EFFECT OF BULLWHIP ON PERFORMANCE OF MILK PROCESSING FIRMS IN KENYA

Rosemary Kathambi Mathae
Master of Science (Procurement and Logistics), Jomo Kenyatta University of Agriculture and Technology, Kenya

Samson Nyang'au Paul (PhD)
Jomo Kenyatta University of Agriculture and Technology, Kenya

Lydia Kwamboka Mbura
Jomo Kenyatta University of Agriculture and Technology, Kenya

Citation: Mathae, R. K., Paul, S. N. & Mbura, L. K. (2018). Effect of bullwhip on performance of milk processing firms in Kenya. *International Academic Journal of Procurement and Supply Chain Management, 3*(1), 58-84

ABSTRACT

Numerous researches have been carried out on how various strategic practices affect organizational performances. There are different factors that affect supply chain performance and the Bullwhip phenomenon (commonly referred to as Bullwhip Effect- BWE) is one of them which suggest demand order variabilities are amplified as one moves up a supply chain which causes inefficiencies resulting to huge operating costs for upstream suppliers. However, there exists minimal information on the effect of Bullwhip on performance of milk processing firms in Kenya. Therefore, it is in this observation that this study is a step forward in filling this gap in literature by reviewing on the bullwhip phenomenon and its effect on performance of milk processing firms. The study adopted a case study design and therefore it was confined to the New Kenya Cooperative Creameries Limited Headquarters in Nairobi. The study is built upon the theories of theory of constraints and transaction cost economics. Various factors can cause BWE and in line with this, the study was guided by specific objectives which are to determine how information sharing, inventory management approaches, shortage gaming and distribution channels affect performance of milk processing firms in Kenya. A descriptive research design was adopted and the target population was all the departments at New KCC Ltd headquarters totaling to 167. Stratified sampling technique was applied to arrive at a sample size of 117 respondents from the list of staff. The main instrument of data collection used was structured questionnaires with both closed and open-ended questions which were pretested using a pilot study for validity and reliability. Descriptive analysis was used in this research to enable the study calculate the mean value, standard deviation and percentages during the data analysis process. Tables and diagrams were obtained for data presentation. Descriptive and inferential statistics data analysis results revealed that information sharing, inventory management approaches, shortage gaming and distribution channels hampered the performance of milk processing firms at New KCC Ltd. The findings reveal that information sharing had the greatest effect on the performance of New KCC Ltd followed by shortage gaming and then inventory management approaches and lastly distribution channels which had a negative effect on the performance of New KCC Ltd. These are the major factors that mostly bring about bullwhip phenomenon which has an effect on the organization's performance. The study recommends focusing on the ICT tools adopted in order to reduce inventory levels in the organization, focusing on transport planning and management which were found to affect performance of the organization, focus on inventory management approaches used by the organization to improve the market share of the organization and focusing on pricing which is a significant attribute through which a firm executes its competitive strategy. The study is expected to be of great use to all the players in the supply chain so that they can realize the impact of these SCM practices that bring about BWE which has a negative effect on performance of their organizations. The study is also expected to be of profound importance to the Kenya Dairy Board and other policy makers in the government

since it will enable them further embrace and formulate policies that will continuously improve the performance of the milk processing firms in Kenya.

INTRODUCTION

A key ingredient especially in the developing nations is successful organizations since they play an important role in the daily lives of its citizens hence the focus of any organization is continuous positive improvement of performance as it is only through this performance that organizations are capable of growing and progressing (Agrawal, Sengupta & Shanker, 2009). In order to successfully compete in the global market and networked economies, companies find that they must rely on effective supply chains as a result of this concept of organizational performance. Therefore Supply Chain Management (SCM) is one of the most important and developing areas as it integrates supply and demand management within and across companies (Bray & Mendelson, 2012). The ultimate objective of any SCM is to minimize or eliminate inventory through proper coordination and management of its entire flow of information, products, services from raw material suppliers through production and finally to the end user (Cecil & Robert, 2008).

Despite the prevalence of the concept of organizational performance in the scholarly literature, its definition is very difficult due to its numerous meanings (Corina et al., 2011). In the 1950's, organization performance was defined as the extent to which organizations, viewed as a social framework, fulfilled their objectives since its evaluation was focused on people, work and organizational structure (Jack et al 2008). Later in the 1960's and 1970's, performance was described as an organization's ability to exploit its environment for acquiring and using limited resources since organizations began to explore new ways to evaluate their performance and therefore greater emphasis was employed into mass production so that manufacturers could minimize their costs. This made production of new products almost impossible due to the changes in production processes and flexibility which proved very difficult and costly to organizations (Bray & Mendelson, 2012).

With increased universal competition in the 1980's and 1990's, JIT initiative was discovered due to the need by organizations to minimize costs, achieve flexibility and quality improvement as a result of the awareness that the identification of organization goals is more complex than initially thought due to the challenges experienced in transportation of products and services to the right place, at the right time and at the lowest cost possible. This means that in order to achieve increased and sustainable results, an organization needs to execute its strategic plans through adoption of such new concept as SCM whose emergence immensely enabled formation of successful relationships across the SC (Ghasemi 2010). Bottlenecks within the supply chain can have a significant impact on performance and therefore it is important that they are identified since performance is a crucial determinant of an organization's survival in today's highly competitive environment and globalization of markets (Erkan et al., 2008).

Different supply chains employ make-to-stock production systems where the production plan and activities are based on demand forecasting so as to position inventory to prevent excess stocks or opportunity loss due to stock outs since customer demand is rarely perfectly stable (Trapero & Fildes, 2012). However, by the nature of demand forecasting, forecast errors are inevitable therefore companies carry buffer stock also known as 'safety stock' since each stage in the supply chain has its own forecast from the end customer to raw material supplier, thus greater need for safety stock in each stage. As a result, these implications give rise to the need of good coordination and information sharing among all the participants otherwise individual forecasts for each stage will continue to cause numerous problems along the supply chain and as a result, weakens the effectiveness of the entire chain (Chopra & Meindl, 2007).

The bullwhip phenomenon (also known as Bullwhip effect, demand amplification, whiplash effect or Forrester effect) is a widely known example of supply chain dynamics which is the tendency of variability of orders as communicated through the echelons from downstream to upstream supply chain which exceeds the tentatively stable actual demand. This happens when there is no or little coordination among the supply chain members and therefore bullwhip is considered an undesirable phenomenon in forecast-driven supply chains as it causes inefficiencies and this returns as costs to organizations hence poor performance (Disney, 2014). In this study, Bullwhip effect (BWE) shall be used as it is commonly known. The major sources of BWE include operational causes which are demand forecasting updating (also known as demand signal processing), order batching, price fluctuation, rationing and gaming (which was proven logically and mathematically) and as a result consequences of these supply chain players' rational behaviors affect the production-distribution system which include excess inventory, poor quality, product shortages, low utilization of capacity, more difficult decision making and suboptimal production.

The lack of information transparency in terms of communication within the chain, lack of knowledge concerning true consumer demand and delay in information transfer result in information asymmetry which is a situation where different parties have different states of information about product demand and the chain operations (Borut et al., 2014). Hence this information distortion and excess inventory produces ambiguity results to entire supply chain suffering from suboptimal and opportunistic behavior (Disney, 2014). In order to force higher prices, an unethical practice of limiting production through creation of an artificial shortage, leads to inefficient supply chain performance in terms of ineffective and excessive transportation (causing large replenishment lead times), excessive investment, missed production schedules and misguided capacity plans. This happens when a product's anticipated demand exceeds supply, and therefore, a manufacturer may ration its products and in return, retailers will tend to order more just in case that they may not be able to get enough later on which is common in other Kenyan industries like sugar industry which further distorts the demand signal (Lambert et.al., 2008).

