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ABSTRACT

A lot of research has been done on JIT use in manufacturing industries in the developed countries. However, there is limited research done on JIT implementation in manufacturing industries in the developing countries. For example, in Kenya limited research has been done on the role of JIT in realization of an efficient supply chain management in cooking oils manufacturing industries in Kenya. The aim of this study was to determine the role of JIT in realization of an efficient supply chain management, to determine the role of continuous improvement, to establish the role of inventory management, to ascertain the role of quality management and to evaluate the role of supplier relationship management in realization of an efficient supply chain management in Bidco Oil Company. The research was carried out through a cross-sectional research survey design whereby the target population comprised of Bidco Oil Company top management and staff. The study used stratified random sampling and simple random sampling where 10% of the target population representative of the entire population was studied. A Questionnaire with close-end questions and likert scales was used as the research instrument by being administered to the respondents and collected after due completion by the researcher. The collected data was analyzed using Statistical Package for the Social Sciences (SPSS version 21) frequencies, percentages, means, standard deviations and regression analysis. The study findings revealed that the employed continuous improvement, inventory management, quality management and supplier relationship management significantly affect supply chain management efficiency. The conclusions from the study indicated that continuous improvements followed by supplier relationship management are the major factors affecting efficient supply chain management. Recommendations of the study included; improvement on the level of minimization of non-value adding work, application of inventory management techniques based on economic order quantity, integration of quality management techniques in the production processes and finally adoption of effective supplier management techniques in the supply chain to enhance efficiency.

INTRODUCTION

Background to the study

Just-in-time (JIT) is a philosophy of elimination of wastes which involves having the right items of the right quality and quantity in the right place and at the right time (Talari, 2013). Just-in-time is also defined as producing and delivering finished goods just in time to be sold, sub-assemblies just in time to be assembled into finished goods, and purchased materials just in time to be transformed into fabricated parts (Schonberger, 1982).The American Production and Inventory Control Society defines JIT as a philosophy of manufacturing excellence based on pursuit of the planned elimination of all waste and consistent improvement of productivity. It encompasses the successful execution of all manufacturing activities required to produce a final product from design engineering to delivery and including all stages from conversion of raw material onward (APICS, 1992).This definitions show a common element where JIT is described as a philosophy for ensuring optimized supply chains.

Initially JIT was an inventory control technique that required maintaining zero inventories in organization. However, the use of JIT has evolved to incorporate management principles like kaizen (continuous improvement), inventory management, quality management, use of technology (ERP), employee involvement, elimination of wastes and supplier relationship management. The above new concepts have facilitated organizations to focus on the ultimate objective of JIT delivery, smoothly synchronized continuous flow (purchasing and production) keyed to final demand, perfect quality of incoming materials, goods in-process and finished products (Kootanaee & Babu, 2013).

Global Perspective of Just-in-Time

There are various researches done on JIT implementation in manufacturing, service and construction industries that provide literature on its benefits and problems. Kannan and Tan (2005) found out that Just-In-Time Production system in the recent years enabled organization to increase production operation outcome and to get optimal supply chains. They labeled it as the newest phenomena in industrial management and engineering, which has got much more attentions in last decade in the world industrial societies while it is still considered a new idea in the supply chain management field. Although this view dates back to several last years and many organizations in the world especially auto producing companies and the like have accepted this system and have successfully applied its rules and techniques in all activities of their organization such as dealing, producing and so on, there are lots of other industrial organizations and institutions in many countries where owners, managers, experts, and employees have got no familiarity with this phenomenon.

Ebrahimpour and Schonberger (1984) were the first to discuss the applicability of JIT in developing countries. They argued that developing countries desperately need to improve the quality and productivity of their goods to survive and to reduce the gap with developed countries. Just-in-time system would help solve many of the problems those companies face. Recently, additional studies on JIT implementation in developing countries have been conducted (Salaheldin, 2005; Adeyemi, 2010; Oral, Mistikoglu, & Erdis, 2003; Gyampah & Gargeya, 2001). Oral et al. (2003) argued that the construction industry in developing countries could also benefit from JIT in terms of substantial productivity and quality problems. However, the benefits of JIT cannot be achieved without initial investments. For example, reducing setup time may require more sophisticated equipment, and more skilled employees will result in higher training costs (Polat & Arditi, 2005).The ideal goal of a JIT system is to have the entire production-of-business cycle operate without interruption and without non-value-added time costs.

Local perspective of Just-in-Time adoption

In Africa Adeyemi (2010) conducted a research on JIT production systems in the Nigerian context and

found out that very few companies are using JIT to optimize their supply chains while most companies are unaware of JIT existence and operation. The survey conducted by him revealed that JIT is just as workable in Nigeria. He concluded that, if Nigeria is to develop and be able to compete at the international market, its manufacturing sector has to acknowledge JIT and work towards achieving it. Salaheldin (2005) studied JIT implementation in Egyptian manufacturing firms and concluded that JIT can be successfully implemented in Egyptian manufacturing companies with thoughtful attention applied to each individual company. The value of the study was to contribute to what is a very limited literature on JIT in the Egyptian context.

Omondi (2008) did the application of lean thinking to business process management and found out that lean management and application of related tools, equipment and techniques is a continuous process at Kenya Revenue Authority highly driven by the need to improve service delivery and tax collection while netting those evading taxes.

History of Bidco Oil Company

Bidco Oil Refineries is one of East Africa's leading FMCG Company with market leadership in cooking oil and detergents with acclaimed brands such as Elianto, Kimbo, Power Boy and many other household names. Established in 1985, BIDCO Oil Refineries is located in Thika town with subsidiaries in Uganda (Jinja Complex Refinery) and Tanzania (Shivji & Sons Limited.). Its main oil/fat products include Golden fry, Chi po, Chipsy, Mallo, Gold Band and 'Biddy Margarines. BIDCO's growth strategy involves both expansion and acquisition as was the case with the purchase of Elianto Oil from Unga in 1998; Kimbo, Cowboy, Veebol and Tiger brands from Unilever in 2002. In 1991, BIDCO moved its operations to Thika with the opening of BIDCO Oil Refineries plant. This marked a turnaround for BIDCO as it now concentrated on its core competencies of manufacturing and marketing edible oil, fats and soaps. Between 1994 and 1997, BIDCO increased its capacity by 500%. This growth led to the acquisition of Elianto business from Unga Group Ltd in 1998. In a year's time this business grew exponentially by 400%. In the year 2002, BIDCO's prowess was demonstrated when the company acquired leading brands in East Africa from Unilever. BIDCO has maintained all these brands under the same superior quality providing total customer satisfaction (Rajiv & Jagongo, 2014).

It has adopted various JIT principles in its supply chain management. For example, the company is an ardent follower of Kaizen, a Japanese management technique that advocates continuous improvements without making any additional investments; through which the company has been able to increase production in its Thika Factory from 100 to 800 tonnes a day without adding any new buildings. The company is ISO 9001 certified and has been consistent in successful development and commercialization of new innovative products almost on an annual basis, the latest being Biddys Margarine launched early 2007, Nuru Soap and Olive Gold Oil in December 2010.The use of Enterprise Resource Planning (ERP) which is been managed by SAP has enabled Bidco to take numerous steps to reinforce its manufacturing and supply chain management in the region. System Application and Product (SAP) has also helped Bidco provide powerful solutions to the most challenging business issues while still unlocking more opportunities for the Bidco's market (Kenya National Bureau of Statistics, 2011).

Quality assurance refer to those planned and systematic activities implemented within the quality systems and demonstrated as needed to produce adequate confidence that an entity will fulfill requirements for quality and is concerned defects prevention involves a number of approaches: quality systems (ISO 9000), new design control, design for manufacturing processes, incoming material control and supplier appraisal (Kumar, 2010). Bidco has very high standards of quality which has enabled it to attain certification for ISO 22000:2005, ISO 18000

certification in 2007 (for Occupational Health and Safety Management System Specification), ISO 9002/1 in 1999 (for Quality Management Systems) and ISO 14000 in 2004 (for Environmental Management). Quality management is well monitored from the acquisition of the raw materials to the production processes so as to eliminate muda of rework (Kenya National Bureau of Statistics, 2011).

