



INVENTORY MANAGEMENT STRATEGIES AND PERFORMANCE OF COMMERCIAL GOVERNMENT ENTITIES IN KENYA

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ABSTRACT

The general objective of this study was to explore inventory management strategies and the performance of commercial government entities in Kenya. Specifically, the study looked at Just-In Time, Economic order quantity model; Perpetual Inventory System and ABC inventory Model in relation to performance of commercial Government Entities in Kenya. The study was anchored on four theories, namely; inventory control theory; Lean theory; theory of constraints and strategic choice theory. Descriptive research design was adopted and the scope was 54 commercial Government entities in Kenya sourced from the presidential taskforce report on parastatal reforms of the year 2013. A total of 54 supply chain managers were the target population. The study adopted census survey of the 54 commercial Government entities in Kenya. The study used primary data that was collected through a structured questionnaire, analyzed using descriptive and inferential statistics and presented by use of frequency tables, figures and graphs. Correlation and multiple linear regression model was used to determine the degree of association between the study variables. The study established that Perpetual Inventory System was the highly adopted and practiced inventory management strategy among commercial Government entities in Kenya followed by ABC inventory Model, Economic order quantity model and Just-in Time respectively. The study concluded that ABC inventory Model had the largest influence on performance of commercial Government entities in Kenya followed by economic order quantity model, Just-in Time and lastly perpetual inventory system. The study recommended that the information and communication managers (ICT) managers of the entities in Kenya should improve on the functionality and effectiveness of the JIT system in place. The supply chain managers of the commercial Government entities in Kenya should formulate relevant policies that guide use of economic order quantity model in their organization. Supply chain managers of the commercial Government entities in Kenya should focus more on ABC inventory model in order to greatly influence performance of their institutions and pay least attention on perpetual inventory system since it does not greatly contribute to their performance.

Key Words: *Just-In Time, Economic Order Quantity Model; Perpetual Inventory System, ABC Inventory Model*

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INTRODUCTION

According to Schreiberfeder J & Snawder T (2017), Inventory management is replenishing stock inventory with the right quantity, of the right item in the right location and at the right time. Therefore, inventory management minimizes carrying cost of inventory, minimize inventory ordering cost and arrangement for sale of slow moving items.

In Kenya, the importance of inventory management continued to grow with Fast Moving Consumer Goods Companies opting for this mode to deliver their products across the country and beyond and not so much on other manufacturing sectors (Nemtajela & Mbohwa, 2018). More so, majority of those firms adopted third part inventory (3PL) in their business and did not care much to have improved inter inventory management. According to Nemtajela and Mbohwa (2018), then, in an era of shrinking product life cycles, proliferation of product lines, shifting distribution chains and rapidly changing technological advancement, use of inventory had become an essential ingredient for organizations in gaining competitive advantage. This was so since inventory management balances two basic objectives: Quality of Service and Low Cost of doing business as every other firm's objective lies on quality service and minimum production cost.

A survey done by SCEA in 2015, revealed an array of factors that were responsible for the efficiency and cost structure of Kenya inventory chain. They included: inventory cost and efficiency indicator; time indicators related to deliver goods; truck turnaround time; complexity indicators which measured the level of complexity in undertaking trade transactions and customer perception indicators.

The commercial government entity is a state enterprise that is formed by a specific Act of the Parliament and is established to achieve specific goals and objectives. The various reasons for existence of some commercial government entity include the need to correct market failures, to

ensure basic services are supplied for instance education, ensure that marginalized areas are developed and realize some political goals. The key attribute of commercial government entity is that all of them are owned by the government.

Some of the commercial government entities are also established by the order of the President and they are required to carry out duties as specified in this order. Commercial government entities are largely established by the State to act as a bridge in provision of services and goods between the government and the general public at relatively lower prices. Most of the commercial government entities in Kenya were created during colonial times so as to offer monopolistic services. There are about 54 commercial government entities operating in various ministries in Kenya (appendix v).

Performance is the ultimate goal of existence of the firms and determines how the goals are realized (Mkumbo, Ibrahim, Salleh, Sundram & Bahrin, 2019). Performance can be expressed in terms of either financial or non-financial dimension. Both financial and non-financial indicators of performance are guided by the Balancer Scorecard (BSC) that also links with the overall strategy. The BSC provides information on four perspectives (the customer, the financial, internal processes and learning as well as growth) that ultimately determine performance of the firm aligning it with the overall strategies that are in place (Herciu & Şerban, 2018).