Documented examples of BWE back in the 19th century have been observed in several internal, national and international supply chains in industries that serve developing markets where demand surges suddenly and examples include electronic products, automotive

products, machine tools, furniture, packaged meals and paper making. Current research show that the BWE is still being experienced in all kinds of supply chains in the Western world including food, health, insurance which gives an indication that a lot has to be researched on and improved in the developing world as well (Jack et al. 2008). This phenomenon has not been relevant in particular supply chains like the food manufacturing sector and hence it has not been studied widely (Bandyopadhyay & Bhattacharrya, 2013).

In the food manufacturing industry, unlike other supply chains, specific characteristics of food products require that participants in the food chain should ensure that the quality of the products is maintained otherwise it will be likely to face customer complaints (Disney, 2014). As a result, managers have the responsibility to make a decisive decision on where they want to position themselves in the trade-off between responsiveness and efficiency hence this necessitates the need for inventory management which involves matching existing demand with the supply of products and materials overtime to achieve specified costs and service level objectives, while observing product, operation and demand characteristics (Chen & Lee, 2012)

This necessitates enhanced coordination among buyers and sellers including continuous innovation especially in developing countries which are becoming more integrated in the global market due to the increased trend on global sourcing and increase of consumer demand for food products all year round. Hence it is essential for producers/processors to make contractual agreements with suppliers to guarantee supply of raw material with the right quantity, right quality, right place, right time and right cost (Jack et al., 2008).

Milk Processing in Kenya

The dairy subsector is dynamic and occupies an important place in the agricultural economy of Kenya as milk consumption levels in the country are among the highest in the developing world which aids in contributing to an estimated 14% of agricultural Gross Domestic Product (GDP) and approximately 4% of overall Kenya's national GDP (KDB, 2014). Also significant is the fact that Kenya is the second largest dairy producer and consumer in Sub-Sahara Africa and is relatively self-reliant where it is dominated by very dairy industries and a high number of smaller and medium processors leading to very stiff competition (Dairy Report, 2016). Milk production has grown at an average of 5.3% increasing from 3.2 billion litres in 2003 to 5.2 billion litres in 2013 while volumes of value added and process sed milk has grown by an average 7% per annum increasing from 197 million litres in 2003 to 523 million litres in 2013 (USAID, 2010).

Before independence, dairy was largely a preserve of large scale white settler farmers and was export oriented. To ensure smooth development in the dairy industry, the Kenya Dairy Board was established through an Act of Parliament in 1958, under the Dairy Industry Act Cap 336 of the laws of Kenya with the overall objective of regulating the industry. After independence, government policy focused mainly on including indigenous Kenyan smallholders in production and marketing with highly subsidized interventions by the

government which has made small holder dairy farmers dominate the industry at production level (Dairy Report, 2011).

The liberalization of the marketing of milk in Kenya in 1992, saw the entrance of a number of private milk processors and marketers including the advent growth of the informal sector (Ngigi 2005). Other milk marketing channels include co-operative societies and farmers' group, informal traders, distributors and retailers while consumers are the major players who have an important influence on how the other players perform. Liberalization has since brought a lot of dynamism of the dairy market and institutions where there is stiff competition in the milk processing sector and therefore there is need to continually measure organizational performance so as to effectively and efficiently operate in the market (Waema, 2013).

Background of New Kenya Co-operative Creameries Limited (New KCC Ltd)

The New KCC Ltd which remains as a parastatal, forms an integral part in the food industry and is one of the leading processor and marketer of milk and milk products where it has an outstanding reputation as the largest dairy company in Africa and the oldest in East and Central Africa, having been founded in 1925 by European farmers. Until 1992, Kenya Cooperative Creameries Ltd (KCC Ltd) as it was known then, was the dominant player since there were no other milk processors in the industry, informal trade of milk was minimal and thus it enjoyed a protected monopoly in marketing of milk and milk products since its inception in 1925 (EPZ 2005). The liberalization ended 60 years of KCC Ltd dominance which brought increasing problems in the KCC's operations where it was put under receivership and selling it by the government in 2002 due to mismanagement. In 2003, the new government at the time, NARC, revitalized KCC Ltd and renamed it as the New KCC Ltd which was a positive intervention in that the farm gate prices are quite predictable as New KCC Ltd sets what amounts to a benchmark price. In 2006, New KCC Ltd was awarded the Parastatal status (Muriuki et al, 2011), however it is currently earmarked for privatization, with the government retaining between 10 and 20 per cent of the shares for oversight.

STATEMENT OF THE PROBLEM

Today's market place is shifting from individual firm performance to supply chain (SC) performance which is an approach by the entire chain to meet end customer needs through product availability and responsive on-time delivery (Dairy Report, 2011). However, the overall operations of a supply chain are affected by uncertainty which leads to Bullwhip Effect (BWE) hence adversely impacting on the effectiveness of SCs (Bakos, 2009). Milk SC is one of the complex food supply chains due to some uncertainties in every stage of the chain which causes inefficiencies in operations and coupled with infrastructural bottlenecks due to poor road infrastructure and inadequate cold chain, this leads to high wastage levels being experienced (Atieno & Karuti, 2008). Owing to the perishability characteristics of milk, successful distribution channel strategy selection, implementation, and management is important so as to provide downstream value through timely delivery to the end users otherwise it is likely to face numerous customer complaints (Saremi & Zadeh, 2014). Food

manufacturing firms are also characterized by the relative largeness of inventories being maintained in order to accommodate demand uncertainty and therefore the longer the lead time, the larger the inventory the firm must carry and also small changes in consumer demand in a supply chain can lead to large variations in supply orders and all this is related to BWE (Yigitbasioglu, 2010). The reason for the surge of demand could be attributed to sales promotions or some other reason except natural demand increase from the customer and therefore it is not the change in demand that drives this effect, but the problem arises from the part of the channel members when this data is not shared or there is delay in the information transfer and as a result, the interpretation of these changes are magnified as forecasting and planning take place (Bakos, 2009). Demand also outstrips supply especially during the growth phase of the product lifecycle and due to alternating periods of seasonal oversupply and undersupply, this leads to milk (as inventory) being rationed by suppliers as well as a hedge by retailers against possible price increase and anticipated shortages through hoarding (gaming) (Kumar et al., 2013). According to Ghasemi (2010), BWE is not harmful by itself but due to its non-industry specific nature, it has seized the attention of many academicians from diverse industries and learning institutions as it describes its undesirable effect on business performance in terms of loss of revenue, bad customer service, high inventory levels and unrealized profits and the effect is even more severe in multi-echelon supply chains. The revitalization of KCC Ltd has been seen as a positive intervention, however not all woes have been resolved in the milk processing sector due to lack of policies to improve the sub-sector, where for instance the dairy industry has been left to processors to dictate pricing thus hurting small scale farmers (Standard Newspaper Aug, 2015). Little has been researched with regard to this phenomenon in Kenya and due to the rapid expansion of the dairy industry, there is potential for improvement for the milk processing firms and therefore this study seeks to investigate the effect of Bullwhip phenomenon on performance of milk processing firms in Kenya, a case study of New Kenya Cooperative Creameries Limited.

General Objective

The main objective of this study was to investigate the effect of Bullwhip on performance of milk processing firms in Kenya. A case study was done on New Kenya Cooperative Creameries Limited- Headquarters, Nairobi. The firm was chosen because it has not been performing well as expected despite its renationalization in June of 2003 and repurchase to New KCC Ltd.

Specific Objectives

1. To determine the effect of information sharing on the performance of New Kenya Cooperative Creameries Limited.

2. To analyze the effect of inventory management approaches on the performance of New Kenya Cooperative Creameries Limited.

3. To assess the effect of shortage gaming on the performance of New Kenya Cooperative Creameries Limited.

4. To establish the effect of distribution channels on the performance of New Kenya Cooperative Creameries Limited.

THEORETICAL FRAMEWORK

Theory of Constraints

Most organizations have not been able to achieve better results related to effectiveness and market share since they mostly consider own local constraints when they should be considering on entire global constraints related to the Supply Chain (SC) as a whole (Wang et al., 2004). Therefore, the theory of constraints (TOC) is usually proposed to assist in make-to-stock SCs and it is an overall management philosophy that seeks to focus on the weakest ring(s) in the SC by identifying a constraint that is preventing the system from reaching its main goal which is to increase manufacturing throughput efficiency or system performance usually measured by sales (Goldratt, 2004).

