GREEN SUPPLY CHAIN MANAGEMENT AND SUPPLY CHAIN RESPONSIVENESS AMONG FOOD AND BEVERAGES MANUFACTURING FIRMS IN NAIROBI, KENYA

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DECLARATION

I declare that this research project is my original work and has never been submitted to any other University for assessment or award of a degree.

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D61/60921/2011

This proposal has been submitted with my authority as the university supervisor.

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For my late parents Mary N. Williams and David Morris Jlopleh

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ABSTRACT

This research study had two objectives: first, to determine the benefits of and challenges facing green supply chain management implementation among food and beverage manufacturing firms in Nairobi and secondly, to determine the relationship between implementation of Green Supply Chain Management and supply chain responsiveness of food and beverages manufacturing firms in Nairobi. A sample of forty-two food and beverage manufacturing firms in Nairobi were selected and responded to a questionnaire.

This study established that the benefits experienced by the firms that implemented GSCM were that there was improvement in information systems; the use of recyclable materials was well promoted; firms experienced savings on costs due to effective utilization of available productive resources. GSCM also did much in helping with reduction of the environmental impact of business processes. Operational costs and risk of prosecution based on anti-environment reasons were considerably reduced.

The most seriously faced challenges arose from limited communication planning among the firms; the increasing resource requirements for the implementation of GSCM; the sustainability of program implementation. Challenges also arose from the limited and narrow views planning process had concerning GSCM. It was difficult to trace carbon footprint from suppliers. These challenges were coupled with lack of awareness about GSC practices and lack of rightful tools to enable effective implement GSCM.

The regression analysis indicated that the most significant factor that influenced the percentage of costs expended on GSCM was Green Packaging (GP). Both SCA and GM had negative effects on GSM.

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CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

During the 1990s, many manufacturers and service providers sought to collaborate with their suppliers and upgrade their purchasing and supply management functions from a clerical role to an integral part of a new phenomenon known as supply chain management. The key terms that came out in the literature during the period are the concepts of: green procurement, green design, green operations, reverse logistics, waste management and green manufacturing (Guide &Srivastava, 1998; Tan et al, 1999; Srivastava, 2007). The very first green supply chain came into context in 1989.

In the 21st century, there have been changes in business environment that have contributed to the development of supply chain networks. First, as an outcome of globalization and the proliferation of multi-national companies, joint ventures, strategic alliances and business partnerships, supply chains were found to be significant success factors, following the earlier concepts of "Just-In-Time", "Lean Management" and "Agile Manufacturing" practices. Second, technological changes, particularly the dramatic fall in information communication costs, which are a significant component of transaction costs, have led to changes in coordination among the members of the supply chain network (Coase, 1998). In the contemporary business world, supply chain management has become popular in every organization.

The concepts of supply chain and supply chain management are receiving increased attention as means of becoming and remaining competitive in a globally challenging environment. Supply chain management is viewed as lying between fully-vertically-integrated systems and those where each channel member operates completely independently (Cooper and Ellram 1993).

Eco-efficiency and remanufacturing processes are now important assets to achieve best practice (Srivastava, 2007). Global market demands and governmental pressures are pushing businesses to become more sustainable (Guide &Srivastava, 1998) even claim that "increasing government regulation and stronger public mandates for environmental accountability have brought these issues into the executive suites, and onto strategic planning agendas."

1.1.1 The Concept of Green Supply Chain

New and Payne (1995) describe supply chain management as the chain linking each element of the manufacturing and supply process from raw materials through to the end user, encompassing several organizational boundaries. According to the definition, supply chain management encompasses the entire value chain and addresses materials and supply management from the extraction of raw materials to its end of useful life. Baatz (1995) further expands supply chain management to include recycling or re-use.

According to Srivastava 2007, Green Supply Chain Management is defined as integrating environmental thinking into supply chain management, including product design, material sourcing and selection, manufacturing processes, delivery of the final product to the consumers, and end-of-life management of the product after its useful life.

There are several benefits that an organization can enjoy due to GSCM. Green SCM helps to improve agility by mitigating risks and speeding innovations. It also increases adaptability through innovative processes and continuous improvements. Green SCM involves negotiating policies with suppliers and customers, which results in better alignment of business processes and principles. Other benefits of GSCM are financial performance; sustainability of resources, lowered costs/increased efficiency, product differentiation and competitive advantage, adapting to regulation and reducing risks and improved quality and products. All these lead to alignment of the supply chain (Lyons, 2010; Emmet and Sood 2010).

The Ryder Center for Supply Chain Management (2008) identified three main challenges facing companies while trying to implement green supply chain. John Wilkerson (2010) also recognized five challenges of implementing GSC. The challenges include: lack of appropriate technology to support companies and their efforts to go green and business processes needed to capture the appropriate data in the supply chain and therefore make great use of their existing technology; the trade-off between green requirement and lean practices and failure to integrate supply chain optimization efforts with green supply chain efforts. Other challenges are: standards, awareness, business case development, sustainability program implementation and communication planning among others.

1.1.2 Supply Chain Responsiveness

The responsiveness of supply chains to changing market requirements and their overall efficiency are important issues in supply chain design and management and therefore currently receive wide attention in the scientific community as well as in practice. Responsiveness can be defined as the "ability to react purposefully and within an appropriate time-scale to customer demand or changes in the marketplace, to bring about or maintain competitive advantage" (Holweg, 2005).

Minnich and Maier (2010) argue that companies have three principal means to buffer against changes in quantity demanded for specific products, namely inventory, capacity and time. Safety stocks, excess capacity and safety lead times all provide a time buffer to be able to react to demand variability (Hopp and Spearman, 2004). One could argue that one sensible approach to increase responsiveness could be to raise the inventory levels of finished goods or components, which would allow more flexibility for reactions to changes in customer demand.

A responsive supply chain, in contrast, requires an information flow and policies from the market place to supply chain members in order to hedge inventory and available production capacity against uncertain demand (Fisher, 1997). Improving responsiveness in a supply chain, however, incurs costs for two primary reasons: (1) excess buffer capacity and inventories need to be maintained, (2) investments to reduce lead times need to be made. Boeing, for example, at the end of the 1990s failed to achieve sufficient buffer capacity or inventory levels by pursuing a lean manufacturing strategy without considering the variability of demand in the aerospace industry (Naylor et al., 1999).

Firms can make their supply chain greener 'by embedding modularity into the product design, using more environmentally friendly materials, and increasing the recyclability of products (Montabon et al., 2007). Changing customer management into a symbiotic relationship is also a key factor in meeting customers' evolving preferences for just-in-time. Evidently, firms can design their supply chains to be greener and thus to fit in with the diverse needs derived from managing internal operations, suppliers, and customers.

1.1.3 Food and Beverages Manufacturing Firms in Nairobi, Kenya

The manufacturing sector in Kenya is among the key productive sectors identified for economic growth and development because of its immense potential for wealth, employment creation and poverty alleviation. In addition, the sector will continue to provide impetus towards achievement of Millennium Development Goals (MDGs) both in the medium and long term particularly goal one on Eradication of extreme Poverty and hunger and goal eight on Global Partnerships for Development **(**Manufacturing and Industry Sector Report, 2008).

The Kenyan food-processing sector, including food, beverages and tobacco, remains the largest component of the manufacturing industry. In terms of structure, economic contributions, and performance with in the manufacturing sector, this sector is the most important and largest comprising of over 1,200 businesses, encompassing everything from small family organizations to large multinational companies (KNBS, 2009).

According to the Kenya National Bureau of Statistics (KNBS) 2009 Statistical Abstract, in 2008, the sector contracted by 3.9 percent from 2007, but still generated over a third (33.4 per cent) of the total manufacturing production, and provided 89,319 jobs. High production and ingredient costs were partially blamed for this contraction. In 2009, the sector grew by 2.1 percent.

The sector's contribution to the country's GDP stood at Ksh 71,338 million in 2009 compared to Ksh 61,194 million in 2008. Export quantities of meals and flours of wheat rose by 78.1 percent in 2009. Significant increases were recorded in export quantities of animal and vegetable oils, coffee, beer made malt (KNBS, 2009).

Major multinationals have established operations in Nairobi as foreign companies or as joint ventures with Kenyan shareholding to supply the domestic and neighboring markets. East African Breweries Ltd (EABL) partners with Guinness PLC and Diageo Group to brew and supply bottled beer to the East African and Common Market for East and South Africa (COMESA) markets. The company produces the same high standard of their products that are well known around the world. There are other companies such as Coca cola, Del Monte, Kuguru food products etc. that are engaged in beverage production (Export Processing Zone, 2005).

1.2 Statement of the Research Problem

In global environmental conscious and awareness, many firms have started to undertake significant efforts towards establishing Green Supply Chain Management (GSCM) initiatives, (Srivastava, 2008; Zhu el al 2007; Tarig and Suhaiza, 2010). The underlying concept of GSCM encompasses environmental initiatives in inbound logistics which includes green purchasing, eco-design and production as outbound which includes reverse logistics. As the name implies, these initiatives involve the relevant stakeholders such as materials suppliers, service contractors, vendors, distributors and end users whom work cohesively to reduce or eliminate adverse environmental impacts which can possibly give rise due to their activities (Beamon, 1999; Vachon and Klassen, 2006; Tarig and Suhaiza, 2010).

