistent with the results of Zhu and Sarkis (2007) and Geng et al (2017). The relationship between environmental customer cooperation and environmental performance turned out positive although very week at coefficient value of (.035) the p-value was not significant.

The observation sheds light on the view that customer cooperation as environmental initiative has not been developed among UK manufacturing firms. The lack of relationship between customer cooperation and environmental performance may be due to the fact that focal firm's cooperation with customers generally bothers on product functionality rather than environmentally oriented cooperation. This indicates that UK manufacturing must strengthen their market orientation strategies to be more proactive with customer's environmental requirement (Green et al 2012). These findings stand opposite to Green et al (2012) where positive and significant relationship was found between customer cooperation and environmental performance among USA manufacturing firms.

From the perspective of social performance, the study did not find any relationship with customer cooperation, with a standardised coefficient of (-.040). Moreover, this result showed insignificant relation between customer cooperation and social performance. This outcome is inconsistent with previous studies that explained that satisfying customers through cooperation will help companies beat their competitors in the competitive market (Chan et al., 2012; Geng et al., 2017). However, this result is in-line with Geng et al (2017) where no relationship was established between customer cooperation and social performance. The reason for this negative relationship between customer cooperation and social performance in this study lies with the inability of the firm to link the cooperation to environmental related enhancement strategies. Furthermore, according to Chaston (1994), UK manufacturing firms place more importance to internal efficiency to produce quality product rather than external customer relations. In other words, minimal effort is paid to integrating customer's opinion in production process. Consequently, implementing customer cooperation does not enhance health and safety of employees and does not directly impact on enhancing the image of the focal firm. This observation further explains that cooperating with customers to enhance health and safety of employees and customers, cooperating to build equality within our society and cooperating with customers to promote the image of the focal company has not been fully developed among UK manufacturing firms.

From economic performance perspective, the study did not find any relationship with customer cooperation with standardised coefficient value of (-.099) and the p-value indicating no relationship between CC and ECO. This observation is consistent with Zhu and Sakis (2007) and Green et al (2012), who found out that, instead, cooperation with customers could have significant positive impact on economic performance when the cooperation is focused on eco design. Hence, this study did not establish positive relations between customer cooperation and economic performance due to the fact that market orientation strategies geared towards responding to customer's environmental design needs has not fully been developed and accepted. In order words, UK manufacturing firms are more product oriented to the extent that they respond quickly to customer's product quality demands. This observation indicates that customer cooperation has not fully developed among UK manufacturing firms. Furthermore, the negative relationship between customer cooperation and all the performance outcomes in this study may be attributed to the fact that majority of the sample of this study fell within small to medium manufacturing firms who may not have financial and human resource ability to undertake extensive customer cooperation agenda focused on enhancing social, economic, and environmental performance. Hence, the difference in the sample of the study may be a contributing factor towards the negative impact of customer cooperation on performance outcomes (Green et al., 20120).

6.4.5 Green Distribution (GD) implementation and sustainability performance

Furthermore, the empirical results show that green distribution (GD) is positively and significantly linked with social, environmental, and economic performances with the following standardised coefficient (GD → SP; β= .095, significant at the level 0.01; GD → ENV; β= .040, significant at the level 0.01; GD → ECO; β= .045, significant at the level 0.01). The theoretical understanding of these results maintains that implementation of green distribution (GD) by UK manufacturing firms' results in improved environmental, social, and economic performances. From the environmental perspective, green distribution implies packaging and transporting of products in an environmentally sustainable way, which reduces negative impact caused to the natural environment (Geng et al., 2017). One of the strategies of green distribution in ensuring environmental protection is to reduce packaging materials and the amount of waste generated, for this reason, fewer resources are consumed (Cankaya and Sezan, 2019). This significant positive relationship between green distribution and environmental performance is expected, since the emphasis of green distribution is to reduce the logistical related effect of material and goods transportation and the extent of pollution caused by this movement of materials and goods among UK manufacturing sectors.

Many manufacturing firms are using alternative form of distribution to transport products where recyclable plastics pallets are being used to help protect the consumption of wood. Previously manufacturing firms adopted the use of wood pallets to transport smaller quantity of product, but through green technology, plastic pallets that can be used over and over again have been employed by manufacturing firms in UK. This strategy is targeted to reduce the negative impact of logistics on the natural environment where wood product is used. The findings of this study are in line with Rao and Holt (2005), Zhu et al (2012), green et al. (2012) and Esfahbodi et al. (2016), who established positive relationship between green distribution and environmental performance outcome. This affirms our findings by providing evidence with existing literature. Again, manufacturing firms in UK are employing third party Logistics companies who possess technology of alternative form of energy (electric trucks) to transport goods and material rather than using diesel and patrol which inject hazardous substance to pollute the environment.

From the economic point of view, the empirical evidence of this study indicates that green distribution positively and significantly impacts on economic performance. One of the strategies of green distribution is to reduce amount of materials used in packaging, and previous studies have found a link between green practices and financial performance, especially those practices that reduce waste, material usage and cost of production in general (Laosirihonthong et al 2013). According to Carter et al (2000), many businesses prefer to use recycled packaging materials because these materials are cheaper. Similarly, reducing packaging materials will reduce not only packaging cost, but also transportation cost and this will help to increase profits (Luthra et al., 2016).

This study has therefore established that implementing green related distribution strategies such as optimisation of loading space, use of less material in packaging and the use of eco-friendly vehicles such as electric cars help to cut down emission caused by fuel-powered vehicles use in transportation and therefore improves on the financial position of the UK manufacturing. Furthermore, most manufacturing firms adopt third party logistics services, where logistics companies are employed to undertake distribution activities of the focal firm. This strategy helps to reduce cost since logistics firms with suitable infrastructures are employed to carry out such activities. For instance, Essety, formerly known as SCA Hygiene product limited employs Eddie Stobart logistics to shunter its finished product from the Manchester Trafford Park factory to distribution centres and customers across UK. This practice takes away the cost of buying trucks and employing drivers by manufacturing firms and this brings in financial benefit to the company. This result is consistent with Lutra et al (2016), thereby reaffirming the position of this study on the relationship between green distribution and economic performance.

From social performance perspective, green distribution is positively and significantly related to social performance. As may be seen, GSCM practices positively affect not only the environmental and economic performances but also the social performance. Businesses that adopt and implement environmentally friendly distribution strategies, which are focused on reducing pollution and waste build good public trust, which in turn translates into building good image of the company and consequently improves customer loyalty (Avila and Whitehead, 1993). Furthermore, green distribution strategy that focuses on preventing the use of hazardous substance helps to improve health and safety of employees and people within the community where the business operates, thereby establishing better relationship with the society (Luthra et al 2016). In this study, green distribution focused on reducing logistical impact of transporting goods and materials, use of less harmful packaging materials and most importantly adopting proper mode of transportation to keep goods safe in transit help to boast the economic position of the focal firms. These strategies significantly impacted on social performance with standardised coefficient of .095 at the significant level of 0.01. This observation is consistent with the findings of Geng et al. (2017), Cankaya, and Sezan, (2019).

6.4.6 Green marketing (GM) implementation and Sustainability performance.

The empirical findings reveal the following results (GM → SP; β= .075, significant at level 0.01; GM → ENV; β=.080, significant at the level 0.01; GM → ECO; β=.065, significant at the level 0.01). Green marketing echoes businesses' responsibility toward stakeholders and society to ensure that they conduct their business activities in a way that minimizes the negative effects on the environment. According to (Alhamad et al., 2019) the last thirty years have seen the growth and development of green theory within operational research area. The theoretical view from these results is that green marketing (GM) implementation is positively related to environmental, social, and economic performances. Due to the escalating concerns of environmental degradation manufacturing firms in UK are being challenged and held responsible for the impact of their operations on the natural environment. As a result of this demands, manufacturing firms in UK are beginning to apply green marketing strategy (Mears, 2019) to emphasis their environmental credentials of their operations to the general public and stakeholders. One of the strategies of green marketing to answer consumers concerns about the sustainability of a product is to show to consumers where and how their products have been manufactured and the impact on the environment (Mears 2019).

This awareness prompts manufacturing firms in UK to integrate environmental consciousness such as eco-labelling (Pickett et al, 1995), eco-packaging and branding Alkhawaldeh and Eneizan, 2018), Environmental Advertisements (Pickett-Baker and Ozaki, 2008), Green Premium Price (European Commission, 2013) and Embedding Eco-Image (Devi Juwaheer et al.2012) in their production process so as to meet consumer's requirement. In essence, green marketing helps to sell and advertise a product by highlighting that they have been produced, and delivered in a more sustainable way (Mears, 2019). Therefore, with green marketing values, products are produced to reduce waste, safe energy, reduce harmful substances and less packaging materials. The positive relationship between green marketing and environmental performance in this study lies with the fact that green marketing practices such as commitment of an enterprise to development of safe and eco-friendly goods, the use of recyclable and easily decomposed packaging, and a more efficient use of energy are all directed towards protecting the environment (Kotler, 2006).

An emphasis on green marketing can help reduce the environmental impact of a product throughout its lifespan (Wu and Lin, 2014). Green marketing can be viewed as a response to concerns about the global environment (Peattie, 1992). Although the aim of green marketing is to help improve environmental performance, Luthra et al (2016) find no significant relationship between green marketing and environmental performance. However, the findings of this study are consistent with published studies that found significant relationship between green marketing and environmental performance (Yang et al 2013: Zhao et al 2011; Koufteros, 2005).

Furthermore, the reason for significant relationship between green marketing and environmental performance in this study may be due to the fact that green marketing strategies employed by UK manufacturing firms are focused highly on eco design and functionality of the product. Generally, green marketing practice is required to meet two objectives: promoting environmental quality and enhancing customer satisfaction. Any attempt to trade-off either one of these objectives may result in "green marketing myopia" (Choudhary and Gokarn, 2013). The findings of this study suggest that manufacturing firms in UK are fully implementing green marketing strategies in order to improve the quality of the natural environment (Choudhary and Gokarn, 2013). As far as the environment is concerned UK manufacturing firms are indicating the harmful effect of their product on the environment such as biodegradable effect, Sustainability, environmentally friendly impact, and recyclable procedures (Pickett et al 1995). In this study, green marketing aims at building closer relationship with customers by assuring them of their determination to produce goods in a more sustainable way. The demand for green packaging and transportation is growing and the role of green marketing is to assure consumers that goods are produced and transported using reusable and biodegradable packaging and recycle materials (Lam, 2019).

From a social performance perspective, the theoretical observation of this study is that green marketing positively and significantly impacts on social performance. This significant relationship may be due to the fact that green marketing focuses on increasing product and company image, protecting employee health and safety, ensuring customer loyalty and satisfaction (Zailani et al., 2012b; Ashby et al., 2012). Again, green marketing is a tool in which business can develop relationship with its stakeholders and therefor, this enhances the image of the business resulting in improved social performance. Although Luthra et al (2016) did not find any relationship between green marketing and social performance, the empirical results of this study are consistent with Yang et al (2013). Again, the opposing results with Luthra et al (2016) may be linked to differences in sample size and location of the study. This study is highly extensive, comprising of UK manufacturing firms with sample size of 375, while the sample size used in Luthra et al (2016) is 123 mainly automobile industries in India. This difference attest to the fact that UK manufacturing firms are keener on enhancing the image and health and safety of their employees, in other words, they conform to environmental regulations (Esfahbodi, 2016).

From economic performance perspective, the theoretical view of this study is that green marketing implementation is positively and significantly related to economic performance. Economic performance relates to the manufacturing plant’s ability to reduce costs associated with purchased materials, energy consumption, waste treatment and financial returns (Zhu et al., 2008). The significant relationship between green marketing and economic performance in this study may be, due to the fact that green marketing strategies are directed towards reducing the use of hazardous materials, and less consumption of energy. This process results in low cost of production and saving of extra capital to boost the bottom line of the firm (Yang et al., 2013). Effective advertisements, labelling of product and regular information to customers about environmental strategies of the firm result in confidence among consumers, which in turn leads to retention and attraction of customers and in consequence, results in increase sales and market volumes (Nyilasy, Gangadharbatla, & Paladino (2013).

In recent times green marketing has taken different perspective to become one of the business strategies for manufacturing firms to gain competitive advantage. The results of this empirical analysis emphasise that green marketing implementation in UK is not just virtuously altruistic but can be profitable effort for sustainable performance Choudhar and Gokaran, (2019). Mear (2019), holds the view that green marketing, which plays a critical role in manufacturing supply chain does not only satisfy customers, but also to consider the interests of society in general. Although green marketing through advertisement requires extra injection of capital within the short term, in the long term the returns in the form of profitability is realisable (Yang et al., 2013). The findings in this study also observed that green marketing claims must clearly state environmental benefits, and corresponding financial outcomes (Hassan and Ali, 2017). This observation indicates that the effort of UK manufacturing firms to implement green marketing results in positive economic performance.

6.4.7 Reverse logistics implementation and Sustainability performance

The empirical findings reveal that reverse logistics significantly and positively impact on social, economic, and environmental performance with the following coefficient values; (RL→SP; β=.010, significant at the level 0.01, RL→ENV; β=.035, significant at the level 0.01 RL→ECO; β=.065, significant at the level 0.01). The theoretical view of this observation is that implementation of reverse logistics is positively and significantly associated with environmental, social, and economic performances. Reverse logistics (RL) is a task associated with the three “Re's” of circular economy; recycling, reusing, and reducing the consumption of raw materials in production stage or after consumption (Zhu et al., 2005; Chan et al., 2012; Lai et al., 2013; Abdullah and Yaakub, 2014; Huang et al., 2015). Reverse logistics has also been described by Stock (1998) as “the part of logistics that is focused on product returns, source reduction, recycling, materials substitution, reuse of materials, waste disposal, and refurbishing, repair and remanufacturing”. Reverse logistics (RL) is also described as “the process of planning, applying, and regulating the efficient, cost-effective flow of raw materials, inventory, finished goods and vital information from the point of consumption to the point of origin for the purpose of recapturing value or proper disposal” (Rogers and Tibben-Lembke, 1999, p. 2).

The aim of reverse logistics implementation is to reduce environmental impact through product recovery, take back or return of product from customers (Zhu and Sarkis, 2004). This study observes that reverse logistics practice is restoration activities such as recycling, reusing, and remanufacturing of product that are once again usable by customers (Kim et al 2006; Kannan et al., 2012; Luthra et al 20156). Manufacturing firms are facing pressure globally to adopt proactive environmental initiatives because of limited natural resources to preserve these resources for the use by future generation (Govindan et al 2015; Luthra et al., 2016). Reverse logistics, therefore, helps to reduce environmental impacts while at the same time maintain quality environment, saving of energy and cost of production (Srivastava, 2007; Lai et al 2013; Luthra et al 2016). RL focuses on activities connected with taking back goods or materials and products from the point of usage for adding value through remanufacturing or proper disposal. The empirical findings of this study show positive correlation between reverse logistics and environmental performance. These findings are consistent with Geng et al (2017), who indicated that reverse logistics has positive and significant correlation with environmental performance. The reason for this positive correlation is due to the fact that UK manufacturing use reverse logistics to enhance the environment by reducing in energy and material consumption, decrease in air and water pollution and minimisation or elimination of waste generation and use of toxic and harmful materials.