A JIT system requires an organization to have a good supplier relationship management. Suppliers are viewed as an extended operation preceding the manufacturing processes to ensure production is as close as possible to a continuous process from receipt of raw materials through to the shipment of raw materials (Hughes, 2010). Bidco is actively supporting and encouraging local farming of cooking oil crops like sunflower and palm trees (Export Processing Zones Authority, 2005). In order to ensure steady supply of its raw materials, the company is pro-actively promoting the growing of maize, sunflower and soya; and is currently working with 30,000 farmers across East Africa under contract farming. In addition, the company has established an integrated oil palm development project in Kalangala and along the shores of Lake Victoria in Uganda. This has increased cooperation with its suppliers and improved mutual trust which is healthy for a good supplier relationship. Agricultural products required in processing of cooking oils like sunflower and palm tree have long growing and maturing cycles and others very short cycles between picking and sale to the end user. Shelf life for the end products can be short and for other products, the procurement cycles are well over a year, with procurement being executed through large scale commodity markets. Food processing lead times that is from the time a machine is turned on to make, to the final packaging can however be quite short. These many variable combinations of lead times, growing cycle times and production lead times add complexity to an already complex business (Chan & Wang, 2009). These complexities should be well handled through elimination of wastes to ensure efficiency in the SCM of Bidco.

Statement of the problem

Just-in-time philosophy is increasingly occupying a significant place in the operations strategy of many companies. Organizations in the developed countries have found it inevitable to adopt JIT as a mode to adapt to the changing business environment. Adoption of just-in-time by these organizations has resulted in a competitive edge in the global market through consistent supply of high quality products at low prices and short lead time (Gupta, 2012). According to Adeyemi (2010) in the developing countries' industries, there is a lot of confusion as to how to organize an effective JIT system to optimize supply chain operations attributed to the limited research on JIT in their context.

Published research papers on JIT (Hou, Chan, & Wang, 2011; John, 2013; Kootanaee, Babu, & Talari, 2013) have tried to identify JIT elements and whether or not they are associated with Japanese culture and their applicability in the developed countries. Hou, Chan, and Wang (2011) carried out a case study of the just-in-time system in the Chinese automobile industry. The research findings reveal that JIT system has a significant positive impact on information system, production planning, inventory management, quality management and supplier management.

Kootanaee, Babu, and Talari (2013) discuss in depth the implementation of JIT in United States manufacturing firms. The researchers' objectives were to acquaint the reader with the overall JIT concept and the factors necessary for its implementation. Their key finding was that JIT reduced inventory levels and warehouse space required in all the seven firms studied. John (2013) argues that the widespread adoption of JIT in the early 1980's is a key to explaining the growth in U.S. manufacturing trade. The researcher attributes three conspicuous changes in U.S. manufacturing: the growth of the trade share of gross output, the decline in the inventory-to-sales ratio, and the

increased use of airplane transportation to JIT implementation.

Other researchers have focused on just-in-time inventory systems rather than addressing in context how JIT in the recent years have evolved to incorporate management principles like elimination of wastes, Inventory Management, Total Quality Management (TQM),Kaizen (continuous improvement) and supplier relationship management which facilitate organizations to realize efficiency in their supply chain management . For example, Satyendra and Singh (2013) carried out a research in Indian firms on JIT being a strategic tool for inventory management while Kros (2007) studied the impact of just-in-time inventory systems on the first tier suppliers. These researchers recommended that the impact of JIT on quality management and supplier relationship management to be a direction for future research motivating the researcher's interest for this study.

In Africa Adeyemi (2010) conducted a research on JIT production systems in the Nigerian context and found out that very few companies are using JIT to optimize their supply chains while most companies are unaware of JIT existence and operation. The survey conducted by him revealed that JIT is just as workable in Nigeria. He concluded that, if Nigeria is to develop and be able to compete at the international market, its manufacturing sector has to acknowledge JIT and work towards achieving it. Salaheldin (2005) studied JIT implementation in Egyptian manufacturing firms and concluded that JIT can be successfully implemented in Egyptian manufacturing companies with thoughtful attention applied to each individual company. The value of the study was to contribute to what is a very limited literature on JIT in the Egyptian context.

Mutheke, Magutu and Akelo (2014) carried out a study on lean supply chain practices and supply chain responsiveness among vegetable oil processing firms in Kenya. The study findings established that the lean supply chain practices used in vegetable oil processing firms in Kenya were demand management practices, waste management practices, standardization practices, behavioral practices, quality inspection activities and quality assurance activities;

This shows that there is limited research on JIT in the developing countries as attested by Adeyemi (2010) and Salaheldin (2005). In Kenya, for example, a research gap exists where limited research has been done on the role JIT in realization of an efficient supply chain management in food manufacturing industries. This study sought to address the knowledge gap in the Kenyan context by determining the role of JIT in realization of an efficient supply chain management in Bidco Oil Company.

General Objective

The general objective of this study was to determine the role of just-in-time in realization of an efficient supply chain management in Bidco Oil Company.

Specific Objectives

The specific objectives of this study were:

1. To determine how continuous improvement leads to an efficient supply chain management in Bidco Oil Company.
2. To establish how inventory management contributes to an efficient supply chain management in Bidco Oil Company.
3. To ascertain how quality management results to an efficient supply chain management in Bidco Oil Company.
4. To evaluate how supplier relationship management leads to an efficient supply chain management in Bidco Oil Company.

LITERATURE REVIEW

Introduction

The chapter is organized under the following sub-headings: Introduction - where the chapter layout is presented; Theoretical Framework - where theories relevant to the study are linked with each variable and objectives of the study to be

undertaken; Conceptual Framework – which discusses the relevant variables postulated by the theories, the research objectives and the current literature based on each of the relevant variables of the study. The end of this chapter includes a detailed critique of the existing literature relevant to the study, summary and research gaps.

Theoretical Framework

This section offers the theoretical foundation of the study with an aim of determining the existing theories that explain the JIT concepts that seek to optimize supply chain management. A theoretical framework is defined as a concrete examination of the amount of theory that has accumulated in regard to an issue, concept, or phenomena and is necessary in order to help establish what theories already exist, the relationships between them to what degree the existing theories have been investigated and to develop new hypothesis to be tested (Kennedy, 2007).

Theory of Constraints

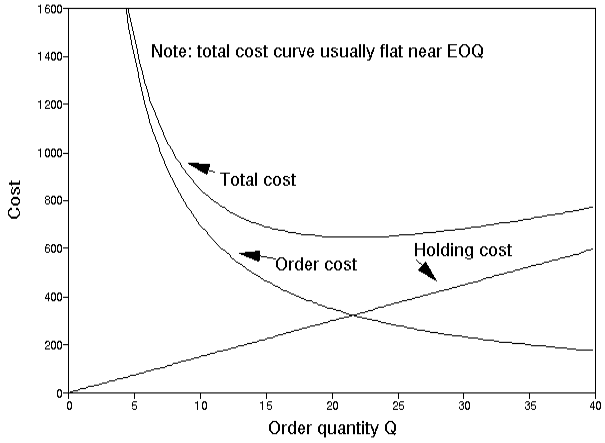
The Theory of Constraints (TOC) was developed during the 1980s by a physicist who had an outstanding knowledge of systems, Eliyahu M. Goldratt, and released it in the form of the business novel *The Goal* in 1984. However, the origins of the TOC relate to the development of a software production schedule during the 1970s, known as Optimized Production Technology, also designed by Goldratt. Nowadays, according to Gupta and Boyd (2008), the TOC is defined as a management philosophy that provides a focus for continuous improvement that result in enhanced organizational performance. Ainapur and Singh (2011) defined the TOC as clearly identifying an orientation to gain along with its three dimensions: mental models, measures and methodology. In manufacturing processes Theory of Constraint focuses on the process that slows the speed of product through the system.

According to Inman, Sale, and Green Jr. (2009) Theory of Constraints focuses on five steps: (1) the first is to identify the constraint. The constraint is identified through various methods. The amount of work-in-queue ahead of a process operation is a classic indicator. Another example is operations where multiple products are processed simultaneously or batch processes,(2) Once the constraint is identified the process is improved or otherwise supported to achieve the most capacity out of the existing process, without major expensive upgrades or changes. The vernacular used for this step is to exploit the constraint, (3) next step to subordinate other processes to the pace of the constraint. Some processes will sacrifice individual productivity for the benefit of the entire system. Subordinate processes are usually found ahead of the constraint in the value stream. Processes after the constraint are not a major concern. They are already producing under capacity, or else they would be the constraint, (4) If the output of the overall system is not satisfactory, then further improvement is required. Major changes to the constraint are now considered. Changes can involve capital improvement, reorganization, or other major expenditure of time or money. This is called elevate the constraint. This step is intended to take whatever action is necessary to eliminate the constraint, (5) once the constraint is broken; the system constraint is moved to another location in the system, or process chain. Now is the time to repeat the cycle of improvement. Performance of the entire system is re-evaluated. Searching for the new constraint process, exploiting the process, subordinating and elevating. Ainapur and Singh (2011) states that focusing on the constraint makes this methodology produce positive effects on the flow time of the product or services through the system. Reduction of waste in the constraint creates the effect of increasing throughput, and improving throughput time. When the constraint is improved, variation is reduced, and quality is improved. Constraint focus does not require intimate knowledge of data analysis. Involvement by a great number of people is not needed to understand elements of the system. A few people with the power to change things are necessary. However, the effort can be localized with minimum

workforce. In this study the theory of constraints was tested to determine how just-in-time leads to continuous improvement in Bidco Oil Company supply chain management.