Food and beverages make up over half of the Kenya's exports and comprises of more than a thousand businesses. Agro-processing is progressively the largest manufacturing sub sector. Businesses range from small family-owned enterprises to large businesses listed on the Nairobi Stock Exchange. Subsidiaries of multinationals such as Nestle, Coca Cola, Unilever and Wrigley have established operations as foreign companies or as joint ventures with locals to supply the domestic and neighboring markets. This sector is composed of key production sectors including dairy and meat products, grain milling, edible fats and oils, beverages, fruits and vegetable processing, fish processing, wines, beer and spirits (Frontier Market Intelligence, 2012).

Several studies have been done on GSCM. Chandra's (1991) article was the first of the literature to consider the need for a green design to reduce the impact of product waste. There are other comprehensive reviews around GSCM, particularly in the late 1990's where issues such as green production, green planning and manufacturing (Bras & McIntosh, 1999; Sarkis & Cordeiro, 2001; Laan and Dekker, 1996) and product recovery (Gungor& Gupta, 1999; Van Der Laan et al., 1996) are discussed. Barros et al., (1998) discussed recycling in the supply chain and Darnall et al., (2008) critique GSCM by saying that Environmental Management Systems (EMS) are making less progress in reducing environmental harms. Some studies, however, are of limited focus. Van Der Laan et al., (1996) only discussed product remanufacturing and disposal, and Zhang et al., (1997) only discussed environmental technologies and design.

Although several studies have been conducted in the area of Green Supply Chain Management, none have been able to address the GSCM in food and beverages manufacturing companies operating in Nairobi. This study will therefore seek to establish how food and beverages production companies in Nairobi implement GSCM and supply chain responsiveness.

The study sought to provide answers to the following questions: What are the benefits of implementing green supply chain management among food and beverages manufacturing firms in Nairobi? What are the challenges of implementing green supply chain management among food and beverages manufacturing firms in Nairobi? And what is the relationship between implementation of green supply chain and supply chain responsiveness among food and beverages manufacturing firms in Nairobi?

1.3 Objectives of the Study

This research study had the following objectives

i. To determine the benefits of and challenges facing green supply chain management implementation among food and beverage manufacturing firms in Nairobi
ii. To determine the relationship between implementation of Green Supply Chain Management and supply chain responsiveness of food and beverages manufacturing firms in Nairobi.

1.4 Significance of the Study

Green supply chain has become a very important concept in supply chain management. Consumers are becoming more demanding and aware of the need for environmentally friendly business practices. The findings of the study will enable food and beverage manufacturing firms in Nairobi to get a clear picture of the benefits that accrue to organizations that have embraced the concept of Green Supply Chain Management. This will motivate the firms to give serious attention to this concept. This study will also assist food and beverage manufacturing companies to better understand the challenges they meet during implementation of the green supply chain concept.

Since consumers also want to find out what the companies are doing in order to reduce their damage to the environment, the findings of this study will also assist consumers of the products

of these firms to get an update of what food and beverage manufacturing firms in Nairobi are doing in order to green the supply chain.

Other firms operating in Nairobi will also get to understand the possible benefits and challenges of implementing green supply chain management in their organizations. They will also get to understand how Green Supply Chain Management is related to responsiveness in the supply chain.

Academicians who are interested in conducting studies in the area of Green Supply Chain Management will also get a source of reference from the findings of this study. They will also be able to find more information on areas that may need further research under this topic.

The findings of this study will also serve as a benchmarking tool in Green Supply Chain Management practices among food and beverages manufacturing companies in Liberia. Most of the food and beverages manufacturing firms in Liberia are yet to adopt this concept. The findings from this study will assist them to understand the various green supply chain management practices, its benefits and challenges associated with the concept. The study will also make consumers of food and beverages products in Liberia to demand from their producers where their products come from, how they are made and distributed and what impact future environmental legislations will have on the products they buy.

CHAPTER TWO: LITERATURE REVIEW

2.1 Overview of Green Supply Chain Management Implementation

According to Kim 2010, recent environmental incidents occurring in the upstream of the supply chains of global firms caused not only financial damage to the firms but also damage to the firms' reputation. These anecdotes raised the alarm to the large buying companies how important supplier selection and support are. Supplier firms that are capable of environmental management could create potential business opportunities because large global firms are seeking such suppliers with environmental management capabilities worldwide. These suppliers with the adoption of Green Supply Chain Management (GSCM) practices would be more sustainable to keep and extend their current contracts.

Green procurement is defined as an environmental purchasing consisting of involvement in activities that include the reduction, reuse and recycling of materials in the process of purchasing. Besides green procurement is a solution for environmentally concerned and economically conservative business, and a concept of acquiring a selection of products and services that minimizes environmental impact, (Ninlawan el al. 2010). Green procurement activities cover the following: Suppliers selection, Energy efficient technology and Green logistic/transportation.

Suppliers selection: purchase materials or parts only from "Green Partners" who satisfy green partner environmental quality standards and pass an audit process in following regulations for the environment-related substances; consider suppliers who acquire ISO14000, OHSAS18000 and/or RoHS directives; and select suppliers who control hazardous substances in company's standard lists and obtain green certificate achievements; 3Rs in procurement process: reuse or recycle –paper, parts container (Ninlawan el al. 2010).

Green manufacturing is defined as production processes which use inputs with relatively low environmental impacts, which are highly efficient, and which generate little or no waste or pollution. Green manufacturing can lead to lower raw material costs, production efficiency gains,

reduced environmental and occupational safety expenses, and improved corporate image, Ninlawan el al. (2010). The following activities are also taken into consideration in green manufacturing: Hazardous substance control replace other substances such as bismuth, silver, tin, gold, copper, (lead free); rinse parts with clean water instead of using chemicals and reuse water; quality control in inputs at vendor site and recheck before processing.

Energy-efficient technology: reduce power consumption in products such as ramp load/unload technology in HDD if electronic materials; increase product life-span resulting in higher efficiency and productivity; improve machine uptime; improve machine performance; design product, for example compact design with improved features yet using fewer resources to produce**.** 3Rs and waste minimization: promotes reuse/recycle of parts; enhance environmental consciousness via 3Rs activities reduce indirect materials such as epoxy glue (Ninlawan el al. 2010).

Green distribution consists of green packaging and green logistics. Packaging characteristics such as size, shape, and materials have an impact on distribution because of their affect on the transport characteristics of the product. Better packaging, along with rearranged loading patterns, can reduce materials usage, increase space utilization in the warehouse and in the trailer, and reduce the amount of handling required, (Ninlawan el al. 2010). Activities associated with green distribution include: Green packaging i.e. downsize packaging; use "green" packaging materials; cooperate with vendor to standardize packaging; minimize material uses and time to unpack; encourage and adopt returnable packaging methods; promote recycling and reuse programs.

Green logistics/transportation: deliver directly to user site; use alternative fuel vehicles; distribute products together, rather than in smaller batches; change to modal shift.

Reverse logistics is the process of retrieving the product from the end consumer for the purposes of capturing value or proper disposal. Activities include collection, combined inspection/selection/sorting, re-processing/direct recovery, redistribution, and disposal. Consider the following activities when using reverse logistics: Used Materials i.e. collect used parts for exportation and reuse; waste collectors, select and sort initially to get used parts which are shipped to disassembly/recycle plants. Disassembly/recycle plants collect used parts 50% from

manufacturing plants, 20% from community, 20% from waste collectors, and the rest 10% from private/public organization, (Ninlawan el al. 2010).

2.2 Green Supply Chain Implementation

There have been a number of approaches proposed in implementing GSCM practice in previous literatures (Hsu and Hu, 2008). However, Wilkerson (2005) identified four best practices in implementing green supply chain. The four best practices include: alignment of green supply chain goals with business goals; evaluation of supply chain as a single life cycle system; use supply chain analysis as a catalyst for innovation and focus on source reduction to reduce waste.

Alignment of green supply chain goals with business goals: Most businesses usually define green supply chain goals and business goals separately. This may lead to businesses defining supply chain goals without a true understanding of the business case and value propositions behind such goal in addition to leading to confusing or conflicting communications to the organization where goals may be contradictory. For example a business goal may be to use eco-friendly packaging that cost more than the traditional packaging which goes against the business goal of reducing cost. This does not support the infusion of green supply chain goals into business goals (Happek, 2005).

Evaluation of the supply chain as a single life cycle system: A typical supply chain has a number of different business process all linked together to form a network, with one process leading to another forming a system. System thinking looks at the supply chain as being composed of activities that have outputs serving as inputs to other activities and thus providing a means of understanding systems at a deeper level in order to see the paths available to bring about changes more effectively (Prugsamatz, 2010).

Use supply chain analysis as a catalyst for innovation: Green supply chain analysis provides an opportunity to review processes, materials, and operational concepts. It targets wasted material, wasted energy or effort and under-utilized resources (Wilkerson, 2005). Chatterjee, Mazumder (2010) and Murrey (2011) observe that businesses that want to make a transition to a greener supply chain should review all their business processes to identify areas where adopting a greener outlook can actually improve their business.

Focus on source reduction to reduce waste: The recycle and re-use waste management programs focuses on management of waste after it has been created. On the other hand Source Reduction focuses on the prevention or the reduction of wastage during production rather than managing it after it has been generated with the aim of efficiently utilizing resources by examining how business is conducted, how materials are used, and what products are purchased (Serkis, 1999; Wilkerson, 2005).

