LEAN SUPPLY CHAIN PRACTICES AND SUPPLY CHAIN RESPONSIVENESS AMONG VEGETABLE OIL PROCESSING FIRMS IN KENYA

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DECLARATION

I hereby declare that the work contained in this project is my original work and has not been previously, in it's entirely or in part, been presented at any other university for a degree requisite. All the references cited in the text have been duly acknowledged.

Signed…….. Date…….

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D61/68050/2011

This management research project has been submitted for examination with my approval as the University supervisor.

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DEDICATION

This project is dedicated to my family members.

ABSTRACT

To make lean process success, level of thinking needs to be changed in order to focus on management from optimizing separate technologies, assets and vertical department to optimizing the flow of products and services through entire value streams that flow horizontally across technologies, assets and departments to customers. Eliminating whole along entire value steams, instead of at isolated points, creates processes that need less human effort, less space, less capital and less time to make products and services at far less cost and with fewer defects, compared with traditional business systems. The research adopted a cross sectional survey of all vegetable oil processing firm in Kenya, that provided quick, inexpensive, efficient and accurate means of assessing information about the population. The target population of the study covered all vegetable oil processing firms in Kenya. There were about 35 firms that were then dealing in the processing and refining of vegetable oils in Kenya. In this study, primary data was collected by use of structured and closed ended questionnaire. The questionnaires was send to supply chain managers or those in equivalent positions in the vegetable oil processing firms in Kenya by way of email, drop and pick later, by postage or by way of face to face interview where applicable. The study findings established that the lean supply chain practices used in vegetable oil processing firms in Kenya were demand management practices, waste management practices, standardization practices, behavioral practices, quality inspection activities and quality assurance activities; the firms that have responsive supply chain experience the advantage of improved lead time for innovative products life cycle, reduced costs/ increased revenue by optimizing inventory levels under demand uncertainty , create a win-win situation with suppliers by implementing quantity-flexible contacts that share risk among supply chain partners, save time and expense by understanding which supply chain strategies do not need expensive software for implementation and reduced costs by learning ways of dealing successfully with supply uncertainty and lean supply chain practices and supply chain responsiveness 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.

ACRONYMS

CPFR:	Collaborative Planning, Forecasting, and Replenishment
EDI:	Electronic Data Interchange
FAO:	Food and Agriculture Organization
GT:	Group Technology
JIT:	Just in time
MRI:	Minimum Reasonable Inventory
SCM:	Supply Chain Management
SKUs:	Stock Keeping Units
TCT:	Total Cycle Time
TPS:	Toyota Production System
TQM:	Total Quality Management
USA:	United States of America

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CHAPTER ONE: INTRODUCTION

1.1 Background

Supply chain has received much attention from researchers and practitioners. Gunasekaran et al. (2001) discussed that the role of supply chain metrics and measures in the success of an organization cannot be overstated because they affect strategic, tactical and operational planning and control. Moreover, the revolution of supply chain management (SCM) in the last decade has testified that an increasing number of companies seek to enhance performance beyond their own boundaries (Boyson et al., 1999; Poirier, 1999).

In the competitive environment, most leading edge companies realized that by transferring costs either upstream or downstream they are actually not increasing their competitiveness, since all cost ultimately make up their way to consumers. Supply chain management guides firms to co-operate with a common goal to increase the overall channel sales and profitability, rather than completing for a bigger share of a fixed profit. One strategy for coordinating within and between firms with focus on achieving efficiency, eliminating waste or overburden and creating value in products is the concept of lean management (Womack and Jones, 1996; Cigolini at al., 2004)

Companies searching for a way to sustain competitive advantage invest heavily in efficient business approaches like Just- In-Time, Total Quality Management and Re engineering designed to optimize the performance of certain firm's processes. The realization that optimization of single firm's operation does not result in appreciable system improvement leads many firms to seek closer coordination and integration with suppliers. Multiple firms working together through shared goals and integrated processes may improve the performance of each

1.1.1 Lean Supply Chain Practices

Harland (1996) stated that supply chain often refers to either a process oriented management approach to sourcing, producing and delivering goods and services to end customers or, in a broader meaning to the co-ordination of the various actors belonging to the same supply chain. Intense competition compels companies to create close relationships with their upstream and downstream partners (Togar and Romaswami 2004).

Mentzer et al (2001) defines a supply chain as a set of three or more entities (organizations or individuals) directly involved in the upstream and downstream flow of products, services, finances and/or information from source to customer. The National Institute of Science and Technology defines Lean as "A systematic approach to identifying and eliminating waste (non-value adding activities) through continuous improvement by following the product at the pull of the customer in pursuit of perfection". Simply lean means to create more value for customers with fewer resources. Thus, the fundamental ideas are to maximize customer value while minimizing waste (MacDuffie and Helper, 1997).

Lee et al (1997) and Lummus et al (2003) explained that the information transferred from one stage to another in supply chain tends to be distorted and can misguide upstream members in the production decision resulting in waste and as such points out four lean supply chain Practices- How organization keep goods and services flowing in a smooth, uninterrupted and cost effective fashion from suppliers to customer firms end to end, inventory management - keeping minimal but sufficient inventory in the supply chain pipeline in order to provide good service level without interruption, lean procurement – how can procurement scale and improve

its processes to minimize transactions, reduce total cost and work with the best possible suppliers who meet its requirements and adopting lean within customer and supplier firms; and how can business work to eliminate waste while adding value to its customers.

Norek (2002) reveals that there are four main significant practices of lean supply chain: Demand management practices, standardization practices, waste management practices and behavioral practices that will make the basis of this study. According to Lysons and Farrington (2006) lean supply chain practices can be developed into three phases. In the first phase which encompasses leanness as a transition is concerned with efforts made by the organization to become lean and the practices include delayering (flattening the organization), downsizing (a reduction in the workforce) and outsourcing (focusing on core activities and subcontracting non-core to outside providers. In the second phase which is leanness as an outcome focuses on the structural flexibility following a period of delaying, downsizing and outsourcing and the practices is Business process re-engineering, which refers to the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical contemporary measures of performance such as cost, quality, services and speed.

Here, lean is characterized by elimination of waste in terms of both material and human resource, low inventories, zero defects (prevention rather than rectification of faults), integrated production chains, team-working and involvement of all employees and suppliers in a continuous process to improve products and job design. And lastly leanness as a process that focuses attention on the attribute of those organizations that can respond to environmentally produced change where the practice is total quality management (TQM)- A management

philosophy and company practices that aim to harness the human and material resource of the organization in the most effective way to achieve the objectives of the organization Just in time (JIT) – An inventory control philosophy whose goal is to maintain just enough materials in just the right place and just the right time to make just the right amount of product.

1.1.2 Supply Chain Responsiveness

Supply chain responsiveness is defined as the capacity of promptness and the degree to which the supply chain can address changes in customer demand (Holweng, 2005; Prater et al., 2001; Lummus et. al, 2003; Duclos et al., 2003). In a rapidly changing competitive world, there is a need to develop organizations and supply chains that are significantly more flexible and responsive than the existing ones (Gould, 1997) Firms need to aptly respond to changing customer needs so as to succeed in today's uncertain environment as well as any disruptions in supply (Lee, 2004; Christopher, 2004).

Supply chain responsiveness is a key differentiator of the modern approach from traditional approach of managing supply chains where in modern approach firms have worked hard to become responsive. In contrast to traditional practices where majority of inventory was held as finished goods awaiting to be sold, customer sensitive supply chains try to hold majority of stock as work in progress waiting configuration information coming from the final customer (Shafer and Meredith, 2009). This is because the insight and information gained from customers would help to resolve problems regarding market uncertainty and assist supply chain to respond better to the final customer requirements. Variables that impact customer sensitivity

in a supply chain include: responding to real time demand, fast introduction of new products, retain and grow customer relationships and customer based measures (Lin et al., 2006).

1.1.3 Vegetable Oil Processing Firms in Kenya

Kenya's domestic production of vegetable oils is estimated at 35,000 metric tonnes which is about 15% of its annual demand. An estimated 559,000 mts is imported making vegetable oils the second most important item after petroleum and about 83,000 mts is exported to foreign markets. The domestic utilization level is estimated at 232,000 mts (Kenya National Bureau of Statistics, 2011).

The key player in the industry comprise of processors who extract the oil from the seeds and oil cake used in the manufacture of animal feeds and refiners who convert crude oil into a form suitable for human consumption. Increased domestic production of oil seeds by local manufacturers in Kenya has been constrained by inadequate supply of raw materials, leading to efforts by Food and Agriculture Organization (FAO) to initiate development of raw material centers in the country, especially in key growing areas of western Kenya and Lake Victoria basin. Processing firm like Bidco Oil has been actively supporting and encouraging local farming of vegetable oil crops especially palm oil. The processing and refining represents the private sector and related development partners including large scale growers and small scale farmers (Export Processing Zones Authority, 2005).

According to Kenya National Bureau Statistics (2011), there are about 35 vegetable oil processors and refiners in Kenya. The largest companies include Bidco Oil Refinaries, Kapa Oil Refinaries, Palmac Oil Refiners, Diamond Industries, Pwani Oil Refiners and Uniliver

Kenta Limited. These companies engage in production of cooking oil, fats, edible oils, copra oil and corn oil among oil products. Some of the large vegetable oil refiners are also involved in growing of vegetable oil crops and supporting small scale farmers in better farming methods to increase vegetable oil production in Kenya. According to Export Processing Zones Authority (2005), these companies are also involved in the marketing of finished vegetable oil products both locally and internationally. This move has been necessitated by the government of Kenya trade policy objective of pursuing an outward-oriented industrial policy in order to redirect industrial production in favour of export.

