SUPPLY CHAIN DESIGN PRACTICES AND BUSINESS PEFORMANCE AMONG MILK PROCESSING FIRMS IN KENYA

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A research project submitted in partial fulfillment of the award of the degree of Masters of Business Administration, School of Business, University of Nairobi

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DECLARATION

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

Signed…… Date…….

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D61/80251/2012

This research project has been submitted for presentation with my approval as the University Supervisor.

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DEDICATION

I dedicate this Masters of Business Administration project with a lot of love and commemoration to my late mother, Mrs. Hannah Mutila Mutunga. My daughter named after her, Sylvia Mutila, you are equally dedicated. My mum's constant love, encouragement, advice, moral uprightness, determination and hard work inspired me to go past the sky. She noted and assured me of the valuable treasure/gift inside me and my ability to fulfill my God-given destiny. In normal life situations and in all life adversities, my mum was always there for me with a lot of love and support. I whole-heartedly, sincerely, lovingly and with a lot appreciation dedicate this project to you, mum.

R.I.P. my dear mum, '*Mwaitu'*.

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ABBREVIATIONS AND ACRONYMS

SC	-	Supply Chain
SCM	-	Supply Chain Management
SCOR	-	Supply Chain Operations Reference Model
KDB	-	Kenya Dairy Board
CRM	-	Customer Relationship Management
ROI	-	Return on Investment
PDTs	-	Product Development Teams

ABSTRACT

Many firms who have implemented the use of various Supply Chain Design practices have had nothing short of enjoying the fruits of their investments. This project set out to establish the relationship between SC design practices and business performance among milk processing firms in Kenya. It also sought to determine the SC design practices commonly used by milk processing firms in Kenya. The research adopted a descriptive cross-sectional survey of Milk Processing Firms in Kenya. The descriptive approach was used to determine the various SC design practices used by Milk Processing Firms in Kenya. A census study of 42 Milk Processing Firms was carried out. Data was collected from the field through use of questionnaires and then analyzed using Statistical Package for Social Scientists (SPSS) and presented in tables and figures with the results well interpreted and discussed. The study revealed that the milk processing firms had invested resources towards the SC and used it as a strategic weapon to beat competition. The researcher concluded from the findings of the study that SC design helped companies to understand where value is being created and destroyed. The regression model on the relationship between SC Design Practices and overall firm's performance indicated that SC Design Practices contributed by 30% towards the performance of the firms. Despite this being a small percentage it should be noted that it was positive and so had positive contribution towards business performance. However, a T-test showed no significant relationship between the dependent variable and the independent variables. The researcher concluded that SC Design Practices contributed positively towards a firm's overall performance. The study recommends that in order to have a successful SC in terms of total SC costs and service performance to the customer, companies need to design their SCs such that they match the type of products they are selling with the type of distribution channels delivering them. It also recommends that it is important to measure performance to determine achievement of goals and alignment of objectives with organizational strategy.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

The management of a firm's Supply Chain (SC) is its competitiveness in the global economy. Increasing competitive pressures drive companies to focusing on core competencies for their competitiveness. Consumer demand for superior service, increased value and competitive price bring ever greater pressure for efficiency gains and performance improvement (Wight and Kelly 2012).

In today's market, firms don't compete; SCs do (Crimi and Kauffman 2001). Firms realize that SC design is crucial in gaining competitiveness. In designing SC to align capabilities directly with enterprise strategy, the results tend to be superior performance and a strong market position. Every successful company should have an operational design and management style tailored to its own purpose and strategy. This calls for designing SCs to suit and to enable achievement of the firm's goals (Kauffeld, Mueller and Michaels 2013).

Various problems are experienced in designing SCs. One problem addresses how to configure a new product's SC where the product's design has already been fixed. Another problem addresses part selection for multi-generation products and the other problem considers the impact of quality on the supplier-manufacturer relationship. The issue in all the problems is to select the options that minimize the total SC cost (Willems, 1999).

Supply Chain design has a myriad of benefits as follows: It helps companies understand where value is being created and destroyed. It helps build closer relationships with customers and suppliers. It facilitates smooth flow of materials and products. Lead time is reduced. Opportunities to improve profits are identified; decision making supports the profitability of the

entire company. Alternate strategies are compared quantitatively and cost tradeoffs are modeled accurately. A good SC design helps firms to understand agility required to serve the customer cost effectively and to segment the SC response to deliver the required strategy. (Alexandre, 2008; Wight and Kelly, 2012).

1.1.1 Supply Chain Design Practices

A supply chain is a system of organizations, people, activities, information, and resources involved in moving a product or service from supplier to customer. Supply chain activities transform natural resources, raw materials, and components into a finished product that is delivered to the end customer (Nagurney A., 2006).

Supply chain design is deploying assets in ways that enhance profitability and shareholder value. Market and sourcing strategies that generate the best financial performance, optimal number of plants, warehouses and distribution centers are considered to maximize long-term profit (Alexandre, 2008).

Supply Chain design practices are strategies tailored to suit and enable deployment of assets in the most profitable ways for optimal operational and financial performance in the SC of a firm. There should be a clear sequence of events in designing an effective SC beginning with Market and Product strategy (Wight and Kelly, 2012). The SC Design practices to be covered in this study are: Design for the Product, Design for the Customer, Design for the Market, Design for Profitability, Design for SC, Design for Life Cycle and Design for the Environment.

1.1.2 Business Performance

This is the extent to which an organization is able to meet the needs of its stakeholders and its own needs for survival. It can be viewed in terms of financial and non-financial perspectives (Santos, et al., 2007).

Jones and Oliver (2006) posit that organizations in all sectors have a common need to manage their business needs efficiently and effectively in line with their stated business objectives. Effectiveness is measured by the extent to which stakeholders or customers' requirements are met over time; while efficiency is measured in terms of how economically the organization's resources are utilized in providing a given level of stakeholder/customer satisfaction.

The key aspects of business performance include: financial performance, operational performance and SC performance. Financial measures include profitability, return on investment, liquidity ratios, return on capital employed while the operational measures include productivity, capacity utilization, cost reduction and the SC performance measures include inventory turnover, lead time, product cycle time and speed to market.

1.1.3 The Milk Processing Firms in Kenya

Kenya is one of the largest producers of milk in Africa. According to e-dairy project (2011) large-scale dairy farming accounts for 20 per cent of national milk production and small scale farming 80 per cent. There is need to upgrade the dairy value chain to eliminate inefficiencies and lower production and processing costs, while simultaneously increasing milk quality from farm to consumer to meet acceptable domestic and international standards. The project further posits that the sector however faces a number of challenges that hinder competitiveness both locally and in the regional market.

The Milk Processing Industry in Kenya has evolved over time and the design of its SC is increasingly becoming a challenge. This is due to the perishability of their products and taking care of the segmentations of its customers. One of the reasons for slow growth of the concept of SC management is failure to broaden the vision of SC beyond the firm's internal value chain and also failure to cooperate metrics to guide the design of the SC networks. There is therefore a need to conduct a study in order to determine the SC design practices used by milk processing firms in Kenya and to establish the extent to which they can improve the firms' business performance.

Challenges in the Milk Processing firms include: ensuring that all products in the firm's local dairy case are fresh, safe, and produced in the most efficient and environmentally-friendly way. Although the country has the capacity to process about a million litres a day, a large percentage of fresh pasteurized milk has a short shelf-life. The market for fresh pasteurized milk is also fairly constant and cannot be easily expanded in the short run. As a solution milk is incorporated into the National Food Strategic Reserve, which helps the uptake of excess produce that can be offloaded into the market during times of scarcity (softkenya.com/farming/dairy-farming-in-Kenya/).

The milk SC includes activities and processes from production, processing, trading and consumption (Ngigi *et al*., 2000). Opportunities exist in production of high quality powdered milk, cheese and butter; provision of affordable small-scale processing and packaging technologies which can tap the milk that currently goes into informal sector or to waste (www.kdb.co.ke).

Milk is processed to produce high value milk products such as farm Fresh Products; Long Life Products e.g. powdered milk; Cultured Products e.g. fermented milk and Creamy products like butter (Africa-Do-Business.Com, 2010). Pasteurization of milk is one of the possible heat treatments being used to kill the entire population of pathogenic bacteria and to strongly reduce the total number of micro-organisms. Milk cooling is done in extensive and trendsetting range of milk cooling tanks with different refrigeration systems such as ice water cooling, direct expansion and instant cooling, and different control and cleaning systems.

1.2 Statement of the Problem

Supply Chain Design influences the ability of the firm to respond to the customer needs and the value delivered to the customers. This will in turn affect the revenues and the level of optimization of the entire SC (Alexandre, 2008).

A number of studies have been done on SC design and business performance. Meixell and Gargeya (2005) carried out a study on decision support models for the design of global SCs and practical issues of global SC design. They found out that few models address the practical global SC design problem in its entirety; hence the need to study further on SC design and address the gap in knowledge the study revealed.

Various past studies in milk processing firms considered different variables from those explored in this study. Kemokai (2012) carried out a study in the same firms to establish the relationship between SC failures and customer satisfaction among milk processing firms in Kenya. Study findings indicated that deterioration in milk production, poor supplier relationship management, poor management of inventory and pilferage of inventory were among the causes of SC failure.

Although the study was on milk processing firms in Kenya it did not match the current study because it addressed SC failures while current study addresses SC design practices.