In Kenya, commercial government entities are established to generate revenues that are directly remitted to the national exchequer. However, majority of the commercial government entities are facing challenges with their performance especially with persistent loss making trends. Some of the worst affected commercial government entities with regard to their performance include the milling firms like Nzoia Sugar Ltd. Obudo and Wario (2015) argues that majority of these commercial government entities have come under increased pressure to enhance their level of efficiency and effectiveness which are core indicators of

performance of any firm. Therefore, it is against this background of poor performance of the commercial government entities that the current study seeks to evaluate their inventory management strategies in place.

Statement of the Problem

The Public Procurement and Asset Disposal Act, 2015 and the Public Procurement and Asset Disposal Regulations, 2020 outlines clear guidelines on how inventory management should be handled with the objective of giving value for money to public entities. The Government of Kenya through the Ministry of Devolution and Planning in its 11th edition performance contracting guidelines for the financial year 2014-2015 set inventory management as a performance indicator for all public entities. However, despite the development of the public procurement policy framework, government entities are still experiencing challenges related to inventory management. Munyao and Moronge (2017) reports that in 2016, 25% of the government entities experienced stock outs and 41% were still using manual records keeping methods. Based on the global investment competitive report 2019/2020, multinational firms are realizing that their historical push towards low-cost, low-inventory supply chains has opened them to significant risk. In response, some of them are changing their corporate strategies, reassessing their approaches to sourcing production inputs diversifying their suppliers and making greater use of digital technologies (Baldwin & Evenett 2020).

In most Commercial Government Entities in Kenya, direct materials represent up to 50% of the total product cost, as a result of the money entrusted in inventory thereby affecting the profitability of the organization. According to Mwangi (2016) managers have ignored the potential savings from proper inventory management, treating inventory as a necessary evil and not as an asset requiring management. According to the PPRA annual assessment report 2016-2017, the inventory and stores management systems of public procuring entities are weak leading to wide variances

between physical and stock ledger balance. This has led to collapse of a number of commercial Government organizations. This can be stopped if proper inventory management is practiced and thoroughly utilized for the benefit of the firm. Kenyan firms are known to have poor inventory management techniques which have negatively affected the firm's ability to service and satisfy their customers (Mwangi & Nyambura, 2015).

Due to this, there is need for Commercial Government Entities in Kenya to embrace the changing competitive trends in the market by adopting robust inventory management strategies to enhance their performance i.e. timely delivery, quality standards, avoid unnecessary cost and ensure high level of return. Based on the foregoing, this study explored Inventory Management Strategies and the Performance of Commercial Government Entities in Kenya.

Objectives of the Study

The general objective of this study was to explore inventory management strategies and the performance of commercial government entities in Kenya. The study was guided by the following specific objectives;

- To establish the influence of Just-In Time on the performance of Commercial Government Entities in Kenya.
- To examine the influence of Economic order quantity model on the performance of Commercial Government Entities in Kenya
- To determine the influence of Perpetual Inventory System on performance of Commercial Government Entities in Kenya
- To ascertain the influence of ABC inventory Model and performance of Commercial Government Entities in Kenya

LITERATURE REVIEW

Inventory Control Theory

The inventory control theory was proposed by Axsater (1985) where managing all kinds of assets in

an organization can be viewed as an inventory problem as noted by Zappone (2014). For the large companies they use a variety of inventory control theories and mathematical formulas to help them optimize the production and storage of many thousands of units of products and to help them minimize costs. At the same time the small-business owners can use ideas from several inventory control methods to manage their production and storage based on their cost-containment and customer service needs. Any inventory manager's goal within an organization is to minimize cost and maximize profit while satisfying customer's demands. Too much inventory consumes physical space, creates a financial burden, and increases the possibility of damage, spoilage and loss (Zappone, 2014) further explains that excessive inventory frequently compensates for sloppy and inefficient management, poor forecasting, haphazard scheduling, and inadequate attention to process and procedures. Too little inventory often disrupts manufacturing operations, and increases the likelihood of poor customer service. In many cases good customers may become dissatisfied and take their business elsewhere if the desired product is not immediately available. Companies with very high inventory ratios have more possibilities to be bad financial performers.