Therefore, a key process in the TOC are the five steps of the Continuous Improvement Methodology which provides the necessary capabilities to detect the system's constraints, exploit them, subordinate everything to the above decision, then elevate the system's constraints and get back to step one, but preventing inertia to become the next system's constraints. The approach used is the Drum-Buffer-Rope (DBR) methodology to effectively manage the system where once the bottleneck is identified; it becomes the drum of the system. A buffer is used to protect against variability during replenishment times so as to utilize full capacity in the bottleneck while a rope is used to subordinate the system to the bottleneck (Yigitbasioglu, 2010). Hence TOC emphasizes on focusing on the effective management of the capacity and capability of the constraints and this can be achieved by milk processing firms applying appropriate inventory control systems with the aim of enhancing their operations to meet the projected operational performance (Fawcett et al., 2012).

During production planning, a manufacturing firm will use sales forecasting to send orders to suppliers through the MRP II. This results to continuous excess inventory or production interruptions due to inadequate inventory in the firm due to the SC's partners' successive erroneous decisions based on information from perceived demand. TOC depicts that there is improved quality and productivity with reduction of supply lead time with use of SCM tools which integrate systems such as MRP but there is still considerable waste with inventory in the SC as a whole. Situations become worse when it is better to use a truckload than a less-than-truckload transportation, resulting to even larger production lots (Reinaldo et al., 2010). Therefore, it is evident that occurrence of unbalanced inventories across the SC prevents a SC from maximizing its profits and that TOC with its bottleneck management strategy through the DBR methodology is highly effective in remedying the BWE which is a proven cause of significant inefficiencies in SCM through a number of ways.

The amplification of variability of orders is much lower and cost savings is achieved by reduction of variability in factory production which translates in cost savings in terms of inventory, labour and transportation costs (Simatupang & Sridharan, 2003). Studies have demonstrated that the use of the TOC reduces inventory, work in process inventory, lead times, and improves due date delivery performance and this is realized through identification

of those processes that are constraining the manufacturing systems restricting an organization from maximizing its performance (Yigitbasioglu, 2010).

In spite of TOC's usefulness, many scholars notice its limitations where one of them is in the proper identification of the constraints where a lot of time and resources are wasted on problems that are not critical to the company. In some organizations, there is lack of support and commitment by top-level management where the implementation of TOC is just delegated to the mid-level managers (Watson et al. 2007). Reid and Koljonen (1999) singled out the inability of TOC to capture the dynamic complexity of modern manufacturing environment as one major drawback. The coupling of the Theory of Constraints' logic trees with System Dynamics modelling techniques was proposed as a way of strengthening the Theory of Constraints process.

Transaction Cost Economics Theory

Transaction Cost Economics (TCE) theory has been an established theory which suggests that a firm organize its cross-organizational activities by selecting governance structures that minimizes its production costs within the firm and transaction costs within the markets hence the critical dimensions for describing transactions are: uncertainty, frequency and asset specificity (Williamson, 2008). TCE is one of the most influential theories on inter-organizational system (IOS) use and inter-firm collaboration hence the link between TCE and SCM where TCE thinks IOS use can reduce transaction costs by increasing asset specificity and reducing uncertainty (caused by market dynamics, environmental complexities, technology uncertainty etc.) (Bakos, 2009). Transaction costs can be divided into coordination costs and opportunity costs (transaction risks) where uncertainty and asset specificity are two factors which increase coordination costs and opportunity costs respectively.

Information sharing can be viewed as an asset specific investment to enable transactions where the benefits of information sharing will be equal to or greater than the Net Profit Value (NPV) of future losses due to opportunism (Yigitbasioglu, 2010). Hence an advantage of inter-firm collaboration facilitated by information sharing through use of Information and Communication Technology (ICT) tools is that it permits parties in the SC to deal with uncertainty and complexity in the markets through coordination mechanisms such as market mechanisms, contracts, partnership arrangements, which lead to the increasing efficiency of all partners (Artz & Brush, 2000). TCE focuses on uncertainty where it is suggested that it exists in the market and more specifically in manufacturing, where it is caused by uncertainty of demand, supply, New Product Development and technology and in other cases from social, natural and political social uncertainties which may have a significant effect on the performance of a firm (Koh & Tan, 2006).

Demand uncertainty which relates to unpredictable events in the downstream part of the SC consisting of retailers and consumers can result from seasonality, volatility of fads and change of consumer preferences due to availability of new products or short lifecycle of products. Supply uncertainties which relates to unpredictable events that occur in upstream

part of the SC is caused by material shortages and late delivery which can lead to disruption of production therefore in the long run adversely affecting sales as well as the distributors and retailers in the downstream (Bakos, 2009). The concept of uncertainty from the TCE point of view assume that there is a probability that partners behaves rationally and opportunistically by ordering more inventory in addition to buffer stock to cushion again possible shortages which increases costs (stockholding costs, ordering costs, carrying costs) hence it provides further insight into the value of information sharing between organizations to reduce firm's exposure to uncertainty otherwise this results to BWE (Jones & Simons, 2000). TCE is however not without criticism. The theory is static in that it is restricted to the efficiency rationale or SC collaboration where the organizational contexts (e.g. culture, power, dependence and trust) are assumed away (Barringer & Harrison, 2000).

RESEARCH METHODOLOGY

Research Design

A research design is the conceptual structure within which the research is conducted and it constitutes the blueprint for the collection, measurement and analysis of data. The study adopted a descriptive research design through a case study while collection of data was through a survey method. The descriptive research design was appropriate as it enabled the study combine both qualitative and quantitative research approaches (Kothari, 2011). Qualitative approach can be used to gain more in-depth info that may be difficult to convey quantitatively and hence will assist in generating appropriate conclusions with respect to the research questions by utilizing questionnaires (Mugenda & Mugenda, 2003). Qualitative approach involves interpretation of phenomena without depending on numerical measurement or statistical methods (Styles et al., 2012). Quantitative approach on the other hand strives for precision by focusing on items that can be counted into predetermined categories and subjected to statistical analysis (Taylor, 2013). The use of these two approaches reinforces each other (Zhu et al., 2013). According to Kothari (2006), a case study design is a way of organizing data and looking at the object as a whole. A case study approach is essentially an intensive investigation of the particular unit under consideration and it helps the study narrow down a very broad field or population into an easily researchable one and seeks to describe that unit in details, in context and holistically (Kombo & Tromp, 2006). Therefore, the case study design was deemed most appropriate in this study since data was gathered from a single source; the New KCC Ltd to represent all other milk processing firms in Kenya. Survey method was used as it permitted the collection of data through questionnaires administered to a sample representing the population and the data collected was used to suggest relationships between variables and produce models for these relationships. Data collection methods were tested for validity and reliability where according to Kothari (2006) these conditions must be present in descriptive studies. The two designs facilitated the gathering of reliable data describing the true characteristics of the factors that depict bullwhip phenomenon which has an effect on the performance of New KCC Ltd.

Target Population

A population is the total collection of elements about which we wish to make inferences (Cooper & Schindler, 2003). The target population comprised of all the departments at New KCC Ltd Headquarters, Nairobi. These departments included: Procurement, Inventory and Logistics, Raw Milk Procurement and Extension, ICT, Sales and Marketing, Finance, Human Resources, Factory Operations, Internal Audit, Risk and Compliance. All these departments currently comprised of a total of 167 employees.