Other studies conducted in the SC had one similar variable to that considered in this study, yet it was considered against different ones hence lacking the exact match with those in the current study. Magutu (2013) carried out a study on 'SC Strategies, Technology and Performance of Large-scale Manufacturing Firms in Kenya'. The study set out to establish the role of technology in the relationship between SC strategies and overall firm performance. Study findings indicated a significant relationship between SC strategy and firm's SC performance. Magutu's study and this current one both explore impacts of different variables on overall firm's performance, but the two studies are in different industries. Also his study is on SC strategies but not on SC design practices.

Studies done in SC design include that on 'How to design the right SCs for your customers' by Jari, Helsinki, Finland, Eloranta and Ian (2009). The researchers found out that by deploying three different SCs that corresponded to three types of customers' demand chains, it could simultaneously improve customer satisfaction and effectiveness. This study was on SC design for the customer; it did not extend to other SC designs covered in this study. Also their study was in industrial engineering and management but not in the milk processing industry.

Still in the SC design, Nuri, Kim and Bryan (2010) carried out a study on "Development of a simultaneous design for SC process for the optimization of the product design and SC configuration problem". The study investigated and quantified the potential benefits of the design for SC focusing on product design. Study findings were that the concurrent optimization provided better visibility and higher profits. This study was in engineering while this current

study is in the milk processing industry. It was on design for the product only hence did not address other design practices addressed in this current study.

Milk processing firms in Kenya have had little reward to their owners and employees in terms of output and revenue. The few studies done in the industry underscore full potential of the milk processing firms in Kenya hence the need to research further on the industry and explore all the conceptual constructs in the current study. To achieve this, the study therefore seeks to answer the following questions: What are the SC design practices commonly used by milk processing firms in Kenya? Is there any relationship between the SC design practices and business performance of milk processing firms in Kenya?

1.3 Objectives of the Study

The objectives of this study will be:

(i) To determine the SC design practices commonly used by milk processing firms in Kenya.

(ii) To establish the relationship between SC design practices and business performance among milk processing firms in Kenya.

1.4 Value of the Study

Policy makers will use the findings and recommendations to make policies helpful in optimizing SCs. The study will be helpful for academic purposes. It will guide learners in more effectively managing tradeoffs such as cost versus service level, improving operational decision-making and re-optimizing regularly for even greater savings. One will apply the knowledge of SC network design to select the right number, location, territory, and size of warehouses, plants, and

production lines; and optimize the flow of all products through the SC even if it extends around the globe

Watson *et al*., (2012) present better ways to decide what to manufacture internally, where to make these products, which products to outsource, and which suppliers to use. It will be helpful to all SC executives, managers, strategists, and analysts; and for all students, instructors, and researchers in advanced SC management and/or logistics courses.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The characteristics of today's competitive environment, such as the speed with which products are designed, manufactured, and distributed, and the need for higher responsiveness and lower operational cost, are forcing companies to search for innovative ways to do business (Razmi and Ghodzi, 2012). Organizations increasingly find that they must rely on effective SCs, or networks, to compete in the global market and networked economy. This calls for appropriate and effective designs of SCs.

A firm's SC allows it to move products from the source to the final point of consumption. Leading firms around the world, from large retailers to high-tech electronics manufacturers, have learned to use their SC as a strategic weapon. The number and locations of these facilities is a critical factor in the success of any SC. The most successful companies place significant emphasis on strategic planning by determining the best facility locations and product flows. The discipline used to determine the optimal location and size of facilities and the flow through the facilities is called SC network design (Watson, Lewis, Cacioppi, Jayaraman 2012).

Wight and Kelly (2012) posit that despite continued economic uncertainty and increasing global competition, customer demands remain to be a major focus for businesses. There is constant demand for superior service, increased value and competitive price. This brings ever greater pressure for efficiency gains and performance improvement. Every business entity strives to meet the needs of customer and to achieve this it requires an optimization of the entire SC. The benefits to be gained from developing formal relationships and collaborative partnerships with key suppliers and customers throughout the SC are too significant to be ignored. Optimized SCs

deliver high-class service at minimal cost and to achieve this, good SC design practices must be embraced.

In the past, researchers and practitioners have primarily investigated the various processes within individual SCs. Of late, there has been increasing attention placed on the performance, design, and analysis of the SC as a whole. This attention is largely a result of the rising costs of sourcing, production, distribution, shortened product life cycles and the globalization of market economy.

2.2. Supply Chain Planning

According to Watson *et al.*, (2012) the SC infrastructure design process depends on forecasts of the future that will not all prove to be accurate; e.g. customer demand, competitors' actions, cost of raw materials and transportation. Those who recognize the uncertainty of the data that drives their business planning can use SC tools to explore different possible futures and evaluate a course of action. That way they can confidently make decisions that will perform well across a wide range of possible futures and position themselves for a positive return.

Planning is a strategic part of SC Management. Companies need a strategy for managing all the resources that go toward meeting customer demand for their product or service. Considering that milk and its products are perishable the SC should be designed to bring out efficiency and effectiveness.

Activities like milk collection from farmers at various centres are planned in advance to ensure that milk reaches the factories at the right time for processing to ensure that it remains in good consumption condition despite its perishability. Processing of the milk and its various products in the factories is also planned in advance so that there is continuous flow of operations (e-dairy project, 2011).

2.3. Supply Chain Design

SCs determine the ability of the firms to compete in the marketplace. The design of the SC will determine the ability to compete effectively. A firm that is attempting to compete in a market where low cost determines who gets the business will have difficulty if it includes high cost suppliers in its SC. The characteristics of the end-market in which a firm is competing must be considered when designing SCs. (https://www.supplychainonline.com/)

According to Supply-Chain Council (2003), SC network design is a powerful modeling approach proven to deliver significant reduction in SC costs and improvements in service levels by better aligning SC strategies. It incorporates end-to-end SC cost, including purchase, production, warehousing, inventory and transportation.

At its highest level, a SC is comprised of two basic, integrated processes: The Production Planning and Inventory Control Process; and the Distribution and Logistics Process. Various models have been designed to help in designing and analyzing the SC. The modeling approach is driven by the nature of the inputs and the objective of the study. The models help in performance measurement in terms of reliability, responsiveness, flexibility and cost.

2.4. Supply Chain Design Practices

Successful SC design is about deploying assets in ways that enhance profitability and shareholder value (Wight and Kelly, 2012). Good Milk processing practices are an important practical tool used world-wide in supporting milk firms to produce and market safe, quality milk and milk products to satisfy the expectations of the food industry and consumers (e-dairy, 2011). SC design practices include:

Design for the Product Practices: This is a product's configuration, composition and style. The design ensures that the product is aesthetically pleasing and fashionable; often requires considerable consumer research, artistic creativity and product planning (Zikmund and d'Amico, 2000). Fisher (1997) embraced designing SCs according to different product characteristics. He distinguished between functional and innovative products. Innovative products required a responsive SC, and functional products required an efficient one hence the SC should be designed accordingly. Payne and Peters (2004) had a different view and argued that, in order to have a successful SC in terms of total SC costs and service performance to the customer, companies need to design their SCs such that they match the type of products they are selling with the type of distribution channels delivering them.

Design for the Customer Practices: This refers to aligning SC infrastructure with customer demands. According to Lee (2004), a great deal of useful customer and demand information is captured and processed as well, for the design of SCs which must be aligned with the customer demands. The design is done as per the voice of the customer (Lysons and Farrington, 2006). Customer Relationship Management (CRM) is a one-to-one type of marketing approach which leverages the relationships to arrive at an understanding of the needs and priorities of each customer (Gronroos, 1990; Collins *et al.*, 2009). Understanding the processes that consumers and businesses use to make purchase decisions is critical to the development of long term mutually beneficial relationships with customers (Fererell, Michael and Hartline, 2000). According to Lysons and Farrington (2006) SC is designed to get the product to the right place at the right time in the right quantities at the lowest possible cost all for the convenience of the customer. Ernest and Young (2012) posit that the SC design practice for the customer

considers through which channels are various customers going to be served, their needs and existing trading terms.

Design for the Market Practices entails designing seeking opportunities for business growth in new or existing markets. It broadly categorizes alternative opportunities in terms of basic strategies for market growth and serves as a planning tool (Zikmund and d'Amico, 2000). In designing for the market the business should consider customers' likes, wants or preferences (Farerell, Michael and Hartline, 2000). The SC is designed as per the market segments. Marketing strategies start with segmentation, targeting and positioning; and the SC is designed to suit each market segment (Kotler, 2012). Design for Market Practice considers how products are manufactured, sold and transported to respective markets. It also considers tax and incentive implications of selling in different market jurisdictions so that the design suits the most economical practices (Ernest and Young, 2012). A good design for the market eliminates market mediation costs which are costs associated with the imbalance of demand and supply. These costs which reflect the unstable and fragile balance between lost sales and product obsolescence arise from the consequences of the degree of demand predictability (Perez, 2013).