Kenya exports oil and fats products to mainly East and Horn of Africa countries as well as Europe and the United States of America (USA) and is ranked 15 Worldwide in export of vegetable fats and oils (Ministry of trade and industry). The COMESA region is the principal market of Kenya's vegetable oil products; including Uganda, Tanzania, Zimbabwe, Zambia, Democratic Republic of Congo, Rwanda and Burundi. Bidco oil refineries opened a plant in Uganda in order to further increase and develop their market in the region. The export destination includes Netherlands, the UK and Germany. The country also imports vegetable oils and fats in order to complement its local production, which is presently inadequate to meet local demand. Competition in the industry has been so intense such that promotion has led to a lot of information being available to the customers. Vegetable oil products have witnessed product changes shifting from traditional and animal oils to solid cooking oils, thereafter the liquid form and the expected herbal cooking oil in the industry.

1.2 Statement of Problem

There has been a drastic increase in the pressure on organizations to find new ways to create and deliver value to customers with fewer resources or to maximize customer value while minimizing waste for improvements in profitability and reduced costs in the supply chain. Manufacturing firms face an increasing pressure of customer requirements while at the same time need to reduce production cost, shorten lead times and lower inventory levels to ensure profitability (Holweng, 2005). The need for lean suply chains to become responsive arises from internal factors such as target costing, use of value engineering, use of cross functional teams, just in time and zero defective products (Lysons and Farrington, 2006) as well as external factors such as customer lead times, demand specification, product variety, product life cycle, order to delivery time and distribution lead time (Reichhart and Holweng, 2007).Supply chain responsiveness relates directly with business performance, increases revenues, lower costs, leads to customer satisfaction and loyalty hence increased profits in the long-run and thus motivates both researchers and practitioners to explore the area (Mageto, 2009).

Considering this the relationship between lean supply chain and supply chain responsiveness has not been addressed. Therefore the unanswered question is how lean supply chain practices relate to supply chain responsiveness. Vegetable oil processing in Kenya has evolved overtime and local firms have joined the industry creating stiff competition among the firms processing vegetable oils. Moreover, various value adding processes from raw material purchase, production and assembly, to distribution and customer order delivering has been integrated and

synchronized to achieve the common goal of enhancing customer satisfaction. In this connection, modern business management has witnessed a significant change from competing as solely autonomous entities to competing as integrated supply chains in the vegetable processing industry in Kenya (Omondi, 2012). LaSalle (2005) carried out a study on the implementation of lean practices in the United States of America and found out that more than 50% of the adopters of lean practices reported improvement and non-adopters were moving into the mid-tier and started to adopt some, less mature, lean practices but did not address the issue of responsiveness.

Daud and Zailani (2011) did a research on lean supply chain practices and performance in the context of Malaysia and found out that lean supply chain practices are directly related to the performance of the electrical, electronics and electronics manufacturing service companies in Malaysia. The study did not address responsiveness in the supply chain. Mageto (2009) studied on the relationship between supply chain performance and supply chain responsiveness in supermarkets in Nairobi and found out that supply chain performance and supply responsiveness, reliability, flexibility and timeliness indicate very strong relationship with supply chain performance. This research did not tackle lean practices in the supply chain. Omondi (2008) did the application of lean thinking to business process management and found out that lean management and application of related tools, equipment and techniques is a continuous process at Kenya Revenue Authority highly driven by the need to improve service delivery and tax collection while netting those evading taxes.

The study did not address the issue of responsiveness of the supply chain.Considering these studies critically, none of them has tried to address the relationship between lean supply chain practices and supply chain responsiveness. Therefore, this project sought to bridge this gap by creating a reasonable model of the relationship between the two. This study sought to answer the question “What is the relationship between lean supply chain practices and supply chain responsiveness among vegetable oil processing firms in Kenya by investigating some of the lean supply chain practices used in the vegetable oil processing firms and how responsive the vegetable oil processing firms are to their supply chain?"

1.3 Objective of the Study

The following were the objectives of this study
(i) To determine the lean supply chain practices used in the vegetable oil processing firms in Kenya.
(ii) To establish how responsive the vegetable oil processing firms are to their supply chains in Kenya, and
(iii) To determine the relationship between lean supply chain practices and supply chain responsiveness among the vegetable oil processing firms in Kenya.

1.4 Importance of the Study

The findings of this research will enable the academicians/researchers in broadening of syllabus with respect to the impact of lean supply chain practices in determining supply chain responsiveness. The results will also assist processing firms and their employees in improving their lean supply chain practices with regard to demand management practices, standardization practices, waste management practices and behavioral practices.

The study was of great value to the field of lean supply chain practices in that it contributes to the existing body of knowledge by focusing on the vegetable oil processing and refining firms in their effort to adapt to environmental turbulence using appropriate lean practices. To policy makers, the research findings was helpful to the government economic advisors, policy strategists and other institution as it will serve as a future reference material to be used to develop policies in the same industry, or other similar sub-sector.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter covers the discussions on the concepts of supply chain management, lean supply chain practices and supply chain responsiveness as well as benefits and challenges of being responsive in an uncertain environment and turbulence market.

2.2 Supply Chain Management

The term supply chain refers to all activities involved in the supplying an end user with a product or service. The perception of each organization that is involved – the ore refiners, transporters, component producer, manufacturers, wholesalers, retailers and the customer – being a link in the process makes the analogy of a chain quite appropriate. Goods flow together with information, funds, paper, and people in both directions along the chain. In addition, the green revolution encourages recycling, recovery and reuse of products, so even the used product may be flowing back up the chain.

The supply chain also involves other functional areas and activities as product/service design, finance, accounting, marketing, human resource, engineering and so on. Supply chain management (SCM) is the process of trying to appropriately manage this network of activities and flow (Power and Sohal, 2001). It coordinates and integrates all the supply chain activities into a seamless process and links all of the partners in the chain, including departments within an organization as well as the external suppliers, carriers, third party companies and

information system providers and enables manufacturers to actively plan and collaborate across a distributed supply chain, to ensure all parties are aware of commitments, schedules and expedites (Shafer and Meredith, 2003)

The objective of attempting to manage activities that lie outside a manager's normal realm of responsibility is to reduce costs of delivering a product or service to a user and improve its value in terms of quality, functionality and timeliness. Other costs in the supply chain can be eliminated with better information sharing and managerial oversight. SCM has exploded in interest primarily because of the development of new information technologies such as intranets, EDI (electronic data interchange) and Internet. These technologies, in conjunction with global competition, have fostered an interest and the ability in improving processes along the entire supply chain resulting in better performance at reduced costs (Tan et al., 1998; Frohlich and Westbrook, 2001; Vickery et al., 2003; Li et al., 2006).

2.3 Lean Supply Chain Practices

Lean is defined as a "Systematic approach to identifying and eliminating waste (non-added activities) through continuous improvement by following the product at the pull of the customer in pursuit of perfection" (The National Institute of Science and Technology). Simply lean means to create more value for customers with fewer resources, thus the fundamental idea is to maximize customer value while minimizing waste. Wu and Wee (2009) concluded that the term 'lean' means a series of activities or solutions to eliminate waste reduce non-value added operations and improve the value added operation.

This value added and non-value added concept were derived mainly from Toyota Production System (TPS) which highlighted eight forms of waste: Overproduction, waiting, conveyance, over-processing, excess inventory, movement, defects and unused employee creativity (Monden, 1998; Liker, 2004). A lean organization understands customer value and focuses its key process to continuously increase it. The ultimate goal is to provide perfect value to the customer through a perfect value creation process that has zero waste. To make lean process success, level of thinking needs to be changed in order to focus on management from optimizing separate technologies, assets and vertical department to optimizing the flow of products and services through entire value streams that flow horizontally across technologies, assets and departments to customers (Lean Enterprise Institute, 2006).

Eliminating whole along entire value steams, instead of at isolated points, creates processes that need less human effort, less space, less capital and less time to make products and services at far less cost and with fewer defects, compared with traditional business systems. Companies are able to respond to changing customer desires with high variety, high quality, lows cost and with very fast throughput times.

Anand and Kodali (2008) emphasized that the theory and principles of lean and its associated tools, practices and procedures can be extended outside the boundaries of an organization to its supply chains. However, the concept of lean supply chain was proposed in 1994, when the proponents of lean manufacturing, Womack and Jones (1994) envisioned the concept of "Lean enterprise". Bozdogan (2002) emphasized that the success of lean supply chain management principles is derived from ten basic lean principles : focus on the supplier network value

stream, eliminate waste, synchronize flow, minimize both transaction and production costs, established collaborative relationships while balancing cooperation and competition, ensure visibility and transparency, develop quick response capability, manage uncertainty and risk, align core competencies and complementary capabilities and foster innovation and knowledge sharing; building and maintaining a lean supply revolves around four key practices. Mastering the four practices leads to a lean and effective supply chain (Norek, 2002). They are demand management practices, waste management practices, standardization practices and behavioral practices.

2.3.1 Demand Management Practices

Demand management is concerned with balancing the requirement of internal and external customers with supply chain capabilities. It includes forecasting demand, synchronizing supply and demand, increasing flexibility, reducing the variability of demand by means of standardization and the control of inventory (Lysons and Farrington, 2006). Demand management practices include: planning demand, communicating demand, influencing demand and managing and prioritizing demand.

Planning demand involves more than just forecasting. Proposed in 1995, Collaborative Planning, Forecasting, and Replenishment (CPFR) has evolved into a Web based tool to coordinate demand forecasting, production and purchase planning, and inventory replenishment between supply chain partners. CPFR is used as a means of integrating all members of an *n*-tier supply chain, including manufacturers, distributors and retailers. Communicating demand involves communicating demand plan to the supply and finance

organization and increasingly, to supply chain partners. Influencing demand includes marketing and selling tactics, product positioning, pricing, promotions and other marketing and sales efforts, while managing and prioritizing demand includes managing customer orders to match available supply (Shafer and Meredith, 2003)

2.3.2 Waste Management Practices

Waste, as defined by Toyota's past President, Fujio Cho, is anything other than the minimum amount of equipment, materials, parts and workers (working time) which are absolutely essential to production, and the seven types if waste to be eliminated in the supply chain are: waste from overproduction, waste of waiting time, transportation waste, inventory waste, processing waste, waste of motion and waste from product defects. Value chain mapping is a great way to analyze existing processes and the practice to waste management include having focused factories networks, employing Group Technology (GT), practicing quality at source. JIT production, uniform plant loading, Kanban production control system and minimizing set-up times (Aquilano et al., 1995).