Sample Size and Sampling Technique

A sample size is a set of entities drawn from a population with the aim of estimating characteristics of the population (Kothari, 2008). According to Orotho and Kombo (2006), sampling is the process of selecting a number of individuals or objects from a population such that the selected group contains the elements which are representative of the characteristics found in the group. The study adopted stratified sampling method where the population was categorized into homogenous strata (staff level) so that the sample was proportionately representative of each strata. This technique was ideal because it gave the respondents at all levels in the organization an equal opportunity to participate in the study without bias (Kothari, 2008). This method was justifiable for this research because it allowed an equal chance for all staff members from all levels within the departments to participate equally as they were selected randomly from each department within the whole organization. Neuman (2003) argues that the main factor considered in determining the sample size is the need to keep it manageable enough. The choices for this technique enable the study to derive detailed data at an affordable cost in terms of time, finances and human resource (Mugenda and Mugenda (2008). Gay (1983) as cited by Mugenda & Mugenda, (2003), a representative sample is one that is at least 10%-20% of the total population which is suggested for descriptive studies. However, Babbie (2005), and Gay & Airasian (2003) have stated that what should determine the sample size should be the type of descriptive research carried out and the overall size of the population. Krejcie & Morgan (2012) also argue that determination of sample size differs depending on the research design and therefore the following formula (Krejcie & Morgan, 1970) was used to determine the sample size for a finite target population for this study calculated at 95% confidence level and 5% standard error:

$$S = \frac{X^2 NP\,(1-P)}{d^{2\,s}(N-1) + X^2 P\,(1-P)}$$

Where: S = Required Sample size; X = Z value (e.g. 1.96 for 95% confidence level); N = Population Size; P = Population proportion (expressed as decimal) (assumed to be 0.5 (50%); d = Degree of accuracy (5%), expressed as a proportion (.05); It is margin of error

Therefore:

$$S = \frac{1.96^2 \times 167 \times 0.5\,(1-0.5)}{0.05^2(167-1) + 1.96^2 \times 0.5\,(1 - 0.5)}$$

S =116.61; Approximately 117 sample size

A table developed by Krejcie & Morgan (see Appendix) also has all the provisions one requires to arrive at the required sample size for the various known populations. Using the above formula, the sample size for this study was 117 respondents which was equivalent to 70% of staff working at NKCC headquarters. Random sampling was then used to pick a sample from each strata where under this sampling design, every item in all the strata has an equal chance of inclusion in the sample. One questionnaire was administered on each sample unit giving us 117 respondents. It is considered the best technique of selecting a representative sample as it ensures the Law of Statistical Regularity which states that if on average the sample chosen is a random one, the sample will have the same composition and characteristics as the universe (Kothari, 2011).

Data Collection Instruments and Data Collection Procedure

Survey method is the most suited for gathering descriptive information and hence it was used to collect primary data in this study. A self-developed survey instrument was designed based on the constructs of the conceptual framework using questionnaires to collect the required data due to their simplicity in the administration and scoring of items as well as data analysis (Gronhaug, 2005). Structured questionnaires were used where closed and open-ended questions were developed for generating information on the key variables of interest from the target respondents in this study. Closed-ended questions have the advantage of collecting viable quantitative data while open-ended questions provide rich insights by allowing the respondents freedom of answering the questions and the chance to offer in-depth responses to the closed-ended questions (Mugenda & Mugenda, 2008). The questionnaires were self-administered through drop and pick method to identify respondents with a brief explanation on their purpose and importance and later picked for analysis. However, in such cases, it is difficult to probe or prompt responden ts, study cannot also ensure that the 'right' person answers the questionnaire and additional data cannot be collected. The study also collected qualitative data through open-ended questions in the questionnaire from the respondents who are conversant with the subject through experience. According to Kothari (2006), structured questionnaires are easily administered, improve confidentiality of the interviewee, are easy to code and analyze, are cost effective in terms of money and therefore generally lead to a higher response rate. Secondary data was obtained from desk review of existing information about the study areas. relevant literature review from previous studies, existing materials like academic journals, magazines, books, periodicals, brochures, company's financial statements and the company website. The objective was to collect, organize and synthesize knowledge relating to BWE on performance of organizations. Therefore, this offered high quality data and also saved resources in terms of money and time.

Data Analysis and Presentation

According to Marshall and Ross man (1999), data analysis is the process of bringing order, structure and interpretation to the mass of collected data which involves the coding, editing and cleaning of data in preparation for processing. The use of closed-end and open-end

questionnaires contributed towards gathering both quantitative and qualitative data. Descriptive statistics was used to analyze the quantitative data in this study where data was scored by calculating the percentages, mean scores and standard deviation with Statistical Package for the Social Sciences (SPSS) version 23 as the main tool for data analysis and presentation. This allowed the study to follow clear set of quantitative data analysis procedures that led to increased data validity and reliability and as well demonstrated the relationship between the research variables. SPSS also assisted in presenting the findings in the form of frequency distribution tables, bar charts and pie charts. Mugenda and Mugenda (2008) points out that the study uses regression analysis to determine with statistical significance, the influence or effect that the independent variables have in the dependent variable. Performance of New KCC Ltd was regressed against four variables of the effect of information sharing, inventory management approaches, shortage gaming and distribution channels. Multiple regression analysis was used since it is appropriate to test a group of independent variables on one dependent variable (Mbwesa, 2006). The statistical multiple regression model that was applied was:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + e$$

Where: Y = Performance of New KCC Limited; β_0 = Constant term (Coefficient of intercept); β_1, β_1, β_3, β_4 =Beta coefficients (regression coefficients of the four independent variables); X_1 = Information sharing; X_2 = Inventory Management approaches; X_3 = Shortage gaming; X_4 = Distribution channels; e = Error

The model provided (R^2) which gives a combined prediction of all the independent variables under study on the dependent variable. The (F) and its statistical significance showed whether independent variables really predict performance of New KCC Ltd or it's a matter of chance only. The (t) values showed multi-collinearity between the independent variables while the regression coefficient shows the contribution of each independent variable in predicting the performance of New KCC Ltd. According to Mugenda & Mugenda (2012), multi-collinearity can occur in multiple regression models in which some of the independent variables are significantly correlated among themselves which is said to be a problem as it results to large standard errors of the coefficients associated with the affected variables. ANOVA was then further be used to test the goodness of the fit of the produced model to the data as Green & Salkind (2013) posit that ANOVA helps in determining the significance of relationship between the research variables. Using content analysis, the qualitative data drawn from the questionnaire was analyzed by summarizing the set of observations drawn from the respondents in frequency tables. Content analysis assists in quantifying qualitative data. The common set of observation derived was entered into the SPSS. All the analyzed findings were presented in form of frequency tables, pie charts and bar charts.

RESEARCH RESULTS

The general objective of the study was to investigate the effect of bullwhip phenomenon on performance of milk processing firms in Kenya. Specifically, the study investigated information sharing, inventory management approaches, shortage gaming and distribution

channels. The study findings showed a great influence of these four variables to the performance of milk processing firms.

Effect of information sharing on the performance of New KCC Ltd

The study findings revealed that information sharing affects the performance of New KCC Limited greatly. In measuring the role of information sharing, the respondents were asked to indicate the level of information sharing available within the organization as well as with the suppliers and customers which was at middle level. Further the study found that ICT tools adopted by the organization lead to improved market share. Supply chain collaboration also improves information sharing leading to smooth flow of supply chain activities and that the level of application of the ICT tools has improved communication with the customers, suppliers and other supply chain partners. Further the effect was evidenced by the fact that relationship between suppliers and the organization influence the amount of products purchased and that the information regarding demand forecasts and orders is shared across the supply chain as soon as it is received. However, the study found out that the ICT tools adopted have not led to a reduction in inventory levels in the organization. The respondents further said that not all information reaches every person in the company however, all information is put on adverts through national TV and daily newspaper, Information is therefore necessary as it plays a role in customer relations, leads to new ideas and innovation as well as employee management.