2.3 Effects of Green Supply Chain Management

According to Llaurado 1994, human activities had unwittingly contributed to global warming and decrease in the ozone layer. Llaurado, (1994) also argue that the impact of development and industrialization over the century had taken a definite toll on the environment.

Reagan (2006) argue that the widespread practices of capitalism for commercialization of commodities to complement modernized lifestyle has slightly over ruin the nature, exploitation of minerals, fisheries and forest products. The environmental disaster caused by corporations' negligence have public's concern and the awareness had begun as early in the 1960s (Kotler, Bowen and Makens, 2006).

In response to the environmental accidents, emphasis was made on companies to run their business responsibly (Saha & Darnton 1005). This responsible business practice is coined the term Corporate Social Responsibility (CSR) depicting business approaches that are concerned with society's well-being (Lamb, Hair & McDaniel 2004). Welford (1998) emphasize that most businesses which respond to environmental issues had done so only in marginal ways. The effects of green supply chain can be viewed from two perspectives, namely, the benefits and the challenges.

2.3.1 Benefits of Implementing Green Supply Chain Management

A green supply chain is one with minimal environmental impact. It is a supply chain that encompasses best practices in reducing carbon emissions across the supply chain, from materials sourcing through product design, manufacturing, distribution, delivery and finally, end-of-life recycling. Organizations that have already made green initiatives part of their overall business strategy are getting the message: being environmentally conscious is a win-win for business and

the environment (Emmet and Sood 2010). Therefore, firms implementing GSC stand to obtain the following benefits:

Improved Agility: helps to mitigate risks and speed innovations, by improving the agility, the components of balance, speed, strength and co-ordination should be taken into account; increased adaptability: GSC analysis often leads to innovative processes and continuous improvement; promote alignment: this involves negotiating policies with suppliers and customers, which results in better alignment of business processes and principles; bring value to the organization (Lyons, 2010).

According to Christopher 2000, supply chain agility is broadly defined as a business wide capability that embraces organizational structures, information systems, logistics process and in particular, mindsets. Agility in supply chain in general is all about being fast and flexible (Lee 2004). Lee also argued that the main objective of supply chain agility is to respond to short-term changes in demand or supply quickly and to handle external disruptions smoothly.

Financial performance: Despite ample evidence to the contrary, there persists a myth that going green costs additional expense. Some of the factors responsible for persistence of this myth are inertia, the lack of a systematic approach and an unwillingness to engage in sustained and changed thinking that is necessary to create a green supply chain. However, the most fundamental benefit of Green Supply Chains is a positive long term net impact on the financial performance of the organization (Emmet and Sood 2010).

According to Murray 2012, companies can find cost savings by reducing the environmental impact of their business processes. He further argued that by evaluating the company's supply chain from purchasing, planning and managing the use of materials to shipping and distributing final products, saving are often identified as benefits of implementing green policies.

Sustainability of Resources: Green Supply Chains sponsor the effective utilization of all of the available productive resources of organizations. By incorporating Green Supply Chain Management thinking through their entire business decision making process, organizations may

now purchase green input resources that will flow through environmental friendly production process to produce the desired green outputs (Emmet and Sood, 2010).

The green vision starts with customer requirements and includes programs the customer is willing to pay for. A company's internal business strategy is then used to identify the role of environmental stewardship. The overall strategy is brought together by requirement for green operation from stakeholders, which include regulations, investors and community members (Wilkerson 2012).

Lowered Costs/Increased Efficiency: According to Emmet and Sood 2010, the core of Green Supply Chain Management is the principle of reducing waste by increasing efficiencies. Effective management of resources and suppliers, can reduce production costs, promote recycling and also, the reuse of raw materials. Also, the production of hazardous substances can be reduced, thereby preventing organizations from being fined as a result of violating environmental regulations. Consequently, the relevant operational costs are reduced while; the efficiency of using resources is improved. Walton et al., (1998) maintained that organizations are integrating their supply chains to reduce operating costs and improve their customer service. Most supply chain management strategies focus on driving down operational costs and maximizing efficiencies.

Product Differentiation and Competitive Advantage: GSCM implementation helps an organization to position itself and its products as environmentally friendly in the customers' perception. Besides attracting new profitable customers for organizations, it gives competitive edge over the competitors in the market place. It also strengthens the brand image and reputation in the market place (Emmet and Sood 2010). According to Wrobleski and Oza 2008, green supply chain is one of the many buzzwords currently being used by companies as they attempted to differentiate themselves in the marketplace by forging the expectation of their customers.

Adapting to Regulation and Reducing Risks: Organizations adopting Green Supply Chain practices can reduce the risk of being prosecuted for anti-environmental and unethical practices. A demonstrated effort towards creating an effective Green Supply Chain through the sustained dedication of resources, activity, measurement and management protocol, will be highly

regarded in the event that any questions arise (Emmet and Sood 2010). Governments are seriously contemplating imposing carbon tax on companies who import from not so eco-friendly countries/organizations. This would mean that they seriously need to re-look into sourcing and producing options: from where to procure and where to produce as this is bound to change the cost effectiveness of the supply chain**.**

Improved Quality and Products: organizations that produce products which are technologically advanced and environment friendly will find this will enhance the brand image and brand reputation in customers' mind (Emmet and Sood 2010). According to European Commission report 2008, manufacturers seeking to improve environmental sustainability are extending their efforts across the supply chain, both upstream to engage their suppliers and downstream to involve distributors and customers. The upstream environmental collaboration leads to improvements in process-based performance, such as superior delivery and greater flexibility from suppliers. In the downstream collaboration, with customers and distributors, later on in the manufacturing process may lead to product improvements, such as improvements in durability and conformance to specifications.

Alignment of business processes: Green SCM also involves negotiating policies with suppliers and customers, which results in better alignment of business processes and principles. There is need for organizations to identify and bring on board suppliers who embrace green supply chain practices. Implementation of green supply chain management therefore gives an organization the basis on which to negotiate policies and contracts with its suppliers and customers. This negotiation helps to align the business processes and principles in the organization (Lyons, 2010).

2.3.2 Challenges in Green Supply Chain Management Implementation

GSCM, as a new business phenomenon, has number of challenges which businesses need to overcome in order to green their supply chain. The Ryder Center for Supply Chain Management (2008) identified several challenges facing companies while trying to implement green supply chain. The challenges are: lack of appropriate technology to support companies and their efforts to go green and business processes needed to capture the appropriate data in the supply chain and make great use of their existing technology; the trade-off between green requirement and lean

practices; failure to integrate supply chain optimization efforts with green supply chain efforts; standards; awareness; business case development; sustainability program implementation and communications planning.

Lack of Appropriate Technology and Business Processes Needed: technology provides energy efficient solutions that have a more favorable impact on the environment. Information technology can make the supply chain greener by optimizing the resources required to support the business and also enable more effective supply chain planning, execution and collaboration, thereby reducing resource requirements (Cognizant, 2008). Green supply chain technologies cannot work independent of the business processes in the supply chain. Both the green supply chain and the supply chain are a complement of one another. A supply chain technology cannot work without which is provided by the business process. There is need therefore to have a process that captures such data.

Trade-Off between Green Requirements and Lean Practices: tean and green strategies are often seen as compatible because of their shared focus on waste reduction. Leanness stresses on reduced amount of inventory to go through the supply chain which minimizes the negative environmental impact of the supply chain. However, lean strategies that employ just-in-time (JIT) delivery of small batch sizes which improves sufficiency can require increased transportation, packaging, and handling which increase emissions contradicting the green approach (Mollenkopf el al., 2010).

Outsourcing also may involve parts of the manufacturing process being transferred to plants on the other side of the world, only for the products to be transported back for the next part of the supply chain process which requires additional transportation and thus increasing emissions (Simchi-Levi, 2008).

Failure to Integrate Supply Chain Optimization Efforts with Green Supply Chain Efforts: Cash & Wilkerson (2003) argue that most firms implementing green supply chain practices do not actually integrate environmental considerations into their supply chain management processes. Their approach is usually driven by a need to green an existing process or a piece of the chain. Although this may have a positive impact on the environment, the environmental aspects are frequently not considered when those responsible for reviewing a business's overall supply chain

performance make changes in the supply chain. They further argued that it is only after changes in the supply chain have been implemented and their effects on the environment revealed that the idea of greening the supply chain has the opportunity to emerge.

Standards: Standards are the most confusing aspect for most supply chain and strategic sourcing professionals. The major standards or rules include the U.S. Greenhouse Gas Protocol, ISO standards, ISO 14065, Environmental Protection Agency (EPA) Greenhouse Gas Reporting Rule, Security Exchange Commission (S.E.C.) Climate Change Interpretive Guidance, Wal-Mart Sustainability Index and the Dow Jones Sustainability Index. The challenge is that each organization may have to comply with all of these standards or rules. They may comply with only part, and the issue faced by manufacturers, retailers and supply chain professionals is that the awareness or knowing what to go after is a challenge (Wilkerson, 2010).

Awareness: one good thing on the awareness front is that the U.S. government is actually mandating sustainability reporting for private companies and nonprofits (nearly $400 billion in annual revenue) selling products and services to the U.S. Federal Government. For example, in 2011 federal vendors, roughly about six hundred thousand of them will have to show evidence that they have measured their greenhouse gas emissions and have water optimization plans in place (Wilkerson, 2010).