The Basic EOQ Model

Economic order quantity is the order quantity that minimizes total inventory holding costs and ordering costs. The most common inventory situation faced by manufacturers, retailers, and wholesalers is that stock levels are depleted over time and then are replenished by the arrival of a batch of new units. A simple model representing this situation is the following economic order quantity model or, for short, the EOQ model (Edward, 2010). It sometimes is also referred to as the *economic lot-size model.* Units of the product under consideration are assumed to be withdrawn from inventory continuously at a *known constant rate,* denoted by *a*; that is, the demand is *a* units per unit time. It is further assumed that inventory is replenished when needed by ordering (through either purchasing or producing) a batch of fixed size (*Q* units), where all *Q* units arrive simultaneously at the desired time. For the *basic EOQ model* to be presented first, the only costs to be considered are (*K)* setup cost for ordering one batch, *(c)* unit cost for producing or purchasing each unit, *(h)* holding cost per unit per unit of time held in inventory (Onawumi, Oluleye, & Adebiyi, 2011).The objective is to determine when and by how much to replenish inventory so as to minimize the sum of these costs per unit time. It's assumed that continuous review is used so that inventory is replenished whenever the inventory level drops sufficiently low. First, shortages are not allowed. With the fixed demand rate, shortages can be avoided by replenishing inventory each time the inventory level drops to zero, and this also will minimize the holding cost (Edward, 2010). To summarize, in addition to the costs specified above, the basic EOQ model makes the following assumptions: (1) A known constant demand rate of *a* units per unit time,(2) The order quantity (*Q*) to replenish inventory arrives all at once just when desired, namely, when the inventory level drops to 0,(3) Planned shortages are not allowed,(4)No backlogging,(5) The holding costs are constant per unit per year,(6) The variable ordering costs are constant per item ordered, and (7) The ordering costs are constant per delivery.



Economic Order Quantity Model

From the EOQ model the following formulas are derived; Holding cost per cycle = $\frac{hQ^2}{2a}$, therefore, Total cost per cycle = *K +Cq +* $\frac{hQ^2}{2a}$ so that EOQ formula (*Q)*=$\frac{\sqrt{2aK}}{h}$. The study used this model to establish how just-in-time lowers inventory investments in Bidco Oil Company.

Total Quality Management Theory

The Total Quality Management Philosophy of William Edwards Deming focus on the notion that quality is the main determinant of a company's success, and is influenced by several components of an organization and its systems (Fotopoulos, Christo, & Evangelos, 2010). In addition to this, Deming went against the popular business conception of quality and its relationship to a company. Deming, a college statistician and pioneer of total quality management theories and practices, used this concept of quality as an instrument to increase the productivity and success of organizations throughout Japan in the 1950s, as well as production improvements during World War II here in the United States. The varieties of methods in which this quality concept

can be implemented into an organization are solely dependent on the organizational mind-state. According to Hur and Hyung (2009) one of the most fascinating aspects of Deming's teachings, one that radically departs from conventional thinking, is his treatment of the relationships among quality, costs, productivity, and profit. According to Deming (1982), as quality is increased, costs decrease. Deming's philosophy of quality can be broken down into four axioms;(1) Quality and costs are not opposites, or trades-offs, with one being improved at the expense of the other. Instead both can be constantly improved, (2) the meaning of quality is different from conventional views that mistake exotic materials and fail-safe designs for quality. In Deming's view, quality is best understood from the point of view of the customer, but one important component of quality is improvement of uniformity, (3) Variation is a naturally occurring phenomenon. It is not an exception or fault .Variation is treated differently depending on whether we are dealing with a stable or unstable system. A stable system creates both success and failures. Lowering the number of defects in a stable system can only be achieved by working on the system, (4) Cooperation is a fundamental ingredient that leads to improvement (Evans & James, 2007). The theory of total quality management was tested to ascertain whether JIT enhances quality management in Bidco Oil Company.

Theory of Transaction Cost Economics

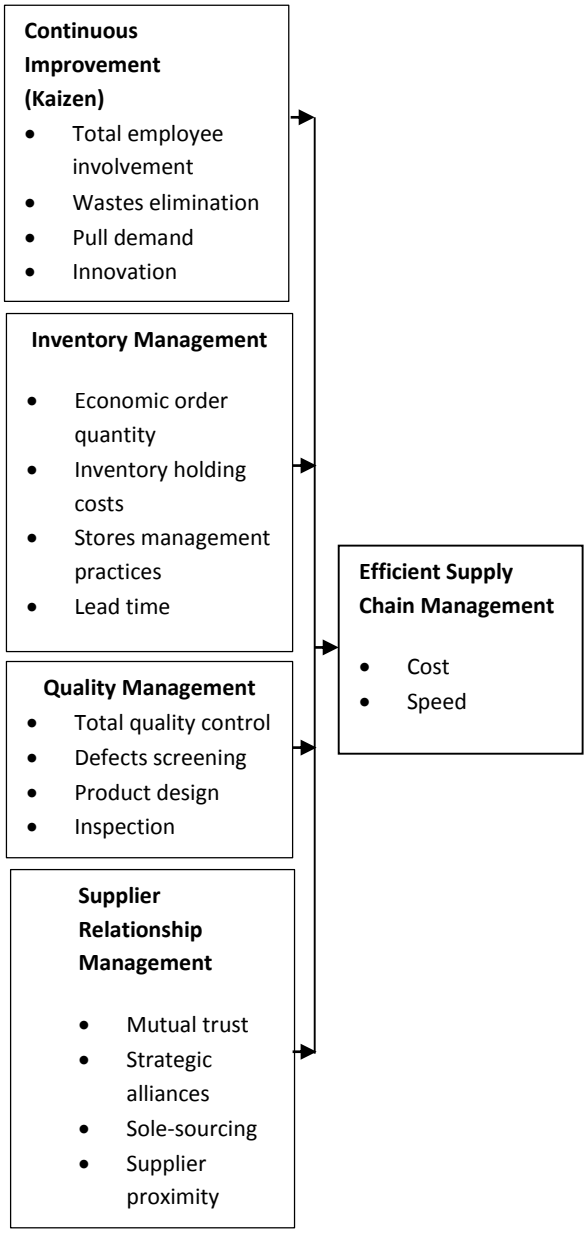
Supplier Relationship Management has to be linked with various organization theories to explain all its research perspectives, one of them being Transaction Cost Economics. In transaction cost economics (TCE) the focus of the firm is to minimize the sum of transaction costs and production costs. Transaction costs affect the firm's decisions on how they organize their activities, whether to move towards vertical integration (hierarchy) or to prefer market exchange. Thus, TCE defines the boundaries of the firm. According to Williamson (1979) TCE recommends that the decision of whether to partner with suppliers or not should be based on the efficiency of governance. High frequency of transaction costs, uncertainty and asset specification guide firms towards hierarchy. Transaction cost economics theory identifies and explains the conditions suitable for a firm to manage an economic exchange internally, and the conditions under which it should manage an economic exchange externally (Williamson, 1979).

Blomqvist, Kyläheiko, and Virolainen (2002) have presented a view of a hybrid governance structure (partnership) between markets and vertical hierarchies based on the TCE. According to them, cooperation is an efficient solution only if it creates extra value compared to the market and hierarchy options. According to their study, the factors that encourage cooperation are a high degree of transaction frequency, mutual dependency, the possibility to share risks, and the possibility to share information. Heide and John (1990) argue that transaction cost analysis is useful in studies of relationships, because it provides insights into the circumstances that cause the development of a closer relationship between the buyers and suppliers. Heide and John (1990) base their theoretical argument on Williamson (1979) studies stating that the establishment of a closer relationship corresponds to a shift away from market-based exchange toward bilateral governance. In this study the theory of transaction cost economics was tested to evaluate whether it applies in the supply chain of Bidco Oil Company.

Conceptual framework

Conceptual framework is a hypothesized model that identifies the concepts under the study and explains graphically the general constructs of the variable to be studied and the relationships amongst them. It expresses the independent variable which influences the dependent variable. A dependent variable is a variable that is a consequence of another while an independent variable is that which is antecedent to the dependent variable or that which makes it change

(Kasomo, 2006).The hypothesized variables include Continuous Improvement, Inventory Management, Quality Management and Supplier Relationship Management while the dependent variable is Efficient Supply Chain Management as illustrated in conceptual framework model.