From social performance perspective, the empirical observation of this study indicates that reverse logistics positively and significantly impacts on reverse logistics. Social performance refers to a firm’s deliberate implementation of issues associated with social responsibility (Alsadat et al 2019) including quality health and safety issues, wages and welfares, equal opportunities for all employees and stakeholders, providing training/education, child labour, forced labour, and human (Dixon et al., 2005; DETR, 1999; Alsadat et al 2019). Issues about health and safety, equal access and social justices were posited by DETR (1999). Sarkis et al.

(2010) touched on social issues such as internal human resources, external population, stakeholder participation and macro social issues. The focus of reverse logistics is associated with the three ‘Re’s’ of circular economy: recycling, reusing, and reducing the consumption of raw materials in the process of production and postproduction (Zhu et al., 2005; Chan et al 2012; Lai et al., 2013; and Geng, et al., 2017). Social issues such as health and safety of people and employees and reduction of air and water pollution are critical in manufacturing supply chain (Gimenez and Tachizawa, 2012). Reverse logistics activities are all geared towards ensuring that the environment is safe, and the warfare of stakeholders are protected. For example, fourteen employees of Foxconn, a leading manufacturer in China for Apple, Dell, HP, Motorola, and Nokia attempted suicide between January and November 2010 due to poor working conditions (Chan, 2013; Geng et al., 2017). This study therefore linked reverse logistics to social performance focusing on the role of reverse logistics to prevent use of hazardous substance in goods, protect the wellbeing of the stakeholder by reducing waste generation and preventing water and air pollution.

This suggests that organisational profitability and production goal must not come at the expense of employees and customer wellbeing (Geng et al., 2017). Although Chan et al. (2012) indicate that reverse logistics implementation improves the image and reputation of the company and potentially increases the value of the firm, Zailani et al. (2012b) in analysing data from 400 manufacturing firms in Malaysia found that the correlation between reverse logistics and social performance was weak and positive yet its associated p-value was insignificant. The findings in this study are consistent with Chan et al. (2012) and Yang et al (20130) who found that reverse logistics implementation is positively and significantly related to social performance.

The reason for this significant relationship between reverse logistics and social performance may be due to the fact that most firms are striving to enhance their image by maintaining the quality standard of life of people preferable without damaging the environment (Yusuf et al

2013). The empirical analysis of this study observed that reverse logistics helps to reduce environmental risk, contributes to environmental protection, and improves the corporate image of the firm. All these practices lead to improving the social performance of the firm (Luthra et al 2016). The second reason for this positive relationship may be that although reverse logistics is capital intensive and technologically driven, most manufacturing firms in UK conform to regulations and that adopt more proactive reverse logistics strategies such as recycling, remanufacturing and resale to avoid the penalty that comes with non-compliance of environmental regulations. Furthermore, most firms adopt reverse logistics to protect the environment in order to benefit from government financial incentives that are available to firms who implement environmental related practices by recycling to reduce or avoid waste generation (Esfahbodi,et al 2016).

From economic performance perspective, the theoretical observation indicates that reverse logistics positively and significantly impact economic performance. Financial performance is the most important driver for manufacturers to implement GSCM practices. These practices are potentially directed towards reduction of environmental cost, reduced raw material purchasing and penalty (Zhu et al., 2010). The result of this study is consistent with Govindan et al (2015) who find positive relationship between reverse logistics and economic performance however, the empirical result of this study is in contrast with findings of previous studies (Eltayeb et al 2011; Clift, 2003), who described the high cost associated with product recovery and recycle, as economically uncompetitive compared to the 'new' ones (Eltayeb et al., 2011). Again, the significant relationship between reverse logistics and economic performance may be attributed to the fact that UK manufacturing firms are deeply initiating reverse logistics especially product take back from customers and reusing and remanufacturing of product. To gain competitive advantage. Again, this study observed that, reverse logistics result in moderate cost savings, reflected by reduction of cost of materials purchased, recycling and reuse of materials, therefore the significant effect of reverse logistics reflects in ‘Macro’ indicators of firm’s economic performance (Clift, 2003; Eltayeb et al 2011). A typical scenario is what prevails in mobile phone production and sale in UK. Mobile phones returned to production point possess valuable parts that could be remanufactured into a new phone and are normally termed as “refurbished phones “. This strategy helps to lower production costs and increase profits Mutha and Pokharel (2009). It is also argued that a used mobile phone can be entirely put into different use by using the plastic parts as the filling material to produce sound insulation products (Vlachos, 2016). Customers who return their mobile phones for example also provide valuable operational information by way of feedback which give insights regarding managing the brand type, designing the product by adding new features and functionality of the product. This process helps to maintain customers and improve the image of the company thereby improving economic performance (Rathore et al. 2011).These peculiar observations maintain a very important insight concerning the existing theoretical view that implementation of GSCM practices lead to financial performance (Geng et al 2017).

6.5 GSCM practices and competitive advantage

This section seeks to answer the bigger question of the research related to: “Being green is Being Competitive”. As illustrated below, each of the seven green initiatives are linked to competitive advantage factors (cost, quality, flexibility, and dependability) to ascertain whether or not GSCM implementation results in competitive advantage. The survey findings have proven eco design, green purchasing, investment recovery, green distribution, reverse logistics and green marketing significantly result in competitive advantage, however customer cooperation did not show any significant relationship with competitive advantage. This section provides a detailed discussion of the survey findings relating to each of the hypothesised relationship. It further discusses the individual GSCM practices and how they relate to competitive advantage, and helps to answer the research question 3, where the research model seeks to examine the relationship between GSCM implementation and various component of competitive advantage.

6.5.1 Green purchasing (GP) implementation and competitive advantage

The empirical findings show that green purchasing significantly and positively impact on cost advantage quality advantage, flexibility advantage, and dependability advantage with standardised coefficient (GP→CA; β=.135, significant at level 0.05;GP→QA; β=.185, significant at the level 0.01; GP→FA; β=.205, significant. at the level 0.05; GP→DA; β=.199, significant at the level 0.05). Competitive advantage represents the manufacturing plant's capabilities to efficiently produce and deliver products to the customer (Zhu, 2008). According to Narasimhan (2001), competitive advantage refers to the strategic dimensions by which a company chooses to compete with its Manufacturing capabilities and resources. In this regard, manufacturing firms should focus on developing competitive priorities, since the achievement of competitive advantage depends on the effective transformation of competitive priorities into strategic capabilities (Ho, et al., 2002). In this study, competitive advantage has been categorised into multiple dimensions namely, cost, quality, flexibility, and dependability (Roberto Chavez, et al., 2014; Mallikarathna and Silva, 2019). In consistent with Carvalho, Azevedo and Machado (2012), results of this study confirmed positive relationship between green purchasing and competitiveness of the firm.

Carvalho et al (2012), debated that resilient supply chain management practices (GSCM) have a positive significant impact on operational performance in terms of delivery flexibility, product quality and customer service in addition to financial performance in respect of reduced costs of procurement, inventory, and manufacturing. The positive impact between green purchasing and all the four generic principles of competitive advantage in this study is not surprising, since the quality impact of green purchasing is dependent on the supplier rather than the manufacturer, while still impacting cost advantage for the manufacturer. Zhu and Sarkis

(2007) indicate that green purchasing is less costly for manufacturer to implement than other GSCM practices, such as in terms of reduced costs of procurement, inventory, and production. Moreover, Carter and Jennings (2002) found out that selecting suppliers based on ISO 14001 certification enhances quality advantage, which leads to lower cost of operation. In this study, it was found out that the adoption of green purchasing strategy such as lead time procurement by UK manufacturing firms helps to reduce cost of inventory and promote dependability and flexibility. Therefore, green purchasing practice significantly affects a company's competitiveness in terms of better quality, low cost of operation, flexibility in delivery and availability. In terms of striving for competitive advantage, it is vital to consider both an organisation's production and consumption patterns (Welford, 1997). In other words, a comprehensive consideration of an organisation's environmental impact requires attention to management of its purchasing process. The development of green purchasing is seen as one part of a raft of green initiatives to promote competitiveness. According to the European Union (EU, 2011), green purchasing is defined as a process whereby authorities seek to procure goods, services and works with a reduced environmental impact throughout their life cycle. In green purchasing the focal company (buying company) wants delivery of a quality material, low-cost material, flexibility in obtaining materials and dependability on the part of the supplier. These values when build together results in competitive advantage (McCrudden, 2004; Renukappa, 2009; Rwelamila et al., 2000; Varnäs et al., 2009), because green purchasing is defined as the process by which organisations buy materials and other asserts, considering a number of factors, including competitive generic factors such as price, quality, flexibility, dependability, and social responsibility attributes (i.e. issues such as ethical sourcing, human rights and employee conditions) (Meehan and Bryde, 2011; UN Global Compact, 2013; UNDP, 2008). Therefore, the survey result of impact of green purchasing initiative on competitive advantage in this study corroborates previous studies, which support the assertion that being green is being competitive on whether being green leads to competitive advantage.

6.5.2 Eco design implementation and competitive advantage

The empirical findings show that eco design significantly and positively impact on three generic principles of competitive advantage with the following standardised coefficient (ED→CA; β=-0.10, not significant; ED→QA; β= 0.90, significant at the level 0.01; ED→FA; β= 0.75, significant. at level 0.01; ED→DA; β= 119, significant at the level 0.01). The theoretical view obtained from this observation indicates that eco design implementation does not impact positively on cost advantage, however eco design implementation impacts positively and significantly on quality, flexibility, and dependability. It is argued that the reason for negative eco design impact on cost advantage may be due to the fact that most eco design related activities require extra investment, which invariable inflates cost of production but do not yield short term returns (Zhu et al., 2013; Esfahbodi, 2016).

Again, due to the fact that the extra investment required to carry out eco design activities increases cost of production, manufacturing firms are unable to sell at a cheaper price to win low-cost competitive advantage. In order words, due to high production cost, manufacturers are unable to sell their product at an incredibly low price, thereby enjoying low-cost competitive advantage (Mallikarathna and Silva, 2019). One significant feature of eco design is to reduce the amount of hazardous substance in the final product. This significantly enhances the quality of the product. UK manufacturing firms have developed the capability to prevent hazardous substance in the final product, hence, ability to produce quality product to win competitive advantage. The study also showed that eco design implementation results in competitive advantage in flexibility. This is achieved when the manufacturing firms can vary the product design to prevent substances that are dangerous to the health of customers.

Furthermore, this variation in product design should allow the manufacturing firm to produce quality at earlier convenient time for customers.

Dependability advantage is achieved when customers can have access to the product at the right time and at the right quantity and quality. This study has shown that implementing eco design strongly results in production of quality product, manufacturers are able to vary the design specification of customers and able to deliver on time. Therefore, it appears that the capability of eco design to reduce energy usage, reduce waste, contain lower amounts of hazardous substances, reduce raw material usage and finally, to deliver those products to customers when they are required serves as a counterbalance by increasing its associated cost (Beamon, 1999; Zhang et al., 2006; Ekins, 2010; Mallikarathna and Silva, 2019). This implies that eco design implementation by UK manufacturers' results in high level of competitive advantage in quality, flexibility, and dependability but at the trade-off of cost advantage. Combining extant literature and survey analysis, this study claims that eco design positively and significantly leads to quality, flexibility, and dependability advantage but not low-cost advantage. Eco-design is a solution which addresses the growing pressure caused by the increasing hazardous substance in goods, delay in delivery of products and availability of customer's products. Eco-design improves quality by reducing waste and emissions as well as improving environmental commitment. Hart and Ahuja (1996) demonstrate that the early moving firms may be opting for more advanced eco design strategies that are built on low emissions, reduction of packing materials, availability of product for consumer use and designing product to meet customers specifications (Ghemawat, 1986). Firms with very low manufacturing emissions relative to competitors gain first-mover advantage in emerging green product markets (Russo & Fouts, 1997). The survey results have confirmed that eco design implementation serves as a capability, which is a prerequisite for attaining competitive advantage in quality, flexibility, and dependability. Flexibility in competitive advantage signifies the ability of the manufacturing firms to alter production process to eliminate or add certain features to the product to meet the aspiration and desire of the customer (Green et al 2012). Designing product with customers cooperation to a large extent enables the manufacturing firm to integrate the desire of the customers relating to the environmental functionality of the product. The survey results also revealed that eco design implementation has a negative relationship on low-cost advantage. In other words, eco design implementation does not necessary lead to cost advantage. The reason behind this observation is that eco design practices require extra investment which goes to increase operational cost thereby depriving the manufacturing firm to sell at competitively low cost than other competitive. In many cases manufacturing firms adopt economic of scale to be able to sell at less competitive price. In this case due to operational efficiency manufacturing firms are able to produce more to spread cost over large number of goods (Porter, 1990). In this sense, manufacturing firms achieve competitive advantage because they are able to produce quality product, able to deliver on time to customers, meet customer specification and sell at competitively low price due to economic of scale as a result of implementing eco design initiative.

6.5.3 Investment recovery (IR) implementation and competitive advantage

The empirical findings of this research provide the following standardised coefficient and significant values. (IR→CA; β= 045, not significant (.565); IR→QA; β= 039, significant. at the level 0.05; IR→FA; β= 050, significant at the level 0.05, IR→DA; β= 159, significant at level 0.05).The empirical observation obtained from these results indicate that while implementation of investment recovery leads to positive and significant attainment of quality advantage, flexibility advantage, and dependability advantage by UK manufacturing firms, direct cost advantage is yet to be achieved. The positive causal relationship between investment recovery and quality may be due to the fact that investment recovery focuses on sale of scrap and used materials of the firm (Zhu et al., 2008). In essence, when a firm disposes of its scrap materials, waste associated with all these materials are prevented leading to quality in production process.

In this sense, implementation of investment recovery has achieved its intended aim of achieving quality operational performance. The findings confirmed previous research on the strong and significant relationship between intra-organisational management such as investment recovery and operational performance in quality and flexibility (Geng et al 2017; Yu et al 2014). Both studies found out that adoption of investment recovery and other intra organisational activities improved operational performance in areas of quality and flexibility. They argue that collaboration within the operational departments within the organisation helps to remove all functional barriers (Zhu and Sarkis, 2004; Geng et al 2017).

On the other hand, the direct impact of investment recovery on cost advantage in this study appeared positive but achieved insignificant level. This indicates that although investment recovery appears to enhance the financial position of the firm, the extent of financial gain does not ensure cost advantage by the focal company. From the perspective of cost advantage, the insignificant relationship between investment recovery and cost may be that UK manufacturing firms are still at the initial stages of implementing investment recovery and therefore not achieving the full benefit related to the practices (Bevis, 2011; Esfahbodi, 2016). For example, according to Esfahbodi et al (2016) UK auto industry has just recently begun implementation of investment recovery practices and that adoption rate is slow, hence the insignificant value in their study. Again, because of limited nature of resources of most small and medium enterprises sale of such surplus scrap and used materials is unable to generate enough income to boost the financial position of the firm to help reduce the cost of production (Shahbazpour and Seidel, 2006).

