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## **EFFECT OF SUPPLY CHAIN MANAGEMENT PRACTICES ON PERFORMANCE OF MILK PROCESSING FIRMS IN KENYA**

**CHEMIRMIR JEPKEMEI ELLA, DR. NDETO CHARLES**

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**EFFECT OF SUPPLY CHAIN MANAGEMENT PRACTICES ON PERFORMANCE OF MILK PROCESSING FIRMS IN KENYA****<sup>1</sup>CHEMIRMIR JEPKEMEI ELLA, <sup>2</sup>DR. NDETO CHARLES`**<sup>1</sup>Masters student, Jomo Kenyatta University of Agriculture and Technology, Kenya<sup>2</sup>Lecturer, Jomo Kenyatta University of Agriculture and Technology, Kenya**ABSTRACT**

The study therefore sought to examine the effect of SCM practices on performance of Kenyan milk processing firms. The study also sought to assess the effect of demand forecasting, distribution, information management and inventory management on performance of Kenyan milk processing firms. The on-going research utilized a descriptive research design. Moreover, study population was therefore 138 heads of procurement, processing, sales and marketing, distribution, finance/accounting and ICT departments in the 23 Kenyan milk processing firms. The present study made use of census approach because the study population is small. Moreover, this study used primary data and secondary data. Secondary data was obtained from Kenya Dairy Board annual reports as well as the annual reports of milk processing firms. On the other hand, primary data was gathered using semi-structured questionnaires. Additionally, a pilot study was performed in order to test the reliability as well as validity of data collection instruments. Semi structured questionnaire was employed to gather quantitative and also qualitative data which was analysed by use of diverse techniques. Qualitative data obtained was analyzed using thematic analysis and findings given in a prose form. Both descriptive as well as inferential statistics were used to analyze all quantitative data collected with the support of SPSS version 25. Additionally, descriptive statistics comprised of frequency distribution, mean, percentages and also standard deviation. Moreover, inferential statistics (multivariate regression as well as correlation analysis) then followed. The researcher then presented the findings in tables as well as figures (pie charts and bar charts). The study found that demand forecasting has a positive and significant effect on performance of milk processing firms in Kenya. In addition, distribution management has a positive and significant effect on performance of milk processing firms in Kenya. Further, the study found that information management has a positive and significant effect on performance of milk processing firms in Kenya. The study established that inventory management has a positive and significant effect on performance of milk processing firms in Kenya.

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**INTRODUCTION**

Supply chain management has emerged in early 21st century as an essential function. It has changed from traditional store keeping and ordering to purchasing, dissemination, warehousing and materials management (Kumar & Mohan, 2014). In other words, it is a related collection of resources as well as processes that starts with sourcing of raw materials and moves through to delivery of the end products to final customer. Moreover, supply chain is gradually becoming a strategic basis of competitive edge with the rise of international production sharing, intensification of international competition as well as reducing the product life cycles (Khuram, Khalil & Khan, 2019). In the highly competitive business environment, quality of SCM has assumed great significance. This is because it influences such decisions of firms as the choice of country to locate in, suppliers to buy from, and/or consumer markets to enter in. In the current business environment, enormous investments are currently being made globally with some of best recognized investment gurus placing their bet on the perishable

products, which is associated with the advancement of any economy (Mollelm, 2015). Supply chain is increasingly becoming a significant factor that can contribute to the realization of a successful organizational strategy.

Most of the milk processing firms around the world are organized as networks of processing as well as distribution facilities that purchase raw materials (milk and packaging material) transform them into finished as well as intermediate products and disseminate the finished goods to customers (Muriithi, Huka & Njati, 2014). The simplest network consists of facilities which undertake procurement, processing and distribution. While the performance of the milk industry in developing countries still remains poor, most firms also experience challenges in procurement, processing and distribution of final products (Damola, 2018). The first challenge is in the collection of milk from farmers. During the rainy seasons, most roads in developing countries become impassible and hence farmers have to struggle to get their products to the milk processors who are miles away (Mideva & Moronge, 2019). In addition, most of the dairy farmers live in rural areas without access to feeder roads. Further, most milk processing firms do not have proper facilities for storage therefore some milk normally goes bad on production or before production.

The cost of raw materials, transportation, production as well as distribution of final dairy products is considered to be high in most parts of the world. For instance, in India, Kumar (2016) indicates that the dairy industry was characterized by high cost that reduced firms' profitability. However, the use of material purchase plan, production plan, inventory plan as well as transportation plan reduce the total cost of supply chain by 9.8 percent. In addition, Padula (2017) indicates that use of distribution management, risk management, and inventory management practices improves efficiency in the process of supply chain, which in turn influences the performance of dairy firms.