Business Case Development: Corporate social responsibility, competitive pressures, as well as where to use limited capital will be a choke point for multi-national supply chains in the future. Strategic planners will likely struggle with business cases as best practices are shared. One interim solution as new business models mature involves integrating tying carbon to future supplier contract. This concept will take years to evolve but is critical to managing greenhouse gases and level playing field in Europe and North America (Wilkerson, 2010).

Sustainability Program Implementation: **i**mplementation is a big challenge. Implementation is a challenge because organizations do not know which rules or standards to follow. In John Wilkerson book, he actually intended to help organizations with implementation of the U.S. Greenhouse Gas protocol and the January 2011 requirement for federal contractors to comply with federal standards. In the book he divided implementation into three phases which include direct emissions, purchase energy (water included) and all indirect emissions (all indirect carbon

emissions, such as purchasing, outsourced activities, travel, and looking at employee commute) (Wilkerson, 2010).

Communications Planning: the environmental, sustainability, green space is very broad. It encompasses everything from renewable energy to various employee commute emissions and industry specific operational definitions. Organizations have to develop a communication strategy early in Green Supply Chain planning process. The communications strategy is kept to driving long term compliance and reducing emissions (Wilkerson, 2010).

Lack of Information about the Green Supply Chain best Practices: It is not usually the investment costs, but a lack in their green initiatives that pose a challenge to green supply chain. In an attempt to alleviate this problem some researchers have come up with the Green SCOR integrates information on regulations and green supply chain environment best practices and metrics into the entire best practices that leave organizations with a limited view supply chain planning process. It also enables a firm to know what to do and implement. Green SCOR incorporated systematic study of the supply chain to unearth within the SCOR framework can provide immense help opportunities for making the supply chain greener by offering information on best practices, waste disposal process and metrics to increase the success of Capabilities of GreenSCOR : GreenSCOR initiatives (LMI,2003).

Lack of Tools to Optimize the Supply Chain with Environmental Management: There is no dearth of tools for supporting green supply chain initiatives. The challenge lies in selecting the right tools. Tools such as ARIS are available for business process modeling based on the SCOR industry framework and its new green SCOR model, which provides environmental metrics that, can be included in the calculations for optimizing the supply chain.

Difficulties in Tracing of Carbon Footprint due to global sourcing: given global sourcing, tracking the carbon footprint of finished products can be difficult. Increasingly, however, new initiatives have emerged for adopting the practice of requesting a carbon footprint from suppliers. One of the examples is the carbon disclosure project that is being piloted by 11 multinationals including Dell, L'Oreal and Unilever. The project asks participating organizations to request carbon footprint information from suppliers and promote emission reduction measures across the supply chain (LMI, 2003).

2.4 Summary of Literature Review

This study is to investigate the implementation of green supply chain management and supply chain responsiveness among food and beverage manufacturing firms in Nairobi. This study aims to establish the relationship between green supply chain implementation and supply chain responsiveness. Green supply chain implementation helps to minimize environmental impact of waste. Organizations adopting this practice stand to benefit immensely. However, the practice has number of challenges which must be overcome by organizations adopting it. It is important to note however that we live in a decade where environmental sustainability gas been an important issue to business practice. Since the 1990s, manufacturers have been faced with pressure to address Environmental Management (EM) in their supply chains. As several studies have been done in this area, it is important to investigate the conclusion made by these studies to establish whether similar conclusion can be reached when using different methodology and researcher to conduct the study.

Barros, Dekker and Scholten (1998), discussed recycling in the supply chain. But Darnall, Jolley, Jason and Harnfield (2008) critique green supply chain management by saying that Environmental Management systems are making less progress in reducing environmental harms. Some studies in this area are of limited focus. For examples, Van Der Laan et al., (1996) only discussed product remanufacturing and design while Zhang et al., (1997) only discussed environmental technologies and design. These studies did not consider life cycle analysis which is an important sub-concept of green design in the implementation of green supply chain management.

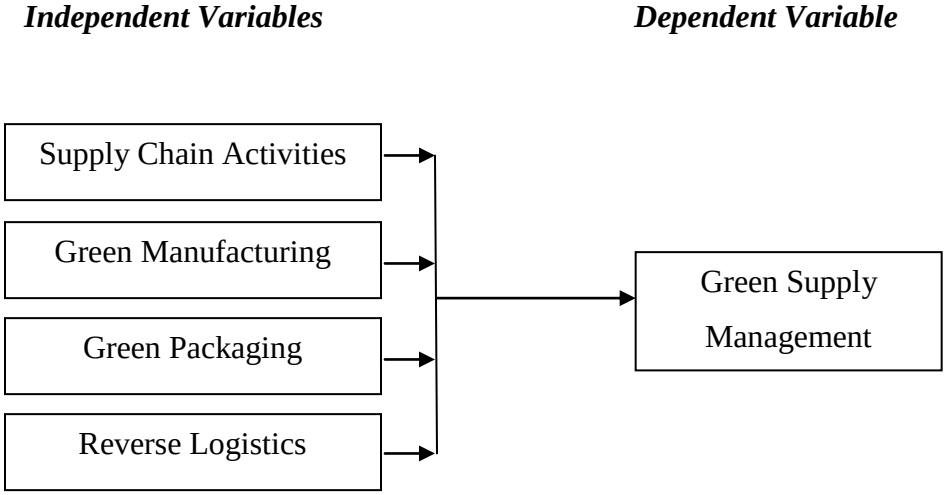
The concept of life cycle analysis is to measure environmental and resource related products to the production process. This measurement involves the stages from extraction of raw materials, production and distribution and remanufacturing reverse logistics, recycling and final disposal. This study, there, will consider the concept of life cycle analysis which covers the measure of all aspects of GSCM. The measurement will assist to examine and quantify the energy and materials used and wasted and assess the impact of product on the environment.

2.5 Conceptual Framework

A conceptual framework assists to simplify the proposed relationships between the dependent variable and the independent variables in a study and allows the same to be depicted diagrammatically. The conceptual framework of this study composed of two independent variables and one dependent variable. The independent variables are Supply Chain Activities, Green Manufacturing, Green Packaging and Reverse Logistics to capture supply chain responsiveness. The performance of the green supply Chain will be measured by Green Supply Management as a percentage in terms of what percentage of total cost is attributed to green supply chain management.

The supply chain activities encompasses all activities associated with the flow and transformation of goods from raw materials stage (extraction), through to the end user, as well as the associated information flows. Bowen et al., (2001) define green manufacturing is the practice of conserving energy and materials, forbidding the use of hazardous materials, and minimizing waste production. They define green packaging as practices including cooperation with suppliers to reduce packaging and to put recycling initiatives into effect. Fleischmann et al., (1997) defined reverse logistics as the process of transforming used products into reusable products.

Fig.1 Conceptual Framework



CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter highlights the methodology that was used to achieve the objectives of the study. Here, the research design, target population, sampling design, data collection and analysis were discussed.

3.2 Research Design

This study adopted a descriptive research design studying the implementation of Green Supply Chain and Responsive Supply Chain Management among food and beverages manufacturing firms in Nairobi. A descriptive design focuses on the investigation of the elements in their current state without necessarily making any changes to them.

3.3 Population of the Study

In this research, the population consisted of all food and beverages manufacturing firms that are situated in Nairobi. Currently, there are 98 food and beverages manufacturing firms in Nairobi which formed part of the population of this research.

3.4 Sampling Design

As a result of cost constraints, the researcher selected a sample size of 50 food and beverages manufacturing firms in Nairobi. According to Mugenda and Mugenda (2003), at least (10%) of the total assessable population is regarded as an adequate sample for a study which uses descriptive research design. Based on this assertion, 50 food and beverages manufacturing firms in Nairobi were selected which constituted (49%) of the total assessable population of the study.

3.5 Data Collection

The researcher considered fifty food and beverages manufacturing firms in Nairobi representing sample of the total population under study. This implies that fifty firms were targeted as respondents of which thirty-two of them responded.

Self-administered questionnaires were developed to collect data from respondents. The questionnaires contained both open and closed ended questions. The researcher used primary data which means responses obtained from respondents through questionnaire. The instrument was divided into two sections. The first section contained questions on the demographic information of the organizations while section two contained questions on the specific objectives of the study. The drop and pick method was used to administer the questionnaire. The production managers and supervisors of these firms were the target respondents for this study.

3.5 Data Analysis

Quantitative techniques were used to analyze the data collected. The researcher made use of the statistical measure of central tendency such as mean and standard deviation to analyze objective one of the study which was to determine the effects of implementing green supply chain management among food and beverages manufacturing firms in Nairobi. The mean was used to analyze on average the number of responses on benefits as well as challenges in implementing green supply chain management. The results from the analysis were presented in tables.