Design for Profitability Practices: Managing the SC is a core competence that an organization must possess to deliver profit and return on investment (ROI) for it has a major impact on organizational objectives and effectiveness in achieving those objectives (Hines, 2004). Maximizing SC network effectiveness is the key to individual and SC profitability (Dyer, 2000). Although low-cost country sourcing is considered a strategy, a comprehensive approach to procurement requires that companies also consider total SC costs and lead times which are the most profitable source. Sourcing strategies must take into account how quickly suppliers can

deliver parts and materials to the manufacturer. Sourcing from a low-cost country makes sense, if only lead-time constraints do not offset any cost advantages. A wise sourcing strategy, therefore, will consider total costs and lead times as well as balance supply with demand to create a globally distributed supply network that best meets the company's business objectives of maximizing profitability (Ellis, 2008). Designing for profitability means illustrating a scenario in which the company produces its ideal product portfolio with the most collaborative supplier base, employing perfect labor model and state-of-the-art production equipment, and delivering it via the optimal route to the customer.

Design for SC Practices: Design for SC is the process of optimizing the fit between SC capabilities and product designs (Domin, Wisner and Marks, 2007). It creates product configurations that address infrastructure limitations and use SC capabilities as they evolve throughout the life of the product. In today's SC, minimal component costs are still a competitive weapon, but the SC that can offer the highest performance at the lowest overall cost is rapidly becoming a far more valuable and sustainable differentiator. The SC approach considers the roles of suppliers, producers, distributors and end users to see how each adds value to and benefits to the final product (Elzel, Walker, and Stanton, 2013).

Design for Life Cycle Practices: The product is designed to be SC friendly to potential component or infrastructure changes throughout its lifecycle. These include events such as small improvement to product design, cost improvements or commodity or technology or infrastructure advances. Product Development Teams (PDTs) determine which of the product's components are likely to be changed throughout the product's lifecycle and facilitate eventual change with minimum impact in the SC. After deciding on the changes that are likely to occur, PDTs

structure the product so that changes can be implemented with minimum disruption to the SC. The product design proactively transitions out old technology while introducing new technology. The product design must consider forward and backward compatibility - not just from a customer viewpoint, but also for component parts in the SC (https://www.supplychainonline.com/). Product lifecycle, which is continually getting shorter in response to the speed of change in technology, fashion, and consumer product trends, affects the predictability of demand and market mediation costs. The design for life cycle puts all these into consideration to ensure effectiveness and efficiency (Hines, 2004).

Design for the Environment Practices: Economies embrace new environmentally responsible values, beliefs and behaviors, to green the entire SC (Mohammed, 2012). 'Going green' is a concept for people to learn how to make environmentally friendly choices, make responsible daily decisions that benefit the environment and help reduce waste and pollution. (Blanchard, 2010). The design for environment practice entails the green strategy which features cross functional collaboration, emphasis on innovation, and strategic focus on SC and enterprise as a whole. Such a framework emphasizes network redesign, packaging changes, and business collaboration that promotes a smaller carbon footprint and generates cost saving (Babu, 2011). The drivers of going green include market demand where consumers are already aware of the concept, regulatory pressure where organizations have been restricted by governments to ensure that they go green, economic competitiveness where the concept assists in the reduction of costs as well as operational efficiency giving a company competitive advantage and environmental regulations which include ISO 1400 which advocates for an environment free from pollution (Easty and Winston, 2006). Designing for the environment practice has a myriad of benefits which include: improved public image for the organization, improved products quality, product

differentiation and competitive advantage, sustainability of resources and positive impact of financial performance i.e. lowered costs and increased efficiency (Blanchard, 2010).

2.5. Business Performance

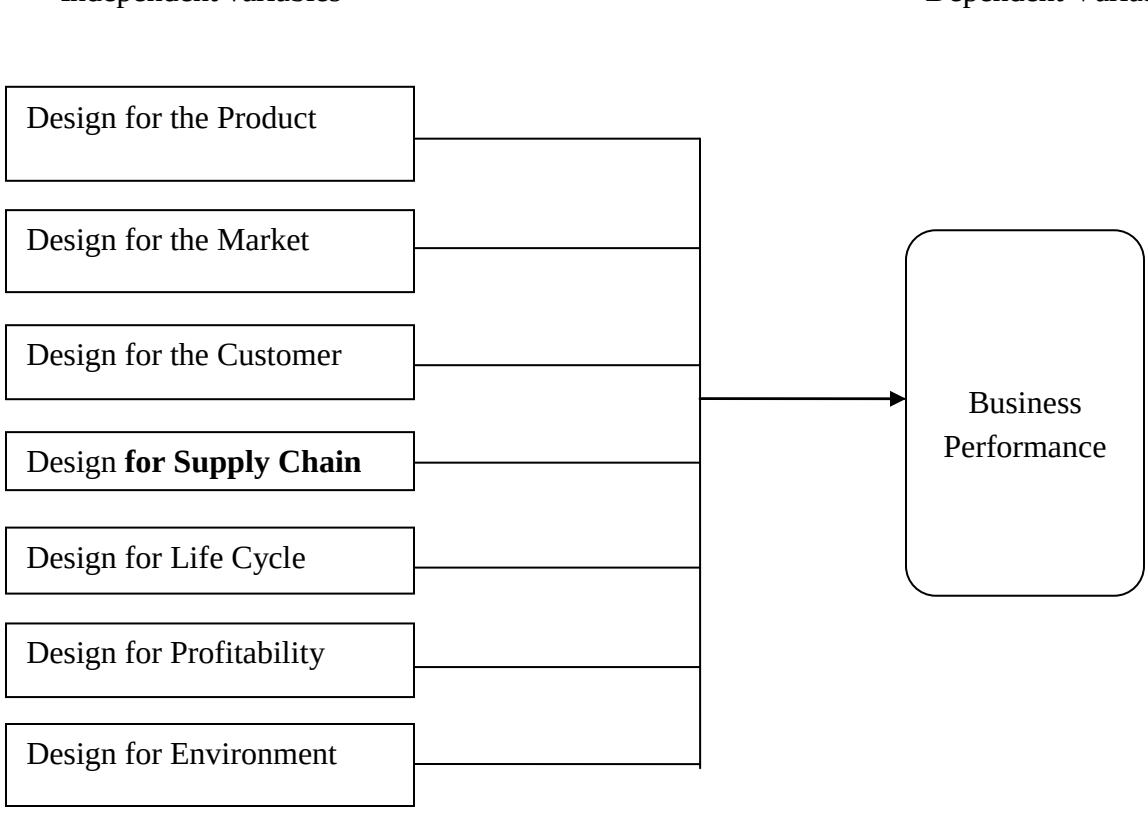
The output of the processes enabled by the SC design must be measured and compared with a set of standards to meet business objectives. The measurement of business performance is the act of quantifying the performance criteria (metrics) of organizational units and services, processes, people and other business activities (Johnson *et al*., 2006). Performance measures are a critical factor for effective management. It is important to measure performance to determine achievement of goals and alignment of objectives with organizational strategy (Delaney *et al*., 2006).

Business performance in this study is viewed from the financial and non-financial perspectives. The balanced score card which offers both qualitative and quantitative measures that acknowledge the expectations of different stakeholders and related assessment of performance in choice of strategy has been used. It is a strategic planning and management system that is used extensively worldwide to align business activities to the vision and strategy of the organization, improve internal and external communications, and monitor organization performance against strategic goals. It provides a framework for performance measurements and helps planners identify what should be done and measured in order to balance the financial perspective. (Kaplan and Norton, 1996). The balanced score card has been used in this study to measure performance because it provides a holistic measure of business performance.

CONCEPTUAL FRAMEWORK

The conceptual framework is a schematic diagram which explains the relationship between independent and dependent variables in a study. It is used to guide the study and structure a subsequent presentation. Various studies covered have not dealt with SC design practices in relation to performance of Milk Processing firms. As a result, this study will seek to explore SC design practices versus performance among Milk Processing firms in Kenya. Business performance is the dependent variable since its outcome depends on the SC design practices used; while SC design practices are the independent variables determining the business performance as shown on the following model.

Figure 2.1 Conceptual Model



(Author, 2014)

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter outlines the methodology that was used in conducting the study. The issues discussed include the research design, the target population, the sampling design, data collection methods, data analysis and data presentation methods.

3.2 Research Design

The study adopted a descriptive research design. A survey method was used to collect primary data by use of questionnaire. The questionnaire method required asking respondents for information, using written questioning (Zikmund, 2011). The survey approach was adopted because it provided a quick, inexpensive, efficient, and accurate means of assigning information about the population (Setlltiz *et al*., 2008). In addition it is considered authoritative by people in general and since it researched on many firms it helped determine the many SC practices used in the various firms hence it was easy to compare performance among them, explain and understand easily.

3.3 Population

The population of the study was all milk processing firms in Kenya. According to Kenya Dairy Board (2013), there were 42 Milk processing firms from which a census study was carried out. A census is an investigation of all the individual elements that make up the population i.e. a total enumeration rather than a sample (Zikmund 2011). The choice of census method was to fulfill the requirements of effectiveness, total representativeness, reliability and accuracy (Kothari, 2004).

3.4 Data Collection

Primary data was used in this study. Data collection was done through use of closed-ended questionnaires. Closed-ended questions are conclusive in nature as they are designed to create data that is easily quantifiable. The questions are easy to code and this makes them particularly useful when trying to prove the statistical significance of a survey's results (Penwarden, 2013). The questionnaire had three sections: section (i) will dealt with general information on the Milk processing firms; section (ii) sought information on the various SC design practices used by Milk processing firms in Kenya; section (iii) sought information on business performance and performance measurements. The respondents to the questionnaires were procurement and SC managers, procurement officers (or their equivalents) at the various Milk processing firms. The questionnaires were administered on 'drop and pick later' method and also through e-mail. Follow up and reminders were done through telephone calls and e-mails.