Focused factory networks means building small specialized plants rather than vertically integrated manufacturing facilities because large operations and their bureaucracies are difficult to manage while plants designed for one purpose can be operated more economically. Group Technology is the philosophy in which similar parts are grouped into families and the processes required to make the parts are arranged in a specialized work cell, that eliminates movement and queue (waiting) time between processes, reduce inventory and reduce the number of employees, Quality at the source means do it right first time, and when something

goes wrong, stop the assembly line immediately, implying factory workers become their own inspectors personally responsible for the quality of their own output. JIT means producing what is needed and no more, anything over the minimum amount necessary is viewed as waste, because effort and material expended for something not needed now cannot be utilized now. The goal is to drive all inventory queues to zero, thus minimizing inventory investment and shortening lead time.

Uniform plant loading refers to smoothing the production flow to dampen the reaction waves that normally occur in response to schedule variations, while Kanban production control system uses a signaling device to regulate JIT flows, where the authority to produce or supply additional parts comes from downstream operations. Because small lot sizes are the norm, machine must be quickly set-up to produce the mixed models on the line. Achieving set-up time's reduction, set-up times are divided into internal and external activities. Internal set-up must be done while a machine is stopped while external set-up can be done while the machine is running (Aquilano et al., 2005)

2.3.3 Standardization Practices

Standards are documents that stipulate or recommend minimum levels of performance and quality of goods and services and operational conditions in a given environment. They help clear specification, achieve reliability and reduce costs, accurate comparison of quotation, less depended on specialist suppliers, reduce error and conflict and reduce cost of material handling (Lysons and Farrington, 2006). Practices include variety reduction, quality assurance and quality control. Variety reduction can make substantial saving in inventory by standardizing

and rationalizing the range of material, parts and consumables and has the benefits of reducing of holding costs for stocks, release of money tied up in stock, easier specification when ordering, narrows range of inventory and reduces supplier base.

Quality assurance refer to those planned and systematic activities implemented within the quality systems and demonstrated as needed to produce adequate confidence that an entity will fulfill requirements for quality and is concerned defects prevention involves a number of approaches: quality systems (ISO 9000), new design control, design for manufacturing processes, incoming material control and supplier appraisal (BS EN ISO 8402, 1995).

Quality control is the technique and activities that are used to fulfill requirements for quality and the main concern is defects detection and correction and relates to such activities as determining where, how and at what intervals inspections should take place, the collection and analysis of data relating to defects and determining what corrective action should be taken (BS EN ISO 8402, 1995). Four inspection activities are receiving inspection, classification inspection, control inspection and audit inspection.

2.3.4 Behavioral practices

Supply chain partners from upstream suppliers to downstream customers must collaborate as a team to provide value to the end user. Organizational behavior is the study of the structure, functioning and performance of the organization, and the behavior of groups and individuals within them. Best in class behavioral practices include job enrichment, multiple carrier ladders,

high employee participation, many and flexible incentives and quality of work life emphasis (Huczyski and Buchanan, 2002).

2.4 Supply Chain Responsiveness

The concept of agility and responsiveness is something to be pursued, meaning that firms that can respond quickly are better placed to balance supply and demand within the supply chain. Firms that have responsive supply chain will experience the advantage of improved lead time for innovative products or those in the early stages of the product life cycle, reduced costs/ increased revenue by optimizing inventory levels under demand uncertainty , create a win-win situation with suppliers by implementing quantity- flexible contacts that share risk among supply chain partners, save time and expense by understanding which supply chain strategies do not need expensive software for implementation and reduced costs by learning ways of dealing successfully with supply uncertainty. It also brings about manufacturing flexibility- the ability of the manufacturing system of an organization to adapt to change (Stalk and Hout, 1990; McCutcheon et al., 1994; Bower and Hout, 1998). Manufacturing flexibility has been considered as a major competitive weapon for manufacturing firms due to its ability to help cope with uncertain environment and turbulence markets and is capable of providing the firms with the ability to change volume and mix of production, to rapidly and frequently develop new products, and to better respond to competition (Shingo, 1989).

A responsive supply chain 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 in two primary reasons: Excess buffer capacity and inventories need to be maintained, and Investments to reduce lead times need to be made. Providing the right degree of responsiveness and having an efficient supply chain at the same time is a goal that is hard to achieve and typically involves trade –off- decision by management , since increased responsiveness can be perceived to come at the expense of reduced efficiency and vice versa (Mason-Jones and Towill 2000). Supply chain responses can be discussed under the following headings

2.4.1 Demand Uncertainty and Variability

Demand uncertainty and demand variability are often used interchangeably. However demand uncertainty refers to a limited knowledge about what is going to sell or the inability to predict demand and is measured by forecast error, while demand variability refers to the range of values for demand, which is variable based on effort in marketing, promotions, holidays, special events and is measured through variability of the historical demand (Davis, 1993).

Uncertainty is identified as the main reason for being responsive. With reliable information about demand condition, there would be no need to be responsive.

The need arises from the uncertainty that comes from volume and/or product mix changes in the customer demand signal (Davis, 1993; Fisher et al, 1994; Towill and Christopher, 2002). Uncertainty comes from three different sources namely supply chain uncertainty, process uncertainty and demand uncertainty, with demand uncertainty being the most severe type (Davis, 1993).

2.4.2 Product Variety

Literature has suggested several techniques to optimize product variety. A classic analysis of the impact of product variety is provided in Baumol and Ide (1956) who captured the trade off by pointing out that greater product variety makes a store more attractive to customers by increasing the probability of finding items that they want in the store, but also makes it less attractive by increasing of shopping in the store. The management of product variety is on its implication on the firms performance and the need arises both from the competitive importance of the product variety in today's market, and its potential financial impact for the product development activities and manufacturing operations (Fisher *et al*, 1994).

Demand uncertainty is amplified by product variety, as the same aggregated demand is split over more Stock Keeping Units (SKUs), leading to an increase in the aggregated errors associated with each forecast. Product variety increases the need to be responsive as the range of the external flexibility increases and customers are not willing to accept longer lead times, implying firms have to rethink the level of product variety that is really demanded (Fisher *et al*, 1994; MacDuffie *et al*, 1997).Three dimensions of product variety are internal, external and dynamic. Internal product variety refers to the complexity within a firms structure and can be approximated by the number and variety of components required for a given product. External product variety refers to the SKUs available to a firm's customers at any given point. Dynamic product variety mainly refers to shortened product life cycle (Davis, 1993).

The demand of a product will always be harder to predict at the beginning of the life cycle, as no past demand patterns for the product is available, and because customers may react unexpectedly to the new product. Higher dynamic variety further increases demand uncertainty. Thus product variety can directly inhibit supply chain from being responsive since it makes the use of finished goods buffer more costly (Davis, 1993; Fisher *et al*, 1994)

2.4.3 Time Compression

Modern supply chains are expected to respond rapidly, effectively and efficiently to changes in the market place. Simultaneously there is the drive to achieve world class customer service levels coupled with Minimum Reasonable Inventory (MRI). This results in classic conflict of interest between marketing, production and materials management. Marketing want the complete product range available off-the shelf; production is looking to manufacture in economic batch quantities so as to achieve economies of scale and materials management is trying to minimize storage and distribution costs which in turn, requires that a total system MRI policy be adopted. Time compression at all stages in the supply chain is seen as the way to respond to these challenges (Mason-Jones and Towill, 2000).

Unfortunately many firms take a restrictive view of time compression which they link purely with production cycle time reduction. However Thomas (1990) utilizes the phrase Total Cycle Time (TCT) stating that the first word of TCT was intended to express how short cycle times can be applied productively to all segments of a business, not just manufacturing efforts". This distinction is important; hence TCT compression programmes

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

The purpose of this chapter is to provide an insight on the research adopted, the target population studies, data collection methods employed and data analysis methods used when organizing and analyzing the data for chapter four.

3.2 Research Design

The research adopted a cross sectional survey of all vegetable oil processing firm in Kenya, that provided quick, inexpensive, efficient and accurate means of assessing information about the population (Zikmud, 2003). Further, this type of design offers an accurate profile of persons, events, or situation (Robinson, 2002). It allowed one to collect quantitative data which can aid in the analysis using descriptive and inferential statistics (Saunders et al., 2007).

3.3 Target Population

The target population of the study covered all vegetable oil processing firms in Kenya. According to Kenya Association of Manufacturers (KAM) (2011) directory Kenya National Bureau of Statistics (KNBS) (2011) economic survey, there were about 35 firms that were then dealing in the processing and refining of vegetable oils in Kenya. The composition of the firms included processors, refiners and millers as classified by Export Processing Zones Authority (2005). Since the population was considered small (35), this study adopted census survey.

3.4 Data Collection

In this study, primary data was collected by use of structured and closed ended questionnaire. The questionnaire was considered most appropriate because it allowed for collection of data from the responds within a short time and provides a high degree of data standardization and adoption of generalized information amongst the population. The questionnaires was send to supply chain managers or those in equivalent positions in the vegetable processing firms in Kenya by way of email, drop and pick later, by postage or by way of face to face interview where applicable. The structure of the questionnaire is in three parts. The first section covers the general information of the firm under study. The second part has questions concerning the lean supply chain practices and the extent to which the practices have been implemented. The last part focuses on supply chain responsiveness where the responsiveness indicators and there unit of measure is obtained and data for the last five years captured.