Muhammad, Akhter and Ullah (2014) indicate that milk producers and consumers in Pakistan have been encountering economic, social as well as health losses because of the informal dairy supply chain partners. The dairy supply chain in Pakistan comprises the firm or individual that took part in milk production, processing (packaging and storage), transportation and delivery of milk products to end users via addition maximum value at smallest possible cost. However, dairy industry experiences issues such as asymmetrical information, adverse selection, poor inventory management, uncertainty, low bargaining power, poor distribution of finished products and incomplete contracts. In Bangladesh, Mor, Bhardwaj and Singh (2017) found that the main supply chain management related challenges in milk processing firms include high production downtime, absence of automation as well as outdated technology, over processing as well as operator's negligence, unbalanced production line, inappropriate demand forecast and more waiting time which is spent at milk packaging line.

The role of SCM in food manufacturing industry in Africa is to enhance movement of required information, materials and also transportation of end product from companies to markets which are close to customers (Haggblade, 2011). However, supply chain management in Africa is faced with challenges; poor road networks, poorly developed railway networks, low adoption of information technology, and inadequate equipment among others. In addition, African business centers are mostly far apart, rising cost and also making it difficult to attain economies of scale (Manuela, 2019).

In Ethiopia, Amentae, Gebresenbet and Ljungberg (2015) observed the existence of essential quantity of milk losses within the milk chain, with about 39 percent of total losses happening at union stage/cooperatives, union/cooperatives were found to be the loss hotspot in the chain. Poor handling of milk practices at collection points, poor tools employed in carrying milk, lack of immediate acceptors, poor means of transport, and unsuccessful communication with other supply chains' partner were identified as essential problems leading to milk losses. The use of information management, inventory management and collection management played a key role in minimizing costs, improving quality as well as minimizing losses in the chain. In Tanzania, Ruteri (2019) indicate that the understanding of supply chain management concept amid the milk processors appears to be

low hence, impeding them from getting the opportunity which is offered by SCM approaches such as inventory management, distribution management and information management.

In a study focusing on milk processing firms in Kenya, Mutunga (2016) observed opportunities occur in processing of quality milk products, provision of reasonable tiny-scale processing as well as packing, but for an improved performance, firms have to adopt supply chain management practices. Birachi (2016) argues that socioeconomic, firm specific and transaction cost factors as well as the type of coordination mechanisms used are important determinants of performance in milk supply chains. Suggested improvements included reduction of key transaction costs, among them, road transport infrastructure, farmer cooperative organizations, information and market search and contractual support institutions.

In addition, Mideva and Moronge (2019) discovered that supply chain management practices for instance, supplier partnerships on distribution practices and inventory management had a positive significant effect on performance of food processing companies within Kenya. In addition Okello and Were (2014) established that supply management practices influence performance of food selected manufacturing companies within Nairobi. Further, Cheraso (2016) revealed that large number of Kenyan manufacturing companies has adopted and embraced supply chain practices to a large extent like inventory management and information management to enhance their performance through maintaining long lasting relation with supplier; they have introduced customer association management as major technique for enhancing their involvement with different customers.

### **Statement of the Problem**

The customers of consumer goods are diverse and are spread over a vast geographical area and hence their supply chains must be very efficient for them to achieve an acceptable level of customer service and avoid reduction of market share (Nassiuma & Njoroge, 2014). In addition, these firms are expected to get the right quantity of the right product to the right place at the right time and at the least possible cost. However, this has been a challenge facing many milk processing firms in Kenya with main issues involving meeting delivery due dates and operating an efficient distribution network (Kenya Dairy Board, 2016). To deal with high cost of transportation, warehousing and stock holding, milk processing firms have adopted supply chain management practices such as demand forecasting, distribution management, information management and inventory management.

The dairy industry is attributed to the 4% of the Gross Domestic Product in Kenya and is responsible for 1.2 million employment opportunities, directly or indirectly. However, the sector has been performing poorly in the last five years. Mwangi and Gakobo (2018) indicate that while the annual turnover in milk processing firms increased by 10.83% the profitability reduced by 7%. In addition, the sector has been experiencing inefficiencies that drive inventories and logistics costs higher than necessary (Kenya Dairy Board, 2020). In the year 2019, milk processing firms experienced overstocking and hence could not collect all the milk from some of their farmers. As indicated by Njuguna (2019), milk farmers were pouring out their milk due to lack of market as well as poor prices. This is despite the Kenya Dairy Board (2020) report that while investment in the purchase of milk coolers has created 3.4 million liters per day capacity, only 37 per cent is being used. In addition, milk intake in Kenya increased by 7.25% between the years 2017 and 2018, which later increased by 8.13% in the year 2019. However, milk products decreased by 7.71% in the 2018 and 8.9% in 2019 (Kenya Dairy Board, 2020). Further, over the years, there has been an increase in the demand for value added products such as yogurt and fermented milk. While this increased demand is important to the processors, as value added products have also higher profits than fresh milk, it has in the last two years led to a decrease in fresh milk packaging by 12%. It is therefore important to understand supply chain management practices deployed by milk processing firms and how they affect performance.