Lean Theory

Lean theory was first coined by Krafcik (1988) and later on defined by Womack and Jones in 1996. Lean theory focuses on optimization of costs in inventory systems. It is posited that through this theory, decisions on manufacturing, warehousing, and general supply chain concerns can be expedited (Tempelmeier, 2011). The theory builds upon the economic order quantity (EOQ) model that seeks to optimize the quantity of any individual item ordered. Choice of Lean Theory for this study was informed by the need to examine how inventory management influences organizational performance thereby calling for a prudent approach to inventory management. The theory therefore brings to the fore, the possibility of diversity in

operating systems used to monitor levels of stock, and the difference in items that may require different treatment. Lean theory is an extension of ideas of just in time. Kros, Falasca and Nadler (2016), elaborate just in time as a pull-based system designed to align the production and business processes throughout the supply chain. Inman and Green (2018) assessed the impact of lean and green combine to impact environmental and operational performance. They say that theory may eliminate buffer stock and minimize waste in production process. Eroglu and Hofer (2011) found that leanness positively affects profitability of a business firm. They argue that inventory leanness is the best inventory control tool. The theory elaborates on how manufacturers gain flexibility in their ordering decisions, reduce the stocks of inventory held on site and eliminate inventory carrying costs. At the aggregate level, the empirical strength of the lean explanation lies both in the timing and the magnitude of the adoption. However, in the theory, inventory constrains a firm's ability to respond to fluctuations in demand. Scholarly studies indicate that companies successfully optimize inventory through lean supply chain practices and systems to achieve higher levels of asset utilization and customer satisfaction leading to improved organizational growth, profitability and market share (Bozarth, Handfield & Weiss, 2018).

Theory of Constraints

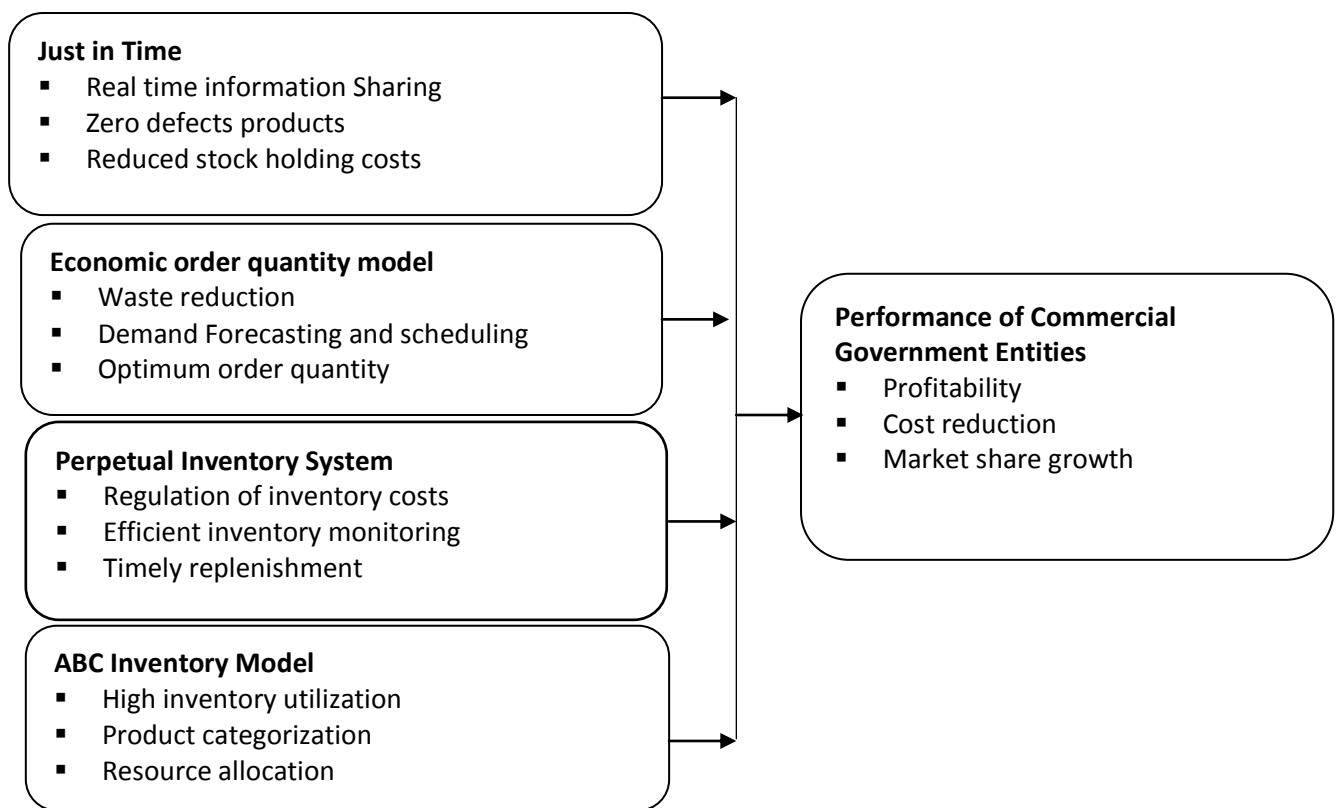
The theory was formulated by Goldratt (1984). It is a management philosophy that seeks to raise the level of proficiency of the manufacturing throughput. An organization can manage inventory through identifying the limiting factors constraining the process and systematically improving that constraint until it is no longer the limiting factor. Some of the limiting factors that may exist in the inventory management process include: very long lead times, large number of unfulfilled orders, high level of unnecessary inventories or lack of relevant inventories, wrong materials order, large number of emergency orders and expedition levels, lack of customer's engagement, absence of control related