3.5 Data Analysis

Completed questionnaire were edited for uniformity, completeness and consistency. The questionnaire was coded to allow for statistical analysis. Analysis was done by way of descriptive statistics. Data was presented by use of tables, graphs, proportions, means and percentages. To assist in analyzing data, factor analysis was used as it enabled to sort out and analyze the major lean supply chain practices as well as the main supply chain responsiveness indicator in the study. A multiple regression analysis was used to establish the relationship

between supply chain responsiveness and lean supply chain practices i.e. Supply chain responsiveness= fx (Lean supply chain practices)

CHAPTER FOUR:
DATA ANALYSIS, RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter covers data presentation and analysis. The main objective of the study was to analyze the effects of lean supply chain practices and supply chain responsiveness among vegetable oil processing firms in Kenya. Specific objectives were to determine the lean supply chain practices used in the vegetable oil processing firms in Kenya; establish how responsive the vegetable oil processing firms are to their supply chains in Kenya and to determine the relationship between lean supply chain practices and supply chain responsiveness among the vegetable oil processing firms in Kenya.

4.2 Descriptive statistics

In order to simplify the discussions, the researcher provided tables and figures that summarize the collective reactions and views of the respondents. The sample population for the study comprised of all vegetable oil processing firms in Kenya. They comprised of 35 vegetable oil processing firms in Kenya and the study targeted 35 supply chain managers of the firms. The questionnaires distributed to the supply chain managers were 35 while those returned were 31 bringing the response rate at 88%. This response rate was adequate according to Mugenda and Mugenda (1999) who argued that a response rate of 50% is adequate for analysis and reporting; a rate of 60% is good and a response rate of 70% and over is excellent.

4.2.1: Demographic Information

The ownership of the firms is as below analyzed. The study found out that the ownership structure of the vegetable oil processing firms is as varied as illustrated and it shows local domination by 29% with foreign coming second at 23%.

Table 4.1: Ownership structure

	Frequency	**Percentage**
Foreign	7	23%
Private	5	16%
Local and Foreign	4	13%
Government owned	2	6%
Private and government owned	4	13%
Local	9	29%
Total	31	100%

Source: research data

According to the study findings, the majority of the vegetable oil processing firms were local accounting for 29%, the ownership structure of foreign vegetable oil processing firms accounted for 23%, the ownership structure of private vegetable oil processing firms accounted for 16%, the ownership structure of both local and foreign and both private and government owned vegetable oil processing firms accounted for 13% respectively while the ownership structure of government owned vegetable oil processing firms accounted for 6%. The study deduced that the majority of the vegetable oil processing firms in Kenya were local firms.

Table 4.2: Computers Networked

	Frequency	**Percentage**
Departmentally	7	23%
Interdepartmentally	15	48%
Externally	9	29%
Total	31	100%

Source: research data

The study sought to find out how the firms' computers were networked in their organization. The study found out that the majority of the firms had their computers networked interdepartmentally accounting for 48%, the firm that had their computers networked externally accounted for 29% while those firms that indicated that their computer were networked departmentally accounted for 23%.

The number of years in operation can influence supply chain responsiveness and the practice of lean principles. The respondents were required to indicate the number of years their firm has been in operation and the results were as shown in the table 3 below.

Table 4.3: Years of Operation

Measurement	Category	Absolute score	Percentage Mean Score
Years of operation	< 5 years	5	16%
	5-10 years	9	29%
	11-15 years	8	26%
	16-20 years	5	16%
	Above 20 years	4	13%
	total	31	100%

Source: research data

From the findings in table 3 above, the majority of the firms have been in operation for more between 16-20 years with a 16% score and above 20 years with 13% and then lowest. As presented by the respective means the (5-10) years bracket had the highest number of respondents at a mean score of 29% followed by (11-15) years. This is an indication that the firms that participated in the study have been in operation for a long while and they use lean supply chain practices in their processing firms. The respondents were required to indicate the size of the company by indicating the number of employees in their company. The respondents

indicated the number of employees ranged from 1000 to 2000 employees in their company. The respondents were required to indicate the factory size i.e. land occupied in Acres. The respondents indicated that the companies owned land that ranged from 7 acres to 15 acres was land for the company.

The respondents were asked to indicate the annual production of the companies and the results indicated that the annual production ranged from 500 tons to 65,000 tons per year. The respondents were asked to indicate the annual production of the companies and the results indicated that the annual production ranged from 500 tons to 65,000 tons per year.

4.3 Lean supply chain practices

The study sought to determine the lean supply chain practices used in the vegetable oil processing firms in Kenya. Lean supply chain practices used in these processing firms include demand management practices, waste management practices and standardization practices.

The respondents were asked the extent to which their firm implements demand management practices in a five point Likert scale. The range was ‘to a very great extent (5)’ to ‘very small extent (1). The scores of ‘Very small extent and small extent’ have been taken to present a variable which had an impact to a small extent (S.E) (equivalent to mean score of 0 to 2.0 on the continuous Likert scale; The scores of ‘Moderately’ have been taken to represent a variable that had an impact to a moderate extent (M.E.) (equivalent to a mean score of 3.0 that is 75% on the continuous Likert scale. The score of ‘Very great extent and Great extent’ have been taken to represent a variable which had an impact to a great extent (G.E.) (equivalent to a mean score of 4.1 to 5.0 on a continuous Likert scale.

A standard deviation of >1.5 implies a significant difference on the impact of the variable among respondents.

Table 4.4: Demand management practices

Demand management practices	Mean	Std. Dev
The firm has invested time and money in collaborative demand planning	4.4	1.29
The firms always conducts annual demand forecasting	4.2	1.23
The firm always conducts annual production and purchasing planning	4.1	1.22
The firm always communicates its demand forecasts to its supply chain partners.	4.2	1.12
The firm always does product positioning, pricing and promotion of its products.	3.6	1.11
The firm manages its customer orders to match available supply.	4.3	1.16

Source: research data

According to the study findings, it was established that the firm has invested time and money in collaborative demand planning was to a great extent (mean of 4.4), the firms always conducts annual demand forecasting was to a great extent (mean of 4.2), the firm always conducts annual production and purchasing planning was to a great extent (mean of 4.1), the firm always communicates its demand forecasts to its supply chain partners was to a great extent (mean of 4.2), the firm always does product positioning, pricing and promotion of its products was to a moderate extent (mean of 3.6) while the firm manages its customer orders to match available supply was to a very great extent (mean of 4.3). The study deduced that

demand management is concerned with balancing the requirement of internal and external customers with supply chain capabilities according to Lysons and Farrington (2006).

Table 4.5: Waste management practices

Waste management practices	**Mean**	**Std. Dev**
The firm has small specialized plants rather than vertically integrated manufacturing facilities.	4.6	1.19
The firm practices the philosophy of grouping similar parts in families to eliminate movement and queue	3.8	1.03
The firm encourages doing the right thing the first time	4.3	1.12
The firm produces what is needed and no more (JIT)	4.2	1.24
The firms production flow is smooth to dampen reaction waves that occur in response to schedule variations	3.6	1.17
The authority to produce or supply additional parts always comes from the downstream	4.3	1.14

Source: research data

The study sought to find out the extent to which firms have implemented waste management practices. According to the study findings, it was established that the firm has small specialized plants rather than vertically integrated manufacturing facilities was to a very great extent (mean of 4.6), that the firm practices the philosophy of grouping similar parts in families to eliminate movement and queue was to a moderate extent (mean of 3.8), that the firm encourages doing the right thing the first time was to a very great extent (mean of 4.3), that the firm produces what is needed and no more (JIT) was to a great extent (mean of 4.2), that the firms production flow is smooth to dampen reaction waves that occur in response to schedule variations was to a

moderate extent (mean of 3.6) while that the authority to produce or supply additional parts always comes from the downstream operations was to a very great extent (mean of 4.3).

The study deduced that waste management practices is anything other than the minimum amount of equipment, materials, parts and workers (working time) which are absolutely essential to production, and the seven types if waste to be eliminated in the supply chain are: waste from overproduction, waste of waiting time, transportation waste, inventory waste, processing waste, waste of motion and waste from product defects according to Aquilano *et al*., (1995).

Table 4.6: Standardization practices

Standardization practices	Mean	Std. Dev
The firm has standardized and rationalized the range of materials, parts and consumables	3.7	1.21
The firm always employs quality assurance at all times	4.6	1.1
The firm encourages quality control activities in all its production stages	3.9	1.14

Source: research data

The study sought to find out the extent to which the vegetable oil processing firm implemented standardization practices.

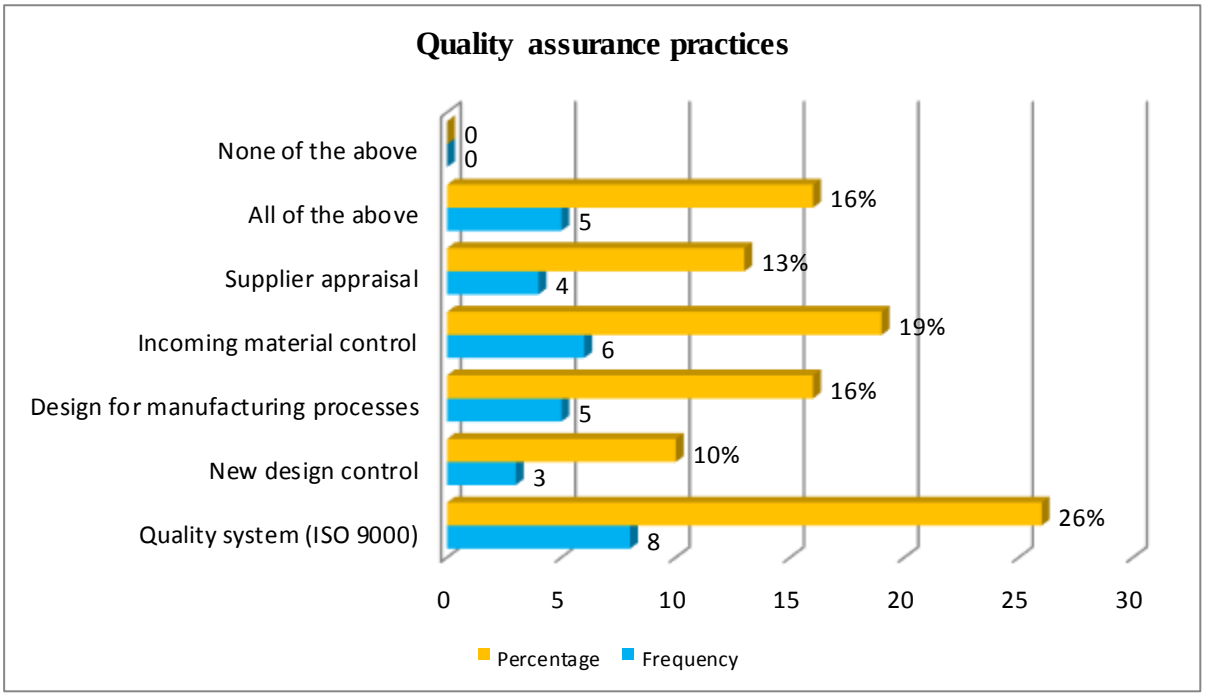
The study sought to find out the extent to which firms have implemented Standardization practices. According to the study findings, it was established that the firm has standardized and rationalized the range of materials, parts and consumables was rated to a moderate extent

(mean of 3.7), that the firms always employs quality assurance at all times was to a very great extent (mean of 4.6) while that the firm encourages quality control activities in all its production stages was to a moderate extent (mean of 3.9). The study deduced that standardization practices help clear specification, achieve reliability and reduce costs, accurate comparison of quotation, less depended on specialist suppliers, reduce error and conflict and reduce cost of material handling (Lysons and Farrington, 2006). These practices include variety reduction, quality assurance and quality control.