3.5 Data Analysis

Data was collected and analyzed using Statistical Package for Social Scientists (SPSS). In order to achieve the objective of determining the SC design practices commonly used by milk processing firms in Kenya, descriptive statistics analysis such as use of means and standard deviation were used to analyze the data. Factor analysis was used in determining the benefits of SC design practices to the Milk Processing firms. To achieve the objective of determining the relationship between SC design practices and business performance regression analysis was used.

CHAPTER FOUR: DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents analysis and findings of the study as set out in the research methodology. The study findings are presented on SC design practices and business performance among milk processing firms in Kenya. The data was gathered exclusively from the questionnaire as the research instrument. The study sought to determine the SC design practices commonly used by milk processing firms in Kenya and also to establish the relationship between SC design practices and business performance among milk processing firms in Kenya. The chapter presents descriptive analysis using means, standard deviation, and factor analysis to determine the extent to which various variables and SC design practices are used in the various firms. Regression analysis was used to explain the relationship between SC design practices and the overall firms' performance.

4.2. Response Rate

A census study of 42 milk processing firms was done. Questionnaires were supposed to be filled in by Procurement Managers/Officers or Supply Chain Managers/Officers. However, some of the firms did not have the said Managers or Officers and so questionnaires were filled in by Human Resource staff and the performance part of the questionnaire was filled in by Accounts staff. Out of the 42 questionnaires distributed to the firms, 37 questionnaires were returned giving a response rate of 88%. This response rate was high and satisfactory as Babbie (2002) observes that in descriptive research, a response rate of above 50% is adequate for analysis. Two of the 37 questionnaires were partially filled in as respondents claimed that information required was sensitive and highly confidential hence not authorized to submit. However, the two questionnaires were still deemed usable. 5 questionnaires were not returned; reasons being that

data required was confidential and also others simply did not fill them in despite constant follow up through phone calls and e-mails. The high response rate was attributed to use of online data collection methods like use of e-mails in addition to physical 'dropping and picking later method' of questionnaire administration. Milk Processing firms located far in the countryside were easily and quickly reached through e-mails and phone calls hence enabling data collection from many firms.

4.3 Firm's general information about its Supply Chain

In business, firms usually apply various strategies in order to enhance their competitiveness. In this study, respondents were asked to indicate the extent to which their firms used SC in enhancement of their businesses on a likert scale (1 - Very Great Extent, 2 - Great Extent, 3 - Moderate Extent, 4 - Small Extent and 5 - Very Small Extent). The results are as shown on the table below:

Table 4.1: Firm's Supply Chain

	Mean	**Std. Dev.**
The firm has invested resources to ease the movement of products to the point of consumption	1.54	.803
The firm incorporates suppliers and customers in its service delivery, quality and feedback	1.57	.765
The firm uses the SC as a strategic weapon to beat the level of competition in the milk industry	1.84	.834
Overall mean and standard deviation	**1.65**	**0.800**

Source: Research data (2014)

From the results in table 4.1 above, to a very great extent (Mean = 1.65, Std. Dev. = 0.800) the SC design process is influenced by the three factors which include: investing resources to ease the movement of products to the point of consumption, using SC as a strategic weapon to beat

the level of competition and incorporating suppliers and customers in service delivery, quality and feedback.

This is in agreement with Watson, Lewis, Cacioppi, Jayaraman (2012) who comply that a firm's SC allows it to move products from the source to the final point of consumption and also emphasize on strategic planning to determine the best facility locations and product flows.

4.4. Factors influencing SC Design Process

There are many factors that can influence the design of a SC in a manufacturing entity. These factors can be internal or external. The respondents were asked to indicate the extent to which a number of factors have influenced the SC design process on a likert scale (1 - Very Great Extent, 2 - Great Extent, 3 - Moderate Extent, 4 - Small Extent and 5 - Very Small Extent). The results are as shown on the table below:

Table 4.2: Factors influencing SC Design Process

	Mean	**Std. dev.**
Formal relationships and collaborative partnerships with key suppliers and customers have influenced the design of the firms SC design process	1.69	.631
The level of customer demand has influenced the design of the firm's SC design process	1.73	.769
Total SC response time has influenced the design of the firms SC design process	1.74	.780
Adoption of technology by your firm has influenced the design of the firms SC design process	1.83	.655
Prices for products have influenced the design of the firms SC design process	1.89	.667
Sourcing processes have influenced the design of the firms SC design process	1.92	.770
Competition actions in the milk industry have influenced the design of the firm's SC design process	1.92	.759
Cost of raw materials in the processing of the milk has influenced the design of the firms SC design process	2.19	.889
Overall mean and standard deviation	**1.86**	**0.74**

Source: Research data (2014)

From the results in table 4.2 above, to a great extent (M=1.86, Std. Dev. = 0.74) the SC design process is influenced by the eight factors which include: formal relationships and collaborative partnerships with key suppliers and customers, level of customer demand, SC response time, adoption of technology, prices for products, sourcing processes, competition actions and the cost of raw materials. This is in agreement with Wight and Kelly (2012) who posit that the benefits to be gained from developing formal relationships and collaborative partnerships with key suppliers and customers throughout the SC are too significant to be ignored.

4.3 Supply Chain Design Practices:

In this section, the researcher wanted to establish the extent to which the various Supply Chain Design Practices were used by the various Milk Processing firms. Respondents were asked to indicate the extent on a likert scale (1 - Very Great Extent, 2 - Great Extent, 3 - Moderate Extent, 4 - Small Extent and 5 - Very Small Extent) on each of the Supply Chain Design Practices as follows:

4.3.1 Design for the Product Practices

Business firms employ various SC design practices in their efforts to improve business performance. Respondents were asked to indicate the extent to which their firms employed the design for Product Practices in enhancement of their businesses on a likert scale (1 - Very Great Extent, 2 - Great Extent, 3 - Moderate Extent, 4 - Small Extent and 5 - Very Small Extent). The results were as shown on the table below:

Table 4.3: Design for the Product Practices

	Mean	**Std. Dev.**
The firm has ensured that the milk products are aesthetically pleasing and fashionable	1.51	.731
The firm has ensured that its product design practice embraced/considered predictable demand	1.81	.710
The firm has ensured through research that the milk product designs/varieties consider consumers' preferences	1.81	.668
The firm has used different product characteristics in its product SC design	1.82	.716
The firm in its product design practice embraced/considered thin contribution margin (small increases in profit)	2.03	.985
The firm has ensured that its product design practice embraced/considered a long product life cycle	2.15	.744
Overall mean and standard deviation	**1.855**	**0.759**

Source: Research data (2014)

From the results in table 4.3 above, the design for the Product Practices are used to a very great extent (M = 1.855, Std. Dev. = 0.759) as indicated by the six factors which include: aesthetically pleasing and fashionable milk products, embracing predictable demand, milk product designs/varieties which considered consumers' preferences, different product characteristics, consideration of thin contribution margin and consideration of a long product life cycle.

This is in agreement with (Zikmund and d'Amico 2000) who argued that the product should be aesthetically pleasing and fashionable. However, it is in contrast with Fisher (2007) who embraced designing products according to different product characteristics by distinguishing between functional and innovative products.

4.3.2 Design for the Customer Practices

The researcher wanted to establish the extent to which design for the Customer Practices were used by the various Milk Processing firms. Respondents were asked to indicate the extent to which their firms employed the design for Customer Practices in enhancement of their businesses on a likert scale (1 - Very Great Extent, 2 - Great Extent, 3 - Moderate Extent, 4 - Small Extent and 5 - Very Small Extent). The results were as shown on the table below:

Table 4.4 Design for the Customer Practices

	Mean	**Std. Dev.**
The firm has aligned its SC with customer preferences such that products are available as per the customer demands	1.57	.689
The firm has considered existing trading terms in the management of its SC	1.77	.770
The firm focuses on Customer Relationship Management (CRM) as a marketing strategy	1.84	.688
The firm has determined customer responsiveness to its services (feedback) through market research	1.89	.658
The firm has ensured that different customers are served through different distribution channels	2.05	.815
Overall mean and standard deviation	**1.824**	**0.724**

Source: Research data (2014)

From the results in table 4.4 above, the design for the Customer Practices are used to a very great extent M = 1.824, Std. Dev. 0.724) as indicated by the five factors which include: aligning SC with customer preferences, considering existing trading terms in management of SC, focusing on Customer Relationship Management (CRM), determining customer responsiveness through market research and serving different customers through different distribution channels.

This is in line with (Lee 2004) who argued that a great deal of useful customer and demand information for the design of SCs must be aligned with the customer demands. It is also in

agreement with (Gronroos, 1990; Collins et al., 2009; Fererell, Michael and Hartline, 2000), all of whom emphasize on the importance of Customer Relationship Management (CRM) and the need to understand the needs and priorities of each customer.