In analyzing data for objective two, the regression analysis was used to determine the relationship between the implementation of green supply chain and supply chain responsiveness among food and beverages manufacturing firms in Nairobi. The regression model used is given below:

$$Y = a + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \epsilon$$

Where

Y = Green supply chain management

a = Constant of regression

X_1 = Supply Chain Activities

X_2 = Green Manufacturing

X_3 = Green Packaging

X_4 = Reverse Logistics

β_i = Sensitivity of green supply chain management to the independent variables

ϵ = Error term

CHAPTER FOUR:
DATA ANALYSIS, FINDINGS AND DISCUSSIONS

4.1 Introduction

This chapter is organized as follows: the first section provides a detailed analysis of the variables to do with green supply chain management. Further, benefits of green management to the thirty-two respondents used in the study, the challenges facing GSCM implementation are discussed. The second part provides a discussion of the findings.

4.2 Response Rate

The study sought to gather information from production managers or any individual responsible for the production function in the food and beverages manufacturing firms in Nairobi. The research was designed to gather information from a sample of 50 food and beverages manufacturing firms in Nairobi. However, of the total sample (50) firms selected, 32 firms responded which constitutes 64 % of the targeted sample.

4.3 Benefits of Implementing GSCM

There are several benefits of implementing GSCM. The respondents were asked to indicate the benefits of implementing GSCM which their firms enjoy. A five point Likert scale was used where 0=not at all, 1=very small extent, 2=small extent, 3=large extent and 4=very large extent. The findings from the respondents are summarized in 4.1 below.

Table 4.1: Benefits of Implementing GSCM

Benefits	MEAN	SD
Innovative processes and continuous improvement	2.594	0.665
Promote alignment	2.875	0.942
Value to the organization	3.063	0.840
Fast and flexible business process	2.938	0.619
Improved information systems	3.250	0.622
Speedy logistics process	3.063	0.759
Reducing the environmental impact of business processes	3.125	0.554
Increased saving	3.156	0.723
Effective utilization of all available productive resources	3.156	0.677
Purchasing green input resources	3.031	0.861
Reduced production costs	3.094	0.928
Promote recycling of materials	3.219	0.706
Promote reuse of raw materials	3.031	0.933
Reduced production of hazardous substances	3.094	0.818
Reduced operational costs	3.125	0.660
Reduced risk of prosecuted based on anti-environment reasons	3.125	0.751
Improvements in durability and conformance to specifications	3.094	0.641
GRAND MEAN	**3.061**	

Source: Researcher (2012)

Table 4.1 above shows the analysis of the benefits of GSCM as indicated by the respondents. The grand mean was 3.061 which indicated that the respondents generally found GSCM as important and of benefit. The main areas of benefit were: improved information systems (M = 3.250); promote recycling of materials (M = 3.219); increased saving (M = 3.156); effective utilization of all available productive resources (M = 3.156); reducing the environmental impact of business processes (M = 3.125); reduced operational costs (M = 3.125) and reduced risk of prosecuted based on anti-environment reasons (M = 3.125). The areas that recorded least benefit due to GSCM were: purchasing of green input resources (M = 3.031); promotion of the reuse of raw materials (M = 3.031); fast and flexible business processes (M = 2.938); promotion of alignment to GSCM (M = 2.875); and innovativeness of processes and continuous improvement (M = 2.594).

The findings of this study are in agreement with several studies by supply chain management scholars. Christopher (2000) argues that supply chain agility is broadly a business capability that embraces organizational structures, information systems, logistics process and in particular mindsets. Emmet and Sood (2010), agree that the fundamental benefit of going green is positive long term impact on the financial performance of the organization while Murray (2012) maintain that companies can find cost savings by reducing the environmental impact of their business processes.

The researcher was also interested to know the sizes of the food and beverages manufacturing firms in Nairobi. Findings from this area were summarized in table 4.2.

Table 4.2 Benefits of GSCM Implementation by Company Size

Benefits	LESS 100		100 TO 200		ABOVE 200	
	MEAN	SD	MEAN	SD	MEAN	SD
Innovative processes and continuous improvement	2.500	0.577	2.714	0.644	2.286	0.756
Promote alignment	3.250	0.957	2.857	0.964	2.714	0.951
Value to the organization	3.000	1.155	3.048	0.805	3.143	0.900
Fast and flexible business process	3.000	0.816	3.000	0.632	2.714	0.488
Improved information systems	3.750	0.500	3.238	0.539	3.000	0.816
Speedy logistics process	3.000	0.000	3.095	0.889	3.000	0.577
Reducing the environmental impact of business processes	2.750	0.957	3.143	0.478	3.286	0.488
Increased saving	2.500	0.577	3.238	0.700	3.286	0.756
Effective utilization of all available productive resources	3.250	0.957	3.190	0.750	3.000	0.000
Purchasing green input resources	2.500	0.577	3.143	0.910	3.000	0.816
Reduced production costs	3.250	0.957	3.143	1.014	2.857	0.690
Promote recycling of materials	2.500	0.577	3.381	0.669	3.143	0.690
Promote reuse of raw materials	2.750	0.957	3.190	0.928	2.714	0.951
Reduced production of hazardous substances	2.750	0.500	3.238	0.831	2.857	0.900
Reduced operational costs	3.250	0.957	3.190	0.680	2.857	0.378
Reduced risk of prosecuted based on anti-environment reasons	3.000	0.816	3.143	0.793	3.143	0.690
Improvements in durability and conformance to specifications	3.000	0.816	3.238	0.625	2.714	0.488
GRAND MEAN	**2.941**		**3.129**		**2.924**	

Source Researcher (2012)

In Table 4.2, the analysis of benefits was done according to the sizes of the surveyed organization based on the number of workers. Among the organizations that had less than 100 workers the most important benefits of GSCM were improved information systems (M = 3.750);

promotion of alignment (M = 3.250); effective utilization of all available productive resources (M = 3.250); reduced production costs (M = 3.250) and reduced operational costs (M = 3.250). Among those that had between 100 and 200 workers the most important benefits were: promotion of recycling of materials (M = 3.381); improved information systems (M = 3.381); improvements in durability and conformance to specifications (M = 3.381); reduced production of hazardous substances (M = 3.381) and increased saving (M = 3.381).

Among those organizations that had more than 200 workers, the identified areas that accrued important benefit were: increased saving (M = 3.286); reducing the environmental impact of business processes (M = 3.286); promote recycling of materials (M = 3.143); reduced risk of prosecuted based on anti-environment reasons (M = 3.143) and value to the organization (M = 3.143).

The findings are also in support of Christopher (2000) who maintains that supply chain agility is broadly a business capability that embraces organizational structures, improved information systems, logistics process and in particular mindsets. Emmet and Sood (2010), agree that the fundamental benefit of going green is positive long term impact on the financial performance of the organization while Murray (2012) maintains that companies can find cost savings by reducing the environmental impact of their business processes.

The analysis of the benefits accrues from GSCM implementation was also done according to the number of branches each organization had. The organizations were grouped into those with one branch, those with two to three and those with more than three branches. The results of this analysis are presented in Table 4.3.

Table 4.3 Benefits of GSCM by Number of Branches

Benefits	ONE BRANCH		2 TO 3 BRA		ABOVE 3	
	MEAN	SD	MEAN	SD	MEAN	SD
Innovative processes and continuous improvement	2.550	0.605	2.556	0.882	3.000	0.000
Promote alignment	2.750	0.967	3.111	1.054	3.000	0.000
Value to the organization	3.050	0.887	2.889	0.782	3.667	0.577
Fast and flexible business process	2.900	0.553	3.000	0.866	3.000	0.000
Improved information systems	3.250	0.550	3.222	0.833	3.333	0.577
Speedy logistics process	2.900	0.852	3.444	0.527	3.000	0.000
Reducing the environmental impact of business processes	3.100	0.553	3.111	0.601	3.333	0.577
Increased saving	3.100	0.641	3.111	0.782	3.667	1.155
Effective utilization of all available productive resources	3.100	0.641	3.111	0.601	3.667	1.155
Purchasing green input resources	2.800	0.768	3.333	0.866	3.667	1.155
Reduced production costs	2.900	0.912	3.111	0.782	4.333	0.577
Promote recycling of materials	3.100	0.641	3.222	0.667	4.000	1.000
Promote reuse of raw materials	2.950	1.050	3.111	0.782	3.333	0.577
Reduced production of hazardous substances	3.100	0.788	3.111	0.928	3.000	1.000
Reduced operational costs	3.250	0.716	3.000	0.500	2.667	0.577
Reduced risk of prosecuted based on anti-environment reasons	3.050	0.759	3.333	0.707	3.000	1.000
Improvements in durability and conformance to specifications	3.100	0.641	3.111	0.601	3.000	1.000
GRAND MEAN	**2.997**		**3.111**		**3.333**	

Among the organizations with one branch the most significant benefits accruing included: improved information systems (M = 3.250); reduced operational costs (M = 3.250); reducing the environmental impact of business processes (M = 3.100); increased saving (M = 3.100); effective utilization of all available productive resources (M = 3.100); promote recycling of materials (M = 3.100); reduced production of hazardous substances (M = 3.100) and improvements in durability and conformance to specifications (M = 3.100).

Among the firms that had two to three branches, the main areas of most benefit were: speedy logistics process (M = 3.444); reduced risk of prosecuted based on anti-environment reasons (M = 3.333); purchasing green input resources (M = 3.333); improved information systems (M = 3.222) and promotion of recycling of materials (M = 3.222). Among the organizations with more than three branches the areas of most benefit included: reduced production costs (M = 4.333); promote recycling of materials (M = 4.000); purchasing green input resources (M = 3.667);

increased saving (M = 3.667); effective utilization of all available productive resources (M = 3.667) and addition of value to the organization (M = 3.667).

