International Journal of Economics, Commerce and Management
United Kingdom Vol. III, Issue 5, May 2015
http://ijecm.co.uk/ ISSN 2348 0386

'ROLE OF INVENTORY MANAGEMENT PRACTICES ON PERFORMANCE OF PRODUCTION DEPARTMENT' A CASE OF MANUFACTURING FIRMS

Raymond Musyoka Munyao
College of Human Resource Development,
School of Entrepreneurship, Procurement and Management
Jomo Kenyatta University of Agriculture and Technology, Kenya
munyaoraymond@gmail.com

Vincent Ochieng Omulo
College of Human Resource Development,
School of Entrepreneurship, Procurement and Management
Jomo Kenyatta University of Agriculture and Technology, Kenya
kenbusina@gmail.com

Mercy Wambui Mwithiga
School of Business, Economics and Social Sciences,
Taita Taveta University College, Voi, Kenya

Bellah Chepkulei
School of Business, Economics and Social Sciences,
Taita Taveta University College, Voi, Kenya

Abstract

This study aimed at examining the role of inventory management practices in the performance of the production department. The study sought to find the inventory management techniques used by manufacturing firms in Mombasa County, established the level of effectiveness of inventory management practices of manufacturing firms in Mombasa County. It also determined the level of performance of production departments of manufacturing firms in Mombasa County and finally determined whether computerized inventory management influences the performance of the production department. The study adopted the descriptive research design. The target population was textile, rolling mills and food and beverage manufacturing firms in Mombasa County. A survey was conducted which adopted stratified random sampling technique. Out of 150 manufacturing firms, a sample size of 45 manufacturing firms was used. A questionnaire was used as data collection instrument. One questionnaire was issued to one respondent at random from each of the forty five manufacturing firms included in the sample. Reliability of research instruments was tested using Split Half Reliability Test. The study found out that manufacturing firms used various inventory management techniques such as the action level methods, just-in-time, periodic review technique, material requirement planning 1 and economic order quantity. The study found that despite the fact that that MRP 1 was most effective in contributing to performance of the production department most organizations in the manufacturing industry used action level methods.

Keywords: Inventory, Inventory Management Practices, Performance of production department, Manufacturing firms

INTRODUCTION

Inventories are the stocks of raw materials, work in progress, finished goods and supplies held by a business organization to facilitate operations in the production process (Pandey, 2005). Inventories can either be assets as well as items held in the ordinary course of business or they can be goods that will be consumed or used in the production of goods to be sold (Green and James, 2000). Inventory is considered to have originated from the military's need to supply themselves with arms, ammunition, and rations as they moved from their base to a forward position (Cachon, and Fisher, 2000). Inventory as a business concept evolved only in the 1950's mainly due to the increasing complexity of supplying one's business with materials and slipping out products in an increasing globalized supply chain and inventory management (Cecil and Robert, 2006).

According to Silver, David and Rein, (1998), inventory management is a system concerned with integration of information, transportation, acquisition, inspection, material handling, warehousing, packaging and control of supplies and ensuring security of inventory. Inventory management aims at discovering and maintaining optimal levels of investment in all types of inventories and maximizing the flow of goods, information and other related resources like people and energy from the point of origin to the point of final consumption (Peter, 2000).

Historically, inventory management has often been associated with either too much inventory and too little management or too little inventory and too much management. There can be severe penalties for excesses in either direction. Inventory problems have proliferated as technological progress has increased the organization's ability to produce goods in greater quantities faster and with multiple design variations. The public has compounded the problem by its receptiveness to variations and frequent design changes (Tersine, 2009).

Since the mid1980s, the strategic benefits of inventory management and production planning and scheduling have become obvious. The business press has highlighted the success of Japanese, European and North American firms in achieving unparalleled effectiveness and efficiency in manufacturing and distribution. In recent years, many of the firms have 'raised the bar', yet again by coordinating with other firms in their supply chains. For instance, instead of responding to unknown and variable demand, they share information so that the variability of the demand they observe is significantly lower (Silver, Pyke and Peterson, 1998).

Silver, Pyke and Peterson (1998) continue arguing that in the United States of America and other Western Countries, productivity improvement was pursued by reducing the amount of direct manufacturing labor expended per unit of output. This was a valid strategy because of high labor content in many manufactured products. In spite of this, the proportion of unit costs resulting from labor has been steadily decreased in recent years. In fact the ratio of purchased materials to sales (in dollars) reached 60 percent for US firms in 1985. This implies that management of raw materials inventories is an area that shows great promise for productivity improvement. Japanese firms received much-deserved attention in the mid-to-late 1980s because of their remarkable performance on quality and inventory management. The tremendous interest in Just-in-Time manufacturing indicates that work-in-progress inventory management is also an area ripe for improvement.

In traditional settings, inventories of raw material spare parts work in progress, components and finished goods were kept as a buffer of a possibility of running out of needed items. However, large buffer inventories consumed valuable resources and generated inventory costs. Consequently, many companies have changed their approach to production and

inventory management. Since early 1980s, inventory management which leads to inventory reduction has become the primary target, as is often the case in just-in-time (JIT) systems where raw materials and parts are purchased or produced just-in-time to be used at each stage of the production process. As a result, inventories have been decreasing in many firms (Chen et al, 2005) although evidence of improved firm performance is mixed (Fullerton et al., 2003; Cannon, 2008; Kolias et al, 2011).

Nevertheless, most of the studies focus on the American firms in the manufacturing sector because of the many revolutions in inventory policies in 1970s and 1980s. Chet et al (2005) observed that the extent of emphasis on inventories among American firms reached the financial markets where there were rules that would reward firm that controlled inventories and punish those that did not do so. This is because, during the 1970s, Japanese manufacturing companies made substantial market share gains in the US markets in a range of industries including most notably the automobile industry.

In recent years, a number of firms have faced numerous challenges especially in inventory management or material control, thus affecting the performance of manufacturing companies. There have been cases of materials overstocking which eventually get expired or out dated, under stocking, lack of stock-taking, theft of materials by workers and delays in deliveries of materials into the organizations among others.

It is therefore important for manufacturing firms in Mombasa County to have sound, effective and well-coordinated inventory management systems because the business environment is rapidly changing, highly competitive and this drastically affects the performance of the organization. With the application of proper inventory management techniques, the right materials will be available at the right time, with the minimum storage costs and investment.

According to Waters (2008), organizations have dramatically changed their views of stock in the recent years. Historically, they saw stock as a benefit, with high stocks ensuring maximum service and even giving a measure of wealth. This thinking encouraged organizations to maximize their stocks and is still the reason why countries keep reserves of gold and why individuals keep food in the freezer. But with the advent of the twentieth century, it became clear that these stocks had costs that could be surprisingly high. Then organizations began to view stocks not as unreserved benefits but as a resource that needs careful control and thus the need to device ways of minimizing overall costs. More recently, organizations have gone further in reducing stocks, and they try to work with very low levels. There has been a trend towards operations that move materials quickly and efficiently through supply chains matching supply to demand so that stocks are not accumulated. When this works, it gives considerable savings, but

it is not a realistic option for all operations. Most organizations cannot work properly without stock and therefore they have to consider its management.