4.3.3 Design for the Market Practices

The researcher further sought to establish the extent to which the firms employed the design for Market Practices in enhancement of their businesses. Respondents were asked to indicate on a likert scale (1 - Very Great Extent, 2 - Great Extent, 3 - Moderate Extent, 4 - Small Extent and 5 - Very Small Extent). The results were as shown on the table below:

Table 4.5 Design for the Market Practices

	Mean	**Std. Dev.**
The firm has focused on existing markets for business growth and expansion	1.73	.769
The firm has focused on establishing itself in new markets for business growth and expansion	1.75	.806
The firm has served its customers according to various market segments	2.06	.674
The firm has considered how products are manufactured sold and transported to respective markets in serving various customer markets	2.11	.854
The firm has incurred costs associated with imbalance of demand and supply (market mediation costs)	2.89	1.369
Overall mean and standard deviation	**2.108**	**0.8944**

Source: Research data (2014)

From the results in table 4.5 above, the design for Market Practices are used to a great extent (M = 2.108, Std. Dev. = 0.894) as indicated by the five factors which include: focusing on existing markets for business growth and expansion, establishing itself in new markets, serving customers according to various market segments, considering how products are manufactured, sold and transported to respective markets and costs associated with imbalance of demand and supply. This is in agreement with Ernest and Young (2012), who argue that a good design for

the market eliminates market mediation costs i.e. the costs associated with imbalance of demand and supply. It is still in line with Perez (2013) whose view is that costs which reflect the unstable and fragile balance between lost sales and product obsolescence arise from the consequences of the degree of demand predictability. The results are further in agreement with Kotler (2012) who argues that the SC should be designed to suit each market segment.

4.3.4 Design for Profitability Practices

Still on the SC Design Practices, the researcher further sought to establish the extent to which the firms used the design for Profitability Practices in enhancing their businesses competitiveness. Respondents were asked to indicate on a likert scale (1 - Very Great Extent, 2 - Great Extent, 3 - Moderate Extent, 4 - Small Extent and 5 - Very Small Extent), and the results were as shown on the table below:

Table 4.6: Design for Profitability Practices

	Mean	**Std. Dev.**
The firm has strategized on sales volume increases to acquire profitability	1.51	.731
The firm has controlled product price increase to ensure increased sales	1.54	.767
The firm has focused on management of total SC costs (costs of sourcing, manufacturing and distribution) to acquire profitability	1.62	.681
The firm has focused on management of lead time costs (period between when an order is placed up to when it is received) to acquire profitability	1.78	.672
The firm has made available product offers that attract new buyers even in saturated markets	1.83	.811
The firm has balanced supply with demand for milk and other products	1.97	.763
The firm 's lead time constraints have increased costs of availing products to customers e.g. delivering a product earlier than firm's scheduled time increases cost	2.89	1.410
Overall mean and standard deviation	**1.877**	**0.833**

Source: Research data (2014)

From the results in table 4.6 above, the design for Profitability Practices is used to a very great extent (M = 1.877, Std. Dev. = 0.833) as indicated by the seven factors which include: sales

volume increases, controlled product price increases, management of total SC costs, management of lead time costs, product offers, balanced supply with demand for milk and other products and firms' lead time constraints. This is in agreement with Ellis (2008) who advocated for a wise sourcing strategy which considered total costs and lead times as well as balancing supply with demand. However, the results are in contrast with Dyer, (2000) who argued that maximizing SC network effectiveness is the key to individual and SC profitability.

4.3.5 Design for Life Cycle Practices

The researcher further sought to establish the extent to which the firms employed the design for Life Cycle Practices in enhancement of their businesses. Respondents were asked to indicate on a likert scale (1 - Very Great Extent, 2 - Great Extent, 3 - Moderate Extent, 4 - Small Extent and 5 - Very Small Extent). The results were as shown on the table below:

Table 4.7. Design for Life Cycle Practices

	Mean	**Std. Dev.**
The firm has made available products that are designed to transition out old technology while introducing new technology	2.05	.621
The firm has designed risk mitigation plans for low volume parts to avoid excess inventories or reduction service leveling when technology is going end of life.	2.16	.834
The firm has ensured that product changes are implemented with minimum disruption to the SC	2.16	.866
The firm has made available product development teams that are used throughout the products' life cycle.	2.46	1.120
The firm's products require modification or improvement to suit its SC at different stages of their life cycle.	2.74	1.379
Overall mean and standard deviation	**2.314**	**0.964**

Source: Research data (2014)

From the results in table 4.6 above, the design for Life Cycle Practices is used to a great extent (M = 2.314, Std. Dev.0.964) as indicated by the five factors which include: products designed to transition out old technology while introducing new technology, risk mitigation plans for low

volume parts, product changes implemented with minimum disruption to the SC, product development teams, modification or improvement to suit firm's SC at different stages of the life cycle. This is in agreement with Hines (2004) who supports all the above factors.

4.3.6 Design for the Environment Practices

Still on the SC Design Practices, the researcher further sought to establish the extent to which the firms used the design for Environment Practices in enhancing their businesses.

Respondents were asked to indicate on a likert scale (1 - Very Great Extent, 2 - Great Extent, 3 - Moderate Extent, 4 - Small Extent and 5 - Very Small Extent), and the results were as shown on the table below:

Table 4.8: Design for the Environment Practices

	Mean	**Std. Dev.**
The firm has aligned its SC with customer preferences such that products are available as per the customer demands	1.30	.571
The firm has ensured that spoilt or expired milk is returned to the firm for disposal	1.41	.644
The firm has ensured the practice of green SC (practices that reduce waste and pollution)	1.46	.558
The firm has considered existing trading terms in the management of its SC	2.11	.737
The firm has ensured that it collaborates with cross functional firms (firms carrying out different functions)	2.16	.727
The firm has ensured that packaging materials are recycled	2.44	1.182
Overall mean and standard deviation	**1.813**	**0.736**

Source: Research data (2014)

From the results in table 4.6 above, the design for Environment Practices is used to a very great extent (M =1.813, Std. Dev.0.736) as indicated by the six factors which include: alignment of SC with customer preferences, return of spoilt/expired milk to the firm for disposal, practice of

green SC, consideration of existing trading terms in the management of firm's SC, collaboration with cross functional firms and recycling of packaging materials.

This is in agreement with Easty and Winston (2006) who advocates for environment free from pollution. It is also in line with Blanchard (2010) who supports the 'Going green' concept which entails making environmentally friendly choices which help reduce waste and pollution.

4.4 Factor Analysis

The factor analysis carried out was to reduce data into key information that was to guide in its method of data reduction. It does this by seeking underlying unobservable (latent) variables that are reflected in the observed variables (manifest variables).

Table 4.9: Supply Chain Design Practices

	Design for the Product Practices
F1	The firm has ensured that the milk products are aesthetically pleasing and fashionable
F2	The firm has ensured through research that the milk product designs/varieties consider consumers' preferences
F3	The firm has used different product characteristics in its product SC design
F4	The firm has ensured that its product design practice embraced/considered predictable demand
F5.	The firm has ensured that its product design practice embraced/considered a long product life cycle
F6.	The firm, in its product design practice embraced/considered thin contribution margin (small increases in profit)
	Design for Customer Practices
F7	The firm has aligned its SC with customer preferences such that products are availed as per the customer demands
F8	The firm focuses on Customer Relationship Management (CRM) as a marketing strategy
F9	The firm has determined customer responsiveness to its services (feedback) through market research
F10	The firm has ensured that different customers are served through different distribution channels
F11	The firm has considered existing trading terms in the management of its SC
	Design for the Market Practices
F12	The firm has focused on existing markets for business growth and expansion
F13	The firm has focused on establishing itself in new markets for business growth and expansion
F14	The firm has served its customers according to various market segments

F15	The firm has considered how products are manufactured, sold and transported to respective markets in serving various customer markets
F16	The firm has incurred costs associated with imbalance of demand and supply (market mediation costs)
	Design for Profitability Practices
F17	The firm has focused on management of total SC costs (costs of sourcing, manufacturing and distribution) to acquire profitability
F18	The firm has focused on management of lead time costs (period between when an order is placed up to when it is received) to acquire profitability
F19	The firm has controlled product price increases to ensure increased sales
F20	The firm has strategized on sales volume increases to acquire profitability
F21	The firm has balanced supply with demand for milk and other products
F22	The firm's lead time constraints have increased costs of availing products to customers e.g. delivering a product earlier than firm's scheduled time increases cost.
F23	The firm has made available product offers that attract new buyers even in saturated markets
F24	The has ensured that different departments concentrate on their respective functions for effectiveness and efficiency
	Design for the Supply Chain Practices
F25	The firm has ensured that its product configurations address infrastructure limitation throughout the products' life
F26	The firm has ensured that its SC offers highest performance at the lowest overall cost for sustainable differentiation
F27	The firm has made available products that require inventories in large stocks to maintain service levels.
F28	The firm's SC requires reduction in complexity
F29	The firm has ensured that suppliers deliver raw milk to production facilities/collection centers on time and in good condition.
F30	The firm has made available product offers that attract new buyers leading to increased sales
F31	The firm has ensured that its design for demand and supply planning gives customers flexibility in choosing exactly the services they desire.
F32	The firm has ensured that it is able to meet customer demand even when there are changes in the amounts of products ordered
F33	The firm has ensured that it is able to take in extra milk when there is excess supply
	Design for Life Cycle Practices
F34	The firm's products require modification or improvement to suit its SC at different STAGES of their life cycle.
F35	The firm has made available product development teams that are used throughout the product's life cycle.
F36	The firm has ensured that product changes are implemented with minimum disruption to the SC.
F37	The firm has made available products that are designed to transition out old technology while introducing new technology
F38	Firm has designed risk mitigation plans for low-volume parts to avoid excess inventories

	or reduced service levels when technology is going end of life
	Design for the Environment Practices
F39	The firm has ensured the practice of green SC (practices that reduce waste and pollution)
F40	The firm has ensured that spoilt or expired milk is returned to the firm for disposal
F41	The firm has ensured that packaging materials are recycled
F42	The firm has ensured business collaboration with other firms e.g. outsourcing some services and products
F43	The firm has observed environmental regulations e.g. ISO 1400 which advocates for environment free from pollution
F44	The firm has ensured that it collaborates with cross functional firms (firms carrying out different functions)