Effect of inventory management approaches on the performance of New KCC Ltd

The study found that inventory management approaches have a great effect of on the performance of New KCC Ltd. The effect was evidenced by the fact that the inventory management approaches used by the organization have improved the market share of the organization and have assisted decision makers react to demand fluctuations. The study also found that inventory management system at New KCC Ltd allows suppliers or immediate customers to access information about their inventory level to manage frequency as well as quantity and timing of ordering and that inventory management approaches has smoothened ordering frequency for each customer brought in some effect on the performance of the New KCC Ltd. Further the effect was evidenced by the fact that Economic Order Quantity has helped to improve customer service levels by ensuring availability of products. However, the study found that Just In Time (JIT) did not help to reduce the inventory levels. The respondents also said that for the performance of New KCC Ltd to increase, it needs to improve on production, distribution and machinery.

Effect of shortage gaming on the performance of New KCC Ltd

The study found out shortage gaming has a great effect on the performance of New KCC Ltd. In measuring the effect of shortage gaming, the study sought to establish the level at which the organization gives incentives to customers in terms of quantity discounts, price discounts, coupons or rebates which was indicated at low level. The study found out that the organization employs order rationing strategy to its customers during milk shortages and that shortage gaming (hoarding) by retailers affect the overall performance of the organization.

Further, the study also found that the organization has managed to offer consistent prices hence minimizing buying surges brought by temporary promotional discounts and that the organization's customers are allowed to cancel their orders. In addition, the study found that the sales promotion or sales incentive plans (e.g. price discounts) cause erratic buying. However, the study found that true milk shortages doesn't impact on the production schedules.

Effect of distribution channels on the performance of New KCC Ltd

The study found that distribution channels have a great effect on the performance of the New KCC Ltd. In measuring the effect of distribution channels, the study sought to establish the level at which the organization's distribution channel is well organized and managed. This effect was evidenced by the fact that there is an effective transportation management system that allows on-time delivery of raw materials to the organization and finished products to the customers and that long lead times lead to significant increase of order quantities by the customer. Again, the effect was brought about by current vehicle scheduling and routing practices having enabled reduction of operational costs and that the current distribution plan offers flexibility to respond to changes in customer demand. Further the study found that the organization's transport infrastructure and processes are adequate and reliable. However, the study was neutral that transport planning and management affect performance of the organization. Further the respondents said that improving distribution to reach the remote areas of the country, establishing lots of New KCC Ltd depots and adding more vehicles and manpower will also affect the performance of New KCC Ltd. Overall, the study found that information sharing had the greatest effect on the performance of New KCC Ltd, followed by shortage gaming, and then inventory management approaches while distribution channels had the least effect on the performance of New KCC Ltd.

MULTIPLE REGRESSION ANALYSIS

A multiple regression model was fitted to determine whether independent variables notably, X_1 = Information sharing, X_2 = Inventory Management approaches, X_3 = Shortage gaming and X_4 = Distribution channels simultaneously affected the dependent variable Y= Performance of New KCC Ltd. This subsection therefore examines whether the multiple regression equation can be used to explain the nature of the relationship that exists between the independent variables and the dependent variable. The multiple regression models were of the form:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + e$$

Where: Y = Performance of New KCC Limited; β_0 = Constant term (Coefficient of intercept); β_1, β_1, β_3, β_4 = Beta coefficients (regression coefficients of the four independent variables); X_1 = Information sharing; X_2 = Inventory Management approaches; X_3 = Shortage gaming; X_4 = Distribution channels; e = Error

Table 1: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.825	0.680	0.662	1.509

Table 1 above is a model fit which establishes how fit the model equation fits the data. The adjusted R^2 was used to establish the predictive power of the study model and it was found to be 0.662 implying that bullwhip phenomenon account for 66.2% of the variations in performance of New KCC Ltd which is explained by information sharing, inventory management approaches, shortage gaming and distribution channels leaving 33.8% percent unexplained. Therefore, further studies should be done to establish the other factors (33.8%) affecting the performance of New KCC Ltd.

Table 2: ANOVA results

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	353.915	4	88.479	37.246	0.000
	Residual	166.285	70	2.376		
	Total	520.2	74			

The probability value of 0.000 indicates that the regression relationship was highly significant in predicting how information sharing, inventory management approaches, shortage gaming and distribution channels relate with performance of New KCC Ltd. The F calculated at 5 percent level of significance was 37.246 and since F calculated is greater than the F critical (value = 2.4495), this shows that the overall model was significant.

Table 3: Coefficients of Determination

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	0.876	0.146		6.000	0.000
Information sharing	0.775	0.302	0.712	2.566	0.012
Inventory management approaches	0.525	0.198	0.397	2.652	0.009
Shortage gaming	0.698	0.276	0.802	2.529	0.014
Distribution channels	0.638	0.056	0.581	11.39	0.013

Dependent variable: Performance

The resulting optimal regression equation was:

$$Y = 0.876 + 0.775\ X_1 + 0.525 X_2 + 0.698 X_3 - 0.638\ X_4$$

The regression equation above has established that taking all factors into account (information sharing, inventory management approaches, shortage gaming and distribution channels) constant at zero, performance of New KCC Ltd was 0.876. The findings presented also show that taking all other independent variables at zero, a unit increase in information

sharing would lead to a 0.775 increase in the performance of New KCC Ltd. Therefore, information sharing is a key factor for performance of milk processing firms in Kenya which further implies that an increase in information sharing through supply chain collaboration and ICT tools investment leads to an increase in performance of milk processing firms. Information sharing was significant since 0.00<0.005. This concurs with Gichuru et al. (2015) and Kinuthia & Ali (2015) who found that information sharing as measured by supply chain collaboration and ICT tools in the industry positively impact their performance by reducing bullwhip phenomenon.

The study also found that a unit increase in inventory management approaches would lead to a 0.525 increase in performance of New KCC Ltd. The variable was found to be significant since p-value is less than 0.005. This concurs with Thogori (2015), who indicates that proper inventory management is crucial in performance and advancement of food processing firms and further reports that inventory management should ensure continuous supply, minimized loss, increased production and cost control which impact on the performance of food processing firms. Further the study found that a unit increase in the scores of shortages gaming would lead to a 0.698 increase in the performance of New KCC Ltd. The variable was significant since 0.00<0.05. The findings concur with Tumaini (2011) who reported that when shortages occur, suppliers employ order rationing strategies and to counter this, buyers will often increase the size of their orders hence suppliers can no longer determine the true demand. This results in unnecessary additions to production capacity, transportation investment and warehouse space which affect overall operating competencies as they are unable to remain reactive to changing market conditions and customer demands.

Further, the findings show that a unit increases in the distribution channels would lead to a 0.638 decrease in the performance of New KCC Ltd. The variable was found to be significant since 0.00<0.005. Distribution channels were found to have weak correlation which was statistically significant. The study findings relate to those Wihdat et al (2013) who reviewed long distribution channel's problems and concluded that long distribution channels pose complex problems which are variability, bottlenecks such as long lead times, BWE, high transportation and logistics costs. The study findings also concur with Jeruto et al. (2014) who deduced that there is a positive relationship between lead time and organizational performance where there is increased customer satisfaction, shorter production schedules and reduced obsolescence and surpluses. Overall, information sharing had the greatest effect on the performance of New KCC Ltd, followed by shortage gaming, and then inventory management approaches while distribution channels had the least effect to the performance of New KCC Ltd. All the variables were significant (p<0.05).

CONCLUSIONS

The study concludes that information sharing affects the performance of New KCC Limited greatly. This was deduced from the fact that ICT tools adopted by the organization led to improved market share and the fact that supply chain collaboration improves information sharing leading smooth flow of supply chain activities. The study concluded that ICT tools adopted have led to a reduction in inventory levels in the organization.

The study also concludes that inventory management approaches has a positive effect of on the performance of New KCC Ltd. The effect was deduced by the fact that the inventory management approaches used by the organization improved the market share of the organization and that inventory management approaches in the organization have assisted decision makers reacted to demand fluctuations. Further the study deduced that Economic Order Quantity has helped to improve customer service levels by ensuring availability of products. However, the study found that Just In Time (JIT) did not help to reduce the inventory levels.