Various studies have been conducted in Kenya on supply chain management practices and

organizational performance. Mideva and Moronge (2019) examined the impact of integrated supply chain on performance of Kenyan beverage manufacturing companies; Okello (2014) conducted a research on effect of SCM practices on performance of companies listed in NSE; and Cheraso (2016) evaluated the influence of SCM practices and operational performance of multinational manufacturing companies. However, these studies were conducted on firms dealing with non-perishable products. Nonetheless, unlike non-perishable goods, perishable goods like milk need to have much efficient supply chain so as to ensure that products get to customers at right time and in proper condition. The study hence attempts to assess the effect of supply chain management practices on the performance of Kenyan milk processing firms.

#### **Objectives of the study.**

- i. To assess the influence of demand forecasting on performance of Kenyan milk processing firms
- ii. To determine the influence of distribution management on performance of Kenyan milk processing firms

## **LITERATURE REVIEW**

### **Theoretical Review**

#### **Game Theory**

The above theory of microfinance was founded by John von Neumann and Oskar Morgenstern (1944). Emphasis of this theory is game that usually serves as a model of interactive situation amidst rational players. Moreover, game theory key is that a single player's payoff is liable on strategy which is executed by other player. Game identifies available strategies, players' identities, preferences, as well as available strategies and how the outcome is influenced by these strategies. Initially, zero-sum games were addressed by this theory, in which partakers losses or gains are equalized by those of other respondents. Game theory started with notion of integrated -strategy equilibria in 2 - individuals 0-sum games and also John von Neumann proved it. Various other assumptions or requirements may be necessary depending on the model (Bellhouse, 2015).

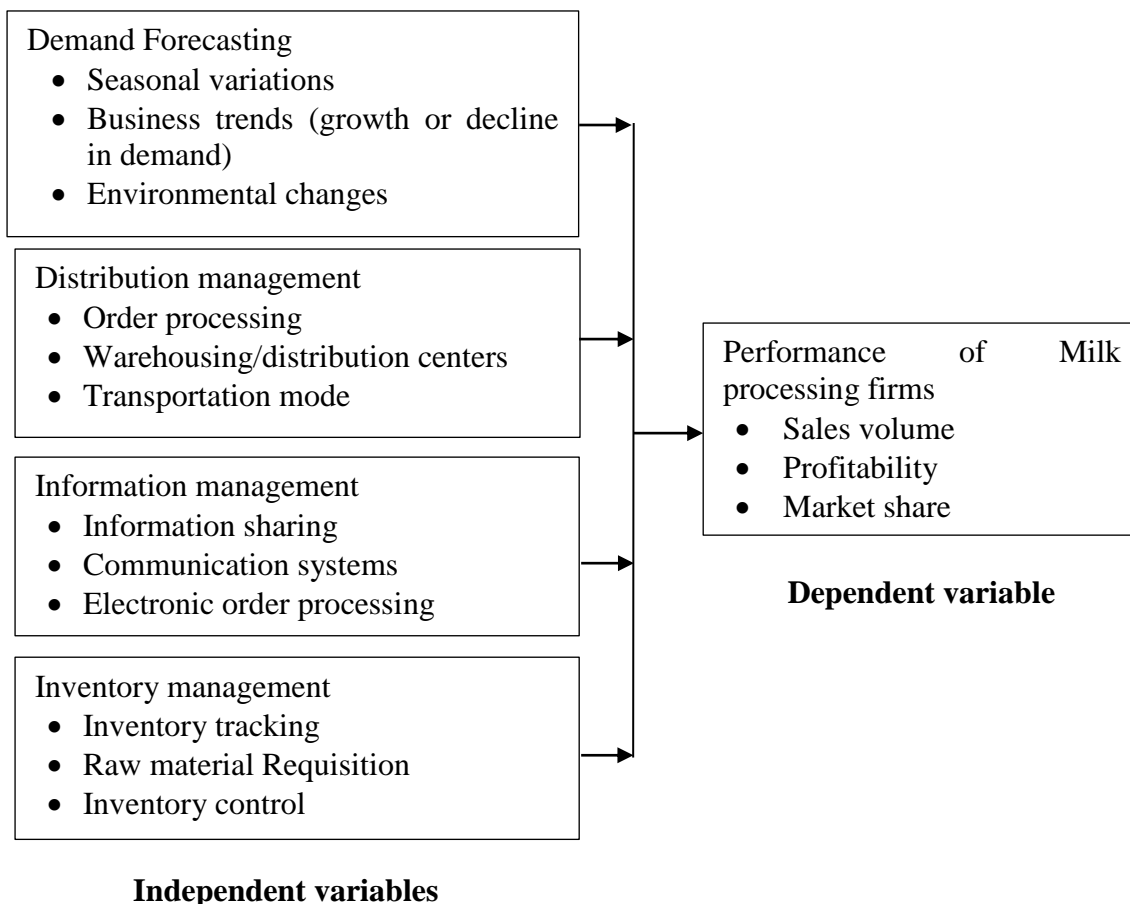
Nash Equilibrium is a product attained that, once achieved, implies payoff can be increased by any player by unilaterally changing the decisions. It can as well be considered of as "no regrets," in the sense that the player will not regret on decisions made considering the outcome after a decision is made. In most cases, Nash Equilibrium is attained over time. Nevertheless, once Nash Equilibrium is attained, it will not be turned from. Nevertheless, this normally takes place in games which have more complex components than two selections by two players (Kim, (2014). One of these numerous equilibria is attained after some trial and error in concurrent games that are usually repeated over time. In the business world, this scenario of diverse selections over time prior to attaining equilibrium is the most regularly played out when two businesses are determining highly interchangeable products' prices, such as soft drinks or airfare.