Communalities indicate the amount of variance in each variable that is accounted for. Small values indicate variables that do not fit well with the factor solution, and should possibly be dropped from the analysis and once they are dropped what remains will be for the factors to be tested and thus the table below:

Table 4.10: Communalities – Supply Chain Design Practices

Communalities		
	Initial	Extraction
The firm has ensured that product changes are implemented with minimum disruption to the SC	1.000	.852
The firm's products require modification or improvement to suit its SC at different STAGES of their life cycle	1.000	.791
The firm has ensured business collaboration with other firms e.g. outsourcing some services and products	1.000	.790
The firm has designed risk mitigation plans for low-volume parts to avoid excess inventories or reeducation service levels when technology is going end of life	1.000	.785
The firm has made available products that are designed to transition out old technology while introducing new technology	1.000	.763
The firm has ensured the practice of green SC (practices that reduce waste and pollution)	1.000	.713
The firm has made available product development teams that are used throughout the product's life cycle	1.000	.709
The firm has ensured that spoilt or expired milk is returned to the firm for disposal	1.000	.701
The firm has ensured that its design for demand and supply planning gives customers flexibility in choosing exactly the services they desire	1.000	.682

The firm has ensured that it is able to take in extra milk when there is excess supply	1.000	.675
The firm has ensured that it collaborates with cross functional firms (firms carrying out different functions)	1.000	.630
The firm has ensured that packaging materials are recycled	1.000	.604
The firm has ensured that it is able to meet customer demand even when there are changes in the amounts of products ordered	1.000	.480
The firm has observed environmental regulations e.g. ISO 1400 which advocates for environment free from pollution	1.000	.435
Extraction Method: Principal Component Analysis.		

Source: Research data (2014)

Communalities in the column labeled 'extraction' reflect the common variance in the data structure. Therefore 85.2% of the variance relating to the firms has shown that "product changes are implemented with minimum disruption to the SC" is a common variance. Similarly 79.1% of the variance to the "firms' products require modification or improvement to suit their SC at different stages of their life cycle" comes as a second variance.

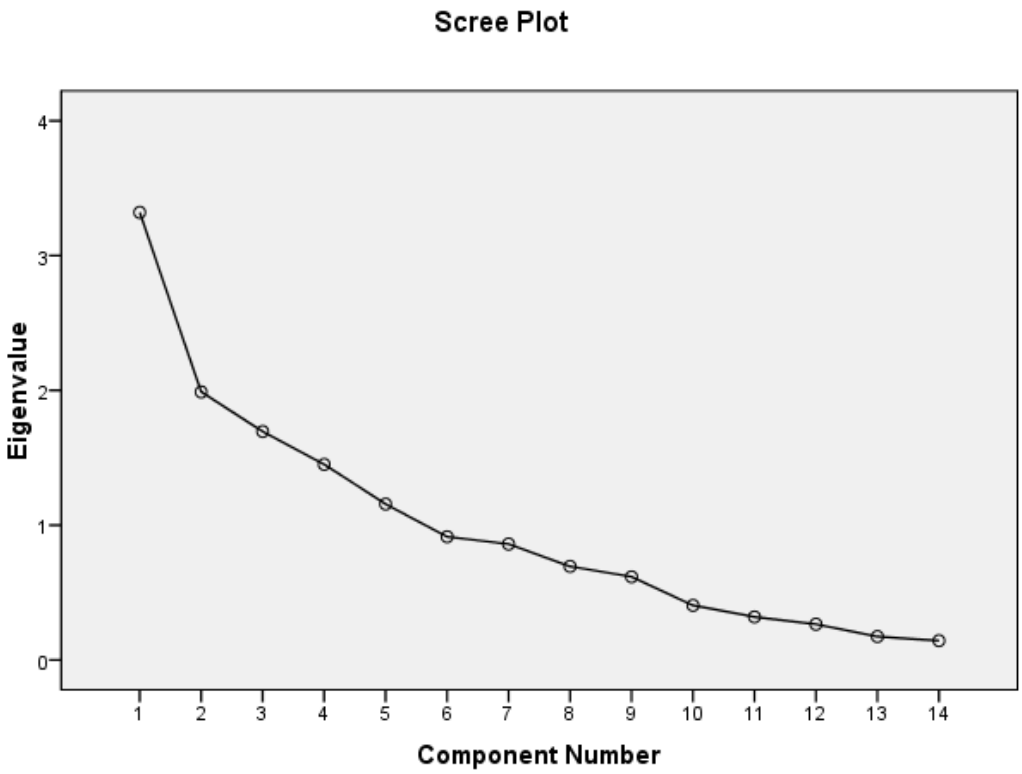
Table 4.11: Supply Chain Design Practices (Total Variance Explained)

Component	**Initial Eigen values**			**Extraction Sums of Squared Loadings**		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.320	23.715	23.715	3.320	23.715	23.715
2	1.988	14.202	37.917	1.988	14.202	37.917
3	1.695	12.108	50.024	1.695	12.108	50.024
4	1.451	10.362	60.387	1.451	10.362	60.387
5	1.156	8.260	68.647	1.156	8.260	68.647
6	.914	6.529	75.176			
7	.860	6.143	81.319			
8	.694	4.956	86.275			
9	.617	4.407	90.681			
10	.404	2.889	93.570			
11	.319	2.281	95.851			
12	.265	1.892	97.744			
13	.173	1.236	98.980			
14	.143	1.020	100.000			
Extraction Method: Principal Component Analysis.						

Source: Research data (2014)

Table 4.11 shows that the first five factors explain a total of 68.647% of the total variance and this shows their significance in the analysis. Since these five factors have all factors with Eigen values greater than 1, they are used in further analysis. Rotation has the effect of optimizing the factor structure and one consequence for these data is that the relative importance of the five factors is equalized. For example factor one before rotation accounted for 23.715% of the variance and after rotation it accounted for 23.715% of the variance.

Figure 4.1 Scree Plot: Supply Chain Design Practices



Source: Research data (2014)

Figure 4.1 above shows the Scree Plot with an inflexion point after the 9th component. This shows that for Supply Chain Design Practices, we could justify the retention of the 9 components for further analysis.

Table 4.12 Rotated Component Matrix - Supply Chain Design Practices

Component Matrix[a]					
	Component				
	1	2	3	4	5
The firm has ensured that its design for demand and supply planning gives customers flexibility in choosing exactly the services they desire	-.242	.673	.241	-.270	-.198
The firm has ensured that it is able to meet customer demand even when there are changes in the amounts of products ordered	-.562	.289	-.090	.267	.036
The firm has ensured that it is able to take in extra milk when there is excess supply	-.547	.478	-.109	.286	-.231
The firm's products require modification or improvement to suit its SC at different STAGES of their life cycle	.799	.038	.034	-.277	.271
The firm has made available product development teams that are used throughout the product's life cycle	.369	.670	.271	-.166	.152
The firm has ensured that product changes are implemented with minimum disruption to the SC	.499	.146	-.445	.466	.409
The firm has made available products that are designed to transition out old technology while introducing new technology	.241	.463	-.546	-.174	-.403
The firm has designed risk mitigation plans for low-volume parts to avoid excess inventories or reeducation service levels when technology is going end of life	.591	.229	.329	.274	-.447
The firm has ensured the practice of green SC (practices that reduce waste and pollution)	-.691	.045	.372	.128	.281
The firm has ensured that spoilt r expired milk is returned to the firm for disposal	-.422	.273	-.536	-.015	.401
The firm has ensured that packaging materials are recycled	.175	.635	.168	-.050	.374
The firm has ensured business collaboration with other firms e.g. outsourcing some services and products	.237	.038	.599	.598	.132
The firm has observed environmental regulations e.g. ISO 1400 which advocates for environment free from pollution	-.642	.004	.122	.059	-.067
The firm has ensured that it collaborates with cross functional firms (firms carrying out different functions)	.247	.073	-.333	.647	-.187
Extraction Method: Principal Component Analysis.					
a. 5 components extracted.					

Source: Research data (2014)

Component 1 loads highly with the factors: The firm's products require modification or improvement to suit its SC at different stages of their life cycle and the firm has ensured the practice of green SC (practices that reduce waste and pollution).

Component 2 loads highly with the factors: The firm has ensured that its design for demand and supply planning gives customers flexibility in choosing exactly the services they desire and the firm has made available product development teams that are used throughout the product's life cycle.

Component 3 loads highly with the factor: The firm has ensured business collaboration with other firms e.g. outsourcing some services and products and the firm has made available products that are designed to transition out old technology while introducing new technology.

Component 4 loads highly with the factor: The firm has ensured that it collaborates with cross functional firms (firms carrying out different functions) and the firm has ensured business collaboration with other firms e.g. outsourcing some services and products.