to priority orders which implies on schedule conflicts of the resources (Boyd & Gupta, 2014).

Strategic Choice Theory

The strategic choice theory was developed by Child (1972) and it points out the link between the choices of management and the performance of a firm as well as relations of the firm’s internal and external environment. The theory emphasizes on the magnitude of the decisions made by management on the performance of firm (Child, 1972). Campling and Michelson (2014) established a

strategic choice model that demonstrates the inter-reliance between the environment and organizations, actions and general business performance. The model focus on attaining a higher performance level so as to enhance efficiency especially in the face of limited resources; however, the strategic theory was unsuccessful in giving a more importance on contextual aspects, including environment, technology as well as the degree of operation into account and merely considered how the structure of a firm help in the performance of a business.



Independent Variables

Dependent Variable

Figure 1: Conceptual framework

Empirical Literature Review

Kamakia (2015) noted that the widespread adoption of just-in-time (JIT) inventory principles undoubtedly makes production operations more efficient, cost effective and customer responsive. Companies’ effectively implementing JIT principles have substantial competitive advantages over competitors that have not. The trick is figuring out

how to apply JIT principles to gain competitive advantages in your specific industry and business situation. The basic premise of JIT is to have just the right amount of inventory, whether raw materials or finished goods, available to meet the demands of your production process and the demands of your end customers.

According to Christopher (2015), JIT is cost effective and can help reduce waste. It also alleviates high stocks, high inventory levels, long lead times, ensures high quality of purchased items, administrative efficiency including fewer suppliers, simplified communication and receiving activities, reduced inspection and lean stocks (Lysons & Farrington, 2016). In addition, JIT approach is hinged on the conventional approach for meeting requirements based on the statistical inventory control that relies on reordering when inventory levels fall to certain predetermined or established levels.

Hovelaque and Bironneau (2015) argues that inventory management need to be organized in a logical way so that the organization can be able to know when to order and how much to order. This can only be achieved through the Economic Order Quantity (EOQ) computation. Economic order quantity enables organizations to plan their inventory replenishment on a timely basis such as monthly, quarterly, half yearly or yearly basis. Sremac, Tanackov, Kopic and Radovic (2018) posit that the economic order quantity (EOQ) is the order quantity that minimizes total holding and ordering costs for the year. It gives a good indication of whether or not current order quantities are reasonable. According to Porteus (2017) the assumptions of inventory management model is that the firm knows with certainty how much items of particular inventories will be used or demanded for a specific period of time. Ballou (2015) argues that the use of inventories or sales made by the firm remains constant or unchanged throughout the period. The model also assumes that the moment inventories reach zero level, the order of replenishment of inventory is placed without delay.