Furthermore, the study found positive and significant relationship with flexibility and dependability. The positive impact may be due to the fact that investment recovery allows manufacturing firms to eliminate hazardous substances that could create difficulties to the production process, thereby easing the burden to quickly produce goods to meet customer demands. In this regard, manufacturing firms are able to meet flexibility advantage because the firm builds more capability to make changes to the product that meets the requirements of the consumer and also ease the burden on the part of the employees to having to remanufacture the product because it contains unwanted materials. With respect to dependability the elimination of hazardous materials due to investment recovery practice allows manufacturing firms to promptly produce goods at the right time to meet the requirements of consumers. For investment recovery green initiative to be effective, requires a more aggressive approach, which is underpinned by an increased desire to approach surplus management as opportunity to support strategic goals of achieving competitive advantage and superior firm performance (Geng et al., 1017). Investment recovery also describes how surplus of the organisation is managed to maximise performance and achieve competitive advantage. The survey results revealed that investment recovery leads to quality advantage. This observation is due to the fact that investment recovery deals with scraps and unused materials that may contain certain hazardous substance. The disposal of such materials may prevent hazardous substance being incorporated into the production process, thereby ensuring quality (Zhu et al. 2008). However, to be able to achieve the full benefit of investment recovery, the focal firm must select best investment recovery partner and implement best practices throughout the reverse supply chain by adopting the three C's of investment recovery success (Angrick, 2014):

- Confidence: Partner with a market leader that can do what it says it can do
- Coverage: Seek a complete solution for surplus that alleviates the burden on internal teams
- Control: Drive strategic impact through a deeper partnership that factors in analytics and risk.

Through a more programmatic, all-inclusive approach and long-term strategy, global organizations can set themselves apart from competitors and extract more value from assets with confidence, coverage, and control in the reverse supply chain (Angrick, 2014). Therefore, it is clear that both internal and external collaboration in dealing surplus assets could lead to competitive advantage in quality, flexibility, and dependability. The argument for achieving flexibility advantage through investment recovery is that surplus materials could help manufacturing firms to quickly develop a product that requires unique specification by the customer. The survey results revealed that investment recovery led to competitive advantage in quality, flexibility, and dependability but not in low cost. The reason for this non-significant relationship with cost advantage is that even though investment recovery is matured in UK, it does not mean closing the loop across industries is actually occurring. Even though the survey analysis showed a positive relationship with competitive advantage in cost, the extent of the relationship was negative, signifying that manufacturing firms have not fully developed the systems to pull these products and materials back into their systems through recycling or remanufacturing (Zhu et al., 2008). These findings corroborate the study by Zhu et al (2008) where no significant relationship was found between investment recovery and financial performance among Chinese manufacturing firms due to the fact that investment recovery has received less attention among manufacturing firms. Again, the findings of this study are consistent with Esfahbodi et al (2016), where the authors reported that investment recovery is positively associated with quality, flexibility and dependability but not cost. Overall, the empirical findings corroborate the exploratory literature review which suggest that adoption of green initiatives leads to competitive advantage.

6.5.4 Customer Cooperation (CC) implementation and competitive advantage

The empirical analysis of customer cooperation revealed the following interesting outcomes (CC→ CA, β = -031, not significant, CC → QA, β = .053, not significant, CC →FA, β = .054, not significant, CC →DA, β = .031 not significant). The empirical findings of this study show that customer cooperation though positively related to quality, flexibility and dependability, the causal relationships are not significant. The theoretical view obtained from this observation shows that implementation of customer cooperation resulted in insignificant impact on competitive advantage. In contrast to this observation, Yu et al (2014) found a positive and significant relationship between customer cooperation and competitive advantage, when they investigated the integrated supply chain management adoption and operational performance among Chinese manufacturing firms. However, the results of this study are consistent with Zhu et al (2007) where they found no significant relationship between customer cooperation and competitive advantage such as product quality, cost, flexibility, and dependability in their study of 89 Chinese automotive manufacturers. The negative causal relationship among UK manufacturing discovered in this study may be due to the following reasons: cooperation with customers may result in competitiveness when it impacts positively on environmental performance (Green et al 2012). However, in this study customer cooperation did not impact positively and significantly on environmental performance hence, the negative relationship with competitive advantage. Furthermore, lack of financial resources to many small manufacturing firms in UK indicates their inability to cooperate with customers for sustainability enhancement initiatives that drive competitive advantage.

Arguable this limitation in resources mobilisation hampered the quality of achieving competitiveness. Furthermore, quality is associated with the ability of the manufacturing processes to deliver products according to design specifications that meet customer's satisfaction (Li et al., 2006). Many of these small manufacturing firms used in this study do not have the capacity to undertake these activities where every specification of each customer is addressed before production hence, the negative impact on competitive advantage.

Moreover, the lack of relationship may arise if decreasing waste, energy usage or other environmental impacts of the production processes results in sub-standard or less quality products. With respect to flexibility, if the manufacturing firm's capability to meet the design specification of the customer is hampered by limited raw materials, it may result in the inability to respond to changes, thereby preventing achievement of competitive advantage. For example, in the case of design flexibility, this could arise if definite customer requirements such as special material or finishes cannot be met in a sustainable fashion (Shahbazpou and Seidel, 2006). Lastly, for dependability, reliability is one manufacturing objective affected by the system constraint and time. Sustainability could be in conflict with this objective if customer cooperation ends in increased lead-times or unpredictable delivery of materials throughout the supply chain. This may happen if additional processes are required to the production process in order to conform to sustainable values (Shahbazpou and Seidel, 2006). Again, this could be a problem if the supply of environmentally friendly raw material is not readily available. Consequently, it is augured that customer cooperation has not fully been embraced by manufacturing firms in UK especially the small to medium firms in order to gain competitive advantage.

This observation is collaborated by Green et al (2012) where they discovered that the lack of positive relationship between customer cooperation and operational performances is due to the use of different groups within the manufacturing sector in a study. Different manufacturing firms have different approach in dealing with customers' demand. According to Green et al (2012) some manufacturing firms are more market sensitive and address customers' demands differently. Many small manufacturing firms in UK are beginning to embrace the concept of market orientation where respond to customers' requirement is giving priority attention. Cooperation with customers has become extremely important for achieving competitive advantage by manufacturing firms. Until now companies developed new ideas and inventions by themselves and retain full control over the production process, which is treated as a prerequisite for achieving competitive advantage. However, at present, in this competitive global market, the narration has shifted, and it is increasingly difficult to lead innovation alone (Kozioł et al 2015). In this sense, the basis of achieving competitive advantage is to cooperate with your customers as sources of information and knowledge that can contribute to the development of business and effectively meeting the desire of customers. The process of learning and adaptation of knowledge at the enterprise level is most fully realized during product development and manufacturing stage. It should be emphasized that innovative products or processes could be created when external views are collected (Roper et al., 2008) Natural external partners in supply chain include customers, competitors, and suppliers (Buganza, Verganti, 2009). Customer cooperation involves strategic information sharing and collaboration between a focal company and their customers and it is aimed to improve visibility and enable joint planning for environmental performance leading competitive advantage (Geng et al., 2017). It is, therefore, important to identify and integrate customer groups to understand their needs and expectations if a firm wants to achieve competitive advantage over competitors (Kozioł et al 2015). In a market-oriented economy, the most important partners of the supply chain are the customers. Participation of customers in product design, innovation and manufacturing process is particularly important. Customers using the products and services could provide information and knowledge that can be very useful to the company. This information and knowledge from customers could take the form of development of products, processes, marketing activities, environmental impact functionality of the product and specification. The survey results of this thesis revealed that UK manufacturing firms have not fully developed their customer cooperation capabilities to enable them to achieve competitive advantage. This non-significant relationship may be due to the fact that manufacturing firms don not fully use ready-made ideas or solutions proposed by the customers. Consequently, to address this very important lack of cooperation and for attempt to achieve competitive advantage, manufacturing firms can initiate actions that will lead to the identification of needs of customers so as to integrate them in their product design and manufacturing process.

6.5.5 Green distribution (GD) and competitive advantage

The empirical findings of this study show that green distribution positively and significantly impact on cost quality, flexibility and dependability, with the following results (GD→ CA, β= .050, significant at the level 0.05; GD→QA, β= .139, significant at level 0.01; GD→FA, β= .101, significant at 0.01 level; GD→DA, β= .095, significant at level 0.01).The reason for undertaking green distribution is to transport goods using capacity of green distribution to bring high quality, flexible and dependability to customers at a reasonable lower cost The positive and significant relationship between green distribution and quality advantage is not surprising since the focus of green distribution is mainly to minimise the environmental effects of logistics activities, which has a potential to affect the quality of the product (Esfahbodi, 2016). It is recognized that GSCM practice when effective, reinforces manufacturing competitiveness in terms of delivery, flexibility, and quality (Yang et al., 2010).

Firms that adopt collaborative green distribution between supplier manufacturers and customers can develop organizational capabilities (Lorenzoni and Lipparini, 1999), which can translate into improved competitive advantage, such as flexibility, dependability, and quality (Hart, 1997; Porter and van der Linde, 1995). Furthermore, it has been identified that GSCM practice cannot contribute to the effective integration of the traditional supply chain process if adopted independently, and hence, success can be achieved through the collaboration of different SCM activities applied simultaneously (Kim, 2006). The use of refrigerated truck to transport highly perishable goods help to maintain the quality of the product while also protecting the environment. Many third-party logistics companies that are used by manufacturing firms have the necessary infrastructure to transport goods that are perishable and fragile. This helps to protect and maintain product quality until they are delivered to the end users. Furthermore, the study also found that green distribution leads to improved flexibility and dependability. Green distribution strategy is to get goods to the customers at the right time and in right quantity and quality (Li et al., 2006).

With green distribution strategies where third-party logistics companies are used to deliver goods on behalf of the focal company delivery to customers are carried out on time and customer delivery options could be met. Meeting customer's delivery option is down to the ability of the focal company to vary its distribution strategies to be able to respond to the delivery needs of customers. UK manufacturing firms have achieved competitive advantage in flexibility and dependability because most of the firms have adopted distribution strategies that allow them to deliver on time. With respect to flexibility green distribution that allows logistics company to transport assorted goods at the same time in one truck helps to meet customer's needs. Different product could be transported at the same time in trucks that have different compartment where refrigerated and non-refrigerated product are transported at the same time. With respect to achieving competitive advantage in cost, this study showed that there is positive correlation between green distribution and cost advantage. This positive causal relationship is due to the fact that most UK manufacturing firms employ the services of third-party logistics companies to deliver goods to distribution centres and customers (Pagell and Wu, 2009)

This practice mitigates the burden of the focal company purchasing fleets of trucks and employing drivers. The third-party logistics companies have the expertise especially in implementing loading space optimisation. This allows the focal company to deliver goods to many customers with one truckload when loading space is optimised to prevent putting many trucks on the road to increase delivery cost. This practice helps to reduce the cost of transporting the goods to customers and hence, allows the manufacturing firm to enjoy low cost of production. Previous studies have argued that using third party logistics inflates delivery cost because, the third-party logistics companies give high quotations (Bevis, 2011). However, this study found out that third-party logistics companies have the infrastructure and the expertise which otherwise would have cost the focal company’s financial performance. Comparatively, the use of third-party logistics companies relieves the manufacturing firms burden of buying new trucks, some with the capacity to transport perishable goods and train drivers. This observation is consistent with Chiou et al. (2011), where it was observed that environmentally related delivery strategies improve competitive advantage. The results from survey analysis and extant literature have revealed that green distribution leads to competitive advantage. By improving the environmental performance through green distribution practices, firms are able to increase their competitive edge by reducing costs, gaining a strong reputation among customers, and increasing their competitiveness in international markets. Hence, these benefits impact positively on firm’s overall financial performance, which results in low cost of production and subsequent low prices to customers (Lindell & Karagozoglu, 2001). Green distribution also leads to competitive advantage through product quality, increasing efficiency, enhancing flexibility in delivery and dependability. The use of multi-purpose delivery truck that can carry both frozen and non-frozen foods offers customers the opportunity to order different types of products. These practices place the manufacturing firm in a competitive advantage over competitors who do not possess this green technology because it assures customers quality of the goods they order. In other words, customers can be assured of prompt delivery of variety of product. Another significant consequence of green distribution is reduction of cost through the use of third-party logistics companies. According to Geng et al (2017), it is cost effective for manufacturing firms to concentrate on their areas of specialisation and leave distribution of their goods to qualify third party logistics companies because it is very expensive for a manufacture firm to operate and manage their own distribution. In contrast to these findings, Esfahbodi et al (2016), in examining the SSCM of UK manufacturing firms revealed that green distribution does not necessary impact on cost advantage positively. The authors argued that the lack of appropriate green technology infrastructure hinders the benefits of sustainable distribution. However, the findings of this study are consistent with Green et al (2012), who report that green distribution directly impacts on competitive advantage in cost and quality. By adopting green distribution, firms are able to increase their competitive edge by reducing costs, gaining a strong reputation among customers, and increasing their competitiveness in international markets. Hence, these benefits impact positively on firm's overall competitive advantage (Lindell & Karagozoglu, 2001).

6.5.6 Reverse logistics (RL) and competitive advantage

The empirical findings of this observation show that reverse logistics impact on quality, flexibility, and dependability positively and significantly with standardised coefficients RL→QA, β=.095, significant at the level 0.01; RL→FA, β=.010, significant at the level 0.01; RL→DA, β= .119, significant at the level 0.01). The theoretical view derived from this observation is that implementation of reverse logistics has led to improvement in quality, flexibility, and dependability but with the trade-off of cost with standardised coefficient of (RL→CA, β= -.119, not significant). These results are consistent with (Rao & Holt, 2005; Azevedo et al., 2011; Laosirihongthong, Adebanjo & Tan, 2013; de Soussa Jabbour, de Oliveira Frascareli & Chiapetta, 2015), who also found no positive correlation between reverse logistics implementation and cost.

It seems that the capability of reverse logistics to enhance quality of process and product, flexibility and dependable delivery is counterbalanced by cost advantage. Reverse logistics depicts those products that have already been put into the supply chain process are channelled back on basis of being substandard or of poor quality (Kabergey and Richu, 2015). In general business environment, products that are reversed take the form of; manufacturing returns, commercial returns, recalled products, warranty returns, service returns, end-of use returns, and end-of-life returns (Price Water House Coopers, 2008; Kabergey and Richu, 2015). Zheng and Zhang (2010) on the other hand, describe reverse logistics in terms of recycling and waste management; collection, classification, processing, packaging, handling, storage, return of packaging materials.

Rogers and Tibben Lembke (1998) observes that reverse logistics is conceptualised into two, products and packaging. These products are reversed as a result of; poor packaging and quality issues (Brito, et al., 2002). According to Schatteman (2010), products are returned because of the following reasons: unsatisfactory quality, installation or usage problems, warranty claims, faulty order processing, retail overstock, end of product life cycle or product replacement and manufacture recall. These activities enhance quality of the product, delivery to customers and able to respond to changes to meet customer demands. But all these activities come with extra cost which in the short run affects the cost of operation, thereby denying the manufacturing firm the ability to achieve cost competitive advantage. From the perspective of cost advantage, the empirical results depict that reverse logistics implementation does not result in cost advantage. This insignificant relationship may be because recycling and collecting, reusable parts and components, remanufacturing and reuse may require high technology and extra investment. It has been discovered that small manufacturing firms in UK struggle to undertake reverse logistics due to high cost involved and the need for high technology (Abdulrahman et al., 2014).

It is also argued that reverse logistics can increase cost of production and hence, increase the operational cost (Abdulrahman et al., 2014). Lack of appropriate product recovery infrastructure, recycle, reuse, and remanufacture hinder manufacturing firms in UK from reaping the full benefit of low-cost advantage. Furthermore, the lack of positive relationship between reverse logistics and cost advantage may be attributed to the high cost of skilled human resources needed to carry out the ‘green manufacturing’ project such as recycling and remanufacturing. It is proposed that such high-cost initiatives hinder the manufacturing firms from reaping the full benefit of cost advantage especially when there are no immediate paybacks.