4.3.1 Quality assurance practices

The respondents were required to identify the quality assurance activities that the firm practices as an approach to defect prevention. According to the study findings, it established that the majority indicated that Quality system (ISO 9000) was the quality assurance practice identified as an approach to defect prevention accounting for 26%, incoming material control was the quality assurance practice identified as an approach to defect prevention accounting for 19%,

Figure 4.1: Quality assurance practices



Source: research data

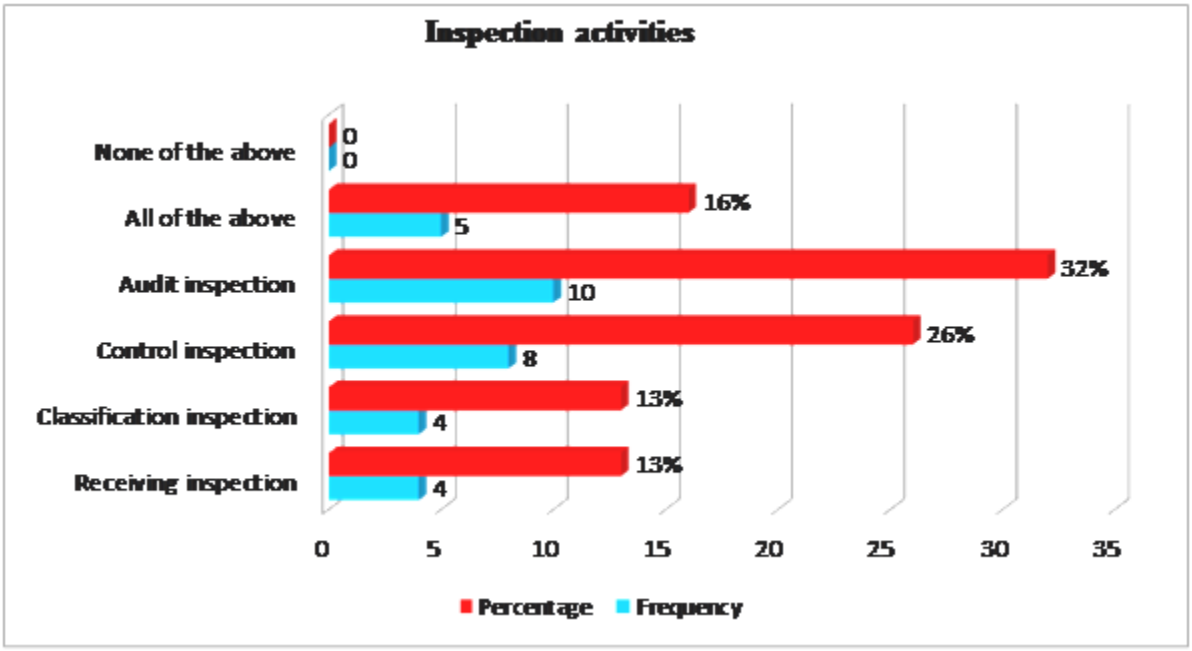
design for manufacturing processes and all of the above quality assurance practice identified as an approach to defect prevention accounted for 16% respectively, supplier appraisal was the quality assurance practice identified as an approach to defect prevention accounted for 13% while new design control was the quality assurance practice identified as an approach to defect prevention accounted for 10%. The study deduced that the quality assurance practice used by the vegetable oil processing firms in Kenya was Quality system (ISO 9000).

4.3.2 Inspection activities

The respondents were requested to identify the inspection activities that are undertaken in their firms to detect defects. According to the study findings, it established that the majority firms identified the inspection activities that are undertaken in their firms to detect defects as audit inspection accounting for 32%, control inspection was identified an inspection activity undertaken to detect defects accounting for 26%, all of the above inspection activities was identified an inspection activity undertaken to detect defects accounting for 16% while receiving inspection and classification inspection were identified an inspection activity undertaken to detect defects accounting for 13% respectively.

The study deduced that the inspection activity that was undertaken by vegetable oil processing firms in Kenya was the audit inspection.

Figure 4.2: Inspection activities



Source: research data

4.3.3 Behavioral practices

The respondents were requested to rate the extent to which the firm implements behavioral practices.

Table 4.7: Behavioral practices

Behavioral practices	Mean	Std. Dev
The firm has always broadened the experience of work to enhance employee needs satisfaction	4.6	1.08
The firm has multiple carrier ladders for its staff	4.1	1.23
The firm always encourages high employee participation	4.6	1.21
The firm has many and flexible employee incentives	3.4	1.03
The firm always encourages quality of working life emphasis	4.3	1.18

Source: research data

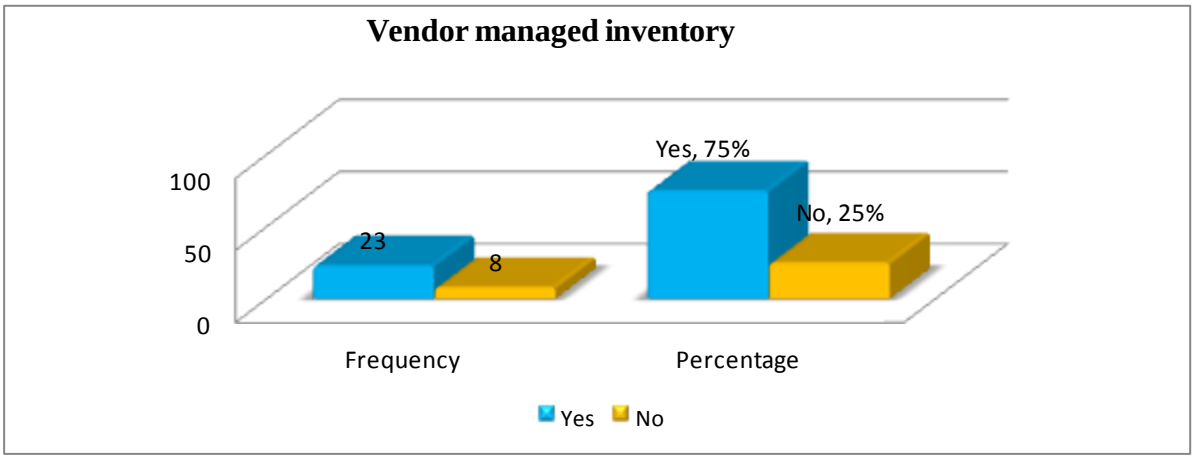
According to the study findings, it established that the respondents rated the behavioral practices on the firm has always broadened the experience of work to enhance employee needs satisfaction to a very great extent (mean of 4.6). The behavioral practice on the firm has multiple carrier ladders for its staff was rated to a great extent (mean of 4.1). The behavioral practice on the firm has always encouraged high employee participation was rated to a very great extent (mean of 4.6).

The behavioral practice on the firm has many and flexible employee incentives was rated to a moderate extent (mean of 3.4) while the behavioral practice on the firm has always encourages

quality of working life emphasis was rated to a great extent (mean of 4.3). The study deduced that the supply chain partners from upstream suppliers to downstream customers collaborate as a team to provide value to the end user. According to Huczyski and Buchanan, 2002 best in class behavioral practices include job enrichment, multiple carrier ladders, high employee participation, many and flexible incentives and quality of work life emphasis.

4.4 Vendor managed inventory

Figure 4.3: Vendor managed inventory



Source: research data

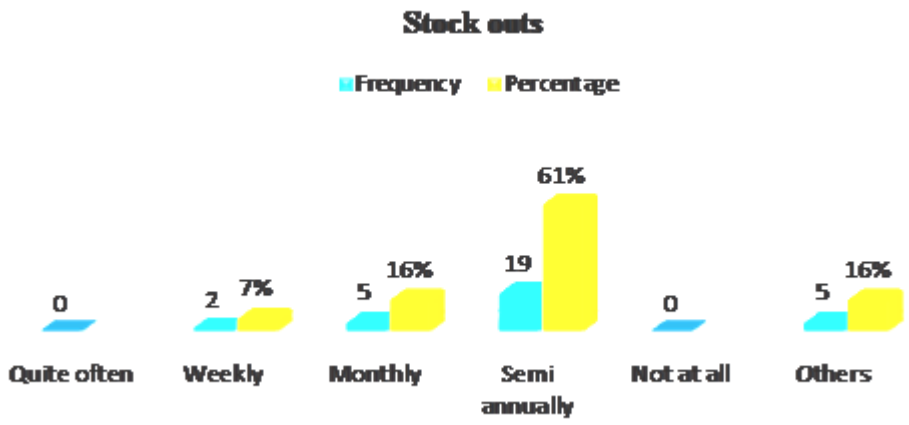
The respondents were requested to indicate yes or no on whether their firm practice "Vendor managed inventory" management technique for the customers. According to the study findings, the majority of respondents indicated yes accounted for 75% while those who indicated no accounted for 25%. The study deduced that the vegetable oil processing firms in Kenya practice vendor managed inventory management techniques for customers.