In Kenya, while some manufacturing firms have adopted the modern inventory management techniques, most of the firms are still lagging behind relying on the traditional methods despite the many benefits that are generated from the use of modern inventory management techniques.

Objectives of the study

Main Objective

The broad objective of this research was to establish the role of inventory management on the performance of the production department.

Specific objectives

(a) To find out inventory management techniques applied by manufacturing organizations in Mombasa County.

(b) To establish the level of effectiveness of inventory management practices of manufacturing firms in Mombasa County.

(c) To determine the level of performance of production departments of manufacturing firms in Mombasa County.

(d) To determine whether computerized inventory management influences the performance of the production department.

Research Questions

(a) Which inventory management techniques are applied in manufacturing organizations in Mombasa County?

(b) What is the level of effectiveness of inventory management practices of manufacturing firms in Mombasa County?

(c) What is the level of performance of production departments of manufacturing firms in Mombasa County?

(d) Does computerized inventory management influence the performance of the production department?

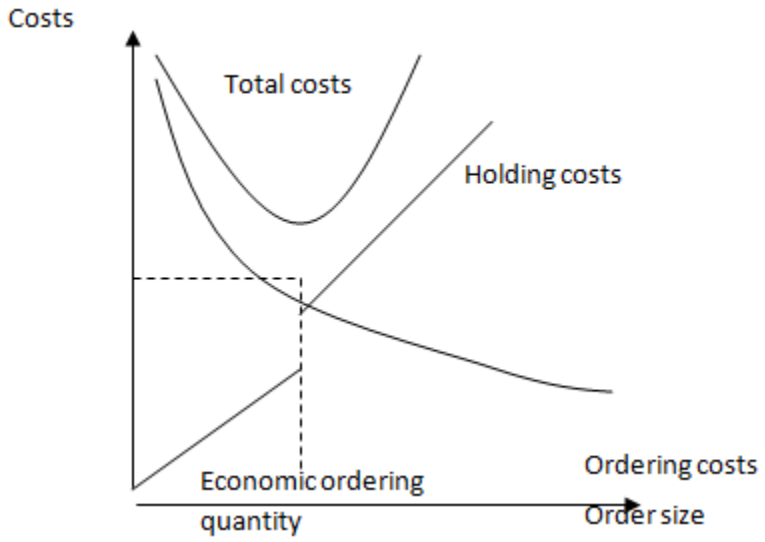
INVENTORY MANAGEMENT TECHNIQUES

Several techniques have been advanced to tackle constraints associated with inventory. These techniques must be in line with the firm's objectives. These techniques include:

Economic Order Quantity (EOQ) Model

The economic order quantity also known as the Wilson EQQ model is a model that defines the optimal quantity to order that minimizes total variable costs required to order and hold inventory (Lee, 2002). EOQ refers to the optimal ordering quantity for an item of stock that aids in the minimization of costs. This inventory management technique assumes that the demand for the item is known with certainty, the lead time is known and fixed, the receipt of the order occurs in single instant, quantity discounts are not calculated as part of the model and shortages of inventory or stock out do not occur. Economic order quantity graphs illustrate the relationship amongst the ordering costs holding total costs and economic order quantity (Nair, 1995)

Figure 1: Graphical Representation of EOQ



Bennet (1999) says in order to arrive at the economic order quantity, the formula below is used.

$$Q^* = \frac{2CR}{H}$$

Where,

Q* indicates the optimal order size

C is cost per order event (net per unit)

R is the monthly demand for the product.

H is the holding cost per unit.

Just in time (J.I.T)

This is an inventory management method whose goal is to maintain just enough material in just the right place at just the right time to make first the right amount of the product (Carlson, 2002). This was pioneered by the Japanese manufacturing firms where inventory is acquired only when required in business for production process and this aimed at improving the return on investment of the business by reducing in-process inventory and its associated costs (Schonsleben, 2000).

In this system, the supplier has the responsibility of delivering the components and part to the production line “Just in Time” to be assembled. Other names for just in time system is Zero stock inventory and production (Lazaridis & Dimitrios (2005).

For the just in time method to work successfully the quality of the parts must be very high because defective materials could up halt the operations of the assembly line, there must be dependable relationships and smooth co-operation with suppliers, ideally this implies that the supplier should be located near to the company with dependable transportation available (Konke, 2003).

Just in time inventory management system helps in reducing inventory costs by avoiding carriages of excess inventories and mishandling of raw materials. According to Kortz(2003), Just in time purchasing recognizes high costs associated with holding high inventory level and as such it has become important in most organizations to order inventory just in time of production so as to cut costs of holding inventory like storage lighting, heating, security, insurance and staffing (Dimitrios, P. (2008).

Material Requirement Planning 1

This is a technique of working backwards from the scheduled quantities and need dates for finished products specified in a master production schedule to determine the requirements for components needed to meet the master production budget schedule (Cooper, 2003). This inventory management technique determines what components are needed, how many are needed, when they are needed and when they should be ordered so that they are likely to be available when needed (Louis, 1981).

The Action Level Methods of Inventory Management

The basic method of managing stock by quantity is by means of fixing for each commodity stock levels which are recorded in the stock control system and subsequently used as a means of indicating when some action is necessary. We have a minimum, ordering, hastening and maximum stock levels (Harrisson, 2001).

The minimum stock level is the amount expressed in units below which the stock of any given commodity should not be allowed to fall. Re-order Level is the amount expressed in units of issue at which ordering action is indicated in time for the materials to be delivered before stock falls to a minimum. The hastening stock level is the amount expressed in units of issue at which it is estimated that the hastening action is necessary to request suppliers to make early delivery. The Maximum stock level is the amount expressed in units of issue above which the stock should not be allowed to rise. It helps avoid excess investments in stock, which is very critical (Harrisson, 2001).

EMPIRICAL REVIEW

In a study done by Kolias (2011), in order to test inventory-performance link using construction firms listed in Bursa Malaysia, it was found that there is a positive correlation between inventory turnover and capital intensity as a result of the nature of investments.

A study by Fullerton et al (2003) provides empirical support that manufacturing firms that implement higher degrees of modern inventory management techniques should outperform competitors; it was found that a positive relationship exists between firm's profitability and the degree to which waste reducing production practices such as reduced set up times, preventive, maintenance programs, and uniform workloads are implemented. These findings indicate that manufacturing enterprises employing modern inventory management techniques are consistently more profitable than their counterparts.

Another study suggesting a positive relationship between inventory management and performance was Eroglu and Hofer (2011), which used the Empirical Leanness Indicator (ELI) as a measurement for inventory management. They argued that inventory leanness is the best inventory management tool. Lean production considers inventory as a form of waste that should be minimized and has become synonymous with good inventory management Their study on USA manufacturing firms covering the period 2003-2008 found that leanness affects profit margins.

According to Eroglu and Hofer (2011), firms that are leaner than the industry average generally see positive returns to leanness. They found that the effect of inventory leanness on firm performance is positive and generally non-linear. Their study also implies that the effect of inventory leanness is concave which is in line with inventory management theory that there is an optimal degree of inventory leanness beyond which the marginal effect of leanness on financial performance becomes negative.