Cost linked with developing the environmental management system, staff training and compliance with the requirements of eco-labels are deemed expensive (Shahbazpour and Seide, 2006). The result of this observation is consistent with (Yu et al 2018) where they investigated the impact of reverse logistics on operational performance among Indian pharmaceutical companies. They observed that undertaking reverse logistics by Indian Pharmaceutical companies leads to low-cost performance due to huge investment required to implement reverse logistics related activities. This study adds empirical evidence to the relationship between reverse logistics and competitive advantage. Specifically, the study demonstrates that competitive advantage is created by implementing reverse logistics through outsourcing, collaborative enterprising, green strategies, and closed-loop supply chain approaches. This is reflective of the study of Hsu, et al (2016), Hung-Lau and Wang (2009), Rao and Holt (2005) and Govindan et al. (2015) respectively. The study recognized that operational performance firmly influenced reverse logistics link with competitive advantage.

Manufacturing firms in UK should implement resource selection processes that enhance the chances of gaining comparative advantage. This selection process should be guided by a strategy that requires identifying the uniqueness of resources the organization has and strategically situating these resources in an approach that yields comparative advantage (Hunt & Madhavaram, 2012). The study compels management of manufacturing firms to make policies that leverage the influence of reverse logistics on competitive advantage. Furthermore, to achieve competitive advantage manufacturing firms should promote outsourcing reverse logistics activities when they do have the capacity, He and Wang (2005), formation of strategic alliances to facilitate reverse logistics activities Hung-Lau & Wang (2009), adoption of reuse, recycle and remanufacture policies Rogers and Tibben-Lembke (2001) and developing closed-loop supply chains (Govindan et al., 2015; Sangwan, 2017).

Hence, this study observed that UK manufacturing firms are keen to implement reverse logistics especially product take back, but many of them are handicapped by the investment involved in building recycling plant (Holt and Ghobadian, 2009).

6.6 Sustainability performance and competitive advantage

The research findings of this empirical analysis have proved that some and not all the triple bottom line principle of; social, environmental, and economic performances lead to achieving competitive advantage. This section discusses the individual sustainability performance principles and their impact on the generic principles of competitive advantage: cost, quality, flexibility, and dependability.

6.6.1 Social performance (SP) and competitive advantage.

The empirical result shows that social performance positively and significantly, impact on all the four principles of competitive advantage: cost, quality, flexibility, and dependability with standardised coefficient: (SP → CA, β=.069, significant at the level 0.01; SP→QA, β= .095, significant at the level 0.01; SP→FA, β=.595, significant at the level 0.01; SP→DA, β=059, significant at the level 0.01) respectively. The theoretical view derived from this observation is that achievement of social performance leads to competitive advantage (cost, quality, flexibility, dependability) of UK manufacturing industries. The reason for this positive and significant relationship lies with the fact that many manufacturing businesses are awakened by public reactions to issues they did not pay particular attention to and did not see them as being part of their business responsibility (Porter and Kramer, 2006).

For instance, Nike faced serious product boycott by consumers in USA due to reports in New York Times and other media outlets about abusive labour practices in their Indonesia’s plants in 1990s (Porter and Kramer, 2006). In 1995, there was a huge protest by Greenpeace against

Shell oil due to their decision to sink the Brent Spar an obsolete oil rig in the North Sea. Fast food companies have been accused of contributing to rapid growing rate of obesity and poor nutrition (Porter and Kramer, 2006). Social performance are strategies that demonstrate an awareness and actively participate in initiatives that contribute to society and the natural environment. Hence, social performance is deliberate strategy that manufacturing firms pursue to achieve competitive advantage. Broadly speaking, social performance strategies that are tailored towards reducing environmental impact of production process and final product lead to achieving competitive advantage (Porter, 1995).

Again, social performance strategies that help to promote the reputation of the firm reduce waste and prevent the use of toxic materials. These strategies generally attract more customers leading to increase in profit and low cost of production. The competitive advantage objective is achieved if social performance activities result in reducing waste, energy usage or other environmental impacts of the production processes. It can also be argued that social performance strategies may influence competitive advantage through employee engagement and productivity. Literature has shown that motivated and committed workers are more efficient and productive (Pfeffer, 2010), and given that social performance strategies emphasize human health and wellbeing in the supply chain, leads to highly competitive advantage. This study is in line with previous research (Porter, 1995; Pfeffer, 2010; Marshall et al., 2015) that find that social performance strategies lead to achieving competitive advantage. With respect to cost advantage, social performance leads to increase in customer loyalty and satisfaction. This therefore enhances increase in sale and profitability, thereby resulting in cost leadership advantage. This study is in line with Chiou et al (2011) who observed that social performance linked to environmental management activities lead to competitive advantage.

6.6.2 Environmental Performance (ENV) and competitive advantage

The empirical results of this observation show that environmental performance is positively and significantly impact on quality flexibility, and dependability, however, this is achieved as a trade-off of cost. The statistical results showed the following standardised coefficient; (ENV→CA, .092, not significant; ENV→QA, β= .064, significant at 0.05 level; ENV→FA, β= .158, significant at 0.05 level; ENV→DA, β=.010 significant at the level 0.05). The theoretical observation of this finding shows that environmental performance strategies lead to quality flexibility and dependability advantages. It appears that the capability of environmental performance strategies to achieve quality and flexibility advantage is counterbalanced by increase in cost.

In essence, the environmental performance strategies are developed with much focus on elimination of waste to achieve competitive advantage in quality while cost advantage is compromised (Grote et al., 2007). According to Azvedo et al (2011) environmental related performance such as collaboration with suppliers for environmental planning and knowledge sharing have positive and significant impact on quality, flexibility, and dependability advantages. The findings of this study are in line with previous studies where positive correlation is established between environmental performance and quality, flexibility, and dependability (Vachon and Klassen, 2008). Environmental performance reduces waste generations and prevent the use of hazardous materials in production.

Hence, this improves the quality of the product leading to achieving competitive advantage in quality (Vachon and Klassen, 2008). On the other hand, environmental related performance activities that help to identify qualified suppliers also to a large extent help by reducing the supply based of the focal company. In this instance manufacturing can take delivery of materials at the right time in right quality, thereby ensuring efficient and on time delivery. This leads to dependability advantage because customers can take delivery of what they order.

Again, with environmental collaboration with suppliers, manufacturers can vary production process to meet customer's requirements (Geffen and Rothenberg, 2000; Azvedo et al., 2011). The elimination of waste results in high environmental performance leading to quality, dependability, and flexibility advantages. The observation of this empirical result is consistent with the findings of Zhu and Sarkis (2007), Green et al (2012), Geng et al (2017). The focus of green strategy is to reduce product related environmental impact on the environment. Reducing environmental impact and any toxic materials in the production process and the final product ensures quality of the final product. In addition, the ability of the environmental performance strategies to eliminate any environmental impact results in increasing the capability of the firm to respond to changing customer requirements at a truly short time interval (Shahbazpour and Seide, (2006)

On the other hand, the achievement of quality and flexibility and dependability advantages come with a counterbalance with trade-off in cost. Environmental performance strategies aim at reducing solid/liquid waste, emission reduction and consumption for hazardous/toxic materials require huge investment thereby increasing the cost of production. This may occur if additional processes are included to the production line in order to meet customer demands (Shahbazpour and Seide, 2006). Again, apart from huge investment required to achieve environmental performance, the lack of appropriate green technology at the disposal of many small and medium manufacturing firms to aid the achievement of the environmental goals affect cost advantage (Esfahbodi, et al 2016). This observation indicates that environmental performance by UK manufacturing firm does not necessary result in achieving competitive advantage in all the generic principles of competitive advantage. The capacity of UK manufacturing firms to leverage on quality, flexibility and dependability advantages is moderated by negative cost advantage.

6.6.3 Economic performance and competitive advantage

The empirical results show that economic performance is positively and significantly related to all the four principles of competitive advantage (cost, quality, flexibility, and dependability) with the following coefficient values; (ECO→CA, β=.045, significant at the level 0.01; ECO→QA, β= .069, significant at the level 0.01; ECO→FA, β=.229, significant at the level 0.01; ECO→ DA, β= .215, significant at the level 0.01). Theoretical view obtained from this observation is that achieving economic performance leads to significant increase in competitive advantage. The positive causal relationship between economic performance and competitive advantage in this study is not surprising since economic performance strategy is measured by the extent to which the firm is able to bring financial inflows into the company. This can be achieved when the firm is making profit due to absence of operational loses (Zhu et al., 2008). If a focal firm has the financial capacity due to low-cost production, it can sell at relatively competitive price to its customers, thereby enjoying competitive advantage in cost. According to previous studies, once a firm reduces cost associated with purchased materials, it gives the firm the capacity to produce product at a lower cost thereby giving the firm competitive edge in selling at a lower price than competitors. Therefore, the positive relationship between financial performance and competitive advantage in cost is achieved when the financial inflow into the company allows the company to produce more and sell at lower cost to customer as compared to competing firms (Li et al (2006). On the other hand, the positive relationship with quality, flexibility, and dependability, stems from the fact that economic performance strategies allow cost reduction and maintains reliability of operations (Lee et al., 2006), thereby increasing quality, flexibility and dependability of the firm's operations and product. Implementing competitive advantage strategies require capital outlay; it is therefore valuable for the firm to have strong economic performance to be able to implement all the generic principles of competitive advantage (Chiou et al., 2011).

6.7 Findings

The findings of this study are based on respondent's perception by rating their company's green activities and performance and competitive advantage outcomes. Hence, the findings did not adopt any approach to confirm the perception and judgement of the managers. Although this research provided sufficient understanding of the research phenomenon using structural equation modelling as a quantitative analysis technique to enhance external validity, using another research strategy within the same paradigm could have further explored the perception and judgement of the managers. In order to justify the outcomes and the results of the quantitative analysis, qualitative literature review was adopted to compare the findings in this study such as eco design impact on environmental performance (Green et al., 2012) investment recovery impact on economic performance (Zhu and Sarkis 2004) and green initiatives with competitive advantage (Geng et al., 2017). The thesis, however, confirms the quantitative results using qualitative results of previous studies that have examined similar phenomenon. In respect to the impact of GSCM practices and firm performance, the results of this study are in line with Younis et al (2016). Younis et al (2016) adopted exploratory semi-structured interviews to further explore why some of their findings were inconsistent with previous studies. To ascertain why customer cooperation did not impact positively with the triple bottom line, Younis et al (2016) asked a manager of manufacturing firm that specialises in the manufacture of building materials; "*Why do you think environmental cooperation practices such as cooperation with customers general fail to improve the triple bottom line?* The manager answered that*:*

……." Firms need to have the knowhow in using the recycled product in manufacturing again. For example, we have made a system to reduce the emissions because we have kept a blower sucking the dust and pumping inside the wall, running down the sediment. We are collecting

90% of the dust generated and entering it again into production which not all firms in this industry are good at".

In ascertaining why green implementation sometimes fail to impact positively on competitive advantage, some mangers felt that the issues in measurement of performance and competitive advantage might be the cause for the lack of relationship between green supply chain management practices and competitive advantage. This claim was supported by many respondents including the quality and assurance (Q&A) manager of company who noted that:

…." *There are no agreed upon measures to gauge how well your corporate performance and competitive advantage has improved after implementing green supply chain management practices as all existing measures are subjective"* (Govindan et al 2014). For instance, in addressing why customer cooperation impacts negatively on social performance competitive advantage, Younis et al (2016) indicated that *"social dimension is underexplored since there are lack of measurement items to validate social performance and competitive advantage.* These observations are in line with the results of this thesis, where no significant relationships were found between customer cooperation and the triple bottom line and competitive advantage. Furthermore, another significant factor that enables green supply chain practices to improve firm performance and competitive advantage is connecting individual practices with individual performance and competitive advantage factors. In other words, some green supply chain practices need to be implemented together with other green supply chain practices to be able to achieve superior competitive advantage. For example, in Younis et al (2016) the production manager of company advised that:

…" *In some cases, green purchasing alone may not impact your corporate environmental performance and lead to competitive advantage unless it is coupled with other green supply chain practice such as eco-design".* These observations confirm the results of this thesis, which finds out that green implementation should cover every aspect of the supply chain because some of the green initiatives depend on one another to be able to achieve the expected outcomes and competitive advantage.

Green marketing initiatives was found to impact positively on firm performance and competitive advantage in this study. These results corroborate the findings of Younis et al (2016) and Geng et al (2017), where they observed that “failure to market green initiatives within the firm will lead to losing the management support needed to successfully implement green supply chain practices and consequently reap the benefits”. The authors further indicated that firms need to advertise any green related initiatives to the wider community to promote the image of the firm that leads to competitive advantage. For instance, to ascertain why green marketing impacts on firm performance and competitive advantage, a production manager of company interviewed by Younis et al (2016) indicated that.

…” *You have to be publicizing yourself, what you are doing in favour of society. If this message did not go to the society, how will people know what you are doing for the environment” This* observation confirms the findings of this thesis; those green practices where chemical content incorporated in the product is clearly labelled helps to promote the image of the firm leading to achieving competitive advantage. Overall, these observations confirm the overall aim of this thesis that “being green is being competitive”. The results of the data analysis coupled with anecdotal evidence from literature review have pointed out that manufacturing firms who implement green initiatives such as eco design, green purchasing, investment recovery, green marketing become more competitive and achieve superior firm performance.

6.8 Summary of the chapter

The aim of this study is to examine the causal relation relationship between green supply chain management practices and firm performance as well as competitive advantage. This chapter presents a comprehensive report of the overall research findings derived from the empirical analysis of the hypothesised causal relationship that are required to answer the research questions. This chapter begins with the overview of the theoretical perspective of enablers-GSCM practices-performance-competitive advantage derived from the empirical investigation. Furthermore, the research findings of enablers and implementation of GSCM practices were discussed followed by empirical results relating to causal relationship between GSCM practices implementation and performance outcomes. The causal relationships between GSCM practices and competitive advantages were discussed followed by the relationship between sustainability performance and competitive advantage. The empirical findings of individual variables were addressed. The research findings were discussed in relation to current studies demonstrating consensus with empirical findings of current literature. The next chapter describes the thesis conclusion, dealing with the study's contribution, managerial implication, research limitations and future research. The outcome of data analysis supports the overall aim of the study that seeks to ascertain whether being green is being competitive.

CHAPTER 7: CONCLUSION

7.1 Introduction

This chapter concludes the research work by re-examining the research objectives, suggested research questions and drawing out the study's main contributions along with the key managerial implications stemming from the research findings. Furthermore, the limitations of the research are discussed and recommendations for future research opportunities proposed. Section 7.2 presents the research model revisited and section7.3 discusses the research objectives. Section 7.4 presents the answers to the research questions; this gives details of how the questions have been answered. Key managerial implications derived from the empirical analysis are presented in section 7.5. Section 7.6 outlines the theoretical methodological and empirical contributions offered by this research specifying various range of the significant of the study. The research limitations and recommendations for future research are highlighted in section 7.7 and 7.8, respectively. Section 7.9 presents chapter summary.