Independent variables **Dependent variable**

Conceptual Framework

Continuous Improvement (Kaizen)

Kaizen is a Japanese business philosophy also known as continuous improvement which is an approach to work that systematically seeks to achieve small incremental changes in processes in order to improve efficiency in quality (Oprean & Grecu, 2010). The aim of kaizen is to continuously improve the existing situation: trying to reduce costs, striving for zero defects, striving for zero inventories, and trying to offer a large product variety (Kitiwanwong & Nuttapon, 2011; Floyd, 2010). Consequences of the focus on perfection can be seen in many different areas. One of these areas is the control of the production system, the logistics. The Japanese way of controlling the production system is to lower stocks to make the real problems clear and then solve these real problems. By solving the real problems, the Japanese try to prevent problems later in the processes. The main idea behind this philosophy is that correcting problems costs much more then preventing them. A focus on the total chain of activities is another important theme. Activities are not studied in isolation, instead the whole chain from supplier to customer is taken into account and all the activities in this chain are important. The people in the process are regarded as very important, the primary responsibility for quality is assigned to the production team and not to the quality control department (Conti, 2010).The focus on the total chain of activities is combined with attention to perfection and striving to prevent problems. This becomes clear in the organization of improvement programs; there, much attention is given to the role of the workers on the shop floor in improvement programs.

There is reasonable consensus among researchers that Just in Time (JIT) is a philosophy of continuous improvement in which non-value adding activities are identified and removed in order to reduce costs, improve product quality, improve performance, improve delivery, add manufacturing flexibility and stimulate innovation in the workplace (Kannan, 2005; Salaheldin, 2005; Ardalan, 2009). Oprean and Grecu (2010) defined JIT as an approach to achieving excellence in a manufacturing company based on continuing elimination of waste and consistent improvement in productivity. Operationally, JIT production

requires that waste be identified and eliminated in the following areas: waste from overproduction, waste created by waiting or idle time, waste of motion, transportation waste, inventory waste, processing waste and waste from product defects (Floyd, 2010). Continuous monitoring of production processes with the goal of eliminating all forms of waste is a key point in understanding JIT. As part of JIT implementation; organizations must instil the habit of expecting continuous small improvements in the process. The operators must never be satisfied with the current environment, but always be moving closer to the ideal situation. Service operations are ripe for significant productivity gains that can be achieved through process improvements.

Floyd (2010) carried out research to illustrate the application of JIT to the warehousing operations of three companies. Under the philosophy of continuous improvement, these companies strove to: reduce errors and complaints; reduce picking route distance; decrease storage space; increase the frequency of replenishment; increase employee involvement; and encourage team identity and teamwork. The results were higher productivity and improved customer service. Continuous improvement doesn't only focus on supply chain operations but also on the knowledge and skills of the workers. Skills and knowledge creates awareness of quality which causes workers to generate ideas for controlling defects and ideas for improving JIT delivery (i.e. more convenient workspaces). More importantly, workers hold the authority to stop the line when problems are identified, and so it is critical for the success of JIT to train and motivate the workforce. Kaizen requires regular cross-training of employees to ensure improved quality and output. Titu (2010) argues that a flexible work force that looks for and solves production problems wherever they appear is required to ensure optimized supply chains. Under this approach, the workers do their own quality inspections and maintain their own equipment. On the same vein, Grecu and Oprean (2010) report the importance of variable skill levels of workers who can perform more than one job. This method also involves some kind of job rotation in order to relieve boredom and improve the efficiency of the worker. A JIT atmosphere is suggestive of a flexible approach towards cross-training of employees. The initial higher costs of training will level off and reflect in higher levels of productivity of employees in the future. There is reasonable consensus among researchers that Just in Time (JIT) is a philosophy of continuous improvement in which non-value adding activities are identified and removed in order to reduce costs, improve product quality, improve performance, improve delivery, add manufacturing flexibility and stimulate innovation in the workplace (Buzacott & Mandelbaum, 2008).

Inventory Management

Inventory management is the application of data collection, demand and forecasting, lean and operational principles to manage the total amount of inventory within the supply chain at any point in time and manage inventory holding costs. According to Satyendra and Singh (2013) investment in inventory absorbs a large portion of the working capital of a company and often it represents a large portion of the total assets of a business. Inventory holding is costly and incurs interest where firms could have held interest-bearing assets instead. Inventories also entail costs in the form of insurance, obsolescence, depreciation, pilfering, storage and handling. Taken together, these various costs average close to 10% of the value of the inventory stock per year (Keane & Freinberg, 2007). By improving return on investment by increasing the rate of inventory turnover, management often wants to ensure economic efficiency. Effective inventory management enables a firm to provide lower costs, rapid response and flexibility for its customers. Just-in-time philosophy has been widely adopted and practiced in the recent years worldwide. It aims at reducing total production costs by producing only what is immediately needed and

eliminates wastes. It is based on a radically different concept, deviating substantially from the existing manufacturing practices in many respects. It is a very effective tool to reduce the wastage of inventory and manage it effectively (Shale, Iravo, & Guyo, 2014). It has the potential to bring substantial changes in the existing setup of a company; can give it a new face, broaden its acceptability and ensure a longer life. It can strategically change the atmosphere needed for longer survival. The understanding of the importance of inventory management by all the levels of organization is essential for the core philosophy of JIT. Salaheldin (2005) study also supports the above argument that for the successful implementation of JIT philosophy, effective modifications are necessary for inventory management as well as for purchasing methods. For this purpose the openness of communication between management and employees is the pivotal necessity. The implementation of JIT can assert marvelous impacts on different factors like production lead time, cost of labor, inventory level and manufacturing space requirement, only when it is implemented correctly. Its effectiveness mostly depends on the technique used while implementation (Singh, 2006). Just-in-time management theory is a wide concept of business and is related to inventories directly. But it is not the whole story yet. Just in time process is the removal of waste including dead inventory, but also including scrap, indirect labor, rework, activities that are not value adding for the firm, machines that are non-productive and the quality of materials as well. The impact on labor and cost controls is also evidently seen. Inventory reduction is only the reduction of cost of in hand inventory to satisfactory levels, with a least amount of safety level for definite unexpected cycles or demands (Mackelprang & Nair, 2010).

The philosophy on JIT is based on simple idea that wherever possible no activity should take place in a system until there is a need for it. It requires the parts to make available at the time of their requirements and not before. It seeks to produce only the required items at the required time, and in the required quantities. Hence, it is one of the effective means to control inventory flow, prevent its storage and manage it effectively. Just in time inventory management strikes a balance between optimum inventory quantity and its holding cost. Inventory made available in right quantity at right price and in right time is the primary objective of JIT (Satyendra & Singh, 2013). According to Patricia, Dale, and Michael (2012) JIT is a technique in which stock held by the company is measured in terms of hours of production rather than in days or months. It eliminates waste through simplification of manufacturing processes, eliminates excess inventory in order to reduce related production cost and emphasizes on the use of small lot size so as to meet quick customer requirements. Inventory managed on JIT basis removes many types of uncertainties in a production system. It ensures timely delivery of customized products to the customers and thus helping the organization in the long run to acquire its brand status.

The main emphasis in JIT manufacturing is the goal of Zero Inventory; to achieve this goal the safety stock must be eliminated, as inventories are viewed as a source of waste and inefficiency. Achieving this goal provides two key benefits. First, eliminating inventories requires a firm to maintain its ordering and delivery system to meet production orders, which means a firm, attains a high degree of flexibility in its operations. In an uncertain selling environment, flexibility allows a firm to respond to all fluctuations in the demand for its product without being constrained by inventories. Secondly, eliminating inventories results in an obvious reduction in a firm's inventory carrying costs. A firm does not have to pay for warehouse space to store its inventory. For example, reduced inventory carrying costs allow a firm to charge lower prices for its product, thereby increasing demand. Note these two benefits occur along a type of extensive and intensive margin for a firm, both of which can lead to greater sales

compared to when not using JIT (Hsu, Tan, Kannan, & Keong, 2009).

Quality Management

According to Fotopoulos and Evangelos (2010) Total Quality Management is a comprehensive and structured approach to organizational management that seeks to improve the quality of products and services through ongoing refinements in response to continuous feedback. Quality management based on JIT is combination of inventory control, quality control and production management functions that makes sincere efforts for quality improvement by two ways. First, it concentrates on philosophical aspect of quality improvement by making the quality everyone's responsibility, and then focused on effective implementation of quality control techniques. It recognizes that most valuable resources of an organization are its workers, and workers work best when they are motivated, valued, encouraged to contribute, and allowed to make their own decisions. Under this approach, workers inspect the product quality after each successive operation. They are trained along with managers in preparation and interpretation of process control charts. Managers motivate the workers to think quality first and production rate second. The workers have authority to halt the production line or cell, if quality problems are uncovered. Thus, this concept not only gives the quality responsibility to workers but also match that responsibility with authority to share the quality control functions so that quality problems can be uncovered and solved quickly (Kumar, 2010).