#### **Queuing Theory**

Agner Erlang Krarup founded the queuing theory in 1909. The model stresses on mathematical disciplined which is related to processes of queuing. This theory helps an individual to mathematically establish how distribution processes takes place (Sundarapandian, 2019). The model emphasis on how to obtain and compute various procurement performance measures for instance determining the duration which is spent on receiving or waiting services or average wait times in goods categories (Mayhew & Smith, 2016).

The techniques that are mostly employed to improve layout design as well as procedures of giving systems focus on decreasing the cost which is incurred when transporting materials (Asmussen, & Boxma, 2019). The reason for this is that inherent variability leads to accumulation of roles that are progressive at different stages of production and as a result influences firm's competitive strategies including cost, quality and time. Therefore, it is wise for firms to incorporate or integrate methods that simultaneously improve their layout designs as well as products transportation processes (Kingman, 2019). The theory can also be utilized to model disparities on product distribution systems by use of genetic algorithms that usually resolve issues associated with incorporated optimization. Moreover, model demonstrate how approaches of optimization can be employed to improve efficiency during distribution which is expressed in total-traveling period, total task which is in progress as well as efficiency of tools for handling material (Sundarapandian, 2019).

### Conceptual Framework



### Empirical Review

#### Demand Forecasting and Performance of Milk Processing Firms

According to Mathae, Nyang'au and Mbura (2018), demand forecasting is concerned with understanding and predicting customer demand so as to enhance supply decisions by business management as well as corporate supply chain. Demand forecasting entails quantitative methods including data usage, particularly historical data on sales, and also statistical methods from targeted

markets. In Italy, Danese and Kalchschmid (2017) carried out a research on the impact of forecasting on companies' performance. Analyses are performed by using data gathered by GMRG. Moreover, data obtained from a total sample of 343 Italian manufacturing firms in 6 diverse countries show that once companies aim at improving cost as well as delivery performances, they ought to give attention to diverse predicting variables. Additionally, findings revealed presence of positive association impact between collection as well as usage of information about market as well as other predicting variables and also the presence of negative relation influence between embracing predicting methods and use of predictions in numerous processes of decision making.

In Nigeria, Sorle (2019) examined the effect of forecasting on organizational performance. The study population comprised of 10 manufacturing firms with easily accessible time sequence data which are in operation for more than 10 years chosen from 4 sub-sectors of cement, food and beverages, rubber and oil as well as gas with operational office in 6 geo-political zones within Nigeria with 250 management employees. The study found that demand forecasting influences organization performance. The study findings established that seasonal variations and environmental changes influence organization performance.

### **Distribution Management and Performance of Milk Processing Firms**

Odondi (2017) indicates that distribution management is concerned with overseeing the movement of goods from manufacturer or supplier to the selling point. It refers to various processes and activities such as supply chain, packaging, inventory, logistics and warehousing. Distribution management entails order processing, warehousing and transportation modes. Rhone (2018) investigated on the distribution management on the performance of milking farms within Thailand central region. Collection of data was at the farm level. The study adopted descriptive survey design. A total of 967,110 dairy farm milk yield, 58,575 bacterial score and milk fat, 24,109 BTSCC as well as 58,575 milk price records from 1,034 farms were obtained from July 2013 to June 2016. Additional details of educational experiences and farm management practices were collected by use of a questionnaire in May 2016. There were 3 seasons: summer, rainy and winter. The study found that distribution management influences the performance of dairy farms located in Thailand central region. The study established that transportation mode and order processing influence performance of dairy farms in Thailand central region.

### **RESEARCH METHODOLOGY**

In a study, research design entails collection of data related to situations, events, products, people as well as individuals and organizes, depicts, tabulates as well as makes a description of the outcome. Target population is a set of events, services or people, group of households or items with similar attributes that a researcher seeks to investigate (Creswell, 2014). In any study, a sampling frame is required to enhance the identification of every person in a population and ensure that they have equal opportunities of being selected in the sample size. This study made use of a census approach, which implies that all the 6 heads of procurement, processing, sales and marketing, distribution, finance/accounting and ICT departments making a total of 138 respondents in the 23 milk processing firms in Kenya were included in the study. The present study employed semi-structured questionnaires to collect data from heads of milk collection/procurement, processing, sales and marketing, distribution, finance/accounting and ICT departments. The study made use of drop-off and pick-up later technique. Moreover, the respondents were given two weeks after which the research instruments (questionnaires) were collected. The qualitative as well as quantitative data was generated from semi structured questionnaire. Thematic analysis is a technique of analysing qualitative data. Qualitative data was analyzed by use of thematic analysis.