7.2 Research model: Revisited

Green Supply Chain Management (GSCM) as a subset of Supply Chain Management (SCM) has received attention over the last three decades from both academics and practitioners (Linton et al., 2007; Sarkis et al., 2011). Within this period, GSCM has identified as the most popular strategy by which manufacturing industries adopt to promote sustainability and competitiveness through reduction of environmental impact and leveraging cost of operations (Zhu et al., 2008d; Pagell and Wu, 2009). (Walker et al., 2008; Esfahbodi 2016). Lately, several high-profile studies focusing on the concept have been identified where justification of positive impact of GSCM implementation on performance and competitive advantage has come out with mixed reactions and inconsistencies (Geng et al., 2017). These inconsistencies have come about as a result of lack of consistency regarding the findings of whether GSCM implementation will lead to positive sustainability performance and competitive advantage (Eltayeb et al., 2011)

Attempt to examine whether being green is being competitive is significant from the perspective of both academic and practical. With respect to this, and to further broaden the scope of GSCM concept, this research has hypothesized and empirically assessed a systematic model linking the fundamental framework of critical enablers, GSCM practices and their associated sustainability performance outcomes and competitive advantage. The main research focus is on various manufacturing firms in UK. For instance, previous studies have indicated that UK automotive industry is a major contributor of environmental pollution and resources depletion (DEFRA, 2011; Esfahbodi, 2016). In line with the focus of this research on sustainability performance and competitive advantage the emphasis on various manufacturing firms seems viable since other manufacturing firms such as metal manufacturing, pharmaceutical manufacturing, electrical manufacturing, food and beverage manufacturing and wood product manufacturing are not immune from contributing to environmental degradation (Jabbour et al., 2015).

Based on empirical analysis, this research has established that there are causal relationships between critical enablers → GSCM practices → sustainability performance → competitive advantage outcomes. The study has further unravelled new research findings concerning contemporary theoretical view of critical enablers → GSCM practices → performance → competitive advantage. The complementary enabler of GSCM implementation which consists of external and internal enablers are deemed necessary for implementation of GSCM practices. It is identified that the interplay of both internal and external enablers serves as a precursor for successful adoption and implementation of GSCM practices.

7.3 Research objectives re-examined.

This study provided six objectives:

- To identify the essential critical enablers that influence implementation of GSCM.
- To explore the significant relationship between critical enablers, and GSCM practices.
- To explore the relationship between GSCM implementation and social, environmental, economic performances and competitive advantage.
- To explore how achieving social, economic, and environmental performance leads to competitive advantage.
- To develop validated and reflective scales to measure all the research constructs.
- To conceptualise an inclusive enablers-GSCM-sustainability performance-competitive advantage model.

These objectives have been identified in this research to help in answering the research questions. In order to realise these objectives, this research carried out systematic literature review on critical enablers, GSCM practices, sustainability performance and competitive advantage. To accomplish this relevant literature touching on critical enablers was reviewed (RO1). This is closely followed by reviewing the most current literature surrounding GSCM practices. Systematic literature review of current operations and supply chain management journals spanning 29-year time limit (1990-2019) to explore and find essential GSCM practices was carried. This period was selected because high quality research on GSCM related studies have been published after 1990 (Giunipero et al 2008; Esfahbodi, 2016).

In order to address research objective two (RO2), an integrated review of literature approach was used to identify the link between the GSCM enablers and GSCM practices. Furthermore, literature review to identify journals that address sustainability, competitive advantage and their relationship was employed to address research objectives three and four (RO3 & RO4). In addition, the appropriate reflective scales measuring the research constructs have been identified and adopted directly from previous studies and from most current and highly cited studies (Zhu and Sarkis, 2005; Zhu et al 2007; Green et al., 2012; Zhu et al 2008; Esfahbodi et al 2016; Geng et al., 2017). This study adopted various statistical analysis to ensure that the measures used in this research truly represent their associated constructs (RO5). Having satisfied objective 1, 2 and 3, this study was able to theorise a comprehensive critical enablers-GSCM practices- sustainability performance-competitive advantage model (RO6).

To assess the theoretical framework of this study quantitative approach was adopted using survey questionnaire. Hence, data for this study was collected from 375 experienced supply chain managers within UK manufacturing sector. Respondents stretched from plant managers, health and safety managers, logistics managers, operations managers, purchasing managers and engineering managers within various manufacturing firms in UK. Lastly, to justify the theorised hypotheses to test the causal relationship in the research model, this study adopts **structural equation modelling (SEM) technique.**

7.4 Answers to the research questions

This research developed four main research questions:

RQ1: Which critical enablers must be present to successfully influence implementation of GSCM practices?

RQ2: What impact does implementation of GSCM practices have on social, economic, and environmental performances?

RQ3: What impact does implementation of GSCM practices have on competitive advantage?

RQ4: What impact does sustainability performance have on competitive advantage?

This study has answered the research questions through the active implementation of the above-mentioned research objectives. The empirical analysis of the data of this study helped to successfully answer the research questions. The research model’s ability to answer all the research questions depended entirely on an integrated nature of the research model in incorporating and operationalising the four main research clusters (critical enablers, GSCM practices, sustainability performance and competitive advantage) into a comprehensive single model, which is very rare in literature. Following the model fit indices and statistical significance achieved in the analysis, it is argued that the proposed model is a good representation of the theoretical relationships among the study's main research clusters.

The empirical findings of this study found out that critical enablers are necessary to the successful implementation of GSCM practices. In consequence, the findings indicate that external enabler; customer pressure and ISO 14001 certification in collaboration with internal enablers; management commitment and sharing of important information and knowledge among departments should be present for successful implementation of GSCM practices, thereby answering research question one (RQ1). This generally confirms that both internal and external enablers when collaborated influence manufacturing firms to integrate environmental good practices into their supply chain successfully.

In addition, the results from the SEM analysis confirm that implementation of GSCM practices promote increasing level of sustainability performance outcomes as well as competitiveness of UK manufacturing firms. This observation answers research questions two and three (RQ2 & RQ3). Furthermore, the empirical analysis shows that high levels of social, environmental, and economic performances (triple bottom line) outcomes lead to achieving competitive advantage in cost, quality, flexibility, and dependability, answering research question four (RQ4).

In conclusion, these new research findings imply that individual GSCM practices affect sustainability performance outcomes individually and not as a whole. For example, the SEM analysis of this study indicates that customer cooperation has no positive and significant relationship with social, environmental, and economic performance. However, green purchasing implementation has a positive and significant relationship with social, economic, and environmental performances. In the same way, implementation of customer cooperation does not positively and significantly impact on competitive advantage cost, quality, flexibility, and dependability. The empirical analysis shows that implementation of reverse logistics leads to achieving high level of quality, flexibility, and dependability advantages but this achievement comes with trade-off of cost advantage.

In effect, these findings indicate that achieving competitive advantage; quality, flexibility and dependability comes with trade-off of cost advantage. It further signifies that cost advantage has not yet been achieved as a result of implementing reverse logistics. In conclusion therefore, these novel research findings indicate that not all GSCM practices lead to achieving competitive advantage, variables at the same time. Individual GSCM practices implementation leads to achieving the principles of competitive advantage differently and individually but not as a whole. Again, high sustainability performance outcomes necessarily do not lead to achieving cost, quality, flexibility, and dependability advantages.

This study is generally in contrast with some arguments that achieving improved sustainability performance (triple bottom line) automatically results in competitive advantage in cost, quality, flexibility, and dependability. The empirical results of this study have shown that high social performance positively and significantly impact on cost, quality, flexibility, and dependability (Porter and Kramer, 1996). This result confirms that there is ‘win-win’ opportunity for high social performance and competitive advantage. This positive and significant impact is attributed to the fact that, reputation of a firm, which is the perception stakeholders hold about a company has become a source of strategic advantage. Therefore, a superior social performance serves as intangible asset that promotes a firm’s ability to create worth (Caves and Porter, 1977; Miles and Covin, 2000). It draws more customers to the firm and as result increases profitability. In return manufacturing firms can sell at competitive low price to attract more customers. Social performance environmental related activities ensure decrease in hazardous substance in product, ensuring the welfare of employees and other stakeholders. This helps to reduce any delays in production and helps employees to efficiently meet the various needs of customers (Geng et al 2017)

Furthermore, based on the empirical results, high level of environmental performance does not necessarily lead to competitive advantage. It has been determined by the SEM analysis that high level of environmental performance leads to achieving competitive advantage in quality flexibility, and dependability. However, this is achieved at the trade-off of cost advantage. This suggests that while improved environmental performance leads to quality and dependability advantage, this comes with the cost advantage being compromised and suffering negative trade- off. With respect to achieving high economic performance, the SEM results indicate that high economic performance comes with win-win opportunities for the firm and thereby leading to highly competitive advantage in cost, quality, flexibility, and dependability.

The novel findings of this research indicate that achieving economic performance leads to competitive advantage. This result extends the current debate on sustainability performance by expounding the suggestion that sustainability performance is undeniably a source of gaining competitive advantage. This study aimed at investigating the relationships between critical enablers-GSCM practices-sustainability performance and competitive advantage.

It can further be emphasised that both external and internal enablers must be present to influence manufacturing firms to implement GSCM successfully. Regarding the relationship between GSCM and sustainability performance, the findings have shown that not all GSCM practices impact on sustainability performance positively. For example, in this study, all the GSCM practices apart from customer cooperation did impact on social, environmental, and economic performances. One can therefore assume that based on the SEM analysis the initial research model can be accepted as valid.

7.5 Overall view of GSCM agenda

This section focuses on the transformational agenda of GSCM to bring about sustainability and competitiveness of the firm. This agenda can be determined by the empirical analysis through the SEM output. This research has four clusters that are joined with a chain of causal relationships (see figure 3.2). The first section of this research model highlights the notion that firms engage in GSCM implementation because of certain critical enablers that influence their decision. The second phase of the research model emphasises the relationship between GSCM practices, sustainability performance and competitive advantage. The last side of the research model focuses on the consequences of sustainability performance on competitive advantage.

Based on the findings of this research, it can be accepted that both internal and external enablers successfully influence implementation of GSCM practices. It is argued that manufacturing firms most likely would not voluntarily engage in GSCM implementation if influencing factors such as customer's pressures are not brought to bear on them (Carter et al., 2000; Zhu et al., 2007; Sarkis et al., 2011; Laosirihongthong et al., 2013). Customers are somewhat important stakeholders as far as manufacturing supply chain is concerned and thus, manufacturing firms cannot ignore satisfying their disposition of quality product such as sustainable packaging (Laosirihongthong et al., 2013). However, whether GSCM practices would be adopted by manufacturing firms to a large extend depends on the effect on the triple bottom line (Zhu and Sarkis, 2007). Hence, many manufacturing firms are engaging in GSCM practices in order to stay in business and outplay their competitors.

However, it is not surprising that in this study the research findings showed that management commitment to sustainability is one of the major enablers that successfully influence GSCM implementation. Even though management are aware that GSCM implementation could have negative impact on economic performance of the firm within the short term, notwithstanding, superior reputations serve as a strategic advantage which outcomes may include: (1) pricing reductions; (2) improved morale; (3) risk reduction; (4) increased flexibility; and (5) enhanced economic performance (Fombrun and Shanley, 1990; Fombrun, 1996). Furthermore, this research findings show that implementation of GSCM practices has a positive impact on social and environmental performance of UK manufacturing firms. These results confirm the position held by previous studies that GSCM implementation leads to achievement of superior environmental, social, and economic performances (Govindan et al., 2014).

The study further revealed that customer cooperation among UK manufacturing firms is yet to gain root since it is negatively associated with social, environmental, and economic performances. The results on second side of the research model supports seventeen prepositions out of twenty-one of this study. According to the results, the only prepositions that are not supported by this study includes H3ei, H3eii, H3eiii and H3eiv. The identification of causal relationship between GSCM implementation and social, economic, and environmental performances is a vital contribution that this study deems necessary to broaden the scope of conceptual and theoretical methods in the areas of operations and supply chain management.

In addition, the research results indicated that achievement of sustainability performance leads to competitive advantage. According to Miles and Covin (2000), achieving financial performance empowers manufacturing firms to constantly improve their cost advantage while meeting the regulations to ensure quality, flexibility, and dependability advantages in the competitive markets. On the other hand, the empirical results of this study indicated that achieving superior environmental performance did not result in significant improvement in cost advantage. This result is consistent with the results of Vachon and Klassen (2008) where they did not derive positive and significant link between environmental performance and cost advantage. However, the result supported the outcome of current and previous studies that have argued that environmental performance positively impacts quality, flexibility, and dependability (Vachon and Klassen, 2008).

Environmental performance has been identified as the most symbolic factor for competitive advantage, although this comes as a trade-off of cost advantage. The positive relationship is achieved when environmental performance focuses on green innovation leading to decrease in pollution, hazardous substances, waste elimination and improving environmental compliance (Chiou et al., 20110). The results of this study also showed that enhanced social performance, that is focused on environmental collaboration with customers can effectively reduce cost, maintain effective reliability of operations hence, ensuring quality and customer dependability (Lee et al., 2007; Azevedo et al., 2011). In other words, manufacturing firms have been proposed to implement GSCM practices in an efficient and effective way to enable them to reap the full benefit of corporate profit, increased market share and enhanced competitive advantage. Therefore, based on the research model and the empirical results it can be concluded that being green is being. This study therefore supports the proposition that there is relationship between GSCM enablers - GSCM practices - triple bottom line - competitive advantage.

7.6 Research contributions

In this section, the research focuses on the major key managerial, theoretical, methodological, and practical implications. This section begins with the key managerial implications.

7.6.1 Managerial contribution

This study is one of the trends of research studies that examines overarching view of GSCM practices and linking them to the triple bottom line and competitive advantage at the same time. The study also uniquely incorporates antecedent of enablers that influence manufacturing firm’s capabilities to implement GSCM practices. Most of the previous studies conducted in this field have paid great attention to the relationship between GSCM and environmental performance and economic performance without considering the competitive advantage. This study is one of the trends of studies conducted in UK that comprehensively links seven GSCM practices with the triple bottom line and the four competitive advantage principles at the same time. Studies such as Esfahbodi, et al (2016) focused on linking four SSCM practices with environmental performance and cost performance. Feng et al (2016) focused on environmental management systems, switching cost, competitive intensity, and performance. Vachon and Klassen (2008) focused their study on linking environmental collaboration with cost, quality, delivery, flexibility, and environmental performance.

However, all the previous studies that have examined the relationship between GSCM implementation, the triple bottom line and competitive advantage in isolation have articulated different results. Therefore, the capability of the GSCM implementation to bring about improved triple bottom line and competitive advantage seems insufficiently and inconsistently articulated. This research, therefore, is a step forward by contributing to filling the research gap through developing a comprehensive and integrated GSCM practice and linking them to the triple bottom line and competitive advantage.

The tendency in most of the previous literature focusing in this area examines either one, two three or four aspects of GSCM practices, however this research has employed a multi-dimensional method by exploring seven GSCM practices: green purchasing, eco design, investment recovery, green marketing, green distribution, customer cooperation and reverse logistics. This study examined each GSCM practices in relation to social performance, environmental performance, economic performance, cost advantage, quality advantage, flexibility advantage and dependability advantage. The findings of this study offer managers with practical procedures as to how GSCM practices are to be employed. Firstly, with the uncertainty surrounding the impact of GSCM on the triple bottom line (TBL) and competitive advantage, this study suggests to managers that GSCM implementation is crucial for firms to gain economic performance. The study further suggests to managers that to achieve success in this competitive global market, managers must cultivate the attitude of realising how both internal and external enablers when collaborated could result in successful implementation of

GSCM practices. Furthermore, the study suggests to managers, which GSCM practices result in improved triple bottom line and achieving competitive advantage. Hence, the study encourages managers of manufacturing firms to cultivate the habit of employing proactive environmental practices in their daily operations. This could be achieved by encouraging their subordinates to be more proactive to continuous environmental enhancement strategies to neutralise any threats posed to their operations and the environment.