Keane and Feinberg (2007) states that a JIT production system demands procurement of parts in Small lots. Small lots require less space and time. Less space and time require less peoples and facilities to complete the same job. Besides, small lots are easy to inspect, and defects can be immediately detected. Thus, the parts that are purchased steadily in small lot sizes with frequent deliveries contribute to higher quality and productivity through lower levels of inventory and scrap, lower inspection costs for incoming parts, and early detection of defects. In short, JIT based approaches has potential to improve the product quality and productivity to significant level but organizations must adopt its principles in way that meet their own organizational structure, design and processes.

In a JIT setting quality control is inevitable. In Japan, TQC activities are not limited to quality control only. Elaborate system of Kaizen strategies has been developed as management tools within the TQC approach. Total quality control in Kaizen is a movement aimed at improvement of managerial performance at all levels. The Japan Industrial Standards recommends implementing quality control effectively through necessitating the cooperation of all people in the company, including top management, managers, supervisors, and workers in all areas of corporate activities such as market research and development, product planning, design, preparation for production, purchasing, vendor management, manufacturing, inspection, sales and after sale services, as well as financial control, personnel administration, training and education (Haouzi, Pétin, & Thomas, 2009).

Quality control carried out in this manner is called company-wide quality control or total quality control (TQC). A defective part brings production to a grinding halt. Poor quality simply cannot be tolerated in a stockless manufacturing environment. In other words, JIT cannot be implemented without a commitment to total quality control (TQC). Total Quality Control is essentially an endless quest for perfect quality. This approach to quality is opposed to the traditional belief, called acceptable quality level (AQL*).* AQL allows defects to occur provided they are within a predetermined level.

A JIT environment requires the management to control the quality of the incoming materials through vertical integration. Vertical integration means managing upstream activities in the supply

chain e.g. ensuring that the suppliers adhere to the set standards of quality and assessing their quality certifications. Caniëls and Gelderman (2007) elaborate on the mechanism of quality certification of suppliers as a formal study of supplier's quality program. The desired objective is to evaluate suppliers on the basis of quality of design, training, capability of delivery on-time, and defect rates. This stage ensures the optimum incoming quality level on the basis of past audit of vendor performance on quality. The steps of sole sourcing and quality certification of suppliers are closely linked. Both steps stress on the long term relationship, sharing of key information, and a problem-solving approach.

Kumar (2010) reported that several Indian industries were implementing basic principles of just-in-time in a fragmentary framework of Total Quality Management with the belief that it would be helpful in facing global competition. The present status of JIT/TQM quality techniques in India had been analyzed through a survey of 46 Indian industries. The survey indicated that techniques such as quality circle, total preventive maintenance, cause and effect diagram, kaizen, JIT purchasing etc. require more attention since their implementation may be helpful to improve present position of Indian industries in the areas of quality, cost and flexibility. In addition, the immediate awareness of quality causes workers to generate ideas for controlling defects and ideas for improving JIT delivery (i.e. more convenient workspaces). Perhaps more importantly, workers hold the authority to stop the line when problems are identified, and so it is critical for the success of JIT to train and motivate the workforce.

Supplier Relationship Management

Supplier Relationship Management (SRM) is a systematic approach for developing and managing partnerships. Hughes (2010) defined SRM as the discipline of strategically planning for, and managing, all interactions with third party organizations that supply goods and/or services to an organization in order to maximize the value of those interactions. It is focused on joint growth and value creation with a limited number of key suppliers based on trust, open communication, empathy and a win-win orientation. Non-partnerships are managed by means of other measures like contract administration, contract management and vendor rating. One of most important components of the JIT operating company is the front end of the supply chain. Suppliers are an important factor contributing to the success of going JIT production system. Given that material costs account for over half of the cost of goods sold for most firms, companies cannot view their suppliers as strangers; rather they should be viewed as a part of the team (Hsu, Tan, Kannan, & Keong, 2009). Supplier integration was introduced first in the automotive industry and one of the pioneers in this was Toyota. In 1950 Toyota started a new move toward development of components supply. Toyota structured its suppliers in to different functional tiers with suppliers in each tier having different responsibilities. Toyota's first-tier suppliers were assigned the task of working with the product development team. The suppliers were told to develop a specific product in a car to meet given performance specifications. Toyota then asked its suppliers to present a trial product for testing, and if the product worked as specified the suppliers would get the production order. The Toyota philosophy was to encourage all the first-tier suppliers to communicate and share information with each other so as to improve the design process (Caniëls & Gelderman, 2007).

Chen and Zhou (2007) view suppliers as an extended operation of the manufacturer in a JIT setting. Choosing of supply partners in JIT setting involves a different way of thinking. Presence of suppliers who provide products or materials with the lowest price and highest quality would not be enough. In JIT, these suppliers should give services in other ways: inventory of the delivered packs and adjusting exit systems among the producer and suppliers in cases where the materials are re-saved for next application are good instances of friendly

cooperation between the producer and his/her suppliers. Lu and Yan (2007) recommend choosing of suppliers on the basis of common geography, where materials are delivered to the producer via an effective logistical system is another example of strategic resource finding. According to them in choosing the suppliers, one should define the conditions and parameters of one powerful JIT source, and it is necessary to survey the way of evaluating the suppliers and the way of introducing the developmental needs to the products in order to improve the JIT setting.

The success and resulting performance of purchasing system is based upon cooperation between the purchaser and supplier. Some of the elements of this system are as follows: (i) smoothed flow of materials between suppliers and buyers, (ii) order cost reduction, (iii) stock reduction, (iv) quality, and (v) product simplification. Just in time purchasing practices are characterized by a small supplier base whose firms are located close to the buyer's production plant, make frequent deliveries, and are considered long-term partners with the buying company. Under these operating conditions, supplier relations are built on a high degree of mutual trust and openness. Both the buyer and the supplier must share information and also protect its confidentiality. When entering a long term relationship, it is important that the buyer selects suppliers that have consistently exhibited high levels of quality and delivery reliability (Teeravaraprug, Kitiwanwong, & Nuttapon, 2011).The new JIT partnership that we are striving for is a long-term, mutually beneficial relationship with fewer but better vendors. Mutual trust must be developed between companies and vendors. This cannot be accomplished if vendors change every time new bids are sent out. For this reason a company should have few suppliers (preferably one) for each purchased material or component (Lu & Yan, 2007). This idea of single sourcing is as troublesome to traditional purchasing people as slower run speeds and smaller batch sizes are to traditional manufacturing people. Traditional purchasing people question whether the company is getting the best price possible by using only one supplier. As a company is reducing its vendors, it is obtaining the best price due to traditional competition. Vendors embrace the idea of a long-term relationship because it allows their sales to remain more constant. Strict criteria concerning dependability (quality and lead time) should be placed upon vendors by companies. When this criterion is satisfactorily met, the vendor will become "certified". Ideally certified vendors deliver products just in time, every time, with 100 percent quality. A partnership is then formed between the company and the vendor so that they can actively work together to continually lower the cost of purchased material. It would be impossible to form such relationships with several, ever changing vendors (Xiaofei & Chun, 2008).

Furthermore, many purchasing departments are viewing suppliers as strategic partners and are acting accordingly. The number of suppliers per firm is being reduced. Suppliers are also accepting longer contracts and making valuable suggestions on product development, and are being recruited as members of product design and continuous improvement teams. Lu and Yan (2007) show how partnerships are critical to the success of JIT purchasing on which competitive ability so often depends. Their research concludes that partnerships will continue to increase in number and that OEMs will certainly reap the benefits of what is necessarily an open, shared approach to business. As interaction between these suppliers and their customers deepens, other techniques have been jointly instituted, such as bar-coding and electronic data interfacing. Some partnerships have developed customer-linked strategies which represent a comprehensive, integrated set of marketing, operations and information policies and practices designed to satisfy mutually the requirements of important customers in their markets. However, the number of partnerships available for loyal, committed suppliers will be

small in relation to former times when multiple sources were pursued by manufacturers. Ever shortening product life cycles require that the activities between engineering, procurement and manufacturing become concurrent. Shale, Iravo, & Guyo, (2014) stresses on the role of purchasing in a world-class manufacturing firm by developing a reliable supplier base through supplier partnering and certification. Supplier partnerships have demanded increased communications and teamwork, and these partnerships are leading the way to a win and win scenario for both buyer and supplier. Purchasing uses partnering as a competitive weapon, and it is one of the keys to success and long-term survival.