The study concludes that shortage gaming has a positive effect on the performance of New KCC Ltd. In this case the study deduced that the organization employs order rationing strategy to its customers during milk shortages. The study also concludes that the sales promotion or sales incentive plans (price discounts) cause erratic buying. However, the study deduced that true milk shortages doesn't impact on the production schedules.

In relation to distribution channels, the study concludes that distribution channels have a negative effect on the performance of the New KCC Ltd. Again, the study deduced that current vehicle scheduling and routing practices having enabled reduction of operational costs and that the current distribution plan offers flexibility to respond to changes in customer demand. Further the study deduced that the organization's transport infrastructure and processes are adequate and reliable. However, the study concludes that transport planning and management affect performance of the organization.

Overall, the study concludes that information sharing had the greatest effect on the performance of New KCC Ltd, followed by shortage gaming, and then inventory management approaches while distribution channels had the least effect to the performance of New KCC Ltd.

RECOMMENDATIONS

With reference to the findings and conclusions made in this study, the study provides recommendations which can be adopted for improvement of the milk processing firm's performance. These include the following;

Concerning the information sharing the study recommends that New KCC Ltd as well as the other manufacturing firms in Kenya need to focus on the ICT tools adopted in order to reduce inventory levels in the organization as well as integrate all functions of an organization. The study further recommends that there should be integration of data and information sharing through technology implementation and increased collaboration as competitive tools in the processing firms for realizing their corporate competitive strategy.

In relation to inventory management approaches, the study recommends that manufacturing firms in Kenya such as New KCC Ltd should focus on inventory management approaches used by the organization to improve the market share of the organization as well as improving inventory records management in general. It helps determine the minimum safety stock needed to provide an insurance policy against supply chain problems either from

manufacturing glitches or distribution uncertainties so that customers get what they ordered. It is also useful for pinpointing the amount of inventory required to replenish deliveries every two weeks and as well, it helps companies find ways to avoid a backlog of excess or obsolete inventory.

Concerning shortage gaming, the study recommends that the manufacturing firms in Kenya such as New KCC Ltd should focus on pricing which is a significant attribute through which a firm executes its competitive strategy. Price is identified as one of the most sensitive factor among the relationship between suppliers and the customers. This is due to the fact that peak in demand during the promotion may be followed by a trough in demand following the promotions, as customers have simply 'bought early'.

Concerning distribution channels, the study recommends that the manufacturing firms in Kenya should focus on transport planning and management which were found to affect performance of the organization. This can be achieved by firms through trying to minimize the cost of production, the costs of transportation of goods to the consumers as well as the operational costs involved. Intermediaries are the additional companies that take a manufacturer's product and sell it to a company, such as a distributor or a retailer. Since these companies are experts at what they do, intermediaries can increase sales volumes and decrease costs.

REFERENCES

Agrawal, S., Sengupta, R. N. & Shanker, K. (2009). Impact of information sharing and lead time on bullwhip effect and on-hand inventory, *European Journal of Operational Research*, 192 (2), 576-593.

Airasian, P. W. & Gay, L. R. (2003). *Educational research: Competencies for analysis and application*. Prentice Hall.

Ali, M. K., Abu-Tair, A. I., Kinuthia, J. M. & Babecki, R. Self-healing and strength development of geopolymer concrete made with Waste by products. *Building Research & Information*, 43(2), 253-262.

Andersen, N. & Segars, G. (2001). Stages in the brand rejuvenation process: The case of IBM UK. *European Management*, 19(3), 301.

Anderson, E.G., Morrice, D.J. & Lundeen, G. (2005). The "physics" of capacity backlog management in service and custom manufacturing supply chains. *In Systems Dynamic Review* 21(4), 217-247.

Artz, K.W & Brush, T.H. (2000). Asset specificity, uncertainty and relational norms: an examination of coordination costs in collaborative strategic alliances. *Journal of Economic behavior & Organization,* 41(4), 337-362.

Babbie, E. (2005). *The basics of research*. Belmont, CA: Thomson Wadsworth.

Bagchi, P. K., Skjoett-Larsen, T. & Boege Soerensen, L. (2005). Supply chain integration: a European survey. *The international journal of logistics management*, 16(2), 275-294.

Bakos, J. (2009). *Organizational Partnerships and the Virtual Corporation*. Boston, Kluwer: Academic Publishers.

Bandyopadhyay, S. & Bhattacharrya, R. (2013). A generalized measure of bullwhip effect in supply chain with ARMA demand process under various replenishment policies. *The International journal of Advanced Manufacturing Technology*, 68(5), 963-979.

Barber, C. L. & Jordan, M. C., (2007). Autocrine VEGF signaling is required for vascular homeostasis. *Cell*, 130(4), 691-703.

Barringer, B.R. & Harrison, J.S. (2000). Walking a tightrope: Creating value through interorganizational relationships. *Journal of Management*, 26(3), 367-403.

Bayraktar, E., Koh, L., Gunasekaran, A., Sari, K. & Tatoglu, E., (2015). The role of forecasting on bullwhip effect for E-SCM applications, *International Journal of Production Economics*, 133(1), 193-204.

Borut, P.C. & Dahmane, R. (2014). The role of antioxidants in skin cancer prevention and treatment. *Oxidative medicine and cellular longevity*, *2014*.

Braxton, J. M. & Hartley, H. V. (2008). The role of active learning in college student persistence. *New Directions for Teaching and Learning*, 8(115), 71-83.

Bray, R. L. & Mendelson, H. (2012). Information transmission and the bullwhip effect: An empirical investigation. *Management Science,* 58(5), 860–875.

Cachon, G. P., Randall, T. & Schmidt. G. (2012). In search of the bullwhip effect. Manufacturing & Service *Operations Management*, 9(4), 457.

Cecil Bozarth & Robert Handfield. (2008). Introduction to Operations and Supply Chain Management. Prentice Hall.

Chen, L. & Lee, H. L. (2012). Bullwhip effect measurement and its implications. *Operations Research,* 60(4), 771–784.

Chen, L. Luo, W. & Shang, K. (2014). *On the implications of measuring bullwhip effect with material flow data.* Working Paper,

Chiang, W.K. & Feng, Y. (2007). The value of information sharing in the presence os supply uncertainty and demand volatility. *International Journal of Production Research,* 45(6), 1429.

Chisanga B., Gathiaka J., Nguruse G., Onyancha, S. & Vilakazi T. (2014). Competition in the regional sugar sector: The Case of Kenya, South Africa, Tanzania and Zambia. Pre-ICN Conference.

Chopra, S. & Meindl, P. (2007). *Supply Chain Management. In Strategy, planning and operations. (3rd ed.)*. New Jersey: Pearson International Edition.

Contributors, W. (2016, September 13). Supply- Chain. Retrieved September 16, 2016, from Wikipedia.org: https//en.wikipedia.org/wiki/Supply-Chain

Cooper, D.R. & Schindler, P.S. (2003). *Business Research Methods* (8th ed.). Irwin, United States of America: Mc Graw-Hill.

Corina, G., Liviu, I. & Roxana, S. (2011). Determinants of Organizational Performance: *The Case of Romania,* 78(2), 133–144.

Creswell, J. W. & Hanson, W. E. (2003). Advanced mixed methods research designs. *Handbook of mixed methods in social and behavioral research*, 20(9), 2-40.

Dai, H., Li, J., Yan, N & Zhou, W. (2016). Bullwhip effect and supply chain costs with low- and high-quality information on inventory shrinkage, *European Journal of Operational Research*, 250, 457-469.

Dejonckheere, J., Disney, S. M., Lambrecht, M. R. & Towill, D. R. (2012) Transfer function analysis of forecasting induced bullwhip in supply chains. *International Journal of Production Economics*, 78(2), 133–144.