In addition, this study helps managers to identify the essential GSCM practices thereby giving them better understanding of the various GSCM initiatives available to them to adopt. In this regards, managers of manufacturing firm will be able to identify which GSCM practices need to be accorded the utmost priority. In this sense, considering that eco design and green purchasing produced highest standardised coefficient and most significant level, the effect is that managers must pay critical attention to these two GSCM practices since they bring more benefit to the firm. Manufacturing managers must adopt eco design and green purchasing technologies that will aid them to derive full economic benefit. Furthermore, managers must pay special attention to behaviours of suppliers and make sure they comply with the focal firm's environmental strategies to achieve and sustain high green purchasing benefit.

The research findings showed that customer cooperation have negative effect on the triple bottom line outcomes. This observation provides useful information to managers to re-examine their customer cooperation implementation to develop strategies to improve its outcomes. Again, the study also points out the GSCM initiatives that are easy to implement and require less or no capital outlay. For instance, to address the negative consequence of customer cooperation, managers must pay attention to customers switching attitudes when evaluating the customer cooperation. Ignoring customer's behaviours, feedback and intelligence will affect the company's ability to achieve the maximum benefit of customer cooperation. The research findings are useful and beneficial to policy makers and regulators since it offers them the opportunity to understand the strategies that are used to motivate and encourage manufacturers to embark on GSCM practices.

Firstly, management own commitment to environmental sustainability, which is informed by their quest to achieve competitive advantage serves as a motivation for GSCM implementation. When management realises the significant of proactive environmental practices, they are somewhat motivated to adopt them to achieve the maximum benefit associated with such initiative. This commitment to environmental initiatives would contribute to harmonizing the economic achievement and environmental practices. On the other hand, effective dissemination of important information and knowledge about sustainability among the various departments and close collaboration triggers balancing effect of environmental protection and financial performance. When quality information and knowledge about environmental protection are shared among the various departments, it serves as a motivation for managers to engage in environmental management practices if they especially realise the economic benefit associated with such practices.

Again, managers of manufacturing firms must also know that there are public stakeholders who exert some form of pressures on manufacturing firms to adopt GSCM implementation. It is explicitly assumed that customers, as stakeholders continuously monitor the environmental footprint of many manufacturing firms and consistently insist on adherence to environmental regulations. These pressures are brought on manufacturing firms to first stick to environmental regulations and secondly to produce goods that meet their requirements (Huang 2013)

Moreover, the study creates awareness among manufacturing managers about the benefit of GSCM implementation and social, economic, and environmental performances. The findings of this research inform managers about individual GSCM practices and how they impact on social, economic, and environmental performances differently. This creates awareness among potential practitioners about the probable benefit these green initiatives have, especially on profitability. In consequence, the study helps to erase the doubt in the minds of manufacturers but whether it pays to adopt GSCM practices. The long-standing inconclusive and inconsistent results of whether green supply chain pays (Rao and Holt, 2005) has been a deterrent to manufacturing firms to implement GSCM. However, this study has cleared some of these doubts by empirically showing the GSCM practices and how they lead to financial and social benefits.

These results particularly inform managers to view GSCM practices as an approach to achieving financial benefit in the long term rather than to satisfy regulatory requirements. Furthermore, the results of this study guide manufacturers to identify which green initiatives result in competitive advantage. The results will guide manufacturers to a large extent incorporate environmental sustainability to their traditional supply chain thereby fulfilling the firm’s sustainability objectives. On the part of regulators and policy makers, the results of this study have shown that extending incentives to manufacturers goes a long way to attract and retain more manufacturers to adopt and implement green initiatives.

Therefore, improving on infrastructures for green initiatives and granting tax incentives to those manufactures who proactively engage in green practices will enhance the capabilities of these practitioners and to a larger extent attract more new manufacturers. Lastly, the study offers practitioners and regulators the necessary and important information regarding how green supply chain operates, the overall consequences of implementing them with respect to enhancing performance outcomes and achieving competitive advantage. This research is a move in advancing the theoretical, methodological, and practical appreciation in the field of green supply chain and especially, with the explosion of environmental activism. The subsequent sections focus on the key theoretical, methodological, and empirical implications of this research.

7.6.2 Theoretical contributions

This research study contributes to GSCM field of study by developing a multi-dimensional and overarching model, that has the capacity to assess the relationship between GSCM implementation, sustainability performance (triple bottom line) and competitive advantage taking cognizance of the influence of critical enablers serving as antecedent. The study's model of critical enablers-GSCM practices-sustainability performance-competitive advantage is novel in that, it attempts to investigate this model in a comprehensive and holistic approach by linking the four frameworks (critical enabler, GSCM practices, sustainability performance and competitive advantage) of this research. This model is hardly found in contemporary literature in the field of green supply chain where all these four frameworks are put together in one study with a very comprehensive GSCM practices and their associated performances outcomes including competitive advantage outcomes.

To be able to appreciate the overarching concept of GSCM practices and associated performance outcomes couple with achieving competitive advantage, there should be an overall integrated and multi-dimensional piece of research that seeks to address all the phenomenon rather than the fragmented and isolated nature of current literature. This study seeks to address this challenge to extend current debate by giving a broader scope of the theory of GSCM practices-sustainability performance-competitive advantage. In this way, practitioners can appreciate the impact of GSCM implementation on performance as well as competitive advantage at the same time. Again, this trend also helps practitioners who want to ascertain whether green implementation can result in performance outcomes as well as gaining competitive advantage from the superior performance outcomes.

The lack of comprehensive literature in this field may be due to the fact that green supply chain management is made up of two different disciplines (supply chain and sustainability), and as such there is difficulty on the part of researchers to bring the different components together to form a single model. In addition, existing studies concerning sustainability performance have been concentrated on either environment or economic performance or both in one study. Combining the three sustainability principles comprising environmental, economic, and social performance in one study are hardly found in literature. In order words, there is lack of balance research towards investigation into social performance as compared to economic and environmental. Another major contribution of this research is about its comprehensive perspective of the green supply chain management initiatives.

According to Zhu and Sarkis (2004) many previous studies in the area of green supply chain initiatives have failed to look at integrating green practices at each level of the traditional supply chain management. This study takes a different perspective by conceptualising green supply chain using seven green initiatives namely eco design, green purchasing, green marketing, green distribution, investment recovery, customer cooperation and reverse logistics in critical enables-GSCM practices-sustainability performance-competitive advantage theory. Many previous studies have adopted the guidelines by Zhu and Sarkis (2005) in conceptualising GSCM practices. However, Geng et al (2017) went a step further to use the guidelines but also included the voluntary willingness of manufacturing firms to adopt GSCM practice. In this sense, the study also included other less used green initiatives in their study. This study replicated the guidelines of Zhu and Sarkis (2005) but went further to include the procedure of Geng et al (2017). These initiatives exhaustively cover both internal and external practices of the traditional supply chain management (Pagell and Wu, 2009; Sarkis et al., 2012). It is assumed that the lack of comprehensive conceptualisation of the green initiatives lies in the difficulty and the complexity to justify the inclusion of some of the initiatives theoretically. Again, green supply chain management is a new field, with some of these variables being newly developed and separately captured in previous studies.

This has resulted in extensive search of previous studies to ensure that the variables identified truly represent GSCM. Hence, this study extends the frontiers of GSCM research by developing a new corroborated conceptual framework for investigating the relationship between GSCM implementation, sustainability performance and competitive advantage, while recognising the role of enablers in influencing GSCM implementation. In addition, this research brings to light the popular assertion that GSCM implementation leads to enhanced social, economic, and environmental performance (Geng et al., 2017). In essence, this research further contributes to knowledge of GSCM literature by expounding the new discovered proposition that individual GSCM initiatives impact on triple bottom line differently.

For instance, this study shows that green purchasing positively and significantly impacts on social, environmental, and economic performances. This initiative confirms that there is win-win situation in implementing green purchasing (GP). However, on the other hand, customer cooperation negatively impacts on social, environmental, and economic performances among UK manufacturing firms. These results, therefore, constitute a new paradigm of GSCM theory that individual GSCM initiatives impact on sustainability performance and competitive advantage differently. Furthermore, this study has shown that achieving sustainability performance (triple bottom line) may lead to enhanced competitive advantage in cost, quality, flexibility, and dependability. For instance, social performance according to this study, impact on cost, quality, flexibility, and dependability. In effect, this study makes new proposition that social performance can lead to competitive advantage. On the other hand, environmental performance strongly impacts on quality, flexibility, and dependability advantages with trade–off from cost advantage.

In consequence, it is proposed that sustainability performance impacts on competitive advantage considering the number of propositions that are positively and significantly related. This observation constitutes a new theoretical paradigm of GSCM theory, that sustainability performance is certainly linked with competitive advantage, thereby confirm the overall aim of the study; being green is being competitive; manufacturing supply chain perspective. In addition, the study contributes to GSCM literature by helping to bring clarity to whether GSCM practices lead to triple bottom line and competitive advantage. Previous studies in this area have all come out with inconclusive findings and therefore to deal with lack of consistency, the findings of this study are in line with (Green et al, 2012; Chiou et al., 2011; Zhu et al., 2012; Elsfahbodi, 2016). This observation helps to clear the inconsistency within theoretical views concerning GSCM impact on sustainability performance and competitive advantage. These research findings provide new direction for future research and support the redefinition of previous knowledge and propositions in this area.

Furthermore, this study provides understanding of how collaboration of external and external enablers successfully influences GSCM implementation. This study extends previous knowledge about GSCM by developing a research framework that supports understanding of the extent to which sharing of information and knowledge among departments, management commitment and pressure from customers influence GSCM implementation. In consequence, the results of this research suggest that the coexisting of both internal and external enablers highly influence the implementation of GSCM. Thus, this research provides substantial contribution to the current debate, which relates integrating environmental practices at each level of the traditional supply chain to achieve superior performance outcomes and competitive advantage in manufacturing perspective, taking into consideration the role of both external and internal enablers. This study has shown that investigating the distinctive environmental variables and their impact on performance and competitiveness is predominantly worthwhile for offering significant theoretical and managerial understandings into the concept of GSCM.

7.6.3 Methodological contributions

This study adopted structural equation modelling (SEM) approach simply because, SEM has the capacity to vigorously examine the causal relationship between different variables and complex research model such as this study. In this regard, SEM can examine the causal relationship between the four frameworks of this research namely, critical enablers, GSCM implementation, sustainability performance and competitive advantage. Furthermore, this study adopted SEM approach because it allows making use of several indicator variables for a construct thereby ensuring valid conclusion (Hair at al., 2010). One major feature of SEM is its ability to simultaneously estimate separate causal relationship in one study and then turn it into one single model. (Kline, 2011). In other word, SEM permits for estimating and combining a huge multiplicity of statistical measures such as multiple regression and factor analysis. Hence, SEM can bring out the comprehensive understanding of the research model covering critical enablers, GSCM practices, sustainability performance and competitive advantage. SEM is best suitable for analysing complex model such as the one in this study than other multivariate analysis such as multiple regression, which is best suitable for estimating a single causal relationship (Hair et al., 2010; Kaplan, 2009).

Another significant feature of SEM is its ability to establish possible relationship between constructs as stipulated in the proposed model (Bagozzi and Yi, 201). Notwithstanding, these advantages of SEM, the approach could be complicated and difficult to understand and demands a comprehensive understanding of the basics of SEM language. Another complication of SEM usage is the application of SEM software such as AMOS and LISRIL. Researchers must be competent in the application of the selected software. As such, adopting SEM requires in-depth appreciation of quantitative methods and thus, the use of SEM in this study demonstrates the research's methodological contribution.

The multivariate approach of SEM extends the methodological significance, as it helps to confirm and justify the proposed research model, that the influence of enablers on GSCM implementation cause a relationship between GSCM and competitive advantage. The methodological contribution of this study supports the theoretical framework justifying the holistic conceptual framework that covers GSCM enablers, GSCM practices, sustainability performance and competitive advantage. This multivariate analysis method also undertakes validity and reliability test of the data, through conducting common method variance test (CMV) confirmatory factor analysis (CFA), multi-collinearity and goodness of fit indices to guarantee the model fit and robustness of the statistical analysis. In addition, it is maintained that the methodological significant of this study lies in SEM ability to vigorously analyse data with comprehensive assessment of the four clusters of the research model comprising the antecedent, the independent variables and dependent variables (Kline, 2011). In essence, it is confirmed that the methodological approach of this study is consistent with the research framework enablers-GSCM practices-performance-competitive advantage model.

7.6.4 Empirical contributions

GSCM practices by manufacturing industries have been investigated by many authors, but GSCM practices, sustainability performance and competitive advantage relative to manufacturing firms in UK has not been sufficiently explored (Nunes and Bennett, 2010; Taylor and Taylor, 2013; Esfahbodi, 2016). It is argued that all UK based studies in this area are in comparatively early stages with majority of them having been analysed using an anecdotal evidence (Yu and Ramanathan, 2015; Esfahbodi, 2016). Furthermore, most studies focusing on UK manufacturing are either examining a particular sector of manufacturing industries or examining the service and construction sectors. investigating different sectors of the manufacturing firms in UK has not been adequately explored (Yu and Ramanathan, 2015). This makes this research of great significance, as it is one of the trends of empirical investigation into the relationship between GSCM practices, sustainability performance and competitive advantage among UK manufacturing firms. Previous studies that examine the relationship between GSCM practices and performance outcomes among manufacturing firms include in UK include Yu and Ramanathan, (2015) and Esfahbodi et al (2016).

In effect, the few studies that have examined the impact of GSCM implementation on performance outcomes in UK have not adequately explored the impact of competitiveness of the firm and the role of enablers in influencing GSCM implementation (Yu and Ramanathan, 2015; Feng et al 2017). On the other hand, several studies have been conducted in other part of the world, concerning the impact of GSCM on sustainability performance and competitiveness of the firm, with the results coming out inconclusive and somehow contradictory (Rao and Holt, 2005; Green et al., 2012; Esfahbodi, 2016). The empirical contribution of this study once again lies in the ability of the research to confront the challenges of lack of consistency within the body knowledge of GSCM hence, conducting this rigorous empirical analysis and reporting conclusive results that are consistent with previous studies. Again, this study is of high quality since data were collected from experienced operations and supply chain managers of manufacturing firms across UK.

7.6.5 Practical contributions

- This is one of the first academic studies, which empirically proved that individual green supply chain management practices impact on various performance outcomes differently. It also further demonstrates that manufacturing firms achieve competitive advantage in cost, quality, flexibility, and dependability when they engage in green supply chain management.
- This study informs practitioners and business decision makers of the significance of GSCM implementation and which GSCM practices make significant contribution in achieving competitive advantage and superior performance.

- The research emphasises that GSCM implementation does not only impact environmental and economic performance positively, but also significantly effect social performance. Previous studies exploring the relationship between GSCM implementation and sustainability performance have failed to empirically assess the relationship between GSCM implementation and social performance due to lack of measurement metrics for social performance. This study has shown that there is positive correlation between GSCM implementation and social performance.
- Internal integration is an important capability triggering many supply chain improvement initiatives.
- As a final point, the cost of engaging in innovative green supply chain management practices is still a substantial concern for many businesses as well as assessing its return on investment (Lee & Ozer, 2007). This research provided an in-depth analysis and managerial interpretation of the impact of these practices on the triple bottom line, thereby clearing any doubt in the minds of manufacturers regarding the feasibility of GSCM implementation.