Findings in the various categories are in agreement with previous studies done by various scholars in supply chain management. The scholars include Christopher (2000), Emmet and Sood (2010), Murray (2012) and Wilkerson (2012) whose arguments the study confirmed regarding the benefits of GSCM implementation.

4.4 Challenges of Implementing GSCM

There are several challenges in the implementation of GSCM. The study sought to establish the challenges of implementing GSCM among food and beverages manufacturing firms in Nairobi. Again a five point Likert scale was used where 0=not at all, 1=very small extent, 2=small extent, 3=large extent and 4=very large extent. Table 4.4 below shows the analysis of the challenges that food and beverages manufacturing firms face in implementing GSCM.

Table 1.4: Challenges in Implementing GSCM

Challenges	MEAN	SD
Increasing resource requirements	1.938	1.190
Increased transportation, packaging, handling and emission	1.688	1.281
Lack of environmental integration with SCM processes	1.656	1.310
Lack of information on actual standards to use in GSC implementation	1.656	1.310
Lack of awareness about GSC practices	1.844	1.439
Limited opportunity for business case development	1.688	1.447
Difficulties sustainability program implementation	1.875	1.519
Limited communication planning	1.969	1.596
Limited view on supply chain planning process	1.875	1.561
Limited information on waste disposal processes and metrics	1.625	1.289
Difficulties in tracing of carbon footprint from suppliers	1.875	1.476
Lack of rightful tools selection to implement GSC	1.844	1.439
GRAND MEAN	**1.794**	

Source Researcher (2012)

In table 4.4 above, the analysis of the challenges that face the GSCM implementation is presented. The Grand mean of 1.794 indicated that the organizations did not find the challenges

identified by this survey as being serious challenges to the implementation of GSCM. However, the most seriously faced challenges were: limited communication planning (M = 1.969); increasing resource requirements (M = 1.938); difficulties in sustainability of program implementation (M = 1.875); limited views on supply chain planning process (M = 1.875); difficulties in tracing of carbon footprint from suppliers (M = 1.875); lack of awareness about GSC practices (M = 1.844) and lack of rightful tool selection to implement GSC (M = 1.844).

The areas that showed the least importance as sources of challenges to the implementation of GSCM among the surveyed organizations were: increased transportation, packaging, handling and emissions (M = 1.688); limited opportunity for business case development (M = 1.688); lack of environmental integration with supply chain management processes (M = 1.656); lack of information on actual standards to use in GSC implementation (M = 1.656) and limited information on waste disposal processes and metrics (M = 1.625).

Even though the study identified some challenges when implementing GSCM. These challenges according to findings of this study do not pose much threat to food and beverages manufacturing firms in Nairobi. The findings therefore are not in total agreement with some early scholars of supply chain like Wilkerson (2010) who argue that organizations have to develop a communication strategy early in GSC planning process. According to the study, challenges like lack of information about GSC practices, difficulties in sustainability of program implementation, limited view on supply chain planning process do not pose major threats to food and beverages manufacturing firms in Nairobi contrary to LMI (2003).

The interest of the researcher also was to establish the challenges of implementing GSCM based on the sizes of the firms. The analysis of the challenges based on the number of workers was done and results presented in Table 4.5.

Table 4.5: Challenges based on Firm Size

Challenges	LESS 100		100 TO 200		ABOVE 200	
	MEAN	SD	MEAN	SD	MEAN	SD
Increasing resource requirements	2.000	1.155	1.857	1.236	2.143	1.215
Increased transportation, packaging, handling and emission	1.000	1.155	1.619	1.244	2.286	1.380
Lack of environmental integration with supply chain management processes	1.750	1.500	1.619	1.396	1.714	1.113
Lack of information on actual standards to use in GSC implementation	1.250	1.500	1.667	1.354	1.857	1.215
Lack of awareness about GSC practices	2.250	2.217	1.667	1.461	2.143	0.900
Limited opportunity for business case development	2.500	2.380	1.429	1.248	2.000	1.414
Difficulties sustainability program implementation	2.250	2.630	1.762	1.375	2.000	1.414
Limited communication planning	2.250	2.630	1.714	1.488	2.571	1.272
Limited view on supply chain planning process	2.250	2.630	1.667	1.426	2.286	1.380
Limited information on waste disposal processes and metrics	1.250	1.500	1.571	1.326	2.000	1.155
Difficulties in tracing of carbon footprint from suppliers	1.750	2.062	1.762	1.446	2.286	1.380
Lack of rightful tools selection to implement GSC	1.500	1.732	1.714	1.419	2.429	1.397
GRAND MEAN	1.833		1.671		2.143	

Source Researcher (2012)

As presented in table 4.5 above, the grand means indicated that the firms with between 100 and 200 workers had the least feeling that the identified challenges were a challenge to them at all as indicated by their lowest Grand mean of 1.671. However, the firms with less than 100 workers indicated that the main challenges were: limited opportunity for business case development (M = 2.500); lack of awareness about GSC practices (M = 2.250); difficulties sustainability program implementation (M = 2.250); limited communication planning (M = 2.250) and limited view on supply chain planning process (M = 2.250).

Among the firms with between 100 and 200 workers the main challenges were: increasing resource requirements (M = 1.857); difficulties sustainability program implementation (M = 1.762); difficulties in tracing of carbon footprint from suppliers (M = 1.762); limited communication planning (M = 1.714) and lack of rightful tools of selection to implement GSC (M = 1.714). The firms with more than 200 workers indicated that the most felt challenges were: limited communication planning (M = 2.571); lack of rightful tools of selection to implement GSC (M = 2.429); difficulties in tracing of carbon footprint from suppliers (M = 2.286); limited view on supply chain planning process (M = 2.286) and increased transportation, packaging, handling and emission (M = 2.286). This is an indication that food and beverages manufacturing

firms in Nairobi do not face major challenges, be it firms with workers less than 100, workers between 100 and 200, or workers more than 200.

These findings seem to confirm the posit by The Ryder Center for Supply Chain Management (2008) which found that the main challenges of GSCM because the challenges that were closely connected to technology were lowly scored due to a lack of awareness and technology for such purposes. These problems seem, however, to be less serious as firms get bigger.

The researcher also sought to establish the challenges of GSCM implementation by branches. The analysis of the challenges faced by the food and beverages manufacturing firms with respect to the implementation of GSCM is presented in Table 4.6 below.

Table 4.6: Challenges Based on Number of Branches

Challenges	ONE BRANCH		2 TO 3 BRANCHES		3+ BRANCH	
	MEAN	SD	MEAN	SD	MEAN	SD
Increasing resource requirements	2.000	1.124	1.778	1.302	2.000	1.732
Increased transportation, packaging, handling and emission	1.600	1.231	1.778	1.394	2.000	1.732
Lack of environmental integration with SCM processes	1.600	1.353	2.000	1.118	1.000	1.732
Lack of information on standards to use in implementation	1.700	1.261	1.667	1.500	1.333	1.528
Lack of awareness about GSC practices	1.900	1.294	2.000	1.732	1.000	1.732
Limited opportunity for business case development	1.700	1.302	1.778	1.856	1.333	1.528
Difficulties sustainability program implementation	1.900	1.518	1.889	1.764	1.667	1.155
Limited communication planning	1.900	1.483	2.333	1.936	1.333	1.528
Limited view on supply chain planning process	1.950	1.432	1.889	1.965	1.333	1.528
Limited information on waste disposal processes and metrics	1.750	1.333	1.444	1.236	1.333	1.528
Difficulties in tracing of carbon footprint from suppliers	2.050	1.605	1.556	1.333	1.667	1.155
Lack of rightful tools selection to implement GSC	2.050	1.432	1.667	1.414	1.000	1.732
GRAND MEAN	**1.842**		**1.815**		**1.417**	

Source Researcher (2012)

The Grand means for the firms with less than one branch, with two to three branches and with over three branches 1.842, 1.815 and 1.417. This indicated that the challenges presented were felt weakly, but the firms with less than three branches felt the challenges more than those with more than three branches. However, among the firms with one branch, the most felt challenges were: difficulties in tracing of carbon footprint from suppliers (M = 2.050); lack of rightful tools

of selection to implement GSC (M = 2.050); increasing resource requirements (M = 2.000); and limited view on supply chain planning process (M = 1.950).

Among those with two to three branches the main challenges were: limited communication planning (M = 1.736); lack of awareness about GSC practices (M = 1.732); lack of environmental integration with supply chain management processes (M = 1.118); limited view on supply chain planning process (M = 1.965) and difficulties sustainability program implementation (M = 1.764). Among the organizations with more than three branches the main challenges were: increasing resource requirements (M = 2.000); increased transportation, packaging, handling and emission (M = 2.000); difficulties in sustainability of program implementation (M = 2.000) and difficulties in tracing of carbon footprint from suppliers (M = .667).

The study supports the findings by Simchi-Levi (2008) who found that outsourcing may involve parts of the manufacturing process being transferred to plants in the other branches, only for the products to be transported back in readiness for the next part of the supply chain process. This requires additional transportation and thus increasing emissions and extra costs in packaging, handling emissions, difficulties in sustainability and other resource requirements.