## RESEARCH FINDINGS AND DISCUSSION

### Response Rate

The sample size of the study comprised of 138 heads of procurement, processing, sales and marketing, distribution, finance/accounting and ICT departments in 23 milk firms located in Kenya. Out of 138 questionnaires which were distributed, 123 were duly filled and returned. The drop-off and pick-up-later method yielded the high response rate of 89.13%. According to Bryman and Bell (2011), a response rate of 75 per cent is adequate for analysis, for making conclusions and making inferences about a population. In addition, Fincham (2010) indicates that a response rate of 60% and above is acceptable for analysis. Further, Greenfield and Greener (2016) indicate that a response rate of 50% should be considered average, 60% to 70% considered adequate while a response rate of above 70% should be regarded as excellent. This implies that the response rate of 89.13% was adequate for analysis, drawing conclusions and reporting.

### Descriptive Statistics

#### Demand Forecasting

The first objective of the study was to assess the influence of demand forecasting on performance of Kenyan milk processing firms. The respondents were asked to indicate their level of agreement with various statements on demand forecasting and performance of milk processing firms in Kenya. The results were as depicted in Table 1.

From the findings, the respondents agreed with a mean of 3.894 (std. dv = 0.998) that milk supply is very high in the rain seasons. The findings agree with Mutunga (2016) findings that when the amount of rainfall received is high, the amount of milk supply increases since food for animals is readily available. However, this was contrary to Damola (2018) argument that during the rainy seasons, most roads in developing countries become impassible and hence farmers have to struggle to get their products to the milk processors who are miles away. In addition, they agreed with a mean of 3.780 (std. dv =1.036) that there is low supply of milk during the dry seasons. These findings are in line with Mutunga (2016) argument that decrease in rainfall leads to decreased supply of milk products. With a mean of 3.764 (std. dv = 0.924) the respondents indicated that variations in seasons determines the quantity of milk sold.

The respondents agreed with a mean of 3.845 (std. dv =0.983) that business trends in the milk processing industry affect the demand for milk. These findings concur with Karanu and Njeru (2016) findings that a steady increase in need for packaged as well as processed milk products within the country and rising urbanization positively influence demand for milk. With a mean of 3.829 (std. dv =0.865) the respondents agreed that demand of milk is forecasted to increase when consumers have high income. The respondents agreed with a mean of 3.780 (std. dv = 1.097) that the milk processing industry is very competitive.

With a mean of 3.894 (std. dv = 1.077) the respondents agreed that demand forecasting helps us to adequately prepare for booms in the milk processing industry. These findings agree with Mathae, Nyang'au & Mbura (2018) that demand forecasting entails quantitative methods including usage of data, and mostly statistical techniques and historical sales data to show expected future trends of the demand of a product. The respondents agreed with a mean of 3.780 (std. dv =0.936) that the demand for milk is forecasted to go down during the drought period. The respondents disagreed with the statement indicating that environmental changes are put into consideration when forecasting future demand for milk as shown by a mean of 2.123(std. dv =1.209).



**Table 1: Aspects of Demand Forecasting**

	1	2	3	4	5	Mean	Std. Deviation
Variations in seasons determines the quantity of milk sold	2.4	8.1	17.9	53.7	17.9	3.764	.924
Milk supply is very high in the rain seasons	2.4	9.8	11.4	48.8	27.6	3.894	.998
There is low supply of milk during the dry seasons	4.1	8.1	17.9	45.5	24.4	3.780	1.036
Demand of milk is forecasted to increase when consumers have high income	2.4	6.5	13.0	61.8	16.3	3.829	.865
Business trends in the milk processing industry affect the demand for milk	4.1	6.5	13.0	53.7	22.8	3.845	.983
The milk processing industry is very competitive	5.7	8.1	14.6	45.5	26.0	3.780	1.097
Environmental changes are put into consideration when forecasting future demand for milk	30.9	22.8	21.1	17.1	8.1	2.123	1.209
The demand for milk is forecasted to go down during the drought period	4.1	6.5	13.0	60.2	16.3	3.780	.936
Demand forecasting helps us to adequately prepare for booms in the milk processing industry	5.7	6.5	9.8	48.8	29.3	3.894	1.077
<b>Aggregate</b>						<b>3.632</b>	<b>1.014</b>

The respondents were asked to indicate challenges related to demand forecasting in their organizations. From the findings, they indicated that one of the challenges was lack of demand forecasting skills and software in their organization. In milk processing firms there were a few people who could conduct accurate demand forecasting. In addition, they indicated that their organizations did not have software and applications to conducted demand forecasting. Another challenges faced in demand forecasting was the use of incomplete data set. Data obtained from supplies and customers is most of the times incomplete. In addition, the market trend is also affected by other external environmental factors. For instance, during political violence the use and distribution of milk to different parts of the country reduces.