A survey of 351 management accountants by the National Association of Accountants (NAA) in a cross-section of industries to assess current inventory management practices in the

U.S indicated that: just-in-time inventory management techniques are increasing in popularity, as are automated time-phased inventory re-order system. The survey further established that 85 percent of respondents have no plans to change their inventory controls and that actual business experience is relied upon more than inventory quantitative models. Also, the survey established that some inventory management practices such as assessing inventory levels and balancing stock-out costs against expenses related to higher inventory levels are seldom used in practice (Romano, 2011).

Lazaridis & Dimitrios (2005) highlighted the importance of firms keeping their inventory at an optimum level by analyzing the relationship between working capital management and corporate profitability and stressed that its mismanagement will lead to excessive tying up of capital at the expense of profitable operations. A similar study by Rehman (2006) empirically established a strong negative relationship between the inventory turnover in days and the profitability of firms.

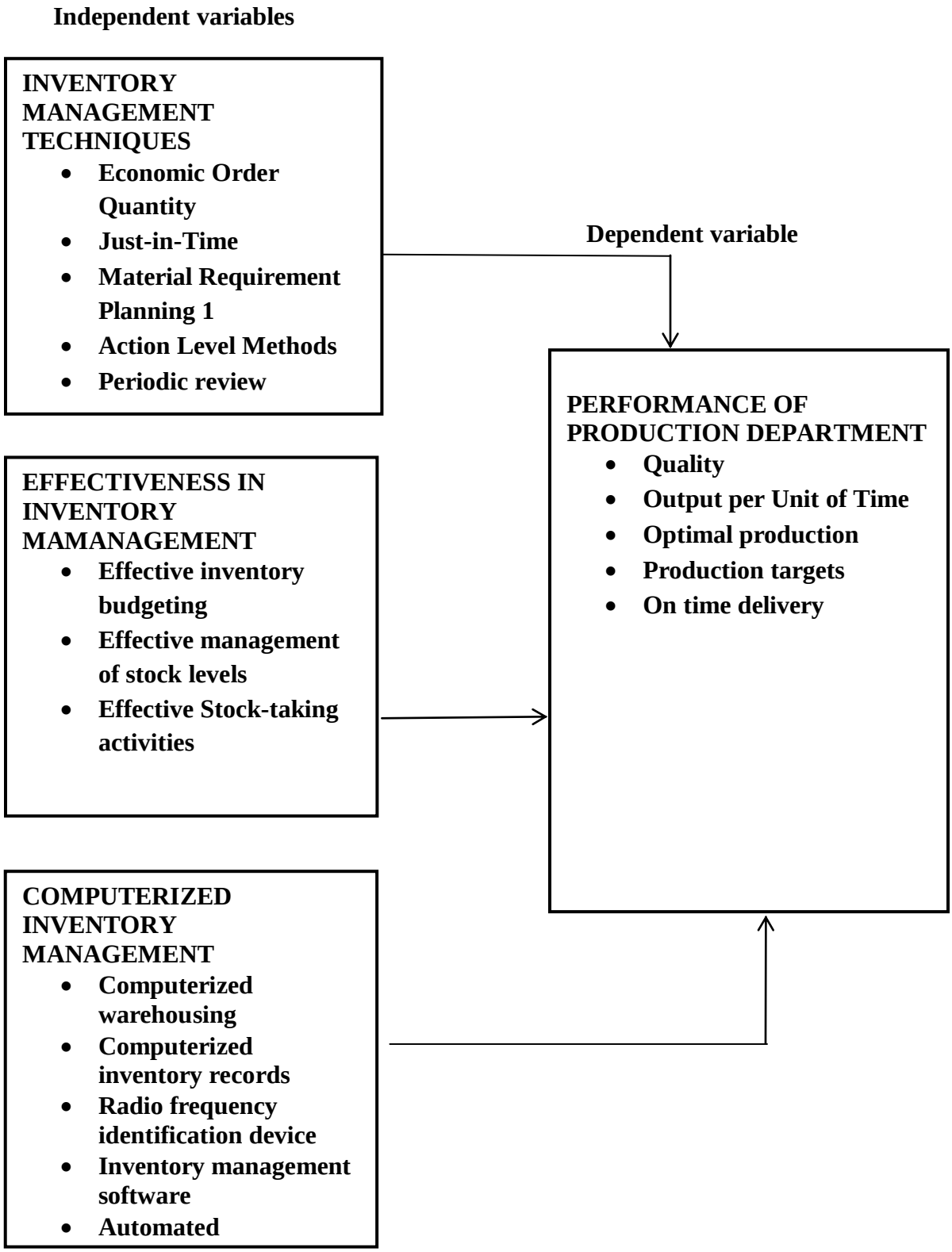
Sushma & Phubesh (2007) in their study of 23 Indian Consumer Electronics Industry firms established that businesses' inventory management policies had a role to play in their profitability performance.

Lazaridis & Dimitrios (2005) in their study of 131 companies listed on the Athens Stock Exchange showed that mismanagement of inventory will lead to tying up excess capital at the expense of profitable operations and suggested that managers can create value for their firms by keeping inventory to an optimum level.

Also, Rajeev (2008) in his study of 91 Indian Machine Tool Enterprises to evaluate the relationship between inventory management practices and inventory cost established that effective inventory management practices have a positive impact on the inventory performance of businesses and also have an eventual effect on the performance of the overall businesses processes.

Juan & Mertinez (2002) in their study of 8872 small and medium-sized Spanish firms also demonstrated that managers of firms can create value by reducing the number of days of inventory. Effective inventory management processes helps increase operational efficiency of firms; improves customer service; reduces inventory and distribution costs; and enables businesses track items and their expiration dates consequently balance between availability and demand (Pandey, 2004).

Figure 2. Conceptual framework for the study



RESEARCH METHODOLOGY

The study used descriptive research design. Descriptive research design was used because the study was not only confined to the collection and description of the data but sought to examine and establish the existence of certain relationships among the variables under study. Survey method was used in which participants answered questions administered to them through questionnaires. Survey method was used because it permits the collection of data through questionnaires administered to a sample and the data collected can be used to suggest relationships between variables and produce models for these relationships. The method is also preferred because it facilitates the collection of a considerable amount of data quickly, efficiently and accurately.

Target Population and Sampling Frame

The target population in the study was rolling mills, food and beverages and textile manufacturing companies within Mombasa County. One questionnaire was given to each organization included in the sample to be filled by one respondent drawn either from production, stores or procurement department.

In this study, the sampling frame consisted of a list of all one hundred and fifty textile, rolling mills, and food and beverage manufacturing firms in Mombasa County.