7.7 Research Limitations

This study, like any other research, has some limitations that serve as a step forward creating opportunities for future research. First, this study relied on self-reported personal data in each firm. This method has the potential to generate common method variance (CMV) issues and that could result in inflated causal relationship outcomes. This limitation is very crucial and therefore in interpreting the results of this study, CMV was taken into consideration. Notwithstanding the limitation associated with CMV, self-reported data cannot be classified as imperfect since on many occasions CMV may be exaggerated. Although the statistical analysis of this study has proven that CMV is not a problem with this study, future research could adopt multiple data collection strategies to guarantee reliability and validity. For instance, future research could adopt interview method alongside survey to assess the relationship between

GSCM implementation and sustainability performance to complement the results from survey source. This limitation is very crucial because the study is based upon a survey which uses a Likert scale. The survey asks managers to rate their firm's activities and performance in a range of manufacturing firms relevant to the study. No performance data is utilised to confirm the perception and judgement of the respondents. This limitation could have been dealt with if further exploratory study had been adopted to confirm the judgement of these managers. Younis et (2016) and Govindan et al (2015) in trying to confirm the results of their quantitative study adopted interview approach to confirm the perspective judgment by respondents in the survey questionnaire. However, in this study, exploratory literature review was adopted to compare the results with extant literature that adopted exploratory method. This approach helps to gain a deeper understanding as to why some green supply chain management practices failed to impact certain corporate performance dimension. Zikmund (2000) indicates that one of the key objectives of exploratory research is to obtain an in-depth understanding of the research topic and its limitations. Since this research adopted quantitative approach strategy, the following limitations are identified.

Methodological limitations.

This research adopted quantitative approach, which assessed the model fit, validity and reliability of the data. Although internal validity of the research has been proved, external validity i.e., generalisability of the research findings is limited due to the nature of quantitative findings that only assessed the perceptive judgement of the respondents without confirming the perception of the respondents.

Finding limitations.

The research findings are limited to manufacturing sector, specifically production of goods. The effects of the research findings are more applicable to product supply chains rather than service ones. This approach threatens the validity and generalizability of studies' results, with sectors such as services, construction, and mining.

Practical limitations.

The limitation of the research resources restricted the opportunity to expand the survey data to cover respondents. Since the nature of a PhD study is framed by a specific time span, it was difficult to collect more responses that were not forthcoming.

7.8 Future research

The limitations mentioned above serve as a step forward in providing opportunities for future research. Furthermore, the research findings provide avenue for further research directions. In this regard, the following area for future direction is significant: first, regarding the sector of analysis, future research may consider other important sectors such as construction and mining, whose operations equal create environmental problems. Secondly, future research may develop a model to examine the role of technology and competition as an antecedent towards GSCM implementation. Thirdly, future research may take into consideration other geographical areas where limited studies have been conducted. This approach may pave way for doing comparative analysis of the findings of the study to combine the generalisability of the findings. New studies may attempt to look at emerging economies within Africa and Asia. Lastly future research may consider the use of different approach to collect data to ensure that the perspective judgment of the respondents could be confirmed.

7.9. Recommendations

The aim of this thesis is to examine whether being green will lead to competitiveness of the firm as well superior performance. Based on the results of this research that is, both the quantitative and exploratory literature review findings, the following recommendations are presented for firms interested in improving their environmental performance as well as competitiveness while implementing green supply chain practices:

Recommendation one: Ensure that senior management supports the initiative. Both the quantitative and exploratory literature review have pointed out clearly that green initiatives lead to strong competitive advantage. According to Younis et al (2016), some companies take EMS certifications for the sake of certification and really do not want to make EMS practical, whatever is the EMS requirement, if you are not following, if you are not doing it, whatever your set goal you will not achieve it. This observation clearly shows that management support is highly needed to ensure successful implementation of GSCM. This confirms the overall aim of the study that critical enablers successfully influence implementation of GSCM implementation.

Recommendation two: Ensure that agreed practices are properly implemented and monitored. Having managers within the organisation to monitor operations and implementation of the agreed GSCM initiatives is important for the success of any green initiative. The absence of such auditing and monitoring can be a strong reason for green supply chain practices failing to improve corporate performance. This observation is corroborated by Younis et al (2016). In this study, the authors quoted an answer given by a respondent regarding how GSCM can improve competitiveness of the firm; "*Companies should appoint a manage to monitor and audit green related matters who should be taking care of green things and who should train all other persons in the company on how green practices must be deployed and then only things can improve".*

***Recommendation three**:* Ensure objective measures are in place to measure the outcomes. To be able to determine whether green implementation has achieved its purpose, firms must set up performance data to measure the implementation of the green initiatives. This thesis clearly indicated the measures of social, economic, and environmental performance and competitive advantage upon which to ascertain whether being green is being competitive. If green implementation prevents environmental accidents, reduce use of hazardous substance in products and reduce the cost of raw materials purchasing then social, economic, and environmental performance as well as competitive advantage have been achieved. Therefore, clear measurement of the performance and competitive advantage outcomes helps to determine the performance implication of the green initiative. This observation is in line with the exploratory outcome of the study by (Govindan et al 2015; Younis et al 2016). These authors indicated that issues in measurement might be the reason for the lack of relationship between green supply chain management practices and corporate performance as well as competitive advantage. This claim was supported by many respondents including the quality and assurance (Q&A) manager of a company, who noted that: … "*There are no agreed upon measures to gauge how well your corporate performance has improved after implementing green supply chain management practices as all existing measures are subjective".*

Finally, it is worth noting that within this study, the use of four theories—stakeholder theory, institutional, resource-based theory, and resources dependency theory to frame the research and to help improve understanding of the findings, was valuable. It is also important to indicate that the insights discovered in this study would not have been uncovered without comparing the quantitative findings with an exploratory literature review. As a result, it is argued that quantitative research, supported by exploratory research techniques, such as in-depth interview, are still important, despite the fact that there are validated measures available to conduct quantitative studies in GSCM literature.

7.10 Summary of the chapter

This is the final chapter of this study. It reconsidered the research objectives, the research questions and addressing the findings of the study. The chapter also highlights the managerial implication, theoretical implications and empirical implications alongside the research limitation and future research directions. This chapter starts with the outline expressing the overview of the research. This section is followed directly by the objectives of the study, which helped to answer the research questions. When answering the research questions, the chapter went further to discuss the research findings. The chapter further discussed the holistic nature of the research model. The research implications, considering managerial, theoretical, methodological, and empirical implications followed subsequently. The research limitation and future research directions were discussed in the last sections.

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APPENDIX:

Appendix A. A Systematic literature review approach

As explained in literature review chapter, this study employed systematic literature strategy to comprehensive categorise the GSCM practices, sustainability performance outcomes and competitive advantage principles existing in extant literature. Systematic literature review refers to a type of review that adopts systematic strategy to collect information from secondary sources that seek to answer the prevailing research questions. The purpose of conducting systematic literature was to set up a dataset of journals that emphasised on GSCM practices and the impact on performance outcomes and competitiveness of the firm. In order not to be looking for all journals on GSCM, the study set a time frame with the aim to identify top tier journals that have been published over the years. Journal papers published from 1990 to 2019. This time frame was adopted because according to Seuring and Muller (2008) top tier literature on GSCM started emerging from 1990s. The use of systematic literature review approach in this study is consistent with previous studies in examining GSCM literature (Carter and Easton, 2011; Esfahbodi, 2016). Based on this method, the following journals papers were used to narrow on top tier papers on GSCM.

Table A1: Significant journals on GSCM

Journals	impact factor (2016)	No of papers.
Journal of Cleaner Production	5.71	80
Supply chain management	4.07	19
Int. Journal of Production Economics	3.49	46
Resource Conservation & Recycling	3.31	17
Transportation Research Part E Logistics And Transportation Review	2.97	24
Computers and Industrial Engineering	2.62	13
Production Planning and Control	2.36	15
International Journal of Production Research	2.36	22

The following journal papers were recognised as top source for GSCM literature which the study found relevant for obtaining relevant information to answer the research question (Tseng et al., 2019). These journals were accessed from Scopus and ISI Web of Science databases. Scopus database is one important source that many scholars use to identify and select journals (Fahimnia et al., 2015; Malviya and Kant, 2015; Seuring and Müller, 2008). Furthermore, ISI Web of Science database has also been highly recommended by academics as an important source for indexing superior content and has been used severally for selecting journals (Apriliyanti and Alon, 2017; Tian et al., 2018).

The data from Scopus databases, included all major publishers including Emerald, Taylor and Francis, Springer, and Willey. As mentioned earlier the papers used included those published from 1990 to 2019. In order to identify the right papers keys words were used to select the appropriate papers focusing on GSCM. The following key words were initially used in search for the right papers, ‘green supply chain,' 'supply chain,' 'environmental,' and 'GSCM. Initially 2800 papers were identified using combinations of three keywords. Table A2 below offers the result of the search of Scopus database.

Table A2: Keywords

Words	numbers
Chain	906
Supply	906
Green	639
Manage	345
Environmental	321
Performance	155
Practice	117
Industry	103
Model	99
Sustained	81

Based on this search, the following top authors and their publications were selected

The table A3 below showed that Joseph Sarkis published the maximum number of journal papers focusing on GSCM (26 out of 880), which is made of 3% of the total. The 2nd and 3rd author with the most papers published is Qinghua Zhu and Kannan Govindan, respectively.

Table A3: Top Authors of GSCM Papers

Authors	Number of Papers
Sarkis, J.	26
Zhu, Q.	24
Govindan, K	20

De Sousa Jabbour	15
Jabbour, C.J.C.	12
Lai, K.H.	9
Geng, Y	9
Diabat, A	9
Mathiyazhagan, K	9
Sheu, J.B.	8

The name of authors and their associated journal papers were predominantly used in this study since they form the top ten tier papers focusing on GSCM (Tseng et al 2019).

Appendix B. Copy of Survey Questionnaire

Section A- Background information

1. What is the main activity of your company?

Major Product Line	tick	Major Product Line	tick
Manufacture of Food and Beverage		Manufacture of Rubber and Plastic Product	
Manufacture of Clothing and Textile		Manufacture of Mineral and Non-Metallic Product	
Manufacture of Wood and related product		Manufacture of Metals	
Manufacture of Paper and Paper Product.		Manufacture of Computers, Electronic and Optical Product	
Manufacture of Petroleum and Gas product		Manufacture of Electrical Product	
Manufacture of Chemicals and Chemical Product		Manufacture of Motor Vehicle and Auto Parts	
Manufacture of Pharmaceutical Product		Others (please specify) ……	

2. How many employees work in this company?
   a. Less than 250 employees
   b. 250 - 1000 employees
   c. More than 1000 employees
3. What is your job title?
   a. Plant Manager
   b. Logistics Manager
   c. Operations Manager

d. Purchasing Manager
e. Supply Chain Manager
f. Health and environmental manager
g. Any other, please specify…………

4. How long have you worked for this company?
    a. Less than 5 years
    b. 5-10 years
    c. 11-15 years
    d. 16-20 years
    e. Above 20 years
5. Is your company an environmental management system (ESM) certified?

    Yes

    No

6. What EMS certification does your company hold?
    a. ISO 14001
    b. British Standard 7750
    c. European Union Eco management and audit scheme (EMAS)
    d. Others please specify. …………
7. What is the annual turnover of your company?
    a. Less than 2 million pounds
    b. Between 2 million and 50 million pounds
    c. More than 50 million

SECTION B

GSCM Practices Implementation

Please indicate the extent to which you perceive that your company is implementing each of the following. On 5-point Likert scale, where 1= strongly disagree; 2 = Disagree; 3 = neither agree nor disagree; 4 = Agree; 5 = strongly agree.

Green purchasing	1	2	3	4	5
1. Our company provides design specification to suppliers that include environmental requirements for purchased items					
2. Our company selects suppliers using environmental criteria (suppliers ISO certification)					

3. Our company requires suppliers to use environmental packaging (degradable and non-hazardous)					
4. Our company audits its supplier’s internal environmental management					
5. Our company evaluates the environmentally friendly practices of second-tier suppliers					

Eco design	1	2	3	4	5
6. Our company designs product to reduce consumption of raw materials					
7. Our company designs product for use reuse, recycle, and recovery of materials and components parts					
8. Our company designs product to avoid or reduce use of hazardous products or materials					
9. Our company designs product for reduced consumption of energy					

Customer cooperation	1	2	3	4	5
10. Our company cooperates with customers for eco design of product					
11. Our company cooperates with customers for cleaner production					
12. Our company cooperates with customers for green packaging					
13. Our company cooperates with customers for using less energy during product transportation					

Investment recovery	1	2	3	4	5
14. Our company engages in sale of excess inventories or materials					
15. Our company engages in sale of scrap and used materials					
16. Our company engages in the sale of the company’s capital equipment to prolong their life span					
17. Our company adds value to unused materials to recapture their values					

Green marketing	1	2	3	4	5
18. Our company uses environmentally friendly labelling of product					
19. Our company engages in providing regular voluntary information about environmental management to customers and other stakeholders					
20. Our company provides customers with environmentally friendly service information					
21. Our company provides customers with information about disposal of unused product					
22. Our company attracts customers with green initiatives and eco-services.					

Green distribution	1	2	3	4	5
23. Our company engages in vehicle optimisation during distribution of product to customers					
24. Our company plans distribution schedules to reduce inventory (just-in-time delivery)					
25. Our company considers the use of renewable energy during product transportation					
26. Our company uses qualified third-party logistics company for transportation of product to customers					

Reverse logistics	1	2	3	4	5
27. Our company engages in product recovery through reuse and recycle of materials					
28. Our company engages in the use of returnable packaging materials (pallets)					
29. Our company accepts returned product from customers					
30. Our company has waste collection departments to collect waste from customers					

SECTION C

Assessment of sustainability performance outcomes because of GSCM implementation

Please indicate the extent to which you perceive that your company has achieved the following performance outcomes. On 5-point Likert scale, where 1= strongly disagree; 2 = Disagree; 3 = neither agree nor disagree; 4 = agree; 5 = strongly agree.

Social Performance	1	2	3	4	5
31. Our company has enhanced its corporate image through its quality standards					
32. Our company has increased its customer satisfaction through its quality standards					
33. Our company takes steps to preserve the environment during production process					
34. Our company has enhanced health and safety at workplace					
35. Our company is committed to improvement of quality of life of its employees					

Environmental Performance	1	2	3	4	5
36. Our company has Reduced air pollution during production process					
37. Our company has reduced wastewater during production					
38. Our company has decreased solid waste generation in its operations					
39. Our company has decreased consumption of toxic/harmful material					

40. Our company has reduced frequency of environmental accidents					

Economic Performance	1	2	3	4	5
41. Our company has decreased the cost of energy consumption					
42. Our company has decreased cost of raw material purchasing					
43. Our company has decreased fees for waste discharge					
44. Our company has decreased fees for waste treatment					
45. Our company has decreased cost of energy consumption					

SECTION D

Assessment of competitive advantage outcomes because of GSCM implementation

Please indicate the extent to which you perceive that your company has achieved the following performance outcomes. On 5-point Likert scale, where 1= strongly disagree; 2 = Disagree; 3 = neither agree nor disagree; 4 = agree; 5 = strongly agree.