According to Reichhart and Holweng (2007) Vendor Managed Inventory is a process where the vendor creates orders for their customers based on demand information that they receive from the customer. The vendor and customer are bound by an agreement which determines inventory levels, fill rates and costs. This arrangement can improve supply chain performance but reducing inventories and eliminating stock-out situations.

4.4.1 Stock outs

The study sought to find out how often firms face stock outs in their firms. According to the study findings, it was established that the majority of the respondents indicated that their firm faces stocks outs semiannually accounting for 61%, the firms that indicated that they run out of stocks monthly and others specified to be annually accounted for 16% respectively while the firms that indicated that they run out of stock weekly accounted for 7%. The study deduced that the vegetable oil processing firms in Kenya run out of stocks semiannually.

Figure 4.4: Stock outs



Source: research data

4.5 Challenges facing vegetable oil processing firms

The study sought to find out the challenges that are facing vegetables oil processing firms in Kenya. According to the study findings, the study deduced the challenges facing vegetable oil processing firms were: ability to develop and maintain the cost leadership process to reduced cost without sacrificing quality; price competitiveness; accessibility of financial resources to high efficient production equipment; designing creative intensive strategies; government imposing external costs; technological innovation; human resource policies; organizations adopt technological innovation and intensive strategies to keep pace with the changing environment.

4.5.1 Mitigation of the Challenges

The study sought to find out how the vegetable oil processing firms mitigation the challenges they face. According to the study findings, it established that in the ability to develop and maintain cost leadership processes they face challenges such as stiff competitive prices hence they produce more stocks that do not run out; accessibility of financial resources to invest in high efficient production equipment in an effort to adapt to the strategic responses while responding to environmental changes; creating intensive strategies to keep pace with changing environment; developing policies that protect the firms from government interference especially on the pricing of their products; through training and seminars the adoption of technological innovation and intensive strategies to improve value for the customers.

4.6 Lean Supply Chain Practices

The respondents were given 19 indicators of lean supply chain and asked to rank the extent to which each factor was significant to their firms using a scale ranging from 1 = very small extent to 5 = very great extent. Dimension reduction technique was then applied on the 19 factors as they were too many. In order to reduce and classify the above factors into meaningfully categories, factor analysis was conducted on the lean supply chain practices.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett's Test of Sphericity was conducted as preliminary test to establish the appropriateness of Principal Component Analysis. From Table 4.9, KMO statistic had a value of 0.930, indicating that the sum of the partial correlations is small relative to the sum of the correlations, an indicator of non-diffusion in the pattern of the correlations. In other words, the pattern of the correlations is relatively compact and so factor analysis should yield distinct and reliable factors. Bartlett's Test of Sphericity had a significance value of $p < .001$. We are therefore confident that factor analysis is appropriate for this data

Table 4.9: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.930
Bartlett's Test of Sphericity	Approx Chi-Square	19334.492
	Df	71
	Sig	.000

Source: research data

Table 8 lists the eigenvalues associated with the linear component (factor) before extraction, after extraction and after rotation. As shown, before extraction, SPSS identified 19 linear

components. The eigenvalue associated with each factor represents the variance explained by the particular linear component. Factor 1 explains 23.01% of total variance. It is clear that the first few explain relatively large amounts of variance as opposed to subsequent once. Factors with eigenvalues greater than one were then extracted, leaving us with only 5 factors. The eigenvalues and the percentage of variance explained associated with the extracted and rotated factors are displayed.

Table 4.10: Factor extraction

	initial eigenvalue			extractions sums of squares loadings			rotations sum of squares loadings		
component	total	% of variance	cumulative %	Total	% of variance	cumulative %	total	% of variance	cumulative %
1	7.29	23.01%	23.01%	7.29	23.01%	23.01%	7.11	22.44%	22.44%
2	5.739	18.11%	41.12%	5.739	18.11%	41.12%	5.70	17.99%	40.43%
3	4.317	13.63%	54.75%	4.317	13.63%	54.75%	4.11	12.97%	53.40%
4	3.227	10.19%	64.93%	3.227	10.19%	64.93%	3.36	10.61%	64.01%
5	2.145	6.77%	71.70%	2.145	6.77%	71.70%	2.44	7.69%	71.70%
6	0.895	2.82%	74.53%						
7	0.806	2.54%	77.07%						
8	0.783	2.47%	79.54%						
9	0.751	2.37%	81.91%						
10	0.717	2.26%	84.18%						
11	0.684	2.16%	86.34%						
12	0.67	2.11%	88.45%						
13	0.612	1.93%	90.38%						
14	0.587	1.85%	92.24%						
15	0.549	1.73%	93.97%						
16	0.523	1.65%	95.62%						
17	0.508	1.60%	97.22%						
18	0.456	1.44%	98.66%						
19	0.424	1.34%	100.00%						

Source: research data

Figure 5 presents the scree plot with a pointer to the point of inflexion on the curve. This confirms our choice of five factors as extracted by the PCA. The Varimax rotated factor matrix.

As shown there are five factors and the variables uniquely load very highly onto only one factor. The indicators/variables that loaded very highly on factor one appears to all relate to major lean supply chain practices and the main supply chain responsiveness. Factor analysis has thus found that cross-functionality of the demand management, waste management, standardization practices, inspection activities, assurance activities and behavioral practices are the success factors for these factors being critical to the success of the major lean supply chain practices and the main supply chain responsiveness. The following brief discussion presents the rationale for these five factors being critical to the success of the lean supply chain process.

An unyielding focus on demand for product is perhaps the guiding attribute of a lean supply chain management strategy. If a product for which there is no demand enters the supply chain, it is immediately a source of wasted material, wasted process and wasted manpower. Implementation requires that all suppliers and processors everywhere in the supply chain process receive demand signals that come from the customer, not from within the company, and turn those signals into components of the final saleable product for which they are responsible. While the impact on profits of waste from unsuitable product is obvious and its magnitude may outstrip all other sources of waste, there is also a fringe benefit in that a demand signal trigger for supply chain activity eliminates the need for forecasting (Balakrishan, 2004).

The supply chain permeates every facet of the enterprise, and if a lean approach to managing it is to succeed, the entire organization has to focus on removing waste and adding value. Part of

that change requires everyone involved to look beyond the boundaries of the company to relationships with customers and suppliers at all levels. The change in focus is essential, but implementing it can be difficult in today's international supply chain environment. Nevertheless, the principles of lean business are straightforward and can form the foundation for an organization's new approach to its supply chain. Product value has to be defined from the customer's point of view, not the company's. This seemingly simple principle is the key to eliminating waste caused by such things as making the wrong product (one that nobody wants), making the product at an unsuitable quality level, making too much or too little of it, or delivering it too slowly or through the wrong channel (Hines et al, 2004).

Process Standardization: The goal of standardizing processes is to provide the continuous flow that lean supply chain management requires. There are two reasons for this. First, a process that is standardized across many of a company's products may be used to produce whatever product is currently in demand. Second, when an industry-standard process is used, the company can readily shift production from one supply partner to another. The same benefits accrue for use of standardized information and financial processes that support the supply chain (Chen & Paulraj, 2004). Creating a lean supply chain is a challenge not to be undertaken lightly. It requires changes in people's behavior, business processes and technology. But companies willing to commit effort and resources to it can position themselves to jump ahead and stay ahead of the competition. Supply chain management is ultimately about influencing behavior in particular directions and in particular ways. The underlying logics, drivers, enablers and barriers merit and require close attention. There is already a reasonably well-developed field

concerned with buyer-supplier behavior (or purchasing) and this has its own set of core concerns (Randall et al 2003).

Inspection activities include the checks of the quality or quantity of product or information delay (or storage). It mainly entails checking three types of defects in the supply process: Product defects, service defects and scrap defects. Product defects comprise defects in physical goods that are not caught by in-line or end-of-line inspection and are therefore passed on to customers. In a few cases, faulty products may be found that were detected but still passed to customers; this would also fall in this category. Scrap defects comprise defects that have been caught by in-line or end-of-line inspection. The in-line inspection methods will vary and can consist of traditional product inspection, statistical process control or through poke yoke devices. Service defects include problems given to a customer that are not directly related to the goods themselves, but due to the accompanying level of service.

The most important of these service defects is inappropriate delivery (late or early). Others include incorrect paperwork or documentation, incorrect packaging or labelling, incorrect quantity and incorrect invoicing. The approach integrates quality and logistics performance measures. It is designed to establish both internal and external quality levels as well as levels of customer service (Reichhart & Holweng, 2007).

Assurance activities include the responsibility to coordinate with suppliers on matters of scheduling, supply continuity, hedging, and research into new sources or programs. It entails the systematic measurement, comparison with a standard, monitoring of processes and an

associated feedback loop that confers error prevention. For example, a low priced product may be viewed as having high quality because it is disposable, where another may be viewed as having poor quality because it is not disposable (Saunders et al , 2007). The subsequent Factor Rotation as shown in table 10 was conducted on the basis of these 6 subgroups.

Table 4.11: Varimax Factor Rotation

	Factor 1	**Factor 2**	**Factor 3**	**Factor 4**
Items				
Factor 1: Cross-functionality				
Demand management	**0.79**	0.17	0.22	0.17
Waste management	**0.84**	0.08	0.18	0.23
Standardization practices	**0.80**	0.16	0.018	0.25
Behavioral practices	**0.85**	0.13	0.17	0.23
Inspection activities	**0.75**	0.12	0.16	0.21
Assurance activities	**0.76**	0.14	0.15	0.22

Source: research data

4.7 Effect of Supply Chain Practices on its Responsiveness

With the objective of the study of seeking to establish the relationship between supply chain responsiveness and lean supply chain practices in mind, the analyzed output using inferential statistics is as follows: Pearson Correlation analysis was used to achieve this end result with associated regression for significant tests set at 95% confidence level. The table below shows that there were significant correlation coefficients established between supply chain

responsiveness and lean supply chain practices. Those relationships falling within the line of best fit in the output were established among the independent and dependent variables: demand management practices (R = 0.686, p =.002); waste management practices (R = 0.690, p = .023); standardization practices (R = 0.719, p = .005); inspection activities (R = 0.692, p = .004); behavioral practices (R = 0.428, p = .001) and assurance activities (R = 0.533, p = .001). Essential relationship in terms of significance set was established between supply chain responsiveness and lean supply chain practices (R = 0.428, p = .001). This depicts that lean supply chain practices positively influence supply chain responsiveness.