4.5 Relationship between GSCM and Supply Chain Responsiveness

A complete observation for each of the respondents had Green Supply Chain Management (GSCM), Supply Chain Activities (SCA), Green Manufacturing (GM), Green Purchasing (GP) and Reverse Logistics (RL). GSCM was measured as a percentage of the cost of production allocated to green supply chain management by the respondents. SCA, GM, GP and RL were variables that were captured by the average response to the questions under the tables with the same title as shown in the questionnaire in Appendix I.

The coefficient of Supply Chain Activities (SCA) was -1.00271 which was significant $t_{(27)} = -270.38, p < 0.05$. The coefficient of Green Manufacturing (GM) was -1.0009 which was significant $t_{(27)} = -233.16, p < 0.05$. further, the coefficient of Green Purchasing (GP) was 3.00018 which was significant $t_{(27)} = 3877.999, \mathrm{p} < 0.05$. However, the coefficient of Reverse Logistics (RL) was -0.00364 which was also significant $t_{(27)} = -1.08179, p < 0.05$. the four

variables Reverse Logistics, Green Manufacturing, Green Purchasing and Supply Chain Activities explained the variation in Green Supply Chain Management (GSCM), $R^2 = 1.00$, $F(1,27) = 115629192, \mathrm{p} < 0.05$. (See Appendix II).

The highest expenditure on GSCM was at (25 %) of costs while the lowest was (0 %). The highest mean score of responses concerning SCA was (M=4.00) while the lowest was (M=1.75). When it came to GM, the highest observed mean (M= 4.00) while the lowest was (M=2.00). The highest percentage expenditure on GP was (M= 13.64) while the lowest was (M=3.86). The scores of RL ranged between (M=2.00) and (M=4.00). (See Appendix II)

Table 4.7 Correlation Matrix

	GSCM	SCA	GM	GP	RL
Green Supply Chain Management (GSCM)	1	0.60275	0.30683	0.35946	0.19268
Supply Chain Activities(SCA)		1	0.39056	0.42714	0.2833
Green Manufacturing(GM)			1	0.35187	0.99142
Green Purchasing (GP)				1	0.30593
Reverse Logistics(RL)					1

Source Researcher (2012)

According to Table 4.7 there was a strong correlation between Green Supply Chain Management (GSCM) and Supply Chain Activities (SCA), $r(32) = 0.60275, p < 0.05$. There was also a strong correlation between Green Manufacturing (GM) and Reverse Logistics (RL), $r(32) = 0.99142, p < 0.05$. The correlation between Green Supply Chain Management and Reverse Logistics was also strong as indicated, $r(32) = 0.19268, p < 0.05$.

The findings are in agreement with Ninlawan et al (2010) who argued that green manufacturing can lead to lower costs, production efficiency gains, reduced environmental and occupational safety expenses and improved corporate image. Ninlawan et al (2010) also maintained that packaging characteristics such as size, shape, and materials have impact on distribution because of their affect on the transport characteristics of the product.

Table 4.2 : Regression Results

	COEFFICIENT	T VALUE	P VALUE
CONSTANT	0.02395	1.91485	0.06616
SCA	-1.00271	-270.38	0
GM	-1.0009	-233.16	0
GP	3.00018	3877.999	0
RL	-0.00364	-1.08179	0.288891
R SQ	1		
ADJ RSQ	1		
F	115629192		0
DW	2.43342		

Source Prepared by Researcher

Regression model

$$GSCM = 0.02395 - 1.00271(SCA) - 1.0009\,(GM) + 3.00018\,(GP) - 0.00364\,(RL)$$

These findings are in line with Ninlawan (2010) who argue that green packaging characteristics such as size, shape, and materials have impact on distribution. Further, the findings support the findings by Wilkerson (2005), Mazumber (2010) and Murray (2011) who concluded that green supply chain activities provide an opportunity to review processes, materials, and occupational concepts. It targets wasted materials, wasted energy or effort and under-utilized resources.

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter provides a summary of the findings of this study. The first section provides a summary of the findings. The other sections provide the conclusions of the study, the limitations of the study, suggestions for further research and recommendations for quality and practice in that order.

5.2 Summary of findings

The study had two specific objectives which were to determine the effects of implementing green supply chain management and the relationship between green supply chain management and supply chain responsiveness. This study established that the benefits experienced by the firms that implemented GSCM were that there was improvement in information systems; the use of recyclable materials was well promoted; firms experienced savings on costs due to effective utilization of available productive resources. GSCM also did much in helping with reduction of the environmental impact of business processes. Operational costs and risk of prosecution based on anti-environment reasons were considerably reduced.

The most seriously faced challenges arose from limited communication planning among the firms; the increasing resource requirements for the implementation of GSCM; the sustainability of program implementation. Challenges also arose from the limited and narrow views planning process had concerning GSCM. It was difficult to trace carbon footprint from suppliers. These challenges were coupled with lack of awareness about GSC practices and lack of rightful tools to enable effective implement GSCM.

The regression analysis indicated that the most significant factor that influenced the percentage of costs expended on GSCM was Green Packaging (GP). Both SCA and GM had negative effects on GSM for they recorded negative regression coefficients which were significantly different from zero basing on the P-values of their T-statistics. The weakest influence on GSCM was from Reverse Logistics (RL).

5.3 Conclusions of the Study

The aim of this study was to answer the questions: what are the effects of implementing green supply chain management among food and beverages manufacturing firms in Nairobi? And what is the relationship between implementation of green supply chain and supply chain responsiveness among food and beverages manufacturing firms in Nairobi? These questions were to be answered through the objectives which were: to determine the benefits of and challenges facing green supply chain management implementation among food and beverage manufacturing firms in Nairobi; and to determine the relationship between implementation of Green Supply Chain Management and supply chain responsiveness of food and beverages manufacturing firms in Nairobi.

The first objective of this study was to determine the effects of implementing GSCM. In the light of this objective, this study found that the benefits experienced by the firms that implemented GSCM were: improvement in information systems; the use of recyclable materials was well promoted; firms experienced savings on costs due to effective utilization of available productive resources. GSCM also did much in helping with reduction of the environmental impact of business processes. Operational costs and risk of prosecution based on anti-environment reasons were considerably reduced.

The most seriously faced challenges were: limited communication planning among the firms; the increasing resource requirements for the implementation of GSCM; the sustainability of program implementation. Challenges also arose from the limited and narrow views planning process had concerning GSCM. It was difficult to trace carbon footprint from suppliers; there was lack of awareness about GSC practices and lack of rightful tools to enable effective implement GSCM.

Secondly, the study was to establish the relationship between green supply chain management and supply chain responsiveness. The regression analysis showed that the most significant factor that influenced the percentage of costs expended on GSCM was Green Packaging (GP). Both SCA and GM had negative effects on GSCM for they recorded negative regression coefficients which were significantly different from zero.

5.4 Limitations of the Study

This study focused on the food and beverages manufacturing firms only and focused on those located in Nairobi. The limitation arising from this is that the findings may not be applicable to other companies in other industries in Kenya because these findings are specific to the companies in the food and beverages manufacturing firms located in Nairobi. The findings may also not be applicable to companies out of Kenya.

The primary data collected by the Likert scale may have biases of the respondent reflected in the results. This might therefore lead to results being dependent upon the attitudes of the respondent officer of the companies that responded. There is a possibility that if the respondents were different, the results might be different.

The results of this study might be limited to the time they were collected. The dynamic nature of supply chain management may mean changes could have taken place soon after the data was collected. The picture might be different after the data collection. The findings might therefore not be expressly applicable across time even with the same companies.

5.5 Suggestions for Further Research

This study can be repeated with a wider population of study across all industries in Kenya so as to get findings that are applicable to all industries in Kenya where GSCM is evident. The study can also be done using secondary data instead of relying on primary data. The assumption is that the weaknesses of the Likert scale concerning objectivity will be mitigated by the use of secondary data. There should be a study to make the study applicable across time by conducting a time series cross-sectional study instead of the onetime study that was done by this survey.

5.6 Recommendations for Quality and Practice

Based on the findings of this study, it is recommended that the implementation of GSCM should be implemented among food and beverages manufacturing firms in Kenya because there are benefits that accrue from such implementation. For instance firms will benefit through improvement in information systems; increased use of recyclable materials; savings on costs due to effective utilization of available productive resources; reduction of the environmental impact

of business processes and reduction of operational costs and risk of prosecution based on anti-environment reasons.

Mechanisms should be put in place by the relevant firms and authorities to address the challenges that are hampering the implementation of GSCM. The areas of challenges that should be addressed were identified as: limited communication planning among the firms; the increasing resource requirements; the sustainability of program implementation; the limited and narrow views planning process had concerning GSCM; the difficulty of tracing carbon footprint from suppliers; lack of awareness about GSCM practices and lack of rightful tools to enable effective implement GSCM.

The strategies that should make GSCM attractive to firms should focus on Green Packaging which had the most significant influence on the percentage of costs expended on GSCM. However, focusing on Reverse Logistics may not produce much influence on the success of implementation of GSCM among food and beverages manufacturing firms.

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APPENDICES

Appendix I: Research Questionnaire

Introduction

This questionnaire is designed for the sole purpose of gathering information on the implementation of green supply chain and responsive chain management among food and beverages production firms in Nairobi. Kindly respond to the questions honestly by ticking the most appropriate response or filling in the blanks spaces. Responses will be treated with highest level of confidentiality.