Component 5 loads highly with the factors: The firm has designed risk mitigation plans for low-volume parts to avoid excess inventories or reeducation service levels when technology is going end of life and the firm has ensured that product changes are implemented with minimum disruption to the SC.

4.4.1 The Relationship between SC Design Practices and Performance

Table 4.13 - Regression Model Summary

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.548[a]	.301	.088	239636086.234

a. Predictors: (Constant), The firm has ensured the practice of green SC (practices that reduce waste and pollution),
b. The firm has focused on management of total SC costs (costs of sourcing, manufacturing and distribution) to acquire profitability,
c. The firm has focused on establishing itself in new markets for business growth and expansion,
d. The firm has ensured that its SC offers highest performance at the lowest overall cost for sustainable differentiation,
e. The firm focuses on Customer Relationship Management (CRM) as a marketing strategy,
f. The firm has ensured through research that the milk product designs/varieties consider consumers' preferences,
g. The firm's products require modification or improvement to suit its SC at different STAGES of their life cycle

This first table of Dependent variable 'Profit 2010' against the other predictors above include information about the quantity of variance that is explained by the above predictor variables. The first statistic which is 0.548 is the multiple correlation coefficient between all of the predictor variables and the dependent variable (Profit 2010). The model value of 0.548 indicates that there is a great deal of variance shared by the independent variables and the dependent variable. R Square is simply the squared value of R that describes the goodness-of-fit or the amount of variance explained by the above set of predictor variables. In our case the value 0.301 indicates that 30.1 % of the variance in the dependent variable is explained by the independent variables in the model. This shows that for the above case the profitability performance for the year 2010 is explained by 30.1% of the above predictor variables of the Supply Chai n Design Practices.

Table 4.14: Analysis of Variances in the Regression Model

ANOVA[a]						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	568033456343602050.000	7	81147636620514576.000	1.413	.248[b]
	Residual	1320785437983273220.000	23	57425453825359704.000		
	Total	1888818894326875140.000	30			

a. Dependent Variable: Profit _ 2010

b. Predictors: (Constant), The firm has ensured the practice of green SC (practices that reduce waste and pollution), The firm has focused on management of total SC costs (costs of sourcing, manufacturing and distribution) to acquire profitability, The firm has focused on establishing itself in new markets for business growth and expansion, The firm has ensured that its SC offers highest performance at the lowest overall cost for sustainable differentiation, The firm focuses on Customer Relationship Management (CRM) as a marketing strategy, The firm has ensured through research that the milk product designs/varieties consider consumers' preferences, The firm's products require modification or improvement to suit its SC at different stages of their life cycle.

Source: Researcher (2014)

The Anova Table 4.14 above describes the overall variance accounted for in the model between the dependent variable and the independent variable. The F Statistic represents the Test of Null Hypothesis. H_0–The expected values of the regression coefficients are equal to each other and that they are equal to zero. It tests whether the R Square proportion (0.301) of variance in the dependent variable accounted for by the predictors is zero. The null hypothesis is rejected since there exists a regression relationship between the dependent variable and the predictor variables since the above seven predictor variables seem to be unequal to each other and could be used to predict the financial performance using the dependent variable (Profit 2010) as indicated by a large F statistic and a small significance level.

Table 4.15: Test of Statistical Significance of SC Design Practices.

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-730709051.281	450651441.189		-1.621	.119
	The firm has ensured through research that the milk product designs/varieties consider consumers' preferences	-58166633.909	90904775.144	-.152	-.640	.529
	The firm focuses on Customer Relationship Management (CRM) as a marketing strategy	128240234.867	78855491.233	.358	1.626	.118
	The firm has focused on establishing itself in new markets for business growth and expansion	152082092.670	70124490.029	.497	2.169	.041
	The firm has focused on management of total SC costs (costs of sourcing, manufacturing and distribution) to acquire profitability	55136200.219	73148111.580	.157	.754	.459
	The firm has ensured that its SC offers highest performance at the lowest overall cost for sustainable differentiation	695321.348	73991225.312	.002	.009	.993
	The firm's products require modification or improvement to suit its SC at different STAGES of their life cycle	85158240.394	48904738.320	.480	1.741	.095
	The firm has ensured the practice of green SC (practices that reduce waste and pollution)	47026897.553	103320966.601	.106	.455	.653
a. Dependent Variable: Profit _ 2010						

The coefficients table provides information about the effects of individual variables.

The unstandardized coefficients indicate the increase in the value of the dependent variable for each unit increase in the value of the predictor variable. The standardized coefficients or beta are

based on data expressed in standardized or Z score form. In our case we can see that “The firm has focused on establishing itself in new markets for business growth and expansion” is a more predictor variable (0.497) as compared to the variable “The firm's products require modification or improvement to suit its SC at different stages of their life cycle” (0.40).

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter provides a summary of the findings in chapter four, conclusions and recommendations based on the findings; and suggestions for further research. The objectives of the study were: to determine the SC design practices commonly used by milk processing firms in Kenya and to establish the relationship between SC design practices and business performance of milk processing firms in Kenya.

5.2 Summary of the Findings

The study found out that firms have invested resources to ease the movement of products to the point of consumption and also have used the SC as a strategic weapon to beat the level of competition in the milk industry. Respondents agreed that the firms incorporate suppliers and customers in their service delivery, quality and feedback. Increasing competitive pressures drive companies to focusing on core competencies for their competitiveness. Consumer demand for superior service, increased value and competitive price bring ever greater pressure for efficiency gains and performance improvement. From the findings the cost of raw materials in the processing of the milk greatly influenced the design of the firms SC design process and that the actions of competitors in the milk industry have influenced the design of the firms' SC design process, the level of customer demand influenced the design of the firms' SC design process. Formal relationships and collaborative partnerships with key suppliers and customers influenced the design of the firms SC design process. Companies need a strategy for managing all the resources that go toward meeting customer demand for their product or service. Considering that milk and its products are perishable the SC should be designed to bring out efficiency and effectiveness.

The study also found that firms ensured their products design practice embraced/considered a long product life cycle, embraced/considered thin contribution margin (small increases in profit), the firms also embraced/considered predictable demand and that milk products are aesthetically pleasing and fashionable. Product lifecycle, which is continually getting shorter in response to the speed of change in technology, fashion, and consumer product trends, affects the predictability of demand and market mediation costs. The design for life cycle puts all these into consideration to ensure effectiveness and efficiency. Milk processing firms have ensured that different customers are served through different distribution channels. The firms also determined customer responsiveness to their services (feedback) through market research and considered existing trading terms in the management of their SC. The firms also aligned their SCs with customer preferences such that products are available as per the customer demand.

On design for the market practices, the study found out that the firms incurred costs associated with imbalance of demand and supply (market mediation costs) to a great extent, the respondents also greatly agreed that the firms considered how products were manufactured sold and transported to respective markets in serving various customer markets; the firms also focused on establishing themselves in new markets for business growth and expansion, the firms focused on existing markets for business growth and expansion. A good supply chain design helps firms to understand agility required to serve the customer cost effectively and to segment the supply chain response to deliver the required strategy. It helps build closer relationships with customers and suppliers. It facilitates smooth flow of materials and products. Lead time is reduced. Opportunities to improve profits are identified; decision making supports

the profitability of the entire company. Alternate strategies are compared quantitatively and cost tradeoffs are modeled accurately.

On design for profitability practice the firms' lead time constraints increased costs of availing products to customers , for example delivering a product earlier than firm's scheduled time increased cost. The firms balanced supply with demand for milk and other products; the firms controlled product price increases to ensure increased sales and they strategized on sales volume increases to acquire profitability.

On design for life cycle practices, the study found that the firms' products required modification or improvement to suit their SCs at different stages of their life cycles to a great extent as shown by a mean score of 2.74, the firms made available product development teams that were used throughout the product's life cycle to a great extent as shown by a mean score of 2.46. The firm also designed risk mitigation plans for low-volume parts to avoid excess inventories or reduction in service levels when technology was going end of life and also the firm ensured that product changes were implemented with minimum disruption to the SCs, the firms made available products that were designed to transition out old technology while introducing new technology. The firms ensured packaging materials were recycled and that there existed collaboration with cross functional firms (firms carrying out different functions). The firms also ensured that spoilt or expired milk was returned to the firms for disposal, the firms aligned their SCs with customer preferences such that products were available as per the customer demands. Some of the challenges in the milk processing firms included: ensuring that all products in the firm's local dairy case were fresh, safe, and produced in the most efficient and environmentally-friendly way.

5.3 Conclusion

From the study the researcher concludes that SC design helps companies understand where value is being created and destroyed. The study also concludes that a good supply chain design helps firms to understand agility required to serve the customer cost effectively and to segment the supply chain response to deliver the required strategy. It helps build closer relationships with customers and suppliers. It facilitates smooth flow of materials and products. Supply chain design deploys assets in ways that enhance profitability and shareholder value. Market and sourcing strategies that generate the best financial performance, optimal number of plants, warehouses and distribution centers are considered to maximize long-term profit.

In addition, the study concludes that SC design practices are strategies tailored to suit and enable deployment of assets in the most profitable ways for optimal operational and financial performance in the SC of a firm. There should be a clear sequence of events in designing an effective SC beginning with market and product strategy.