Table 1. Target Population

Manufacturing firm	Population	Percentage
Rolling Mills	10	6.67
Textile	60	40.00
Food and beverages	80	53. 33
Total	**150**	**100**

Sampling Technique and Sample Size

The study used stratified random sampling. The target population was divided into strata. The strata are necessary because the target population is heterogeneous in nature. The strata consisted of rolling mills, food and beverage firms and textile manufacturing firms. Respondents were randomly selected from the three strata and each respondent selected was issued with a questionnaire. Stratified random technique was chosen because it gives each member of the population an equal chance of being selected and it thus reduces biasness in the selection of cases to be included in the sample. Since the units selected for inclusion within the sample are chosen using probabilistic methods, stratified random sampling allows us to make statistical conclusions from the data collected that will be considered to be valid.

A Sample size of 45 manufacturing was used. The sample size was computed using Nassiuma Formula;

$$n = \frac{NC^2}{C^2 + (N-1)e^2} = \frac{150*(0.4)^2}{(0.4)^2 + (150-1)0.05^2} = 45$$

Where n is the sample size, N is the population, C is the coefficient of variation (0.4) and e is the margin of error (0.05). A confidence level of 95% was used.

Table 2. Sample Size

Manufacturing firms	Population	Ratio	Sample size
Rolling Mills	10	0.3	3
Textile	60	0.3	24
Food and beverages	80	0.3	18
Total	**150**		**45**

Data collection instruments

Questionnaires were used as the data collection instruments. In carrying out the research, the researchers paid close attention to the issue of the validity of the research instrument hence a test of reliability and validity of research instrument was be conducted.

Reliability of research instruments

A Pilot Study was carried out on 10 employees who were not included in the main sample. To test for reliability of the instrument the researchers adopted the split-half reliability test. They administered 45-items bearing Likert weighted questions to a sample of ten respondents. The questionnaire was also looking if the sample respondent marked the questionnaires in the right way.

The total number of ten questionnaires used in the pilot study was returned some fully answered and others partially answered. This led to the calculation of the reliability of the research instrument.

The researchers adopted the criteria of: if the respondent marked any of given choices in the questionnaire, the respondent understood the question but if he/she left the question unmarked, the respondent did not understand the question and this was given a score zero otherwise the answer given were given one score.

To calculate the KR-20, the researcher entered data from the questionnaire in an Excel Spreadsheet then used the formulae below:

$$r_{KR20} = \left(\frac{k}{k-1}\right)\left(1 - \frac{\sum pq}{\sigma^2}\right)$$

K = the number of items in the questionnaire.

P= proportion of the sample who answered each item correctly. That is the number of question answered correctly or those that scored one divided by the number of the respondent who answered the question.

Q= the proportion of the sample who did not answer the item correctly.

In simple P+Q =1

The first value in the formula is K which is the total number of items (question) which was 45.

The next value is $\sum pq$. This is the sum of proportion of those who answered item correctly and those who did not answer the question correct. This value was calculated to be 1.4471 from the spread sheet.

The other value was variance σ^2 which was calculated to be 5.92

Equating these variables in the above formulae the solution was:-

$$r_{KR20} = \left(\frac{45}{45-1}\right)\left(1 - \frac{1.3473}{5.92}\right)$$

=0.78997

≈78.6%

This was an indication that the questionnaires were reliable for the study of the role of inventory management practices on performance of production department. According to Kathuri & Pals (1993), items with validity and reliability coefficients of at least 0.7 are accepted.

Response rate

Thirty eight out of the forty five questionnaires issued were returned fully filled with the remainder being treated as non-response bias. The response rate reflected the view of Mugenda & Mugenda (2003) who indicated that a response rate of 70% and over is very good as it gives a representative sample for meaningful generalization and minimizes errors.

Table 3. Response rate

Questionnaire	**Frequency**	**Percent,%**
Returned	38	84.4
Not returned	7	15.6
Total	**45**	**100**

ANALYSIS

Inventory Management Techniques

Respondents were asked to indicate the inventory management technique used in their organization.

Table 4. Inventory management techniques

Inventory Management Technique	Frequency	Percent
Economic Order Quantity	6	15.8
Action Level Methods	14	36.8
Just-in-Time	5	13.2
Periodic Review Technique	7	18.4
Material Requirement Planning 1	6	15.8
Total	38	100.0

15.8% said that their organization used economic order quantity, 36.8 % indicated that they used action level methods, 13.2% used Just-in-time, 18.4% used periodic review technique and 15.8 % used material requirement planning 1. It is evident that action level methods were the most used.

Inventory management techniques and their contribution to the performance of production department

Respondents were asked to rate inventory management techniques based on their contribution to the performance of the production department.

Table 5. contribution of inventory management techniques to the performance of production department

Inventory Management Technique	Poor	Fair	Good	Very Good	Excellent	Total
Economic Order Quantity	6 (15.8%)	11 (28.9%)	10(26.3%)	5(13.2%)	6(15.8%)	38(100%)
Action Level Methods	11(28.9%)	9(23.7%)	11(28.9%)	3(7.9%)	4(10.5%)	38(100%)
Just-in-Time	5(13.2%)	6(15.8%)	6(15.8%)	12 (31.6%)	9(23.7%)	38(100%)
Periodic Review Technique	16(42.1%)	10(26.3%)	7(18.4%)	2 (5.3%)	3 (7.9%)	38(100%)
Material Requirement Planning 1	2(5.3%)	6(15.8%)	5(13.2%)	8(21.1%)	17(44.7%)	38(100%)

15.8% rated economic order quantity as poor, 28.9% rated it as fair, 6.3 % rated it as good, and 13.2% rated it as very good while 15.8% rated it as excellence. It is evident that most respondents rated economic order quantity as fair.

28.9% rated action level methods as poor, 23.7% rated it as fair, 28.9% rated it as good, and 7.9% rated it as very good, while 10.5% rated it as excellent. It is evident that most respondents rated action level methods as good.

13.2% rated Just in time as poor, 15.8% rated it as fair, 15.8% rated it as good, and 31.6% rated it as very good while 23. 7% rated it as excellent. It is evident that most respondents rated just-in-time as very good.

142.1% rated periodic review technique as poor, 26.3 % rated it as fair, 18.4% rated it as good, and 5.3% rated it as very good while 7.9% rated it as excellent. There, it is evident that most respondents rated periodic review techniques as poor.

5.3% rated material requirement planning as poor, 15.8% rated it as fair 13.2% rated it as good and 21.1% rated it as very good while 44.7% rated it as excellent. It is evident that most respondents rated material requirement planning 1 as excellent.

Frequency of occurrence

Respondents were asked to indicate frequency of occurrence of the incidences (Table 6).

Table 6. Frequency of occurrence

Incidence	Never	Rarely	Sometimes	Often	Very Often	Total
Underproduction	1(2.6%)	4 (10.5%)	4(10.5%)	13(34.2%)	16(42.1%)	38(100%)
Overproduction	3(7.9%)	3(7.9%)	6(15.8%)	10(26.3%)	16(42.1%)	38(100%)
Excessive stocks	0 (0%)	4(10.5%)	5(13.2%)	17 (44.7%)	12(31.6%)	38(100%)
Stock out situations	4(10.5%)	3(7.9%)	2(5.3%)	15 (39.5%)	14 (36.8%)	38(100%)
Production Bottlenecks	2(5.3%)	5(13.2%)	7(18.4%)	14(36.8%)	10(26.3%)	38(100%)
Delays in delivery of raw materials	4(10.5%)	8(21.1%)	12(31.6%)	7(18.4%)	7(18.4%)	38(100%)
Stock outs of spare parts for machines	2(5.3%)	5(13.2%)	2(5.3%)	6(15.8%)	23(60.5%)	38(100%)

2.6% indicated that underproduction never occurred, 10.5% indicated that it rarely occurred, 10.5% indicated that it sometimes occurred, 34.2% indicated that it often occurred while 42.1% indicated that it occurred very often. It is evident that most respondents indicated that underproduction occurred very often in their organizations.