SECTION A: GENERAL INFORMATION

1. How many people has your organization employed? _____
2. How many branches do you have in Kenya? _____

SECTION B

EFFECTS

Kindly tick the most appropriate response concerning the various benefits of implementing Green Supply Chain Management.

a) Kindly tick to what extent your organization enjoy the below listed benefits in implementing green supply chain. Use five point scale, where

0=Not at all, 1=Very small extent, 2=Small extent, 3=Large extent, 4=Very large extent

Benefits	**0**	**1**	**2**	**3**	**4**
Innovative processes and continuous improvement					
Promote alignment					
Value to the organization					
Fast and flexible business process					
Improved information systems					
Speedy logistics process					
Reducing the environmental impact of business processes					
Increased saving					
Effective utilization of all available productive resources					
Purchasing green input resources					
Reduced production costs					
Promote recycling of materials					
Promote reuse of raw materials					
Reduced production of hazardous substances					
Reduced operational costs					
Reduced risk of prosecuted based on anti-environment reasons					
Improvements in durability and conformance to specifications					

b) To what extent does the environment in which you operate benefit from the implementation of green supply chain?

Not at all☐ Very small extent☐ Small extent ☐ large extent ☐ Very large extent ☐

CHALLENGES

By use of a tick indicate the extent to which your organization face the below listed challenges in implementing green supply management. Use a five point scale, where
0=Not at all, 1=Very small extent, 2=Small extent, 3=Large extent, 4=Very large extent

Challenges	**0**	**1**	**2**	**3**	**4**
Increasing resource requirements					
Increased transportation, packaging, handling and emission					
Lack of environmental integration with supply chain management processes					
Lack of information on actual standards to use in GSC implementation					
Lack of awareness about GSC practices					
Limited opportunity for business case development					
Difficulties sustainability program implementation					
Limited communication planning					
Limited view on supply chain planning process					
Limited information on waste disposal processes and metrics					
Difficulties in tracing of carbon footprint from suppliers					
Lack of rightful tools selection to implement GSC					

To what extent do these challenges cause operational delay for your organization? **Circle one.**

Not at all =0 Very small extent =1 Small extent-2 large extent =3 Very large extent=4

RELATIONSHIP

Kindly tick the appropriate response concerning the relationship between green supply chain implementation and supply chain responsiveness.

1. To what extent does green supply chain implementation improve supply chain responsiveness**? Circle one**

Not at all Very small extent Small extent large extent Very large extent

2. Kindly tick the level at which green supply chain management implementation can help obtain the below listed supply chain activities.

0=Not at all, 1=Very small extent, 2=Small extent, 3=Large extent, 4=Very large extent

SUPPLY CHAIN ACTIVITIES	**0**	**1**	**2**	**3**	**4**
Reduce material costs of production					
Reduce response time					
Reduce product life cycle & increase new product introduction					
Improve lead time					

GREEN MANUFACTURING	**0**	**1**	**2**	**3**	**4**
Setting a regulation for using green materials					
Making environmental management material lists					
Investigating raw materials using					
Reviewing environmental management material lists					

Modifying production process for environmental products					
Looking for alternative materials positively					
Adopting low pollution raw materials					
Adopting environmental friendly designs					
The new products can reduce environmental destruction					
Implementing GSCM can saving material cost					

GREEN PACKAGING	**0**	**1**	**2**	**3**	**4**
Adopting recycled materials					
Using easily decomposed materials					
Implementing reused package system					
Adopting simple materials					

REVERSE LOGISTICS	**0**	**1**	**2**	**3**	**4**
Positively launching recycle system					
Setting internal material recycling system					
Implementing recycle system and increasing profit					

Appendix II

SUMMARY OF THE VARIABLES USED IN REGRESSION ANALYSIS.

OBSERVATION	GSCM %	SCA	GM	GP	RL
1	15	3.00	4.00	5.75	2.67
2	12	2.50	2.90	4.85	3.33
3	20	2.75	3.20	7.24	3.33
4	8	3.00	2.90	4.48	2.67
5	15	2.50	2.70	6.30	3.33
6	9	3.25	3.20	5.36	3.33
7	11	3.25	3.20	6.11	3.33
8	8	3.00	3.20	5.55	4.00
9	0	2.75	3.70	3.86	3.00
10	7	4.00	3.50	6.13	3.00
11	12	3.25	3.10	7.34	3.67
12	15	3.25	3.50	8.44	3.00
13	6	3.00	3.40	6.35	4.00
14	12	3.25	3.40	8.16	4.00
15	5	3.25	3.10	6.59	3.00
16	0	3.75	3.20	5.74	3.33
17	5	3.50	3.10	7.15	3.33
18	8	3.25	3.50	8.19	3.33
19	6	3.00	3.60	7.90	2.67
20	20	3.50	3.00	11.63	3.00
21	15	3.00	3.60	10.65	3.33
22	25	3.75	3.80	13.64	4.00
23	7	3.50	3.80	9.33	4.00
24	10	3.25	3.80	10.26	4.00
25	15	3.00	3.80	11.70	4.00
26	7	1.75	2.50	9.31	3.00
27	10	3.50	3.00	10.88	3.33
28	0	3.25	3.30	8.64	3.33
29	10	3.00	3.60	11.40	4.00
30	7	3.00	3.50	10.88	3.00
31	3	2.00	2.00	9.50	3.00
32	0	2.00	2.30	9.08	2.00

APPENDIX III

Food and Beverages Manufacturing Firms in Nairobi, Kenya

1	Africa Spirit Ltd	51	Insta Products (EPZ) Ltd
2	Agriner Agricultural Development Ltd	52	Jambo Biscuits (K) Ltd
3	Belfast Millers Ltd	53	Jetlak Foods Ltd
4	Bidco Oil Refineries Ltd	54	Karirana Estate Ltd
5	Bio Foods Products Ltd	55	Kenafric Industries Ltd
6	Breakfast Cereal Company (K) Ltd	56	Kenblest Ltd
7	Broadway Dairy Ltd	57	Kenya Breweries Ltd
8	C. Czarnikow Sugar (EA) Ltd	58	Kenya Nut Company Ltd
9	Cadbury Kenya Ltd	59	Kenya Sweets Ltd
10	Centrofood Industries Ltd	60	Nestle Kenya Ltd
11	Coca-Cola East Africa Ltd	61	Nicola Farms Ltd
12	Confec Industries (EA) Ltd	62	Palmhouse Dairies Ltd
13	Corn Products Kenya Ltd	63	Patco Industries Ltd
14	Crown Foods Ltd	64	Pearl Industries Ltd
15	Deepa Industries Ltd	65	Pembe Flour Mills Ltd
16	Del Monte Kenya Ltd	66	Premier Flour Mills Ltd
17	East Africa Breweries Ltd	67	Premier Food Industries Ltd
18	East Africa Sea Food Ltd	68	Proctor & Allan (EA) Ltd
19	Eastern Produce Kenya Ltd	69	Promasidor (Kenya) Ltd
20	Farmers Choice Ltd	70	Trufoods Ltd
21	Frigoken Ltd	71	UDV Kenya Ltd
22	Giliol Company Limited	72	Unga Group Ltd
23	Glacier Products Ltd	73	Usafi Services Ltd
24	Global Allied Industries Ltd	74	Uzuri Foods Ltd
25	Global Beverages Ltd	75	Valuepak Foods Ltd
26	Global Fresh Ltd	76	W. E. Tilley (Muthaiga) Ltd
27	Gonas Best Ltd	77	Kevian Kenya Ltd
28	Hail & Cotton Distillers Ltd	78	Koba Waters Ltd
29	Al-Mahra Industries Ltd	79	Kwality Candies & Sweets Ltd
30	Alpha Fine Foods Ltd	80	Lari Dairies Alliance Ltd
31	Alpine Coolers Ltd	81	London Distillers (K) Ltd

32	Annum Trading Company Ltd	82	Mafuko Industries Ltd
33	Aquamist Ltd	83	Manji Food Industries Ltd
34	Brookside Dairy Ltd	84	Melvin Marsh International
35	Bunda Cakes & Feeds Ltd	85	Kenya Tea Development Agency
36	Candy Kenya Ltd	86	Mini Bakeries (Nbi) Ltd
37	Capwell Industries Ltd	87	Miritini Kenya Ltd
38	Carlton Products (EA) Ltd	88	Mount Kenya Bottlers Ltd
39	Chirag Kenya Ltd	89	Nairobi Bottlers Ltd
40	E & A Industries	90	Nairobi Flour Millers Ltd
41	Kakuzi Ltd	91	NAS Airport Services Ltd
42	Erdemann Co. (K) Ltd	92	Rafiki Millers Ltd
43	Excel Chemicals Ltd	93	Razco Ltd
44	Kenya Wine Agencies Ltd	94	Re-Suns Spices Ltd
45	Highlands Canners Ltd	95	Smash Industries Ltd
46	Highlands Mineral Water Co. Ltd	96	Softa Bottling Co. Ltd
47	Homeoil	97	Spice World Ltd
48	Wrigley Company (EA) Ltd	98	Spin Knit Dairy Ltd
49	Super Bakery Ltd		
50	Sunny Processors Ltd		

Source: Kenya Association of Manufacturers (KAM) Directory, June 2011