RESEARCH METHODOLOGY

Introduction

This chapter describes the methodology that was used in undertaking the study.

Research Design

According to Wiersma and Jurs (2009) a research design is a plan, structure of investigation conceived so as to obtain answer to research questions and to control variances. The study used a cross-sectional survey research design to help in indicating trends in attitudes and behaviors and enable generalization of the findings of the research study to be done. Cross-sectional survey is a method that involves the analysis of data collected from a population, or a representative subset, at one specific point in time (Orodho, 2003).

Population of the Study

A population is defined as a large collection of individuals or objects that is the main focus of a scientific query and have similar characteristics (Agarwal, 2009). The target population for this research study was 800 respondents drawn from Bidco Oil Company procurement department and other departments such as Administration, human resources department and stores department because this are the departments that work hand in hand with the procurement department. This target population included; Supply chain management officers (SCMO), Supply chain management assistants (SCMA) who work with in the stores department, production officers, Finance officers, human resources officers and accounts officers. The target population was chosen since the respondents were in the departments that work hand-in-hand during the procurement cycle's beginning to end.

Sample Size

According to Zikmund, Babin,Carr, and Griffin (2010) sampling is defined as a selection of a subject of individuals from within a population of making predictions based on statistical inference. From the target population of 800 a sample size of 10% was taken, giving a base of 80 respondents.

Sampling Technique

Sampling technique refers to the process so conducted to provide a basis of generalizing results about the population. The sampling technique can either be probabilistic or non-probabilistic (Gall & Borg, 2007).This study used simple random sampling procedure as the sampling technique to select a sample that represents the entire population.

Data Collection Instruments and Procedure

Data collection is a means by which information is obtained from selected subjects of an investigation (Creswell, 2003). The instruments of data collection are tools used to collect both primary and secondary data. Suitable, usable and adequate data for the study was collected through administering questionnaires. The questionnaires were delivered to the Bidco Oil Company management and staff and filled by respondents at their own convenient time. Most questions and statements in the questionnaire were of of close-end design i.e. expecting standard responses that could be analyzed statistically. For example, likert scales representing a spectrum of feelings and opinions with (1) implying strong disagreement and (5) proxying strong agreement was included in the questionnaire to collect ordinal data. The secondary data used for this study was obtained

from the documented files in the departments of finance, production and procurement.

Data Analysis and Presentation

Data analysis is defined as the ordering and organizing of raw data to extract useful information from it (Saunders, Lewis, & Thornhill, 2009). The gathered data was analyzed to ascertain the effect of JIT on the independent variables. Quantitative data was edited to eliminate inconsistencies, summarized and coded for easy classification in order to facilitate tabulation and interpretation .Descriptive statistics was used in describing the sample data in such a way as to portray the typical respondent and to reveal the general response pattern. Analyzing of the qualitative data involved use of frequency distribution and cross tabulation in describing and explaining the information from views, ideas, feelings and opinions. Through content coding a list of key ideas and themes for each variable was generated which guided the nature of integration needed for both qualitative and quantitative data. These statistics was generated with an aid of the computer software, Statistical Package for Social Sciences (SPSS version 21) which offers extensive data handling capability and numerous statistical analysis routines that can analyze small to very large data statistics (Zikmund, 2010).

Multiple Regression Analysis

Efficient supply chain management was regressed against four variables of the role of just-in-time namely (Continuous improvement, Inventory management, Quality management and Supplier relationship management). The equation was expressed as follows:

$Y = \alpha + \beta_1 X_{1+} \beta_2 X_2 + \beta_3 X_{3+} + \beta_4 X_4 + e.$

Where,

Y = Efficient supply chain management

α = constant (coefficient of intercept)

X_1 = Continuous improvement

X_2 = Inventory management

X_3 = Quality management

X_4 = Supplier relationship management

e = error term

$B_1 \ldots B_4$ = regression coefficient of four variables.

RESEARCH FINDINGS AND DISCUSSION

Introduction

The study sought to determine the role of just-in-time in realization of an efficient supply chain management in Bidco Oil Company in Thika, Kenya. This chapter describes the analysis of data followed by a discussion of the research findings.

Response rate

Response rate refers to the extent to which the final data sets includes all sample members and is calculated as the number of respondents with whom interviews are completed and divided by the total number of respondents in the entire sample including non-respondents (Orodho, 2009). The data was collected from the management and staff of Bidco Oil Company plant at Thika, Kenya. The sample of the study consisted of 80 respondents. Out of 80 respondents the questionnaires were filled and returned by 68 respondents translating to a response rate of 85%.

Descriptive Statistics

Descriptive statistics are used to describe the basic features of the data in a study by providing summarizes about the sample and the measures. Together with simple graphical analysis, they form the basis of virtually every quantitative analysis of data (Kothari, 2004). The study used descriptive statistics to present the frequency and the percentages of the gathered data on the role of just-in-time in realization of an efficient supply chain management in Bidco Oil Company in Thika, Kenya.

Respondents Respective Departments

The study further sought to establish the respondents departments in order to determine if the respondents were from the key departments concerned with the execution of supply chain management functions. Based on the study

findings, the majority 36.8% respondents were from procurement department, 26.5% were from production department, 13.2% were from administration department, 11.8% were from finance department and 11.8% from sales and marketing department.

Education Level of the Respondents

It was important to establish the education level held by the study respondents in order to ascertain if they were equipped with relevant knowledge and skills on just-in-time and supply chain management functions. The findings indicated that the majority (52.9%) had bachelor's education level, 29.4% had diploma education level and 17.6% had master's education level. These findings implied that most of the respondents were qualified to understand the nature of the study problem.

Experience of the Respondents

The study determined the working experience held by the respondents in order to ascertain the extent to which their responses could be relied upon to make conclusions on the study problem using their working experience. From the findings, 17.6% of the respondents indicated they had a working experience of less than an year, 29.4% had a working experience of 1-3 years, 41.2 % had a working experience of 3-5 years, 5.9 % had a working experience of 5-10 years and 5.9% had a working experience of over 10 years.

The application of Just In Time in the company

The study sought to assess the application of Just in Time in the company by determining whether the respondents had knowledge of JIT production systems. The study found out that a large percentage of 64.7% was aware of JIT system while a percentage of 35.29% had no knowledge of JIT.

Continuous Improvement

Continuous Improvement towards supply chain management efficiency

According to the likert-scale from the questionnaire that sought to determine the level of concentration of wastes in Bidco company supply chain, 1 represented Not at all, 2 represented Low, 3 represented Medium, 4 represented High,5 represented Very high.The study sought to find out the levels of concentration of wastes in the respondents work areas that affect supply chain management efficiency. The study findings showed that most respondents agreed that the highest levels of wastes were from transportation as discovered by a mean of 3.5882 and a standard deviation of 1.16203; waste from overproduction had a mean of 3.5441 and a standard deviation of 1.27471; inventory waste had a mean of 3.3382 and a standard deviation of 1.20460 and waste from product defects had a mean of 3.2059 and a standard deviation of 1.14029. Kaizen is a Japanese business philosophy also known as continuous improvement which is an approach to work that systematically seeks to achieve small incremental changes in processes in order to improve efficiency in quality (Oprean & Grecu, 2010). The aim of kaizen is to continuously improve the existing situation: trying to reduce costs, striving for zero defects, striving for zero inventories, and trying to offer a large product variety (Kitiwanwong & Nuttapon, 2011; Floyd, 2010). Oprean and Grecu (2010) defined JIT as an approach to achieving excellence in a manufacturing company based on continuing elimination of waste and consistent improvement in productivity. Operationally, JIT production requires that waste be identified and eliminated in the following areas: waste from overproduction, waste created by waiting or idle time, waste of motion, transportation waste, inventory waste, processing waste and waste from product defects (Floyd, 2010). Continuous monitoring of production processes with the goal of eliminating all forms of waste is a key point in understanding JIT.