The respondents were requested to indicate was of improving demand forecasting in their organizations. According to the findings, they indicated that milk processing firms should recruit individuals with demand forecasting skills. In addition, they can seek for the services of consultants dealing with market surveys and demand forecasting. The respondents also suggested that milk processing firms should develop exit surveys for milk distributors and collection centers that can be used to obtain information on market trends.

### Distribution Management

The second objective of the study was to determine the influence of distribution management on performance of Kenyan milk processing firms. The respondents were asked to indicate their level of agreement with various statements on distribution management and performance of milk processing firms in Kenya. The results were as presented in Table 2.

From the findings, the respondents indicated with a mean of 3.829 (std. dv =0.955) that they were satisfied with the level of management of order processing in their firms. This is in agreement with Odondi (2017) who emphasis on the importance of proper order processing to ensure efficiency in picking of orders from customers, processing the orders, parking and delivering the milk products to the respective clients in right quantity as well as the right time. In addition, the respondents agreed with a mean of 3.764 (std. dv =0.992) that order processing is done on the basis of first come first

serve. Further, the respondents disagreed with statement indicating that their firms have automated systems for processing orders as shown by a mean of 2.239 (std. dv =1.062).

With a mean of 3.951(std. dv =1.100) the respondents agreed that their firms have adequate milk refrigeration machines. The respondents also agreed with a mean of 3.813 (std. dv =0.994) that there were many centers for collecting milk and distributing processed milk. These findings disagree with Mideva & Moronge (2019) argument that most milk processing firms do not have proper facilities for storage therefore some milk normally goes bad on production or before production. Also, the respondents agreed with a mean of 3.585 (std. dv =1.115) that all milk distribution centers are properly managed from the headquarters.

The respondents agreed with a mean of 4.065 (std. dv =1.076) that their firms have adequate vehicles to transport processed milk. Also, the respondents agreed with a mean of 3.845 (std. dv =1.016) that their firms have outsourced transportation of processed milk. Further, the respondents agreed with a mean of 3.748 (std. dv =0.910) that processed milk is mainly transported through the roads. According to Zvirbule-Berzina and Rozentale (2015) owing to the use of roads in transportation, the risk of damage of products increases and the availability of products on store shelves decreases.

**Table 2: Aspects of Distribution Management**

	1	2	3	4	5	Mean	Std. Deviation
Am satisfied with the level of management of order processing in our firm	2.4	8.1	16.3	50.4	22.8	3.829	.955
Our firm has automated systems for processing orders	34.1	32.5	10.6	16.3	6.5	2.239	1.062
Order processing is done on the basis of first come first serve	5.7	6.5	9.8	61.8	16.3	3.764	.992
Our firm has adequate milk refrigeration machines	12.2	19.5	6.5	35.8	26.0	3.951	1.100
There are many distribution centers for collecting milk and distributing processed milk	4.1	6.5	16.3	50.4	22.8	3.813	.994
All milk distribution centers are properly managed from the headquarter	8.9	6.5	17.9	50.4	16.3	3.585	1.115
Processed milk is mainly transported through the road	4.1	4.9	17.9	58.5	14.6	3.748	.910
Our firm has adequate vehicles to transport processed milk	22.8	35.8	24.4	7.3	9.8	4.065	1.076
Our firm has outsourced transportation of processed milk	4.1	4.9	21.1	42.3	27.6	3.845	1.016
<b>Aggregate</b>						<b>3.649</b>	<b>1.024</b>

The respondents were asked to indicate the challenges they faced in relation to distribution management in their organizations. From the findings, the respondents indicated that there were challenges in order processing, which was considered to be slow. Most of the milk processing firms have one individual processing the orders manually. In addition, some of the orders from the customers were not received on time and hence they were not delivered on time. The main mode of transport used in the collection of milk and distribution of milk products was road. Traffic in most of the urban areas delayed delivery to distribution centers in major towns.

The respondents were requested to suggest ways of improving distribution management in their organization. From the findings, they indicated that milk processing firms should automate the ordering process so as to increase accuracy and efficiency of order deliveries. In addition, the automation of the ordering process will help distributors to make their orders at their own convenience. The respondents also suggested the use of other modes of transport like the railway in

distributing milk products to locations that are far from the processing location.

#### Correlation Analysis

Correlation coefficient measures the strength of association between independent and dependent variables. The correlation coefficient values are in the range of +1 and -1. In this study, Pearson product-moment correlation coefficient was used to determine the association between dependent variable (performance of milk processing Firms) and independent variables (demand forecasting, distribution management, information management and inventory management).

As shown in table 3, there was positive and significant association between demand forecasting and performance of milk processing firms in Kenya ( $r=0.786$ ,  $p\text{-value}=0.000$ ). These findings concur with Danese and Kalchschmid (2017) argument that Demand forecasting had a positive association with performance of firms. The findings also agree with Sorle (2019) findings that demand forecasting measured in terms of seasonal variations and environmental changes influences organization performance.