According to Chołodowicz and Orłowski (2016) stock records are expected to maintain particulars of receipt, issues and balances remaining in stock for each individual item held in the storehouse from day to day. For the records to provide accurate up-to-date information which is useful to the stock controller, it requires that every transaction of

receipt or issue of a particular item is recorded promptly and accurately. Proper up-to-date and complete records result in reduction of wastage and misappropriation in the stores department. Inventory record inaccuracy has had a significant impact on decreasing levels of customer service, increasing costs, and decreasing productivity. Customer service decreases due to more inaccurate stock information, more backordering, and more stock-outs. This excess inventory has increased annual carrying cost and increases the chance for product obsolescence (Christopher, 2015).

ABC analysis is sound recognized categorization technique as far as the pareto principle is concerned, whose main purpose is for establishing the items that should be prioritized in the management of an inventory (Ramanathan 2016). Baye (2017) is of the view that ABC analysis is a method for prioritizing inventories. Inventories are classified into 3 sub-classes, including A, B and C. A large portion of the efforts of management are utilized on administering A Items A, B in-between and C items get the least attention.

Ngubane, Mayekiso, Sikota, Fitshane, Matsoso and Juan-Pierré (2015) focused on establishing the impact of inventory management practices on performance of Non-Governmental Organizations. By targeting ten Non-Governmental Organizations situated in Nairobi County, the research study focused on a total sample of seventy respondents. According to the analysis of the data via descriptive statistics, the study recognized that a unit in ABC Analysis would lead to an increase in operational performance of Non-Governmental Organizations by a factor of 0.683 whilst a unit increase in Economic Order Quantity leads to an increase in operational performance of Non-Governmental Organizations by a factor of 0.702. On the other hand, a unit increases in Demand focus inventory leads to an increase in operational performance of Non-Governmental Organizations by a factor of 0.699.

Commercial Government entities are government parastatals that directly generate income and can independently manage their financial obligations without depending on the exchequer. Commercial state corporations in Kenya continue to underperform, with high economic and financial losses creating opportunity costs for the wider economy (Hills and Jones, 2009). This is explained by the huge amount of costs involved in setting up strong inventory management systems and lack of skills.

Nteere, Namusonge, and Mukulu, (2012) asserts that performance measurement is important for organization in ensuring continuous improvement and also assist in determining whether or not an organization is achieving its objectives. Performance measures should assess the gap between actual and targeted performance and determine organization effectiveness and operational efficiency. Ideal measures of performance will ensure attainment of double benefits; improvement of supply chain management and effective measurement of the achieved benefits. The performance measure can be grouped into two; namely financial measures such as profit return on investment and productivity. Also there are those measures that put more emphasis on less tangible and non-financial measures in performance measurements. Financial performance measure while important to shareholder, it may provide too little information regarding the long-term effectiveness of firm in satisfying customer needs. Performance results into a number of benefits to an organization for instance; effective management of risks, enhanced efficiency as seen through reduction in resource use and waste, product differentiation, market entry and penetration, enhanced reputation and brand of the company and possibility for innovation (Hahn, Pinkse, Preuss & Figge, 2015).

METHODOLOGY

The study used a descriptive research design. The target population of this study was 54 commercial Government entities in Kenya as per the

presidential taskforce report on parastatals reforms of 2013. The study adopted a census sampling approach on all the 54 commercial Government entities in Kenya that were found to be operational as per the presidential taskforce report on parastatals reforms of 2013 since the sample size was less than 210.

The study used primary data using questionnaires as a major tool. The study applied content validity as it measures the extent to which the selected items contained in the sample represents the content being measured by the test. Quantitative data was analyzed by employing descriptive statistics e.g. means and standard deviation while inferential analysis was done using statistical package for social science (SPSS) and regression analysis.

Regression analysis was used to test the relationship between the independent variable (Just-In Time, Economic order quantity model, Perpetual Inventory System and ABC inventory model) and the dependent variable (performance of commercial Government entities in Kenya).

FINDINGS

Performance of Commercial Government entities

Performance of Commercial Government entities was the dependent variable of the study and the findings were reported in table 1 which gave a summary of the descriptive statistics covering the frequencies and percentages. Table 1 indicated that majority of the respondents 43.6% rated profitability of their organization at 41-60%.

The results also indicated that 46.2% of the firms had approximated cost reduction of 61-80%. Further 30.8% of the firms had recorded total revenue growth of over 81% and 41% of the firms had achieved over 41 million net income. In addition (30.8%) had recorded 21-40% growth in their market share.