Table 4.12: Correlation

Lean supply chain practices	**Supply chain responsiveness**	
Demand management	Pearson Correlation	0.686**
	Sig. (2-tailed)	.002
Waste management	Pearson Correlation	0.690*
	Sig. (2-tailed)	.023
Standardization practices	Pearson Correlation	0.719**
	Sig. (2-tailed)	.005
Behavioral practices	Pearson Correlation	0.428**
	Sig. (2-tailed)	.001
Inspection activities	Pearson Correlation	0.692**
	Sig. (2-tailed)	.004
Assurance activities	Pearson Correlation	0.533**
	Sig. (2-tailed)	.001

Source: research data

Correlation is significant at the 0.05 level (2-tailed).*

Correlation is significant at the 0.01 level (2-tailed). **

The study sought to establish how various lean supply chain practices are employed by vegetable oil processing firms in Kenya using multiple linear regression analysis. The practices were: demand management practices, waste management practices, standardization practices, and behavioural practices.

The table below shows that there is a good linear association between the dependent and independent variables used in the study. This is shown by a correlation (R) coefficient which came out as 0.887. The determination coefficient as measured by the adjusted R-square presents a moderately strong relationship between dependent and independent variables given a value of 0.764. This depicts that the model accounts for 76.4% of the variations in supply chain responsiveness while 33.6% remains unexplained by the regression model. Durbin Watson test was used as one of the preliminary test for regression which to test whether there is any autocorrelation within the model's residuals. Given that the Durbin Watson value was close to 2 (2.104), there was no autocorrelation in the model's residuals.

Table 4.13: Regression Model's Goodness of Fit Statistics

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
.887[a]	.787	.764	.757	2.104

a. Predictors: (Constant), demand management practices, waste management practices, standardization practices, behavioural practices, inspection activities, assurance activities

b. Dependent Variable: Supply Chain responsiveness

The ANOVA statistics presented in the table below was used to present the regression model significance. An F-significance score of p=0.001 was established showing that there is a probability of less than 0.1% of the regression model presenting false information. Thus, the model is very significant.

Table 4.14: Analysis of Variance (ANOVA) in the Regression model

	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Regression	120.450	5	20.075	35.037	.000[b]
Residual	32.659	32	.573		
Total	153.109	37			

Source: research data

a. Predictors: (Constant), demand management practices, waste management practices, standardization practices, behavioural practices, inspection activities, assurance activities

b. Dependent Variable: Supply Chain responsiveness

Table 4.15: Test of Statistical Significance of Lean Supply Chain Practices

Lean supply chain practices	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
	B	**Std. Error**	**Beta**		
(Constant)	2.653	.861		10.055	. 983
Demand management	.316	.097	.270	3.268	.002
Waste management	.003	.137	.002	.022	.023
Standardization	1.403	.141	.998	9.925	.000

Behavioural	.462	.204	.328	2.260	.028
Inspection activities	.552	.073	.307	2.506	.003
Assurance activities	.563	.281	.494	4.953	.016

a. Dependent Variable: Supply chain responsiveness
Source: research data

As shown in regression analysis results and Table 4.15, lean supply chain has a positive effect on supply chain responsiveness and explains 78.7% of the changes in the latter. Lean supply chain practices ensure that there is demand management by producing only what is needed, when it is needed, and where it is needed; supply is tightly linked with demand. Lean supply chain management also ensures that inventory risk is reduced, processes focus on activities that add value for the customer and employees work to create mistake-proof processes (Lysons and Farrington, 2006). Consequently, supply chain responsiveness enhances a firm's adaptiveness to demand fluctuation and overcome the environment uncertainty at a lower cost due to the shorter lead time. A well-designed supply chain operate, delivers products quickly to the end customer, with minimum waste.

As established by the findings, responsiveness enables firms to compete based on cost, quality, time to market, and delivery dependability; responsiveness of a firm's logistics (transportation and distribution) process enable organizations to introduce new products faster than major competitors and also lead to greater ability of a firm to provide on time the type and volume of product required by customers (increasing delivery dependability); responsiveness of a firm's supplier network improves - the ability of the firm to rapidly introduce new products and features in the market place (compete based on product innovation and time to market), as well

as improve a firm's ability to provide on time delivery (increase its delivery dependability) as the firms are endowed with responsive suppliers.

CHAPTER FIVE: SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter consists of the summary of findings, conclusion and recommendation of the study and there after the suggestions for further studies respectively.

5.2 Summary of Findings

Supply chain has received much attention from researchers and practitioners. In the competitive environment, most leading edge companies realized that by transferring costs either upstream or downstream they are actually not increasing their competitiveness, since all cost ultimately make up their way to consumers. Supply chain management guides firms to co-operate with a common goal to increase the overall channel sales and profitability, rather than completing for a bigger share of a fixed profit. There was a variety of vegetable oil processing firms in Kenya whom a majority of the firms had been in operation for above 10 years and above. The ownership structure of the majority of the vegetable oil processing firms was local ownership.

The study also found out that the majority of the computers were networked interdepartmentally with other departments linked to the main source of information. The study found out that the size of the firms differed ranging from 1,000 to 2,000 employees in their company. The factory size of the company ranged from 7 acres to 15 acres of land for the company. The study found out the annual production of the vegetable oil processing firms

ranged from 500 tons to 65,000 tons per year. The study found out that the lean supply chain practices included demand management chain practices, waste management practices, standardized practices, quality assurance practices, inspection activities and behavioral practices.

The study also found out that the majority of the firms practice vendor managed inventory management techniques for the customers. The study found out that the firms face stock outs semiannually and the results accounted for 61%. There were some challenges that face the vegetable oil processing firms were: ability to develop and maintain the cost leadership process to reduced cost without sacrificing quality; price competitiveness; accessibility of financial resources to high efficient production equipment; designing creative intensive strategies; government imposing external costs; technological innovation; human resource policies; organizations adopt technological innovation and intensive strategies to keep pace with the changing environment.

The study also found out ways to mitigate the challenges they face in the ability to develop and maintain cost leadership processes they face challenges such as stiff competitive prices hence they produce more stocks that do not run out; accessibility of financial resources to invest in high efficient production equipment in an effort to adapt to the strategic responses while responding to environmental changes; creating intensive strategies to keep pace with changing environment; developing policies that protect the firms from government interference especially on the pricing of their products; through training and seminars the adoption of technological innovation and intensive strategies to improve value for the customers.

The study results depicted that lean supply chain practices positively influence supply chain responsiveness; that there is a good linear association between supply chain responsiveness and lean supply chain practices and also that study depicted that the model accounts for 76.4% of the variations in supply chain responsiveness while 33.6% remains unexplained by the regression model. The study results depicted that among the lean supply chain practices, standardization practices followed by assurance activities, inspection activities, behavioural practices, demand management practices and waste management practices would have the most positive influence on growth.

5.3 Conclusion

The study concluded that the lean supply chain practices used in vegetable oil processing firms in Kenya were demand management practices, waste management practices, standardization practices, behavioral practices, inspection activities and assurance activities. The study concluded that the firms that have responsive supply chain experience the advantage of improved lead time for innovative products life cycle, reduced costs/ increased revenue by optimizing inventory levels under demand uncertainty , create a win-win situation with suppliers by implementing quantity- flexible contacts that share risk among supply chain partners, save time and expense by understanding which supply chain strategies do not need expensive software for implementation and reduced costs by learning ways of dealing successfully with supply uncertainty.

The study also concluded that lean supply chain practices and supply chain responsiveness 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.

5.4 Recommendations

The study recommends that demand management practices on the firms should invest in time and money in collaborative demand planning. The study recommends that demand management practices on the firms should communicate its demand forecasts to its supply chain partners. The study recommends that waste management practices on the firm should practice the philosophy of grouping similar parts in families to eliminate movement and queue. The study recommended that the firm should have standardized and rationalized the range of materials, parts and consumables. The study recommended that the behavioral practices on the firm have always broadened the experience of work to enhance employee needs satisfaction.The study recommended that all firm's business activities should be technologically driven in order to have a competitive edge which is seen as path to better results given the quality of processes and procedures that are enhanced by environmental force.

5.5 Recommendation for further studies

The researcher recommends that a similar study should be embarked on different processing firms in Kenya to verify the study results. Finally the researcher recommends that future researchers should investigate on the influence of government policies on lean supply chain practices and supply chain responsiveness.

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APPENDIX 1: RESEACH QUESTIONAIRE

This is a research aims at determining how your firm and other firms lean supply chain practices relate to supply chain responsiveness in trying to meet the need of end customers along the supply chain. There is no right or wrong answers and the results are confidential and strictly for academic purpose. Your honest participation in this survey was highly appreciated.