Cost	1	2	3	4	5
46. Our company offers competitive price to its customers					
47. Our company offers prices lower than competitors					
48. Our company has decreased cost of holding inventory level					
49. Our company has decreased cost of waste treatment					

Quality	1	2	3	4	5
50. Our company has improved quality of production process					
51. Our company offers products that are durable					
52. Our company offers product that are reliable					
53. Our company has reduced the number of rejected products by customers					

Flexibility	1	2	3	4	5
54. Our company provides customised product to meet customers' satisfaction					
55. Our company alters product offering to meet clients' needs					
56. Our company responds to customers request for new features better than its competitors do.					
57. Our company can change output volumes to meet customers' demands					

Dependability	1	2	3	4	5

58. Our company provides dependable delivery to customers					
59. Our company delivers customers' orders on time					
60. Our company delivers product to market quicker than competitors					
61. Our company can produce different variety of product to meet customers requirement					

SECTION E

Critical Enablers and GSCM implementation

Please rate the extent to which the following critical enablers successfully influence implementation of GSCM practice. (5-point Likert scale: where 1 = strongly disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; 5 = strongly agree

Critical Enablers	1	2	3	4	5
62. Management of our company is committed to sustainability issues					
63. Departments within our company share vital information on sustainability					
64. Our company is ISO 14001 certified					
65. Our company is influenced by its customers to commit to sustainability issues					
66. Our company is influenced by its suppliers to commit to sustainability					
67. Our company is keen on adhering to government legislation on sustainability					

Name of respondent…………. (Optional)
Telephone……………….

Email……………

Appendix C. Survey invitation letter

Dear Sir,

Thank you for taking time to read this email. Mr Augustine Bempong (PhD student), in collaboration with Coventry University centre for Business in Society (CBiS) is conducting research aimed at improving manufacturing supply chain to restore sustainability to the natural environment while harnessing the potential to improve performance and competitiveness. We do greatly appreciate your busy schedules, so we have designed a questionnaire, which takes approximately 10 minutes to complete.

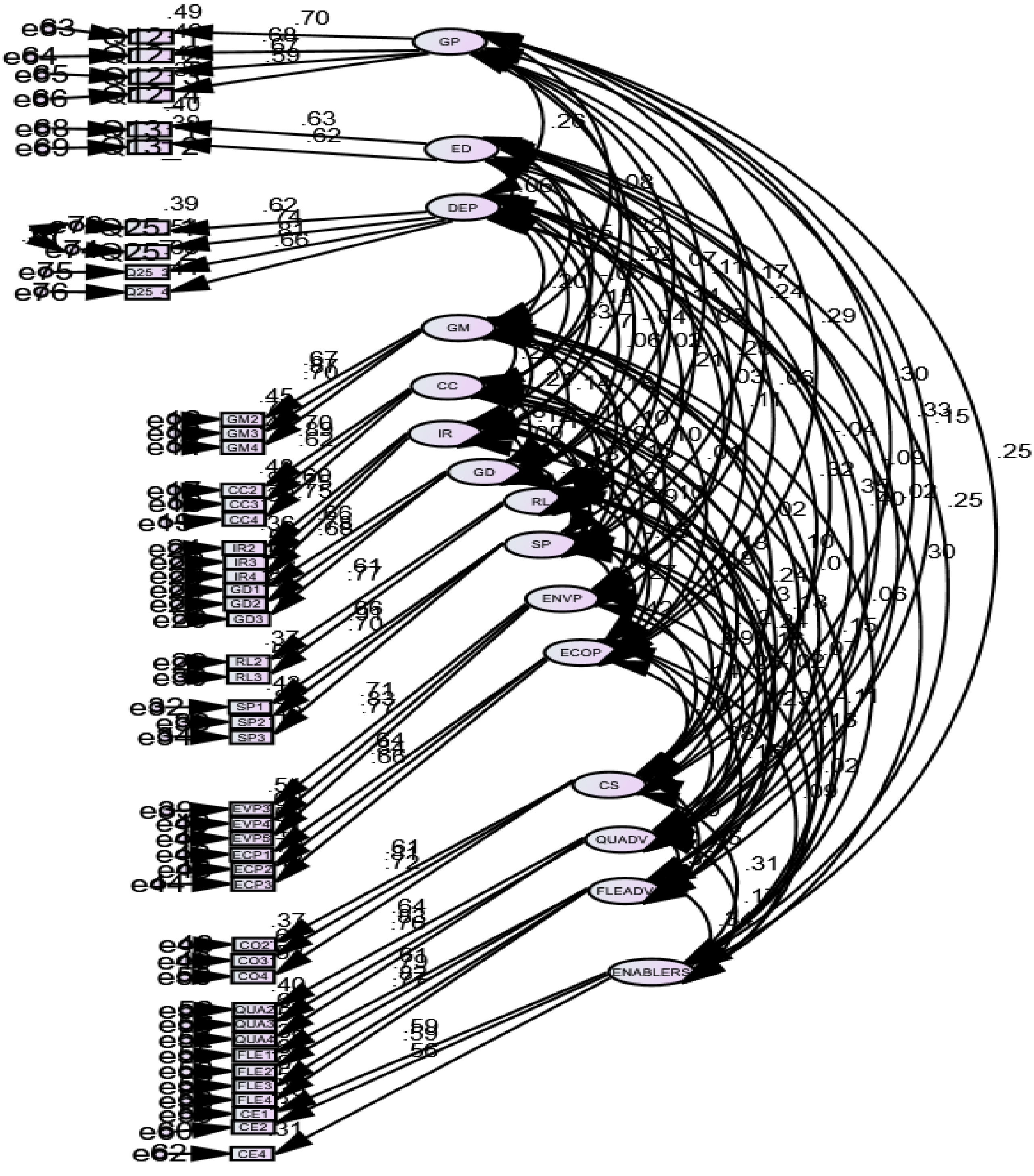
To receive a summary of report of this research, please add your email address to the end of questionnaire. Be assured that all information will be treated with the strictest confidentiality.

To begin the survey, please click on the link below:

Content removed on data protection grounds

Content removed on data protection grounds

Appendix D. CFA Measurement model



Note: Green Purchasing (GP), Eco Design (ED), Dependability advantage (DEP), Green Marketing (GM), Customer Cooperation (CC), Investment Recovery (IR), Green Distribution (GD), Reverse Logistics (RL), Social performance (SP), Environmental Performance (ENVP), Economic Performance (ECOP), Cost Advantage (CS), Quality Advantage (QUADV), Flexibility Advantage (FLEADV), Enablers (ENABLERS).

The following model fit indices, results were generated after the initial measurement model estimation, chi-square value. (3112.509), df (1920), IFI (.850), TLI (.834), CFI (.847), RMSEA (.043). The results above indicate that the initial chi-square value of the entire measurement model exceeded the recommended maximum value recommended by (Kline, 2011). In addition, the output generated by the AMOS software produced incremental fit indices of IFI (.850), CFI (.847), and TLI (.834), all these values were below the recommended 0.90 level raising serious concerns about model fit (Byrne, 2010). However, these results are not strange in social science research, as it is not always positive to develop a theoretical model that would fit the data collected through survey questionnaire Kaplan, 2011; Esfahbodi, 2010). In such situation where model fit is not achieved after initial measurement model estimation, researcher is advised to undertake adjustment process of the model in order to achieve the good model fit (Lomax, 2010, Kaplan, 2011)

As mentioned earlier on the best method of achieving model fit is deletion of low standardised coefficient. According to Anderson and Gerbing (1988), Saleh, (2004) indicated that under unacceptable but converged and proper solutions relating or deleting the indicator from the model are the preferred basic ways to re-specify the model. This shows that item deletion and adding a new path indicator are the perfect ways to get a better fitting model. Any changes or deletion of items in this iterative process results in change in the parameters and model fit statistics. The measuring items that produced low standardised coefficient below recommended value of 0.50 (Hair et al 2010) were deleted. Again, in performing CFA, the AMOS software suggests some modification indices to add covariance between measuring items that could results in decrease in chi-square resulting in good model fit (Inman et al., 2011; Esfahbodi, 2016). In view of this measuring items with low loading factors were deleted and these measuring items are listed below

GM1, CC1, IR1, GD4, RL 1&4, SP 4&5, ENV 1&2, ECO 4&5, CA 1, QA 1, CE 3, 5&6, GP5. In addition to this deletion, the AMOS software also suggested co-varying of measuring items 73 and 74. Having deleted the above measuring items and co-varied measuring items 73 & 74 the model was modified to achieve good model fit. After the deletion and co-varying the measuring items, the CFA was re-specified and re-estimated, and the output produced by AMOS software is shown in the diagram below showing good model fit. As shown in figures 9.4 the chi square value after the modification is now (1236.124; df, 893) is well below the recommended maximum level of 3.00 (Kline, 2011) and RMSEA value of .032 falls within the recommended maximum value of ≤ 0.08 (Hair et al., 2010; Schumacker and Lomas, 2010). Furthermore, the IFI (0.936), TLI (0.927), CFI (0.937) all exceeded the recommended value of 0.90 after model modification (Byrne, 2010). Based on the results from the AMOS output, as reported on goodness of fit indices, the measurement model supports the claim of goodness of fit model. This generally implies that the research model perfectly fits with the data collected from the survey. Figure C1 above shows the summary and results of the confirmatory factor analysis (CFA) as produced by the AMOS software version 25.0.

Appendix E. Discriminant validity

Table B1: Discriminant validity test

Research Constructs	Chi-Square Difference	Significant Level
CE <--> ED	19.21	p-value = 0.019
FA <--> ED	21.86	p-value = 0.001
QA <--> ED	21.37	P-value = 0. 028
CS <--> ED	13.48	p-value = 0.011
ECO <--> ED	13.97	p-value = 0.034
ENV <--> ED	16.19	p-value = 0.022
SP <--> ED	16.74	p-value = 0.027
RL <--> ED	19.54	p-value = 0.000
GD <--> ED	9.49	P-value = 0.021
IR <--> ED	22.19	p-value = 0.027
CC <--> ED	18.54	p-value = 0.009
GM <--> ED	19.29	p-value = 0.018
DEP <--> ED	20.01	p- value = 0.003
DEP <--> GP	13.53	p-value = 0.021
DEP <--> GM	12.23	p-value = 0.027

DEP <--> CC	9.53	p-value = 0.009
DEP <--> IR	21.16	P-value = 0. 010
DEP <--> GD	19.16	p-value = 0.025
DEP <--> RL	10.75	p-value = 0.040
DEP <--> SP	11.23	p-value = 0.029
DEP <--> ENV	23.17	p- value = 0.020
DEP <--> ECO	24.19	p-value = 0.023
DEP <--> CS	23.19	p-value = 0.001
DEP <--> QA	21.19	p-value = 0.004
DEP <--> FA	24.16	p-value = 0.035
DEP <--> CE	11.42	p- value = 0.005
CE <--> GP	13.25	p-value = 0.009
FA <--> GP	28.18	p-value = 0.013
QA <--> GP	16.38	p-value = 0.010
CS <--> GP	11.29	p- value = 0.023
ECO <--> GP	10.09	p-value = 0.021
ENV <--> GP	9.29	p-value = 0.035
SP <--> GP	13.74	p-value = 0.019
RL <--> GP	21.28	p-value = 0.028
GD <--> GP	20.26	p- value = 0.001
IR <--> GP	21.39	p-value 0.015
CC <--> GP	34.10	p-value = 0.031
GM <--> GP	25.18	p-value = 0.004
	17.24	p-value= 0.023
SP <--> ENV	16.21	p-value = 0.021
SP <--> ECO	12.28	p-value = 0.021
SP <--> CS	18.42	p-value = 0.023
SP <--> QA	12.30	p-value = 0.009
SP <--> FA	19.21	p-value = 0.021
SP <--> CE	28.19	p-value = 0.030
ENV <--> ECO	21.10	p-value = 0.022
ENV <--> CS	9.27	p-value = 0.002
ENV <--> QA	8.21	p-value = 0.008
ENV <--> CE	23.19	p-value = 0.011
ECO <--> CS	11.21	p-value = 0.007
ECO <--> QA	18.29	P-value = 0. 011
ECO <--> CE	21.85	p- value = 0.021
ECO <--> FA	10.25	p-value = 0.002
CS <--> QA	27.10	p-value = 0.007
CS <--> FA	14.19	p- value = 0.011
CS <--> CE	12.38	p-value = 0.023
RL <--> CE	10.80	p-value = 0.031
QA <--> FA	20.12	p-value = 0.004
QA <--> CE	29.18	p- Value = 0. 007
FA <--> CE	30.28	p-value = 0.012
GD <--> RL	20.12	p-value = 0.008
GD <--> SP	24.18	p-value = 0.002
GD <--> ECO	16.20	p-value = 0.017
RL <--> CS	21.27	p-value = 0.023
	8.29	p-value = 0.032

RL <--> QA	7.82	p-value = 0.024
RL <--> FA		
IR <--> GD	10.21	p-value = 0.011
IR <--> RL	15.23	p-value = 0.027
IR <--> SP	17.10	p-value = 0.028
IR <--> ENV	16.09	P-value = 0. 011
IR <--> ECO	13.18	p-value = 0.011
IR <--> CS	21.20	p-value = 0.020
IR <--> QA	23.64	p-value = 0.009
IR <--> FA	12.71	p-value = 0.023
IR <--> CE	20.23	p-value = 0.031
CC <--> IR	10.06	p-value = 0.030
CC <--> GD	13.48	p-value = 0.018
CC <--> RL	14.71	p-value = 0.021
CC <--> SP	23.18	p-value = 0.023
CC <--> ENV	21.09	p-value = 0.021
CC <--> ECO	17.12	p-value = 0.008
CC <--> CS	18.19	p-value = 0.010
CC <--> QA	23.12	p-value = 0.031
CC <--> FA	19.80	p-value = 0.022
CC↔ CE	21.28	p-value = 0.001
GM <--> CC	20.18	p-value = 0.003
GM <--> IR	17.29	p-value = 0.011
GM <--> GD	14.07	p-value = 0.013
GM <--> RL	25.71	p-value = 0.005
GM <--> SP	12.18	p-value = 0.013
GM <--> ENV	20.87	p-value = 0.009
GM <--> ECO	17.16	p-value = 0.010
GM <--> CS	14.27	p-value = 0.005
GM <--> QA	19.21	p-value = 0.009
GM <--> FA	24.21	p- value = 0.010
GM <--> CE	18.19	p-value = 0.005

Discriminant validity assumes that items should highly correlate among them rather than correlate with other items from other constructs that in theory should not correlate. Testing for discriminant validity can be done using one of the following methods: O-sorting, chi-square difference test and the average variance extracted analysis (Zait and Bertea, 2011). In this study, the chi-square difference test was used to test the discriminant validity. According to Gerbing and Anderson (1988), the discriminant validity test can be conducted using the CFA through chi-square difference comparison. Segars (1997) posits that the use of chi-square difference test allows the researcher to compare two models, one in which the constructs are correlated and one in which they are not. Discriminant validity is present when there is significant difference in the discriminant statistics between the fixed and the unconstrained model (Garver and Mentzer, 1999; Esfahbodi, 2016).

With discriminant validity in mind, test was conducted separately for each construct using Amos software, which involved pairing all the available combinations of the construct. According to Driscoll (2000), discriminant validity is when the same method is used to measure different constructs and the results that are produced do not correlate. We will illustrate the chi-square difference test on two constructs that had different item. The constructs were picked from the correlation part of the AMOS output. In order to test for discriminant validity, we followed Segars (1997) recommendations:

- Create a model in which the two constructs do not correlate and perform CFA.
- Calculate the chi-square difference test and if the result is significant than discriminant validity has been satisfied.

Discriminant validity was performance on the entire construct suggested by the SPSS AMOS output shown in table B1. The correlation of these construct was extracted from the AMOS output after CFA has been performed on the constructs.