Table 1: Commercial Government entities Performance

Category	Classification	Frequency	Percentage
Profitability rating	21-40%	6	15.4
	41-60%	17	43.6
	61-80%	11	28.2
	above 81%	5	12.8
	Total	39	100.0
Approximate cost reduction	21-40%	6	15.4
	41-60%	5	12.8
	61-80%	18	46.2
	above 81%	10	25.6
	Total	39	100.0
Total revenue growth	Less than 20%	5	12.8
	21-40%	6	15.4
	41-60%	6	15.4
	61-80%	10	25.6
	above 81%	12	30.8
Total	39	100.0	
What was the net income	less than 10 million	7	17.9
	21-30 million	5	12.8
	31-40 million	11	28.2
	over 41 million	16	41.0
	Total	39	100.0
What was the Market share growth	Less than 20%	7	17.9
	21-40%	12	30.8
	41-60%	5	12.8
	61-80%	10	25.6
	above 81%	5	12.8
Total	39	100.0	

Just in Time

The study sought to establish the influence of JIT inventory management strategy on performance of commercial Government entities in Kenya. The findings on JIT as the first independent specific objective variable of the study as indicated in Table 2. The results indicated an overall score of (M=3.72, SD=0.676), which was interpreted to mean that majority of the studied institutions did practice JIT as one of their inventory management strategies and also agreed on various statements under JIT inventory management system and how it influenced performance. According to Cheng (2017), JIT system ensures that the firm has minimum level of inventories which helps in reduction of waste and inventory costs. It involves arranging for materials to be delivered from supplier only when they are needed thus avoiding

the necessity of stock holding. A JIT system enables companies to operate efficiently with the least amount of resources, and thus, improves quality, reduces inventory levels, and provides maximum motivation to solve problems as soon as they occur. JIT also deals with Order frequency materials, reduced warehouse space, movement of inventory from the storage locations to the production sites can be avoided (Kumar & Suresh, 2018). Filippini and Forza (2016) viewed just-in-time (JIT) as an operating concept designed to eliminate waste and that the goal for just in time is to produce goods and service without waste. This is achieved by testing each step in a process to determine if it adds value to the product or to the service. According to Kumar and Suresh (2018), just in time technique of inventory management bring about the following benefit to an organization; production cost is

greatly reduced due to elimination of waste and also indicates that the productivity of the organization will also greatly improve due to system

flexibility and administrative ease as well as management simplicity.

Table 2: Just in Time

Statements	Mean	Std. Dev
Use of Just In Time (JIT) improves movement of inventory	3.66	.477
Use of JIT reduces the number of order frequency	3.71	.825
Commercial Government Entities in Kenya use JIT to reduce on warehousing space and costs	3.76	.958
Use of JIT improves timely delivery of goods and services	3.74	.442
Overall Score	3.72	.676

Economic Ordering Quantity Model

The study further examined the influence of EOQ model inventory management strategy on performance of commercial Government entities in Kenya. The results of the economic ordering quantity model were as indicated in Table 3. As shown, the overall score (M=3.73, SD=0.693), meant that the studied organization highly practiced EOQ model as their inventory management strategies. As shared by Dobson, Pinker and Yildiz (2017), the Economic Order Quantity denotes the optimal ordering level of an inventory which helps in the minimization of expenses. This inventory management approach (EOQ) makes the assumption that the Demand Forecasting for an item is well-known, the lead time is well-known and constant, that the receipt of an order happens immediately, the discounts of quantity are not computed as part of the model and that inventory's shortages do not happen. The EOQ graphs demonstrate the association between the costs of ordering, the expense of holding inventories and the economic order quantity

(Jawad, Jaber & Bonney, 2015). Economic order quantity is the quantity of inventory that should be ordered at once. The quantity of inventory ordered at once affects inventory ordering and holding costs and will ultimately have a bearing on profitability. Put differently, EOQ is the optimum size of the order that minimizes the cost of ordering and holding cost. Economic order quantity is used to determine the optimal number of units of the product to order or reorder levels so as to minimize the total cost associated with the purchase, delivery and storage of the product. The main objectives of economic order quantity are to minimize the cost of ordering, cost of carrying materials and total cost of production. Ordering costs include cost of stationery, salaries of those engaged in receiving and inspecting, general office and administrative expenses of purchase departments. Carrying costs are incurred on stationery, salaries, rent, materials handling cost, interest on capital, insurance cost, risk of obsolescence, deterioration and wastage of materials and evaporation (Nair, 2015).