7.9% indicated that overproduction never occurred, 7.9% indicated that it rarely occurred, 15.8% indicated that it sometimes occurred, 26.3% indicated that it often occurs while

42.15 % indicated that it occurred very often. It is evident that most respondents indicated that overproduction occurred very often in their organizations.

No respondent indicated that excessive stocks occurred, 10.55 % indicated that it rarely occurred, 13.2% indicated that it sometimes occurred 44.7% indicated that it often occurred while 31.6% indicated that it occurred very often. It is evident that most respondents indicated that excessive stocks occurred often in their organizations.

10.5% indicated that stock out situations never occurred, 7.9% indicated that it rarely occurred, 5.3% indicated that it sometimes occurred, 39.5% indicated that it often occurred while 36.8% indicated that it occurred very often. It is evident that most respondents indicated that stock out situations occurred often in their organizations.

5.3% indicated that production bottlenecks never occurred, 13.2% indicated that it rarely occurred, 18.4% indicated that they sometimes occurred, 36.8% indicated that they occurred often while 26.3% indicated that they occurred very often. Most respondents (31.6%) indicated that delays in delivery of raw materials sometimes occurred.

The extent to which effective inventory management practices contributes to the frequency of occurrence

Respondents were asked to indicate the extent to which they agreed that ineffective management practices contributed to the occurrence of the incidences indicated in the table.

Table 7. Contribution of effective inventory management to the frequency of occurrence

Incidence	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Total
Underproduction	(5.3%)	4(10.5%)	3(7.9%)	7(18.4%)	22(57.9%)	38(100%)
Overproduction	2(5.3%)	4(10.5%)	4(10.5%)	11(28.9%)	17(44.7%)	38(100%)
Excessive stocks	5(13.2%)	5(13.2%)	2(5.3%)	8 (21.1%)	18(47.4%)	38(100%)
Stock out situations	4(10.5%)	5(13.2%)	4(10.5%)	9 (23.7%)	16 (42.1%)	38(100%)
Production Bottlenecks	4(10.5%)	5(13.2%)	6(15.8%)	8(21.1%)	15(39.5%)	38(100%)
Delays in delivery of raw materials	5(13.2%)	2(5.3%)	4(10.5%)	9(23.7%)	18(47.4%)	38(100%)
Stock outs of spare parts for machines	2(5.3%)	3(7.9%)	6(15.8%)	13(34.2%)	14(36.8%)	38(100%)

5.3% strongly agreed that ineffective inventory management practices contributes to underproduction, 10.5% disagreed that it contributes, 7.9% were neutral, 18.4% agreed while 57.9% strongly agreed. It is evident that most respondents strongly agreed that ineffective inventory management practices contributed to underproduction.

Most respondents that is 44.7% strongly agreed that ineffective management practices contributed to overproduction. Most respondents that is 47.4% strongly agreed that ineffective inventory management contributed to excessive stock.

Most respondents that is 42.1% strongly agreed that ineffective inventory management contributes to stock out situations. Most respondents that is 39.5% strongly agreed that ineffective inventory management contributes to stock out situations. Most respondents that is 47.4% strongly agreed that ineffective inventory management contributes to stock out situations. Most respondents that is 36.8% strongly agreed that ineffective inventory management contributes to stock out of spare parts for machines.

Organization's commitment in using effective inventory management techniques

The respondents were asked to indicate to what extent they thought that their organizations were committed in using effective inventory management techniques.

Table 8. Organization's commitment in using effective inventory management techniques

	Frequency	Percent
Not at all	3	7.9
Slightly	13	34.2
To some extent	9	23.7
Moderately	7	18.4
To great extent	6	15.8
Total	38	100.0

7.9% indicated that their organizations was not at all committed in using effective inventory management techniques, 34.4% indicated that their organizations were slightly committed, 23.7% indicated that their organizations were to some extent committed while 18.4% indicated their organizations were moderately committed and 15.8% indicated that their organizations were to great extent committed.

Frequency in preparation of inventory budget

The respondents were asked to indicate the frequency of preparation of inventory budget in their organizations.

Table 9. Frequency in preparation of inventory budget

	Frequency	Percent
Never	1	2.6
Rarely	12	31.6
Sometimes	14	36.8
Often	7	18.4
Very Often	4	10.5
Total	38	100.0

2.6% said that their organization never prepared inventory budget, 31.6% said that their organization rarely prepared inventory budget, 36.8% said that their organizations sometimes prepared inventory budget, 18.4% said that their organizations often prepared inventory budgets an equivalent of 10.5% indicated that their organizations prepared inventory budget. It is evident that most of the respondents indicated that their organizations sometimes prepared inventory budget.

Frequency of stock taking

The respondents were asked to indicate the frequency of stock taking in their organization.

Table 10. Frequency of stock taking

	Frequency	Percent
Never	5	13.2
Rarely	10	26.3
Sometimes	10	26.3
Often	9	23.7
Very Often	4	10.5
Total	38	100.0

13.2% indicated that their organization never did stock taking, 26.3% indicated that their organization rarely did stock taking, 26.3% indicated that their organization sometimes did stock taking, 23.7% indicated that their organization often did stock taking while 10.5% said that their organization did stock taking very often.

Frequency in review of inventory levels

Respondents were requested to indicate the frequency of review of inventory levels in their organization the results are shown in the table below.

Table 11. Frequency in review of inventory levels

	Frequency	Percent
Never	3	7.9
Rarely	6	15.8
Sometimes	17	44.7
Often	6	15.8
Very Often	6	15.8
Total	38	100.0

7.9% indicated that their organization never reviewed their inventory levels, 15.8% said that their organization rarely reviewed their inventory levels. 44.7% indicated that their organizations sometimes reviewed inventory levels, 15.8% indicated that their organization reviewed their inventory levels often while 15.8% indicated that their organizations reviewed their inventory levels very often.

Effectiveness in inventory management practices

Respondents were asked to indicate the level of effectiveness of their organization in the preparation of inventory budget. The responses are as shown.

Table 12. Effectiveness in inventory management practices

	Frequency	Percent
Not effective	10	26.3
Least effective	3	7.9
Fairly effective	8	21.1
Effective	9	23.7
Highly effective	8	21.1
Total	38	100.0

26.3% indicated that their organizations were not effective in preparation of inventory budget, 7.9% indicated that they were least effective, 21.1% indicated that they were fairly effective, 23.7% indicated that they were effective while 21.1 % indicated their organizations were highly effective in preparation of inventory budget.

Level of effectiveness in updating the inventory budget

The respondents were requested to indicate the level of effectiveness of their organization in updating the inventory budget. The table below shows the responses.