The results show that distribution management has a positive and significant association with performance of milk processing firms in Kenya ( $r=0.841$ ,  $p\text{-value}=0.000$ ). These findings are in line with Rhone (2018) findings that distribution management significant influences performance of milking farms within Thailand central region. The findings also concur with Odondi (2017) findings that physical distribution management has an effect on sales performance of dairy processing firms in Nairobi.

In addition, the results show that information management has a positive and significant association with performance of milk processing firms in Kenya ( $r=0.819$ ,  $p\text{-value}=0.000$ ). These findings are in line with Tomaszewski *et al* (2015) findings that information management influenced performance considerably. The findings are also in line with Lemma, Singh and Kaur (2015) findings that information management influences supply chain cooperation of Ethiopian dairy industries.

Also, the results show that inventory management has a positive and significant association with performance of milk processing firms in Kenya ( $r=0.886$ ,  $p\text{-value}=0.000$ ). The findings agree with Damola (2018) findings that inventory management has a significant effect on productivity of Fan milk Nigeria private limited company. In addition, the findings concur with Efiok, Etimb and Ime (2015) observation that inventory management had a considerable effect on performance.

**Table 3: Correlation Coefficients**

		Performance of Milk Processing Firms	Demand Forecasting	Distribution Management
Performance	Pearson Correlation	1		
	Sig. (2-tailed)			
	N	123		
Demand Forecasting	Pearson Correlation	.786**	1	
	Sig. (2-tailed)	.000		
	N	123	123	
Distribution Management	Pearson Correlation	.841**	.189	1
	Sig. (2-tailed)	.000	.063	
	N	123	123	123
	Sig. (2-tailed)	.000	.029	.038
	N	123	123	123

### Regression Analysis

Regression analysis was used to show the weight of the relationship between the independent variables (demand forecasting, distribution management, information management and inventory management) and the dependent variable (performance of milk processing firms). Regression analysis covers the model summary, analysis of variance and regression coefficients.

The R-squared is the variance proportion in the dependent variable that can be explained by the independent variable: the larger the R-squared the larger the effect of the independent variable on the dependent variable. As depicted in Table 4.9, the R squared for the relationship between supply chain practices and performance of milk processing firms was 0.7814. This implied that 78.14% of the variation in the dependent variable (performance of milk processing firms) could be explained by the independent variables (demand forecasting, distribution management, information management and inventory management).

**Table 4: Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.884 <sup>a</sup>	0.7814	0.787	0.11335

a. Predictors: (Constant), Inventory Management, Information Management, Demand Forecasting, Distribution Management

The analysis of variance was used to determine whether the regression model is a good fit for the data. As depicted in Table 4, the F-calculated (273.743) was greater than the F-critical, which was 2.447. The p-value 0.000 was less than the significant level (0.05), which implied that the model was a good fit for the data and hence it can be used to predict the influence of independent variables (demand forecasting, distribution management, information management and inventory management) on dependent variable (performance of milk processing firms).

### Analysis of Variance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	106.862	4	26.715	275.412	.000 <sup>b</sup>
	Residual	11.516	118	0.097		
	Total	118.378	122			

a. Dependent Variable: Performance of Milk Processing Firms

b. Predictors: (Constant), Inventory Management, Information Management, Demand Forecasting, Distribution Management

The regression equation was;

$$Y = 0.566 + 0.209X_1 + 0.457X_2 + 0.239X_3 + 0.658X_4$$

The results in Table 5 indicate that holding supply chain practices constant, performance of milk processing firms would be having an index of 0.566. The results also indicated that demand forecasting has a positive and significant effect on performance of milk processing firms in Kenya as shown by a regression coefficient of 0.209. This implies that a unit improvement in demand forecasting would lead to a 0.209 improvement in performance of milk processing firms in Kenya. Since the p-value (0.035) was less than the significance level (0.05), the effect of demand forecasting on performance of milk processing firms in Kenya was significant. These findings agree with Mathae, Nyang'au and Mbura (2018) argument that demand forecasting, measured in terms of seasonal variations and environmental changes, has an effect on performance of Kenyan milk processing firms. The findings also concur with Mutunga (2016) findings that demand forecasting has a positive effect

on performance of selected milk processing firms.

The findings also indicated that distribution management has a positive and significant effect on performance of milk processing firms in Kenya as shown by a regression coefficient of 0.457. This implies that a unit improvement in distribution management would lead to a 0.457 improvement in performance of milk processing firms in Kenya. Since the p-value (0.003) was less than the significance level (0.05), the effect of distribution management has a positive and significant effect on performance of milk processing firms in Kenya. These findings agree with Chesio and Makokha (2016) observation that distribution channels have an effect on the performance of supply chain of the new Kenya cooperative creameries located in Eldoret. The findings also agree with Mwangi (2018) findings that distribution management influence performance of the milk processing companies.

### Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.566	0.149		3.799	0.000
	Demand Forecasting	0.209	0.087	0.218	2.402	0.035
	Distribution Management	0.457	0.129	0.463	3.543	0.003
	Information Management	0.239	0.088	0.255	2.716	0.012
	Inventory Management	0.658	0.151	0.661	4.358	0.000

a. Dependent Variable: Performance of Milk Processing Firms

### SUMMARY, CONCLUSION AND RECOMMENDATIONS

#### Conclusion

The study concludes that demand forecasting has a positive and significant effect on performance of milk processing firms in Kenya. This implies that an improvement in demand forecasting would lead to an improvement in performance of milk processing firms. The study established that seasonal variations, business trends (growth or decline in demand) and environmental changes had an effect on the performance of milk processing firms in Kenya.

The study also concludes that distribution management has a positive and significant effect on performance of milk processing firms in Kenya. This implies that an improvement in distribution management would lead to an improvement in performance of milk processing firms. The study established that order processing, warehousing/distribution centers and Transportation mode had an effect on the performance of milk processing firms in Kenya.

#### Recommendations

The study found that some of the firms were not conducting demand forecasting due to lack off or inadequacy of staff with demand forecasting skills. The study recommends that milk processing firms should recruit individuals with demand forecasting skills. In addition, they can seek for the services of consultants dealing with market surveys and demand forecasting.

The study found that milk processing firms had not adopted order processing systems and hence the ordering process was slow and at times inaccurate. Thus, the study recommends that milk processing firms should automate the ordering process so as to increase accuracy and efficiency of order

deliveries. In addition, the automation of the ordering process will help distributors to make their orders at their own convenience.

## REFERENCES

- Adams, J. (2014). *Research methods for business and social science students*. New Delhi: ISAGE Publications. I
- Adams, J. (2014). *Research methods for business and social science students*. New Delhi: SAGE Publications.
- Ajwang, O. F. (2014). Factors influencing performance of smallholder dairy farmers' in kiptaren division of Nandi County, Kenya. *Management of Environmental Quality*, 30(6), 1279-1296.
- Amentae, T.K., Gebresenbet, G. & Ljungberg, D. (2015). Characterizing Milk Supply and Marketing Chains and Losses in Wolmera and Ejere Districts of Ethiopia. *Journal of Service Science and Management*, 8(6), 1-21.
- Asmussen, S. R.; & Boxma, O. J. (2019). Editorial introduction. *Queueing Systems*. 63 (1–4): 1–2.
- Babbie, E.R. (2017). *The Basics of Social Research*. Boston: Cengage Learning.
- Bellhouse, D. R. (2015). Le Her and Other Problems in Probability Discussed by Bernoulli, Montmort and Waldegrave. *Statistical Science. Institute of Mathematical Statistics*. 30 (1), 26–39.
- Berut, Z. J., Namusonge, G. S., & Nambuswa, E. M. (2018). influence of information sharing on performance of new Kenya Cooperative Creameries Limited. *International Journal of Social Sciences and Information Technology*, 4(8), 99-110.
- Bhattacharjee, A. (2012). *Social Science Research: Principles, Methods, and Practices*. New York: Free Press.
- Birachi, E.A. (2016). Determinants of Coordination and Supply Chain Performance Supply Chain Performance: The Case of Fresh Milk Supply Chains in Kenya. *International Journal of Social Sciences and Information Technology*, 4(1), 2622-2645.
- Bryman, A. & Bell, E. (2011). *Business Research Methods*. London: Oxford University Press.
- Bryman, A. & Cramer, D. (2012). *Quantitative Data Analysis with SPSS Release 8 for Windows*. New York: Routledge
- Chesio, B., & Makokha, E. N. (2016). Influence of Distribution Channels on Supply Chain Performance: A case study of the new Kenya cooperative creameries Eldoret. *European Journal of Business and Management*, 8(30), 112-118.
- Claude, S., & Warren, (2011). *The Mathematical Theory of Communication*. University of Illinois Press.
- Creswell, J.W. (2014). *Research design. Qualitative, quantitative, and mixed methods approaches*. Thousand Oaks CA: Sage.
- Damola, O. A. (2018). Impact of stock management on the productivity of business organizations: a case study of fan milk Nigeria plc. *Benchmarking: An International Journal*, 27(1), 319-346.
- Danese, P., & Kalchschmid, M. (2017). The impact of forecasting on companies' performance: Analysis in a multivariate setting. *International journal of production economics*, 13(3), 143-154.
- Dombrowski, U.; Mielke, T (2014). Lean Leadership 15 Rules for a Sustainable Lean Implementation. *Procedia CIRP*, 17, 565–570.

- Dost, M. K. B., Gilaninia, A. R. S., Ismail, K. B., & Akram, M. W. (2017). The impact of knowledge management's practices on supply chain performance of the dairy sector in Central Punjab: a mediating role of decentralization. *Journal of economic Research*, 31(1), 123-145.
- Efiok, N. E., Etimb, J. J., & Ime, J. U. (2015). Inventory management practices and operational performance of flour milling firms in Lagos, Nigeria. *International Journal of Supply and Operations Management*, 1 (4), 392-406.