PART A: ORGANIZATIONAL PROFILE

1. Name of company_____

2. How many years has your company been in operation?

a) Below 5 years

b) 5 to 10 years

c) 11 to 15 years

d) 16 to 20 years

e) Above 20 years

3. Title of interviewee_____

4. Ownership structure

a) Foreign

b) Private

c) Both local and foreign

d) Government owned

e) Both private and government owned

5) Size of company (No. of employees) _____

6) Factory size (land occupied in Acres) _____

7. How are your computers networked?

a) Departmentally

b) Interdepartmentally

c) Externally, with supply chain partners

8. Annual production through put _____

PART B: LEAN SUPPLY CHAIN PRACTICES

1. To what extent has your firm implemented the following **demand management** practices (please tick appropriately using a scale of 1-5, where 1= very great and 5 = very small)

Demand management practices	Very great	Great	Moderately	Small	Very small
The firm has invested time and money in collaborative demand planning	[1]	[2]	3 [ ]	4 [ ]	5 [ ]
The firms always conducts annual demand forecasting	[1]	[2]	[3]	[4]	[5]
The firm always conducts annual production and purchasing planning	[1]	[2]	[3]	[4]	[5]
The firm always communicates its demand forecasts to its supply chain partners.	[1]	[2]	[3]	[4]	[5]
The firm always does product positioning, pricing	[1]	[2] 3	[ ] 4	[ ]	5 [ ]

and promotion of its products.					
The firm manages its customer orders to match available supply.	(1)	(2)	(3)	(4)	(5)

2. To what extent has your firm implemented the following waste management practices (use a scale of 1 -5, where1 = very great and 5 = very small)

Waste management practices	Very great	Great	moderately	Small	Very small
The firm has small specialized plants rather than vertically integrated manufacturing facilities.	(1)	(2)	(3)	(4)	(5)
The firm practices the philosophy of grouping similar parts in families to eliminate movement and queue	(1)	(2)	(3)	(4)	(5)
The firm encourages doing the right thing the first time	(1)	(2)	(3)	(4)	(5)
The firm produces what is needed and no more (JIT)	(1)	(2)	(3)	(4)	(5)
The firms production flow is smooth to dampen reaction waves that occur in response to schedule variations	(1)	(2)	(3)	(4)	(5)
The authority to produce or supply additional parts always comes from the downstream operations.	(1)	(2)	(3)	(4)	(5)

3. To what extent has your firm implemented the following **standardization practices** (use a scale of 1 – 5, where 1 = very great and 5 = very small)

Standardization practices	Very great	Great	Moderately	Small	Very small
The firm has standardized and rationalized the range of materials, parts and consumables	[1]	[2]	[3]	[4]	[5]
The firm always employs quality assurance at all times	[1]	[2]	[3]	[4]	[5]
The firm encourages quality control activities in all its production stages	[1]	[2]	[3]	[4]	[5]

4. Which of the following **quality assurance activities** does your firm practice as an approach to defects prevention

a) Quality system (ISO 9000) [ ]
b) New design control [ ]
c) Design for manufacturing processes [ ]
d) Incoming material control [ ]
e) Supplier appraisal [ ]
f) All of the above [ ]
g) None of the above [ ]

5. Which of the following inspection activities does your firm undertake to detect defects

a) Receiving inspection [ ]
b) Classification inspection [ ]
c) Control inspection [ ]
d) Audit inspection [ ]
e) All of the above [ ]
f) None of the above [ ]

6. To what extent has your firm implemented the following behavioral practices (use a scale of 1 -5, where 1 = very great extend and 5 = very small extend)

Behavioral practices	Very great	Great	Moderately	Small	Very small
The firm has always broadened the experience of work to enhance employee needs satisfaction	[1]	[2]	[3]	[4]	[5]
The firm has multiple carrier ladders for its staff	[1]	[2]	[3]	[4]	[5]
The firm always encourages high employee participation	[1]	[2]	[3]	[4]	[5]
The firm has many and flexible employee incentives	[1]	[2]	[3]	[4]	[5]
The firm always encourages quality of working life emphasis	[1]	[2]	[3]	[4]	[5]

PART C: SUPPLY CHAIN RESPONSIVENESS INDICATOR: DATA FOR THE LAST FIVE YEARS

Responsiveness indicator	Unit of measure	2008	2009	2010	2011	2012
Cost of after sale service	Kenya Shillings					
Order fulfillment time	Time					
Time of delivery	Hours					
Value of raw materials	Kenya Shillings					
Work-In-Progress (W.I.P)	Numbers					
Finished goods	Numbers					
Number of planned deliveries	Percentage					
Number of not-on- time deliveries	Percentage					
Number of incorrect quantity deliveries	Percentage					
Number of good units made	Number					
Quantity of defective units	Parts per million					
Total quantity of units supplied	Parts per million					
Employee output value	Kenya shillings					
Employee input value	Kenya shillings					
Number of employees	Number					

2. Does your firm practice “Vendor managed inventory” management technique for your customers?

( )

Yes No [ ]

3. How often does your firm face stock outs? Tick appropriately

a) Quite often [ ]

b) Weekly [ ]

c) Monthly [ ]

d) Semiannually [ ]

e) Not at all [ ]

f) Others specify

_____
_____
_____

4) What are some of the challenges facing vegetable oil processing firms in meeting customer requirement

_____
_____
_____

5) How are these challenges mitigated?

_____
_____
_____
_____

Thank you very much for your time and cooperation.

Appendix II: Correlation Matrix of major lean supply chain practices and the main supply chain responsiveness

		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19
Correlation	Q1	1.00	-.90	.10	.42	.43	.305	.19	.15	-.12	.37	.305	-.41	.32	.21	.50	.36	-.61	-.16	.37
	Q2	-.09	1.00	-.34	-.12	.25	.33	.23	.12	-32	-.12	-.09	.03	-.34	-.12	-.20	-.19	.34	-32	-.12
	Q3	-.34	.32	1.00	-.38	-.56	-.09	.45	.62	-.36	.20	-.34	.32	0.26	-.38	-.16	.34	.25	-.36	.20
	Q4	.44	.43	.305	1.00	.09	.43	.21	.37	-.61	.34	.44	.43	.305	.04	.305	.35	.50	-.61	.34
	Q5	.40	.25	.33	.40	1.00	.44	.35	-.16	-17	-.19	.40	.25	.33	.40	-.19	.26	.37	-17	-.19
	Q6	.22	-.56	-.09	.28	.18	1.00	.21	.305	-.24	-.17	.22	-.56	-.09	.28	-.35	.40	.37	-.24	-.17
	Q7	.305	-.32	.21	.50	.34	.22	1.00	.33	.23	-.16	.31	-.32	.21	.50	-.13	.31	-.19	.23	-.16
	Q8	.33	-.12	.36	.37	.37	.07	.05	1.00	.29	.47	.29	.25	.33	.23	-.20	-.19	.21	-.10	.04
	Q9	-.09	-32	.34	.37	-.09	1.00	-.34	-.12	1.00	.17	.38	-.56	-.09	.45	.37	-.16	-.13	.31	-.05
	Q10	.21	-.36	-.20	-.19	-.34	.32	1.00	-.38	-.10	1.00	.41	.09	.43	.21	.37	.305	-.41	.32	-.06
	Q11	.36	-.61	-.16	.34	.44	.43	.305	1.00	-.08		1.00	.22	.15	.49	-.19	.33	-.32	.09	-.06
	Q12	.34	-17	.305	.35	.40	.25	.33	.40	-.34	.32	.17	1.00	.16	.23	.21	-.26	-.42	.03	-.09
	Q13	.25	-.24	-.19	.26	.22	-.56	-.09	.28	.44	.43	.31	.27	1.00	-.03	-.03	.43	.47	-.10	-.04
	Q14	.50	-.20	-.35	.40	.305	-.32	.21	.50	.40	.25	.33	.19	.23	1.00		-.06	-.19	-.61	-.16
	Q15	.37	-.16	-.13	.31	-.09	.28	.18	.305	-.41	-.56	-.09	.28	.34	.15	1.00	.03	.34	-17	.305
	Q16	.37	.305	-.41	.32	.21	.50	.34	.33	-.32	-.32	.21	.50	.305	.33	.51	1.00	.35	-.24	-.19
	Q17	-.19	.33	-.32	.09	.36	.37	.37	-.26	-.42	-.12	.36	.37	.33	.40	.19	.02	1.00	-.05	-.07
	Q18	.21	-.26	-.42	.03	.34	.37	-.09	-.37	.27	.43	.16	.19	-.09	.28	.01	.06	.51	1.00	.23
	Q19	-.10	-.15	.15	.42	.14	.16	.28	-.33	-.20	-.35	.40	.305	-.32	.21	.09	.05	-.21	-.39	1.00
Sig (1-tailed)	Q1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Q2		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Q3		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Q4		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Q5		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Q6		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Q7		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Q8		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Q9		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Q10		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Q11		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Q12		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Q13		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Q14		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Q15		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Q16		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Q17		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Q18		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Q19		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Determinant = 5.271E-04																			

Source: Survey Data (2013)

APPENDIX III: LIST OF VEGETABLE OIL PROCESSING AND REFINING FIRMS IN KENYA

1 ARKAY INDUSTRIES

2 VOI INDUSTRIES

3 BIDCO OIL REFINARIES

4 DARFORDS ENTERPRISES LTD

5 DIAMOND INDUSTRIES

6 EARTH OIL KENYA

7 EASTERN INDUSTRIES LTD

8 KAPA OIL REFINERIES

9 MALINDI INDUSTRIES

10 PREMIER OIL MILLS

11 TINGA TINGA LIFESTYLE

12 TOWRIT OIL LTD

13 UMOJA MAINTENANCE CENTRE

14 UNILIVER (K) LTD

15 EDIBLE OIL PRODUCTS

16 KISUMU WALLA OIL INDUSTRIES

17 RIFT VALLEY PRODUCT

18 MENEGAI OIL REFINERIES LTD

19 GILOIL COMPANY LTD

20 PWANI OIL PRODUCTS

21 CORN PRODUCTS KENYA LTD

22 KENYA NUT COMPANY

23 PREMIER FOOD INDUSTRIES LTD

24 ABERDARE OIL MILLERS

25 AFYA COOKING OIL MANUFACTURES

26 NAKURU MILLS

27 OIL CROP DEVELOPMENT LTD

28 PALMAC OIL REFINERIES

29 OIL EXTRACTION LTD

30 SANSORA OIL MILLS

31 WESTERN SEED AND GRAIN COMPANY

SOURCE: KAM (2011) Directory; KNBS (2011)