Extent of agreement of statements on continuous improvement that affect supply chain management efficiency

According to the likert-scale from the questionnaire that sought to determine the extent

which continuous improvement aspects affects efficient supply chain management, 1 represented strongly disagree, 2 represented Disagree,3 represented Moderately agree,4 represented Agree,5 represented strongly agree.The study sought to find out the respondents' extent of agreement of statements on continuous improvement that affect supply chain management efficiency. Based on the study findings, most respondents agreed the company believes that every problem offers some new improvement opportunities as shown by a mean of 4.2353 and a standard deviation of 1.27100; that parts are made in the company when needed by the subsequent processes as shown by a mean of 4.4118 and a standard deviation of 0.91807; that the company continuously minimizes non value adding work as shown by a mean of 4.0588 and a standard deviation of 1.31447;that the company entrusts the workforce in decision making as shown by a mean of 3.9412 and a standard deviation of 1.48507 and that a worker can stop the line and issue warning when a problem occurs as shown by a mean of 3.6471 and a standard deviation of 1.50387. The efficiency of the supply chain management is realized through consistent small incremental improvement changes in the value chain of the organization (Flyod, 2010). This can be achieved through systematic monitoring of the continuous improvement concepts above studied that indicated their implementation had a positive bearing on supply chain management efficiency. There is reasonable consensus among researchers that Just in Time (JIT) is a philosophy of continuous improvement in which non-value adding activities are identified and removed in order to reduce costs, improve product quality, improve performance, improve delivery, add manufacturing flexibility and stimulate innovation in the workplace (Kannan, 2005; Salaheldin, 2005; Ardalan, 2009)

Inventory Management

The data was collected from the different indicators of the variable inventory management which was ordinal categorical. The data was, therefore, presented in frequency tables with the median being used as the appropriate measure of central tendency. Under inventory management, the first question was to find out the extent of EOQ use in purchasing and ordering processes, 22.1% of the respondents said EOQ use in purchasing and ordering is done to a very great extent, 42.6% to a great extent, 29.4% to a moderate extent , 4% to a low extent and 0% said no extent at all. The modal class is of the respondents who said management use economic order quantity on purchases and ordering to a great extent. The median was found to be (4) which imply that on average the management use economic order quantity on purchases and ordering to a great extent. The study also sought to determine to what extent Bidco Oil Company reduced delivery quantities, 33.8% of the respondents said reduction of delivery quantities is done to a very great extent, 36.8% to a great extent, 13.2% to a moderate extent, 8.8% to a low extent and 7.4% said no extent at all. The modal class is of the respondents who said they reduce delivery quantities to a great extent. The median was found to be (4) which imply that Bidco Oil Company reduces delivery quantities to a great extent. When asked about the firms level of compliance with stores management practice, 22.1% of the respondents said the firms level of compliance with stores management practice is to a very great extent, 42.6% to a great extent, 23.5% to a moderate extent, 5.9% to a low extent and 5.9% indicated no extent at all. The median was found to be (4) which implies that on average the respondents were compliant with stores management practices to a great extent. The last indicator under inventory management required the company to state their levels of reduction of production runs, 36.8% of the respondents said to a very great extent, 16.2% to a great extent, 20.6% to a moderate extent, 13.2% to a low extent and 13.2% indicated no extent at all. The modal class is of the respondents who said the level of reduction of production runs was to a very great extent. The median was found to be (4) which

imply that on average the respondents levels of reduction of production runs was to a great extent (See Table 4.6). Inventory management is the application of data collection, demand and forecasting, lean and operational principles to manage the total amount of inventory within the supply chain at any point in time and manage inventory holding costs (Satyendra & Singh, 2013).The scope of inventory management concerns the fine lines between replenishment lead time, carrying costs of inventory, asset management, inventory forecasting, inventory valuation, inventory visibility, future inventory price forecasting, physical inventory, available physical space for inventory, quality management, replenishment, returns and defective goods, and demand forecasting. Balancing these competing requirements leads to optimal inventory levels (Mackelprang & Nair, 2010).

Quality Management

Extent of agreement of statements on Quality Management that affect supply chain management efficiency

The study sought to find out the respondents' extent of agreement of statements on quality management that affect supply chain management efficiency. The findings as presented indicate that most respondents agreed that quality comes from good design as shown by a mean of 4.6029 and a standard deviation of 0.79438; that defects are investigated at the source as shown by a mean of 4.5294 and a standard deviation of 0.65724; that defects are screened out immediately after occurrence as shown by a mean of 4.1324 and a standard deviation of 1.22053. However, most respondents disagreed to the statement that quality does not come from inspection as shown by a mean of 1.5588 and a standard deviation of 0.87045. According to Fotopoulos and Evangelos (2010) Total Quality Management is a comprehensive and structured approach to organizational management that seeks to improve the quality of products and services through ongoing refinements in response to continuous feedback. Keane and Feinberg (2007) states that in a JIT production system inspection of raw materials, parts and goods ensure early detection of defects contributing to higher quality and productivity through lower levels of inventory and scrap.

Supplier Relationship Management

Extent of agreement of statements on Supplier Relationship Management that affect supply chain management efficiency

The study sought to determine the extent of agreement of statements on supplier relationship management that affect supply chain management efficiency. The study findings were, most respondents agreed that the company's relationship with its suppliers is based on mutual trust as shown by a mean of 4.1176 and a standard deviation of 1.33304; cooperation as shown by a mean of 3.9853 and a standard deviation of 1.22770; long term commitment as shown by a mean of 3.9853 and a standard deviation of 1.22770 and strategic partnerships as shown by a mean of 3.8971 and a standard deviation of 1.45725. Supplier Relationship Management (SRM) is a systematic approach for developing and managing partnerships. Hughes (2010) defined SRM as the discipline of strategically planning for, and managing, all interactions with third party organizations that supply goods and/or services to an organization in order to maximize the value of those interactions. The new JIT partnership that we are striving for is a long-term, mutually beneficial relationship with fewer but better vendors. Lu and Yan (2007) also agree that mutual trust must be developed between companies and vendors. This cannot be accomplished if vendors change every time new bids are sent out. For this reason a company should have few suppliers (preferably one) for each purchased material or component. A partnership is then formed between the company and the vendor so that they can actively work together to continually lower the cost of purchased material. It would be impossible to form such

relationships with several, ever changing vendors (Xiaofei & Chun, 2008).

Regression analysis

A multiple regression model was fitted to determine whether independent variables notably, X_1 = Continuous improvement, X_2 = Inventory management, X_3 = Quality management and X_4 = Supplier relationship management simultaneously affected the dependent variable Y = Efficient supply chain management. As a result, this subsection 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. Based on the study findings, the regression model efficient supply chain management coefficient of determination R Square was 0.993 and R was 0.996. The coefficient of determination R Square indicated that 99.3 % of the variation on efficient supply chain management can be explained by the set of independent variables, namely; X_1 = Continuous improvement, X_2 = Inventory management, X_3 = Quality management and X_4 = Supplier relationship management (See Table 4.9). The remaining 0.7% of variation in efficient supply chain management can be explained by other variables not included in this model. This shows that the model has a good fit since the value is above 80%. This concurs with Orodho (2009) that R-squared is always between 0 and 100%: 0% indicates that the model explains none of the variability of the response data around its mean and 100% indicates that the model explains the variability of the response data around its mean. In general, the higher the R-squared, the better the model fits the data. The adjusted R square is slightly lower than the R square which implies that the regression model may be over fitted by including too many independent variables. Dropping one independent variable will reduce the R square to the value of the adjusted R square.

Regression Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.996[a]	.993	.991793	.124438

The study further used Analysis of Variance (ANOVA) in order to test the significance of the overall regression model. Kothari (2004) posit that Analysis of Variance helps in determining the significance of relationship between the research variables. The results of Analysis of Variance (ANOVA) for regression coefficients in Table 4.10 reveals that the significance of the F statistics is 0.007 which is less than 0.05 and the value of F (3.908) being significant at 0.00 confidence level. The value of F is large enough to conclude that the set coefficients of the independent variables are not jointly equal to zero. This implies that all of the independent variables (Continuous improvement, Inventory management, Quality management and Supplier relationship Management) have an effect on the dependent variable.

ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	11.235	4	2.809	3.908	.007[b]
Residual	45.280	63	.719		
Total	56.515	67			

Coefficients of Overall Regression model was used to present the beta coefficients of all independent variables versus efficient supply chain management.

$Y= 0.164+0.641X_1+0.570X_2+0.170X_3 + 0.048X_4$

The study findings were, continuous improvement (X_1) had a coefficient of 0.641 which is greater than zero. The t statics is 2.813 which has a p-value of 0.000 which is less than 0.05 implies that the coefficient of X_1 is significant at 0.05 level of significance. This shows that continuous improvement have a significant positive influence on efficient supply chain management. The coefficient of inventory management (X_2) was 0.170 which was greater than zero. The t statistic of this coefficient is 2.965 with a p value of 0.004 which is less than 0.05. This implies that the coefficient 0.170 is significant. Since the coefficient of X_2 is significant, it shows that inventory management has a significant effect on efficient supply chain management.