Disney, S. M. (2014). Supply chain aperiodicity, bullwhip and stability analysis with jury's inners. *IMA Journal of Management Mathematics*, 19(2),101–116.

Dunn, S.D. (2001). *Statistics and Data Analysis for the Behavioural Science*. Mc Graw Hill.

EPZ (Export Processing Zones Authority). (2005). Dairy Industry in Kenya.

Erkan, B., Lenny K.C. & Ekrem T. (2008). The role of forecasting on bullwhip effect for E-SCM application. *International Journal Econ* 113(1),3-12.

Fawcett, S.E., Fawcett, A., Watson, B. & Magnan, G. (2012). Peeking inside the black box towards understanding of supply chain collaboration dynamics. *Journal of Supply Chain Management*, 48(1), 44-72.

Feng C.H. & Chiang, C. W. (2007). GSK-3β acts downstream of PP2A and the PI 3-kinase-Akt pathway, and upstream of caspase-2 in ceramide-induced mitochondrial apoptosis. *Journal of cell science*, 120(16), 2935-2943.

Feng, Z., Wang, D. & Xu, X. (2013). Human infection with a novel avian-origin influenza A (H7N9) virus. *New England Journal of Medicine*, 368(20), 1888-1897.

Fransoo, J. C. & Wouters, M. J. F. (2012). Measuring the bullwhip effect in the supply chain, *Supply Chain Management: An International Journal*, 5(2), 78-89.

Gaither, N. & Fraizer, G. (1999). *Production and Operations Management*. Thomson South-Western, USA.

Gay, J. C. & Penent, F. (1983). Diamagnetism of the hydrogen atom-an elementary derivation of the adiabatic invariant. *Journal of Physics B: Atomic and Molecular Physics*, 16(23), 693.

Geary, S., Disney, M. & Towill, D. R. (2014). On bullwhip in supply chains— historical review, present practice and expected future impact. *Intern. Journal of Production Economics*, 101(1), 2–18.

Ghasemi, V. (2010). *Structural equation modelling in social research*. Amos, Publication: Jameh Shenasan.

Ghauri, P. N. & Grønhaug, K. (2005). *Research methods in business studies: A practical guide*. Pearson Education.

Gichuru, M., Iravo M. & Arani W. (2015). Collaborative Supply Chain Practices on Performance of Food and Beverages Companies: A Case Study of Del Monte Kenya Limited. *International Journal of Academic Research in Business and Social Sciences*, 5(11).

Goldratt M. E. (2004). The Goal: A Process of Ongoing Improvement.

Green, S. & Salkind, N. (2013). Using SPSS for Windows and Macintosh (7th Ed. ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Greenberg, S. (2010). *Contesting the food system in South Africa: issues and opportunities*. Institute for Poverty, Land and Agrarian Studies, University of the Western Cape.

Hamind S. & Seydeh M. (2014). Management of Distribution Channels. *Indian Journal Science Research,* 5(3), 452-456.

Hendricks, K.B. & Singhal, V.R. (2004). Association between supply chain glitches and operating performance. Working Paper, Georgia Insitute of Technology, Atlanta.

Idisemi, A., Ann, L. & Robert, M. (2011). Factors affecting the effective utilization and adoption of sophisticated ICT solutions: Case studies of SMEs in Lagos, Nigeria. *Journal of Systems and Information Technology*, 13(2),125 - 143

Jack G., Carlos A. & Jacques H. (2008). Agro-Industrial Supply Chain Management: Concepts and Applications. Food and Agriculture Organization of the United Nations.

Jaipuria, S. & Mahapatra, S.S. (2014). An improved demand forecasting method to reduce bullwhip effect in supply chains", *Expert Systems with Applications*, 41(5), 2395-2408

Jeruto, P., Tooa, E., Mwamburia, L. A. & Amuka, O. (2015). An inventory of medicinal plants used to treat gynaecological-obstetric-urino-genital disorders in South Nandi Sub Country in Kenya. *J Nat Sci Res*, 5(18), 136-52.

Joel D.W., Keah-Choon T. & Keong L.G. (2014*). Intergration Issues in Supply Chain Management. In 4th (Ed.), Principles of Supply Chain Management: A Balanced Approach (p. 474).* Boston, USA: Cengage Learning.

Jones, D.T & Simons, D. (2000). ECR in the Third Millenium - Academic Pespectives on the Future of Consumer Goods Industry. In ECR, Future directions for the supply side of ECR (pp. 34-40). Europe, Brussels.

Jutner, U. (2005). Supply Chain Risk Management. *The International Journal of Logistics Management,* 16(1), 120-141.

Keitany P., Wanyoike M.D. & Richu S. (2014, March). Assessment of the role of materials management on organizational performance: A case of New Kenya Cooperative Creameries, Eldoret. *European Journal of Material Sciences*, 1(1), 1-10.

Kenya Dairy Board. (2014). The Dairy Industry in Kenya.

Koh, S.L. & Tan, K.H. (2006). Translating knowledge of supply chain uncertainty into business strategy and actions. *Journal of Manufacturing Technology Management*, 17(4).

Koljonen, E. L. & Reid, R. A. (1999*). Using system dynamics models to validate thinking process logic models.* In Proc. APICS Constraints Management Symp. Alexandria, Va.

Kombo, D.K & Tromp, D. A. (2006). *Proposal and Thesis Writing.* Nairobi: Paulines Publications Africa.

Kothari, C. (2008). *Research Methodology* (2nd Ed. ed.). New Delhi: New Age International (P) Ltd.

Kothari, C.R. (2004). *Research Methodology. Methods and Techniques*. London: New Age International Limited.

Kothari, C.R. (2006). *Research Methodology: Methods & Techniques.* (1st ed.). New York: New Age International Publishers.

Kothari, D. & Nagrath, I. (2011). *Modern power system analysis*. Tata McGraw-Hill Education.

Kotler P., Arrmstrong G., Wong V. & Suanders O.J. (2008). *Principles of Marketing (Fifth European Edition ed*.). Essex: Pearson Education Limited.

Kotler, P. & Lee, N. (2008). *Corporate social responsibility: Doing the most good for your company and your cause*. London: John Wiley & Sons.

Krejcie, R. V. & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and psychological measurement*, 30(3), 607-610.

Krol, B., Keller, S. & Zelewski, S. (2015). E-logistics overcome the bullwhip effect", *International Journal of Operations and Quantitative Management*, 11(4), 281-289.

Kumar, M., Dr. Srinivisan S. & Dr. Gundeep T. (2013, April). Tackling Rationing and Shortage Gaming Reason of Bullwhip Effect with Fuzzy Logic Approach. International Journal of Engineering and Science, 2(10), 48-52. Retrieved from http://www.research inventy.com

Lambert, D.M., Cooper, M. C. & Douglas. (2000). *Issues in Supply Chain Management (Vol. 29).* New York: Elsevier Science Inc.

Lambert, D.M., Cooper, M.C. & Pagh, J.D. (2008). Supply Chain Management: Implementation Issues and Research Opportunities. *The International Journal of Logistics Management*, 9(2), 49-51.

Law C.H & Ngai W. T. (2007). An investigation of the relationships between organizational factors, business process improvement and success' benchmarking. *An International Journal,* 14(3), 387-406.

Lee, H. L., Padmanabhan, V. & Whang, S. (2013). The bullwhip effect in supply chains. *Sloan management review*, 38(3), 93–102.

Lee, H.L., Padmanabhan, V. & Whang, S. (1997a). Information Distortion in a Supply Chain: The Bullwhip Effect. *Management Science*, 43(4), 546-558.

Lerner, M. & Almor, T. (2002). Relationships among strategic capabilities and the performance of women- owned small ventures. *Journal of Small Business Management*, 40(2), 109-125.

Li, S & Lin, B. (2006). Accessing information sharing and information quality in supply chain management. In Decision Support Systems (3 ed., Vol. 42, pp. 1641-1656).