Table 13. Level of effectiveness in updating the inventory budget

	Frequency	Percent
Not effective	4	10.5
Least Effective	13	34.2
Fairly effective	10	26.3
Effective	6	15.8
Highly effective	5	13.2
Total	38	100.0

10.5% indicated that their organizations were not effective in updating the inventory budget,34.2% said that their organizations were least effective, 26.3% indicated that their organization were fairly effective, 15.8% indicated that their organization were effective while 13.2% indicated that their organizations were highly effective in updating the inventory budget.

Level of effectiveness in the use of computers in inventory budgeting

Respondents were asked to indicate the level of effectiveness of their organizations in the use of computers in inventory budgeting. The responses were as shown below.

Table 14. Level of effectiveness in the use of computers in inventory budgeting

	Frequency	Percent
Not effective	16	42.1
Least effective	5	13.2
Fairly effective	11	28.9
Effective	3	7.9
Highly effective	3	7.9
Total	38	100.0

42.1% indicated that their organizations were not effective, 13.2% indicated that their organization were least effective, 28.9% indicated that their organization were fairly effective, 7.9% indicated that their organizations were effective while 7.9% indicated that their organizations were highly effective.

Level of effectiveness in inventory levels management practices

Respondents were asked to indicate the level of effectiveness of their organizations in inventory levels management practices. Below are the responses.

Table 15. Level of effectiveness in inventory levels management practices

Inventory level management indicators	Not effective	Least effective	Fairly effective	Effective	Highly effective	Total
Establishment of maximum and minimum inventory levels	4 (10.5%)	3 (7.9%)	7(18.4%)	14(36.8%)	10(26.3%)	38(100%)
Determination of re-order level of stock	9(23.7%)	6(15.8%)	11(28.9%)	8(21.1%)	4(10.5%)	38(100%)
Ensuring availability of adequate stock at all time	18(47.4%)	11(28.9%)	4(10.5%)	2 (5.3%)	3(7.9%)	38(100%)
Use of computers in monitoring inventory level	17(44.7%)	5(13.2%)	7(18.4%)	5 (13.2%)	4 (10.5%)	38(100%)

10.5% indicated that their organization were not effective in the establishment of maximum and minimum inventory levels.7.9% indicated the organizations were least effective, 18.4% indicated that organizations were fairly effective, 36.8% indicated that their organizations were effective while 26.3% indicated that the organizations were highly effective. It is evident that most organizations were effective in the establishment of maximum and minimum inventory levels.

Effectiveness of stock taking practices

Respondents were requested to indicate the level of effectiveness of their organizations in stock taking practices. Below were the responses.

Table 16. Effectiveness of stock taking practices

	Frequency	Percent
Not effective	3	7.9
Least effective	4	10.5
Fairly effective	6	15.8
Effective	16	42.1
Highly effective	9	23.7
Total	38	100.0

7.9% said that their organizations were not effective. 10.5% indicated that their organizations were least effective, 15.8% indicated that the organizations were fairly effective, 42.1%

indicated that their organizations were effective while 23.7% indicated that their organizations were highly effective.

Frequency of stock tacking

The respondents were asked to indicate how often stock taking was taken in their organizations. Below are the responses.

Table 17. Frequency of stock tacking

	Frequency	Percent
Daily	5	13.2
Weekly	3	7.9
Fortnightly	7	18.4
Monthly	15	39.5
Quarterly	8	21.1
Total	38	100.0

13.2% indicated that stock taking was conducted daily, 7.9% indicated that stock taking was conducted weekly, 18.4% indicated that stock taking was conducted fortnightly, 39.5% indicated that stock taking was conducted monthly while 21.1% indicated that stock taking was conducted quarterly.

Extent of satisfaction with the level of performance of the production department based on quality of goods

Respondents were asked to indicate the extent to which they were satisfied with the level of performance of the production department based on the quality of goods.

Table 18. Extent of satisfaction with the level of performance of the production department based on quality of goods

	Frequency	Percent
Least satisfied	4	10.5
Moderately satisfied	17	44.7
Satisfied	12	31.6
Very satisfied	2	5.3
Most satisfied	3	7.9
Total	38	100.0

10.5% indicated that they were least satisfied, 44.7% indicated that they were moderately satisfied, 31.6% indicated that they were satisfied, 5.3% indicated that they were very satisfied while 7.9 % indicated that they were most satisfied.

Extent of satisfaction with the level of performance of the production department based on optimal production

Respondents were asked to indicate the extent to which they were satisfied with the level of performance of the production department based on optimal production. The responses are depicted in the table below.

Table 19. Extent of satisfaction with the level of performance of the production department based on optimal production

	Frequency	Percent
Least satisfied	14	36.8
Moderately satisfied	9	23.7
Satisfied	7	18.4
Very satisfied	4	10.5
Most satisfied	4	10.5
Total	38	100.0

36.8% indicated that they were least satisfied, 23.7% indicated that they were moderately satisfied, 18.4% indicated that they were satisfied, 10.5% indicated that they were very satisfied while 10.5% respondents indicated that they were most satisfied.

Extent of satisfaction with the level of performance of the production department based on on-time delivery

Respondents were asked to indicate the extent to which they were satisfied with the level of performance of the production department based on on-time delivery.

Table 20. Extent of satisfaction with the level of performance of the production department based on on-time delivery

	Frequency	Percent
Least satisfied	7	18.4
Moderately satisfied	18	47.4
Satisfied	6	15.8
Very satisfied	2	5.3
Most satisfied	5	13.2
Total	38	100.0

18.4% indicated that they were least satisfied, 47.4% indicated that they were moderately satisfied, 15.8% indicated that they were satisfied, 5.3% indicated that they were very satisfied while 13.2% indicated that they were most satisfied.

Level of performance of production department of manufacturing firms in Mombasa County

Respondents were asked to indicate the extent to which they were satisfied with the level of performance of the production department based on achievement of production targets. The responses are depicted in the table below.

Table 21. Level of performance based on achievement of production targets

	Frequency	Percent
Least Satisfied	12	31.6
Moderately satisfied	11	28.9
Satisfied	7	18.4
Very satisfied	3	7.9
Most satisfied	5	13.2
Total	38	100.0

31.6% indicated that they were least satisfied, 28.9% indicated that they were moderately satisfied, 18.4% indicated that they were satisfied, 7.9% indicated that they were very satisfied while 5 13.2% respondents indicated that they were most satisfied.

Extent of satisfaction with the level of performance of the production department based on output per unit of time

Respondents were asked to indicate the extent to which they were satisfied with the level of performance of the production department based on output per unit of time.

Table 22. Extent of satisfaction with the level of performance of the production department based on output per unit of time

	Frequency	Percent
Least satisfied	1	2.6
Moderately Satisfied	3	7.9
Satisfied	6	15.8
Very satisfied	9	23.7
Most satisfied	19	50.0
Total	38	100.0

2.6% indicated that they were least satisfied, 7.9% indicated that they were moderately satisfied, 15.8% indicated that they were satisfied, 23.7% indicated that they were very satisfied while 50% respondents indicated that they were most satisfied.