Coefficients of Overall Regression model

Model	B Coefficients	Std. Error	t	Sig.
Constant	.164	.472		.029
Continuous Improvement	.641	.228	2.813	.000
Supplier Relationship Management	.570	.106	5.351	.000
Inventory Management	.170	.176	2.965	.004
Quality Management	.048	.019	2.444	.019

The study findings also indicate that quality management (X_3) had a coefficient of 0.048 which is greater than zero. The t statics is 2.444 which has a p-value of 0.019 which is less than 0.05 implies that the coefficient of X_3 is significant at 0.05 level of significance.

This shows that quality management has a significant positive influence on efficient supply chain management. The study findings reveal that supplier relationship management (X_4) had a coefficient of 0.570 with a t static of 5.351 which has a p-value of 0.000 which is less than 0.05. This implies that the coefficient of X4 is significant at 0.05 level of significance. This shows that supplier relationship management has a significant positive influence on efficient supply chain management.

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This chapter discusses the summary of the key findings along the study objectives and the corresponding hypothesis. It then draws conclusions based on these findings and discussions are put forth for the recommendations of the study based on both policy and practice. Finally, the chapter presents the study limitations and recommendations for further areas of research.

Summary of Key Findings

The general objective of the study was to determine the role of just-in-time in realization of an efficient supply chain management in Bidco Oil Company in Thika, Kenya. The study specifically determined the role of continuous improvement; inventory management; quality management; supplier relationship management in realization of an efficient supply chain management in Bidco Oil Company. The reviewed literature showed that JIT concepts play an important role in optimization of manufacturing firms supply chain management. The key findings summarized from the four specific objectives are as follows:

How does continuous improvement lead to an efficient supply chain management in Bidco Oil Company?

The study sought to find out the extent to which continuous improvement affected efficient supply chain management in Bidco Oil Company in Thika, Kenya. From the findings, the study found out that continuous improvement has a significant strong positive correlation with efficient supply chain management of 0.641.Increasing levels of continuous improvement by a unit would increase the levels of efficient supply chain management by 0.641. On overall, a high percentage of the respondents rated all continuous improvement factors which included minimization of non-value adding work, waste reduction, pull production, innovation and open decision making policy as influencing efficient supply chain management to a large extent. The study further revealed that the elimination of wastes in the various work areas was done to a low extent. The study also showed high levels of concentration of waste were from overproduction and transportation waste while waste from product defects and inventory waste was at moderate levels. Concentration of these wastes had a significant negative effect on efficient supply chain management in Bidco Oil Company.

How does inventory management contribute to an efficient supply chain management in Bidco Oil Company?

The study sought to find out the extent to which inventory management affected efficient supply chain management in Bidco Oil Company in Thika, Kenya. From the findings, majority of the respondents rated inventory management factors such as use of EOQ in purchasing and ordering, reduction of delivery quantities, reduction of production runs and compliance with stores management practices as influencing efficient supply chain management to a great extent and very great extent respectively.

How does quality management result to an efficient supply chain management in Bidco Oil Company?

The study evaluated the effect of quality management on efficient supply chain management in Bidco Oil Company. The study findings showed that quality management factors notably; product design, investigation of defects at the source, immediate defects screening on occurrence and inspection of raw materials to a large extent influenced how quality management affected efficient supply chain management in Bidco Oil Company.

How does supplier relationship management lead to an efficient supply chain management in Bidco Oil Company?

The study sought to find out the extent to which supplier relationship management affected efficient supply chain management in Bidco Oil Company in Thika, Kenya. The study findings showed that supplier relationship management factors notably; mutual trust, cooperation, long term commitment and strategic partnerships to a large extent influenced how supplier relationship management affected efficient supply chain management in Bidco Oil Company. From the findings, the study also found out that supplier relationship management had a significant strong positive correlation with efficient supply chain management of 0.570.Increasing levels of continuous improvement by a unit would increase the levels of efficient supply chain management by 0.570. This indicates that there exists a strong positive relationship between supplier relationship management and efficient supply chain management.

Conclusions

Based on the study findings, the study concludes that efficient supply chain management in Bidco Oil Company in Thika, Kenya is affected by continuous improvement followed by supplier relationship management, inventory management and then quality management. These are the major factors that mostly affect efficient supply chain management in Bidco Oil Company. The study concludes that continuous improvement is an important factor that affects efficient supply chain

management in Bidco Oil Company. The regression model of the study shows that continuous improvement has a significant influence on efficient supply chain management. This implies that increasing levels of continuous improvement by a unit would conversely increase the levels of efficient supply chain management. Continuous improvement factors which included minimization of non-value adding work, waste reduction, pull production, innovation and open decision making policy affects efficient supply chain management in Bidco Oil Company.

The study also concludes that inventory management is the other important factor that affects efficient supply chain management in Bidco Oil Company. The regression model of the study shows that inventory management has a significant influence on efficient supply chain management in Bidco Oil Company. Increasing levels of inventory management by a unit would conversely increase the levels of efficient supply chain management by the same measure. Inventory management factors such as use of EOQ in purchasing and ordering, reduction of delivery quantities, reduction of production runs and compliance with stores management practices to a large extent affects efficient supply chain management in Bidco Oil Company.

The study concludes that quality management is also a factor which affects efficient supply chain management in Bidco Oil Company. Quality management factors notably; product design, investigation of defects at the source, immediate defects screening on occurrence and inspection of raw materials to a large extent influenced how quality management affected efficient supply chain management in Bidco Oil Company.

Supplier relationship management also affects efficient supply chain management in Bidco Oil Company. According to the study findings, supplier relationship management factors notably; mutual trust, cooperation, long term commitment, supplier selection strategies, supplier performance management and supplier performance evaluation methods, supplier relationship management, payment of suppliers and strategic partnerships to a large extent affected efficient supply chain management in Bidco Oil Company.

Recommendations

Based on the research findings, the study recommends the management of manufacturing firms to improve on the level minimization of non-value adding work, waste reduction, pull production, innovation and open decision making policies to ensure their production processes fully meets the JIT requirements of the kaizen philosophy. Implementation of continuous improvement of production processes requires the management to streamline and integrate all processes in the manufacturing system firstly. Secondly, it is recommended the firms establish goals that require continuous improvement of the production process. In attainment of the goals towards continuous improvement the management should encourage a total employee involvement through ensuring all employees participate in meeting the commitments of the company. Full involvement of the employees in the continuous improvement processes requires the organization to invest extensively in employees training by emphasizing and promoting the culture of kaizen that is different from the traditional trends where many institutions leave the decision making about continuous improvement of processes entirely to the top management. The management of manufacturing firms are also recommended to employ professional trained supply chain management staff and continuously train the staff to be flexible, multi-skilled and multi-functional in conformance with the just in time philosophy.

Efficient supply chain management in manufacturing firms in Kenya is hindered by the employed inventory management methods that don't conform to pull production system requirements. The study recommends management of manufacturing firms to apply the

principle of economic order quantity in inventory management practices, use effective stores management practices, avoid procurement methods that lead to long lead time and embrace inventory management strategies that help in minimization of inventory costs. In order to achieve the benefits of the pull (customer-demand) production, manufacturing firms should utilize the Just-In-Time production system. The procedures necessary to implement the pull production system are simple yet powerful in maintaining efficiencies with minimum inventory. The basic idea is that the companies are only responding to the company's actual-customer demand for their product families.

Efficient supply chain management in Kenyan manufacturing firms cannot be realized without integration of quality management techniques in the production processes. It is recommended that quality oriented product designing, investigation of defects at the source, immediate defects screening on occurrence and inspection of raw materials should be implemented in the operations to promote efficient supply chain management. The study also recommends that on-final product inspections should be eliminated and that the primary responsibility for product quality with each team member should be practiced. The company should also support the workers with process audits or spot analysis of workstation procedure. The more the companies can build into these procedures, the easier it becomes to identify problems and strengthen quality.

Finally, the management of manufacturing firms in Kenya should embrace effective supplier relationship management strategies in order to support efficient supply chain management. It is recommended that effective supplier appraisal techniques are adopted, better supplier selection strategies are used, effective supplier selection process is employed, better supplier performance methods are applied, effective supplier relationship management techniques are adopted and supplier development and supplier collaboration are also employed. Another recommendation is development of a few nearby suppliers' preferably local suppliers so as to increase supplier reliability and reduce lead times.

Areas for further research

The findings emphasized on the role of just-in-time in realization of an efficient supply chain management, which is continuous improvement, inventory management, quality management, supplier relationship management in Bidco Oil Company in Kenya. As a future avenue of research, there is need to undertake similar research in other industries in Kenya and other countries in order to establish whether the explored factors can be generalized to affect efficient supply chain management.

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