Luo, C., Chen, Q. & Shang, H. F. (2014). Reduced functional connectivity in early-stage drug-naive Parkinson's disease: a resting-state fMRI study. *Neurobiology of aging*, 35(2), 431-441.

Mabin, V.J & Balderstone, S.J. (2003). The World of the Theory of Constraints. Boca Raton, FL.: Lucie Press.

Mackelprang, A. W. & Malhotra, M. K. (2015). The impact of bullwhip on supply chains: Performance pathways, control mechanisms, and managerial levers, *Journal of Operations Management*, 36, 15-32.

Mckinnon, D. (2010). *Australian dairy industry: technology and management practices, 2008–09*. ABARE-BRS research report 10.11, Canberra, Australia.

Manoj, K., Srinivasan.D. & Dr. Gundeep., T. (2013). Tackling Rationing and Shortage Gaming Reason of Bullwhip Effect with Fuzzy Logic Approach. *International Journal of Engineering and Science,* 2(10), 48-52.

Marshall, C. & Rossman, G. (1999). The "what" of the study: Building the conceptual framework. *Designing qualitative research*, 5(3), 21-54.

Mbwesa, J. (2006). *Introduction to Management Research: Methods and Techniques*: New Delhi. Gupta KK.

McGrath, S. & King, K. (2004). Knowledge-based aid: a four-agency comparative study. *International Journal of Educational Development*, 24(2), 167-181.

Miller, C., Al-Wer, E., Caubet, D. & Watson, J. C. (2007). *Arabic in the city: Issues in dialect contact and language variation*. London: Routledge.

Moffat, K. & Mercer, S. W. (2015). Challenges of managing people with multimorbidity in today's healthcare systems. *BMC family practice*, 16(1), 129.

Mugenda, O.M & Mugenda, A.G. (2003). *Quantitative and Qualitative Approaches. In Research Methods.* African Centre for Technology Studies, ACTS Press.

Mugenda, O.M & Mugenda, A.G. (2008). *Quantitative and Qualitative Approaches. In Research Methods.* Nairobi: African Centre for Technology Studies.

Muriuki,H., A Omore, N., M, Waithaka, R, Ouma, S.J.,Staal & P, Odhiambo. (2003). The Policy Environment in the Kenya Dairy Subsector:A review. Regal Press Kenya.

Navon, R. & Berkovich, O. (2006). An automated model for materials management and control. *Construction Management and Economics*, 24(6), 635-646.

Neuman, S. (2003). Maximum likelihood Bayesian averaging of uncertain model predictions. *Stochastic ental Research and Risk Assessment*, 17(5), 291-305.

Ngigi, M. (2005). The Case of Smallholder Dairying in Eastern Africa. Discussion Paper 131, Washington D.C.

Orodho, A. J. (2009). *Techniques of Data Analysis Using Statistical Package for Social Sciences (SPSS) Computer Package*. Maseno, Kenya: Kanezja Publishers.

Petersen, K.J., Ragatz, L.G. & Monczka, R.M. (2005). An Examination of Collaborative Planning Effectiveness and Supply Chain Performance. *The Journal of Supply Chain Management,* 41(2), 2.

Richard, P.J., Devinney, T.M., Yip, G.S & Johnson, G. (2009). Measuring Organizational Performace: Towards Methodological Best Practice. *Journal of Management*., 35(3), 718-804.

Rosemary A. & Karuti K. (2008,). The Revitalisation of Kenya Cooperative Creameries: The Politics of Policy Reforms in the Dairy Sector in Kenya. (D. Hughes, Ed.) Future Agricultures Consortium.

Saffu, K. & Manu, T. (2004). Strategic capabilities of Ghanaian female business owners and the performance of their ventures. In *ICSB World Conference, Johannesburg, South Africa*.

Salisbury, M. & Styles, M. (2012). *Children's picture books: The art of visual storytelling*. Laurence King Publishing.

Saremi H. & Seydeh., M.Z. (2014). Management of Distribution Channels. *Indian Journal Science Resources,* 5(3), 452-456.

Seligman, M. E. & Peterson, C. (2005). Positive psychology progress: empirical validation of interventions. *American psychologist*, 60(5), 410.

Serekan, U. (2003). Research Methods for Business: A Skill Approach. (4th ed.). New York: John Willy & Sons Inc.

Simatupang, T.M. & Sridharan, R. (2003). The collaborative supply chains. *International Journal of Logistics Management,* 13(1), 15-30.

Standard Newspaper. (2015, August 24). Newspaper Publication, p.6.

Sterman J.D. (2006). *Operational and Behavioral Causes of Supply Chain Instability. In C. &. Villages (Ed.), The Bull Whip in Supply Chains: A Review of Methods, Components and Cases.* New York: Palgrarc Mc Millan.

Taylor, M. (2013). *Partial differential equations II: Qualitative studies of linear equations*. Springer Science & Business Media.

Techno Serve (2008). The Dairy Value Chain in Kenya. *Project report for the East Africa Dairy Development Program.*

Teo,H., Wei, K. & Bendasat, I. (2003). Predicting Intention to Adopt Interorganizational Linkages: An Institution Perspective. Terms/p/pull-through-production-asp. (2016). Retrieved from Investopedia: www.investopedia.com

Thogori, M. (2015). The Role of Inventory Management on Performance of Food Processing Companies. *European Journal of Business and Social Sciences*, 4(4), 64-78.

Timothy, D. J. & Ron, A. S. (2013). *Understanding heritage cuisines and tourism: Identity, image, authenticity, and change*. London: Routledge

Trapero, J.R., Kourentzes, N. & Fildes, R. (2012*). Impact of information on supplier forecasting performance*. Omega.

Trochim, W. M. (2006). Nonprobability sampling. *Research methods knowledge base*, 1(1), 1-10.

Tsao, M., Chen, Y. H., Tsai, S. M., Ou, H. & Hsiao, J. H. (2015). *Research on the inventory forecasting model and bullwhip effects for SMEs: the food manufacturing for example*, Graduate project, Department of Industrial Engineering and Management, Kaohsiung: I-Shou University.

Umar, A. & Hamilton, S. R. (2004). Revised Bethesda Guidelines for hereditary nonpolyposis colorectal cancer (Lynch syndrome) and microsatellite instability. *Journal of the National Cancer Institute*, 96(4), 261-268.

USAID KENYA. (2010). *Usaid Kenya Dairy Sector Competitiveness Program*. Nairobi, Kenya: Land O' Lakes Inc.

Valeur, B. & Santos, M. N. (2012). *Molecular fluorescence: principles and applications*. London: John Wiley & Sons.

Waema, M. (2013). *The effects of competitive strategies on performance of dairy firms in Kenya*. Research Project, Kenyatta University, School of Business.

Wang, G., Huang, S.H & Dismukes, J.P. (2004). Product-Driven Supply Chain Selection Using Integrated Multi-Criteria Decision- Making Methodology. *International Journal Production Economics,* 91(1), 1-15.

Wells., A. & Cartwright., S. (2003). A short form of the metacognitions questionnaire: properties of the MCQ-30. *Behavior research and therapy*, 42(4), 385-396.

Wihdat,D., Yousef,A. & Sang-Heon L. (2013). A Review of Long Distribution's Channnel's Problems. *International Journal of Materials, Mechanics and Manufacturing, 1*. 91(1), 1-15.

Williamson, O.E. (2008). Outsourcing: Transaction Costs Economics and Supply Chain Management. *Journal of Supply Chain Management*, 44(2), 5-15.

Yigitbasioglu O. (2010). Information sharing with key suppliers. *International Journal of Physical Distribution and Logistics Management,* 40(7), 550-578.

Yusuf, A. & Saffu, K. (2005). Planning and performance of small and medium enterprise operators in a country in transition. *Journal of small business management*, 43(4), 480-497.

Zinbarg, M. (2005). *Research Methods*. (1st Ed. ed.). New Jersey: Pearson Publishers.