Extent to which application of computerized warehousing influences production efficiency

Respondents were asked to indicate the extent to which they agreed that application of computerized warehousing influences production efficiency.

Table 23. Extent to which application of computerized warehousing influences production efficiency

	Frequency	Percent
Strongly disagree	1	2.6
Disagree	6	15.8
Neutral	4	10.5
Agree	6	15.8
Strongly agree	21	55.3
Total	38	100.0

2.6% strongly disagreed, 15.8% disagreed, 10.5% were neutral, 15.8% agreed and 55.3% strongly agreed. It is evident that most respondents strongly agreed that computerized warehousing influences production efficiency.

Extent to which application of computerized inventory records influences production efficiency

Respondents were asked to indicate the extent to which they agreed that application of computerized inventory records influences production efficiency.

Table 24. Extent to which application of computerized inventory records influences production efficiency

	Frequency	Percent
Strongly disagree	4	10.5
Disagree	1	2.6
Neutral	5	13.2
Agree	4	10.5
Strongly agree	24	63.2
Total	38	100.0

10.5% strongly disagreed, 12.6% disagreed, 13.2% were neutral, 10.5% agreed while 2 63.2% strongly agreed. It is evident that most respondents strongly agreed that computerized inventory records influences production efficiency.

Extent to which use of bar codes influences production efficiency

Respondents were asked to indicate the extent to which they agreed that application of bar codes influences production efficiency.

Table 25. Extent to which application of computerized inventory records influences production efficiency

	Frequency	Percent
Strongly disagree	2	5.3
Disagree	3	7.9
Neutral	4	10.5
Agree	15	39.5
Strongly agree	14	36.8
Total	38	100.0

Two respondents 5.3% strongly disagreed, 3 respondents 7.9% disagreed, 4 respondents 10.5% were neutral, 15 respondents 39.5% agreed while 14 respondents 36.8% strongly agreed. It is evident that most respondents agreed that application of bar codes records influences production efficiency.

Extent to which application of automated replenishment influences production efficiency

Respondents were asked to indicate the extent to which they agreed that application of automated replenishment influences production efficiency. The responses are shown below.

Table 26. Extent to which application of automated replenishment influences production efficiency

	Frequency	Percent
Strongly disagree	3	7.9
Disagree	2	5.3
Neutral	5	13.2
Agree	7	18.4
Strongly agree	21	55.3
Total	38	100.0

7.9% strongly disagreed, 5.3% disagreed, 13.2% were neutral, 18.4% agreed while 55.3% strongly agreed. It is evident that most respondents agreed that application of bar codes records influences production efficiency.

Extent to which application of inventory management software influences production efficiency

Respondents were asked to indicate the extent to which they agreed that application of inventory management software influences production efficiency.

Table 27. Extent to which application of inventory management software influences production efficiency

	Frequency	Percent
Strongly disagree	3	7.9
Disagree	2	5.3
Neutral	5	13.2
Agree	4	10.5
Strongly agree	24	63.2
Total	38	100.0

7.9% strongly disagreed, 5.3% disagreed, 13.2% were neutral, 10.5% agreed while 63.2% strongly agreed. It is evident that most respondent strongly agreed that application of inventory management software influences production efficiency.

Extent to which application of radiofrequency identification device influences production efficiency

Respondents were asked to indicate the extent to which they agreed that application of radio frequency identification device influences production efficiency.

Table 28. Extent to which application of radiofrequency identification device influences production efficiency

	Frequency	Percent
Strongly disagree	4	10.5
Disagree	3	7.9
Neutral	1	2.6
Agree	5	13.2
Strongly agree	25	65.8
Total	38	100.0

10.5% strongly disagreed, 7.9% disagreed, 2.6% were neutral, 13.2% agreed while 65.8% strongly agreed. It is evident that most respondent strongly agreed that application of radio frequency identification device influences production efficiency.

Extent to which application of computerized inventory management affects the performance of production department

Respondents were asked to indicate the extent to which they agreed that application of computerized management affects the performance of production department.

Table 29. Extent to which application of computerized inventory management affects the performance of production department

	Frequency	Percent
Strongly Disagree	4	10.5
Disagree	3	7.9
Neutral	4	10.5
Agree	4	10.5
Strongly agree	23	60.5
Total	38	100.0

10.5% strongly disagreed, 7.9 % disagreed, 10.5 % were neutral, 10.5% agreed while 6.5% strongly agreed.

Organization's commitment to the use of computerized inventory management

Respondents were asked to indicate the extent to which they agreed that their organizations were committed to the use of computerized inventory management.

Table 30. Organization's commitment to the use of computerized inventory management

	Frequency	Percent
Strongly disagree	10	26.3
Disagree	13	34.2
Neutral	4	10.5
Agree	5	13.2
Strongly agree	6	15.8
Total	38	100.0

26.3% strongly disagreed, 34.2% disagreed, 10.5% were neutral, 13.2% agreed while 15.8% strongly agreed.

SUMMARY OF THE FINDINGS

The purpose of the study was to examine the role of inventory management practices in the performance of production department. The target population was manufacturing firms within Mombasa County. The study population comprised of 150 manufacturing firms consisting of 10 rolling mills, 60 textile manufacturing firms and 80 food and beverage manufacturing firms. A

sample of 45 firms comprising of 3 rolling mills, 24 textile manufacturing firms and 18 food and beverages firms.

The first objective was to find out inventory management techniques applied by manufacturing organizations in Mombasa County. The general observation concerning inventory management techniques is that action level methods were the most used inventory management technique. 14 respondents (36.8%) indicated that their organizations used this technique. The least used inventory management technique was JIT whereby 5 respondents (13.2%) used this technique. Concerning the contribution of inventory management to the performance of production department, most respondents (44.7%) indicated that MRP 1 was excellent in contributing to the performance of production department. Moreover, most respondents (42.1%) ranked periodic review technique as poor. It was established incidences of overproduction, excessive stock, stock out situations and stock out of spare parts of machines occurred very often. The general observation was that most people strongly agreed that ineffective inventory management practices contribute to the said incidences.

The second objective of the study was to establish the level of effectiveness of inventory management practices of manufacturing firms in Mombasa County. The inventory management practices being examined were inventory budgets preparation, stock tacking practices and inventory levels management. The overall view was that most organizations were not effective in preparation of inventory budgets as depicted by 10 respondents (26.3%) who indicated that the organizations were not effective. Most organizations represented by 34.2 % were least effective in updating the inventory budget, whereas most organizations representing 42.1% were not effective in the use of computers in inventory budgeting. Most organizations representing 42.1% were effective in stock tacking practices. Most organizations representing 47.4% were not effective in ensuring availability of adequate stock at all times.

The third objective was to determine the level of performance of production departments of manufacturing firms in Mombasa County based on quality of goods, optimal production, on-time delivery, achievement of production targets and output per unit of time. Most respondents (44.7%) were moderately satisfied with the performance of the department based on the quality of goods. Based on optimal production, most respondents (36.85) were least satisfied. Based on on-time delivery, majority of the respondents (47.4%) were moderately satisfied. Based on achievement of production targets, majority of the respondents (31.6%) were least satisfied while based on output per unit of time, majority of the respondents (50%) were most satisfied.