This refers to aligning SC infrastructure with customer demands. According to Lee (2004), a for the design of SCs, a great deal of useful customer and demand information is captured and processed as well, which must be aligned with the customer demands. The design is done as per the voice of the customer. Understanding the processes that consumers and businesses use to make purchase decisions is critical to the development of long term mutually beneficial relationships with customers. SC is designed to get the product to the right place at the right time in the right quantities at the lowest possible cost all for the convenience of the customer. The study also concludes that, SC design practice for the customer considers the specific channels which various customers are going to be served, their needs and existing trading terms.

5.4 Recommendations

The study recommends that SCs should be designed according to different product characteristics. Innovative products require a responsive SC, and functional products require an efficient one. The study also recommends that in order to have a successful SC in terms of total SC costs and service performance to the customer, companies need to design their SCs such that they match the type of products they are selling with the type of distribution channels delivering them.

The study further recommends that performance measures are a critical factor for effective management. It is important to measure performance to determine achievement of goals and alignment of objectives with organizational strategy.

5.5 Recommendation for further studies

This study investigated supply chain design practices and business performance among milk processing firms in Kenya. Further studies should be done on supply chain design practices and business performance in other firms in Kenya.

5.6 Limitations of the Study

The findings of the study are restricted to Milk Processing firms only since firms in other industries may be working or operating under different environmental conditions.

Also during data collection, respondents were not willing to give data on business performance for they regarded it as confidential. Those who gave the same may have given wrong figures for the researcher had to persuade and convince them to give.

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APPENDICES

(i). QUESTIONNAIRE

SECTION A: Firm's general information about its Supply Chain

To what extent has your firm used its supply chain in enhancement of its business? (Use the scale 1= Very Great Extent, 2= Great Extent, 3= Moderate Extent, 4=Small Extent and 5=Very Small Extent). Please tick appropriately.

		Very Great Extent (1)	Great Extent (2)	Moderate Extent (3)	Small Extent (4)	Very Small Extent (5)
	The firm has invested resources to ease the movement of products to the point of consumption	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm uses the SC as a strategic weapon to beat the level of competition in the milk industry	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm incorporates suppliers and customers in its service delivery, quality and feedback.	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**

(ii). To what extent have the following factors influenced the SC design process within your firm? (Use the scale 1= Very Great Extent, 2= Great Extent, 3= Moderate Extent, 4=Small Extent and 5=Very Small Extent). Please tick appropriately.

		Very Great Extent (1)	Great Extent (2)	Moderate extent (3)	Small Extent (4)	Very Small Extent (5)
	The level of customer demand has influenced the design of the firm's SC design process.	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	Competitor actions in the milk industry have influenced the design of the firm's SC design process.	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	Cost of raw materials in the processing of the milk has influenced the design of the firms SC design process.	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	Adoption of technology by your firm has influenced the design of the firms SC design process.	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	Formal relationships and collaborative partnerships with key suppliers and customers have influenced the design of the firms SC design process.	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	Total SC response time has influenced the design of the firms SC design process.	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	Sourcing processes have influenced the design of the firms SC design process.	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	Prices for products have influenced the design of the firms SC design process.	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**

SECTION B: Supply Chain Design Practices:

To what extent has your milk processing firm implemented the following supply chain design practices in its efforts to improve business performance? (Use the scale: 1 = Very Great Extent, 2 = Great Extent, 3 = Moderate Extent, 4 = Small Extent and 5 = Very Small Extent).

	Design for the Product Practices	**Very Great Extent (1)**	**Great Extent (2)**	**Moderate Extent (3)**	**Small Extent (4)**	**Very Small Extent (5)**
	The firm has ensured that the milk products are aesthetically pleasing and fashionable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm has ensured through research that the milk product designs/varieties consider consumers' preferences	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm has used different product characteristics in its product SC design	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm has ensured that its product design practice embraced/considered predictable demand	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm has ensured that its product design practice embraced/considered a long product life cycle	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm, in its product design practice embraced/considered thin contribution margin (small increases in profit)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	Design for Customer Practices					
	The firm has aligned its SC with customer preferences such that products are availed as per the customer demands	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm focuses on Customer Relationship Management (CRM) as a marketing strategy	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm has determined customer responsiveness to its services (feedback) through market research	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm has ensured that different customers are served through different distribution channels	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm has considered existing trading terms in the management of its SC	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	Design for the Market Practices					
	The firm has focused on existing markets for business growth and expansion	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm has focused on establishing itself in new markets for business growth and expansion	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm has served its customers according to various market segments	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm has considered how products are manufactured, sold and transported to respective markets in serving various customer markets	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm has incurred costs associated with imbalance of demand and supply (market mediation costs)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**

	Design for Profitability Practices					
	The firm has focused on management of total SC costs (costs of sourcing, manufacturing and distribution) to acquire profitability	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm has focused on management of lead time costs (period between when an order is placed up to when it is received) to acquire profitability	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm has controlled product price increases to ensure increased sales	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm has strategized on sales volume increases to acquire profitability	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm has balanced supply with demand for milk and other products	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm's lead time constraints have increased costs of availing products to customers e.g. delivering a product earlier than firm's scheduled time increases cost.	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm has made available product offers that attract new buyers even in saturated markets	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The has ensured that different departments concentrate on their respective functions for effectiveness and efficiency	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	Design for the Supply Chain Practices					
	The firm has ensured that its product configurations address infrastructure limitation throughout the products' life	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm has ensured that its SC offers highest performance at the lowest overall cost for sustainable differentiation	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm has made available products that require inventories in large stocks to maintain service levels.	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm's SC requires reduction in complexity	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm has ensured that suppliers deliver raw milk to production facilities/collection centers on time and in good condition.	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm has made available product offers that attract new buyers leading to increased sales	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm has ensured that its design for demand and supply planning gives customers flexibility in choosing exactly the services they desire.	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm has ensured that it is able to meet customer demand even when there are changes in the amounts of products ordered	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm has ensured that it is able to take in extra milk when there is excess supply	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	Design for Life Cycle Practices					
	The firm's products require modification or improvement to suit its SC at different STAGES of their life cycle.	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm has made available product development teams that are used throughout the product's life cycle.	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**

	The firm has ensured that product changes are implemented with minimum disruption to the SC.	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm has made available products that are designed to transition out old technology while introducing new technology	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	Firm has designed risk mitigation plans for low-volume parts to avoid excess inventories or reduced service levels when technology is going end of life	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	Design for the Environment Practices					
	The firm has ensured the practice of green SC (practices that reduce waste and pollution)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm has ensured that spoilt or expired milk is returned to the firm for disposal	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm has ensured that packaging materials are recycled	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm has ensured business collaboration with other firms e.g. outsourcing some services and products	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm has observed environmental regulations e.g. ISO 1400 which advocates for environment free from pollution	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	The firm has ensured that it collaborates with cross functional firms (firms carrying out different functions)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**

SECTION C: Business Performance

Please provide information on the following measures of business performance:

	FINANCIAL PERFORMANCE	**2010**	**2011**	**2012**	**2013**
	Return on Investment **(Ratio)**				
	Profit **(Ksh.)**				
	Cost reduction **(Ksh.)**				
	Sales **(Ksh.)**				
	SUPPLY CHAIN PERFORMANCE				
	Order fulfillment time **(Days/hours)**				
	Lead time **(Days)**				
	Delivery reliability **(%)**				
	Supply Chain costs (warranties, returns, processing) **(Ksh.)**				

	Asset Management (utilization of machines, equipment, human resources) **(%)**				
	OPERATIONALPERFORMANCE				
	Capacity/Resource utilization **(%)**				
	Product Quality **(defects rate)**				
	Service Quality **(customer complaints on service)**				
	Product availability **(%)**				

(ii) MILK PROCESSING FIRMS IN KENYA

NO.	NAME OF FIRM
1	BROOKSIDE DAIRY
2	NEW KCC
3	GITHUNGURI DAIRY
4	NEW SUMMER A & L
5	MERU CENTRAL CO-OP
6	ASPENDOS DAIRY
7	KINANGOP DAIRY
8	KABIANGA DAIRY
9	SUNPOWER PRODUCTS
10	DONYO LESSES
11	PAMSIDE DAIRY
12	HAPPY COW DAIRY
13	AFRODANE INDUSTRIES
14	PALMSHOUSE DAIRIES
15	BIOFOOD PRODUCTS
16	ELDOVILLE FARM
17	STANLEY & SONS
18	MOIS BRIDGE
19	KINYAGI FOODS
20	NEW ISLAND DAIRY
21	NDUMBERI DFCS
22	MIYANJI DAIRY FARM
23	RAKA MILK PROCESSORS
24	EGERTON UNIVERSITY
25	TEITA ESTAGES
26	BARAKA CHEESE FARM
27	KIBARANI DAIRY
28	PALM FARM LTD

29	ORCHARD SPILLERS
30	MINI DAIRIES
31	COUNTRYSIDE DAIRY
32	RAZCO LTD
33	FARMERS MILK PROCESSORS
34	HUSSEIN DAIRY
35	CROWN CREAMERIES
36	SILENT VALLEY CREAMERIES
37	SOLAI STORES
38	SNOWPACK DAIRY
39	BICO FARM
40	MARIAKANI DAIRY PLANT
41	LARI DAIRY ALLIANCE
42	EAST AFRICAN DAIRIES

(Kenya Dairy Board, 2013)