The fourth objective was to determine whether computerized inventory management influences the performance of production department. Most respondents (55.3%) strongly agreed that computerized warehousing influences production efficiency. 63.2% strongly agreed

that computerized inventory records influences production efficiency. Majority of the respondents (39.5%) agreed that the use of bar codes influences production efficiency. Majority of the respondents (63.2%) strongly agreed that the use of inventory management software influences production efficiency.

CONCLUSION

The study established that majority of the respondents either agreed or strongly agreed that the use of computerized inventory management practices such as Computerized warehousing, computerized inventory record, bar codes, inventory management software, automated replenishment and radio-frequency identification device influence production efficiency.

It can also be concluded that ineffective inventory management leads to incidences of overproduction, underproduction, excessive stocks, stock out of spare parts for machines, production bottlenecks and delays in delivery of raw materials. The study established that MRP 1 was most effective in contributing to performance of production department despite the fact that most organizations used action level methods.

FURTHER RESEARCH

The study was conducted in the textile, rolling mills and food and beverage companies. Similar studies could be replicated in other industries to examine the role of inventory management practices in the performance of production department. Similar studies can also be carried out to determine the impact of effective inventory management on organization's performance, challenges in inventory management and also the impact of the use of vendor managed inventory. Future studies should attempt to achieve a larger sample to determine whether the results can be generalized.

REFERENCES

Ballou, R. (2001). *Basic Business Logistics Transportation Material Management, Physical Distribution,* 2nd Edition, Prentice Hall, New Jersey.

Baggott, J (2005). *Cost and Management Accounting*, 2nd Edition, Richard Clay Limited, Bunguy.

Ballou, C.P. (2004). *Business Logistics/Supply chain management planning, organizing and controlling the supply chain.* 5th Edition, Volume 6.2001:2.

Bowersox, D.J, Closs, DJ, and Copper, MB. (2002). Supply chain-Logistics Management, International edition, MC Graw Hill, USA.

Carlson, J. G. (2002). *Just-in-time approach to system wide efficiency and quality borrows from industrial techniques,* Strategies for Healthcare Excellence, 6(2), 9-12.

Cannon, A.R. (2008). Inventory Improvement and Financial Performance, *International Journal of Production Economics* 115, 581–593.

Cachon, G.P. and M.L. Fisher (2000). *Supply Chain Inventory Management and the Value of Shared Information,* Management Science 46, 1032 – 1048

Cecil Bozarth and Robert Handfield, (2006). *Introduction to Operations and Supply Chain Management*, Prentice-Hall.

Dimitrios, P. (2008). The effect of inventory management on firm performance, *International Journal of Productivity and Performance Management*, 57 (5)

Eroglu, C. and C. Hofer (2011). Lean, Leaner, Too Lean? The Inventory-Performance Link Revisited, *Journal of Operations Management* 29, 356–369.

Eroglu, C., Brent, W., and Waller, M. (2011). Consumer driven retail operations, The moderating effect of consumer demand and case pack quantity, *International Journal of Physical distribution and logistics management*, 41 (5), 420-434

Fullerton R.R., C.S. McWatters and C. Fawson (2003). An Examination of the Relationship between JIT and Financial Performance, *Journal of Operations Management* 21, 383–404.

Green, James H. (2000). *Production and Inventory Control Handbook*, 3rd edition, New York, McGraw-Hill.

Harrisson, F. (2001). *Supply chain management workbook*, Butterworth/ Heinemann, Great Britain.

Horngren, T Charles. (2008). *Cost Accounting Management Emphasis,* 5th Edition, Prentice Hall, New Jersey.

Harroson P and Jundern G. (2000). *Supply Chain Management*, 3rd Edition, Mac Graw Hill Book Company, Singapore.

Juan, P. G., and Martinez, S. (2002). Effects of working capital management on SME profitability, *Journal of Business Finance & Accounting*, 30 (3–4), 1-14. Retrieved from http://www.sagepublications

Kolias, G.D., S.P. Dimelis and V.P. Filios (2011). *An Empirical Analysis of Inventory Turnover Behavior in the Greek Retail Sector:* 2000-2005. International Journal of Production Economics 133(1), 143–153.

Kotabo, K. (2002). *Management of Finance Company*, Sixth Edition, International Thomson Business Press, London.

Lee, H. L. (2002). *Aligning Supply Chain Strategies with Product Uncertainties,* California Management Review. 44(3), Spring: 105–119.

Lazaridis, I., and Dimitrios, T. (2005). *The relationship between working capital management and profitability of listed companies in the Athens Stock Exchange*, Retrieved from http://ssrn.com/ on July 2013.

Nair N.K (2006). *Purchasing and Material Management ,*1st Edition, Heinemann Educational Publishers Limited, Oxford.

Nasiurma, D. K. (2000). *Survey Sampling: Theory and methods*, University of Nairobi, Nairobi, Kenya.

Peter Zachariah (2000). *Inventory and Credit Management* 1st Edition, Mittall Publication, New Delhi, India.

Pandey, I. M. (2004). *Financial Management* 9th (ed), Vikas Publishing House PVT Ltd.

Rajeev, N. (2008). *An Evaluation of Inventory Management and Performance in Indian Machine Tool SMEs: An Exploratory Study*, 4th IEEE International Conference on Management of Innovation and Technology, 2008. ICMIT 2008, 21-24 Sept. 2008, Bankok, Thailand, pp. 1412-1417.

Rehman, A. (2006). *Working Capital Management and Profitability: Case of Pakistani Firms* (Unpublished Dissertation), COMSATS Institute of Information Technology (CIIT), Islamabad, Pakistan.

Sushma, V., and Bhupesh, S. (2007). *Effect of Working Capital Management Policies on Corporate Performance an Empirical Study,* Global Business Review, 8 p.267, Accessed at http://www.gbr.sagepub.com on July 2013.

Schonsleben, P. (2000). *Integral logistics Management, planning & control of comprehensive Business processes,* The St-Lucie Press/AIPCS Series.

Silver EA, Pyke DF & Peterson R. (1998). *Inventory management and production planning and Scheduling,* 3rd Edition, John Wiley & Sons. USA.

Silver, Edward E., David F. Pyke, and Rein Peterson. (1998). *Inventory Management, Production Planning, and Scheduling*, 3rd edition, New York, John Wiley & Sons.

Sander, L., Matthias, H., and Geoff, W. (2010). The impact of decentralized control on firm- level inventory, Evidence from the automotive industry, *International Journal of Physical Distribution & Logistics Management* 41 (5) 435-456. Accessed at www.emeraldinsight.com/0960-0035.html

Tersine RJ. (2009). *Principles of inventory and material management*, 2nd edition, North Holland.

Waters, D. (2008). *Quantitative Methods for Business*, 4th Edition, Prentice Hall, England.

Zinn, W. and Liu, P. (2008), A comparison of actual and intended consumer behavior in response to retail stockouts*, Journal of Business Logistics*, 29 (2), 141-59.