Table 3: Economic Ordering Quantity Model

	Mean	Std. Dev
Use of EOQ model minimizes operational cost	3.74	.938
Use of EOQ minimizes lead time	3.53	.755
Use of EOQ enables Commercial Government Entities in Kenya to meet demand	3.87	.338
Use of marginal analysis techniques helps control optimal stock levels of goods	3.76	.742
Overall Score	3.73	.693

Perpetual Inventory System

The study sought to understand the influence of perpetual inventory management strategy on performance of commercial Government entities in

Kenya. The results on perpetual inventory system are as indicated in table 4. From the table, the overall score was (M=3.83, SD=0.855), which meant that respondents agreed that perpetual inventory

system was highly practiced in the studied organizations. Chofodowicz and Orłowski (2016) argue that perpetual inventory accounting system engages supplementary records than periodic inventory accounting systems. Perpetual inventory systems provide the company owner with a proof of what is sold, when it was sold, where it was sold from, and at what price it was sold. Therefore, it allows for companies to have centralized inventory accounting system. Yet with a perpetual inventory accounting system, the firm requires to close down

at least once a year to do a manual, periodic count. The scrutinized records should tell the firm's proprietor unerringly what stock should be in hand. The main measures of perpetual inventory systems are, effective inventory control, cost of managing inventory and efficient inventory management (Axsäter, 2015). According to Barrett and Crossley (2015), a perpetual inventory control process reviews inventory status daily to determine inventory replenishment needs.

Table 4: Perpetual Inventory System

	Mean	Std. Dev
Use of Perpetual Inventory System enhances planning and inventory control	3.97	.537
Use of Perpetual Inventory System has improved connectivity with a wide range of suppliers	3.89	.967
Use of Perpetual Inventory System enhances integration of all supply chain partners	3.64	1.063
Use of Perpetual Inventory System has led to improved inventory accuracy and cost management	3.82	.854
Overall Score	3.83	.855

ABC Inventory Model

The study sought to determine the influence of ABC inventory management strategy on performance of commercial Government entities in Kenya. The results on ABC inventory model were as indicated in table 5. The findings indicated the overall score of (M=3.80, SD=0.866), which meant that ABC inventory model was embraced in the studied organization. According to Axsäter (2015), ABC Analysis is an inventory control technique in which inventory items are classified into three groups according to their value. Group A: High value items.

ABC inventory Model works under four inventory measures which include inventory prediction, Product categorization and Safety stock (Axsäter, 2015). At the same time, Zheng, Fu, Lai and Liang (2017) shared that ABC analysis is where stocks are classified into three categories namely: A –stock items that are of high value and material to the organization but low volume such as land, building and motor vehicles; B –stock items which are of medium value and medium volume; C –stock items baring minimal value but are of great volume.

Table 5: ABC Inventory Model

	Mean	Std. Dev
Use of ABC assists in inventory prediction and management of resources	3.74	.849
Use of ABC enables the commercial Government entities to concentrate on the most cost-effective areas	4.05	.759
ABC helps in establishing safety stock for each category	3.79	.893
ABC system facilitates inventory control, over-usage and selective control	3.61	.962
Overall Score	3.80	0.866

Statistical Modeling

Correlation Analysis

Correlation analysis was used to determine the significance and degree of association of the variables and predict the level of variation in the dependent variable caused by the independent

variables in table 6. From the results, there was a very strong relationship between Just-In Time and the performance of Commercial Government Entities in Kenya ($r = 0.811$, $p \text{ value} = 0.000$). The relationship was significant since the $p \text{ value} 0.000$ was less than 0.05 (significant level). The findings

were in line with the findings of Cheng (2017) who indicated that there is a very strong relationship between Just-In Time and the performance of Commercial Government Entities. Moreover, the results revealed that there was a very strong relationship between economic order quantity model and the performance of Commercial Government Entities in Kenya ($r = 0.810$, p value $=0.001$). The relationship was significant since the p value 0.001 was less than 0.05 (significant level). The findings were in line with the findings of Kumar and Suresh (2018) who indicated that there is a very strong relationship between economic order quantity model and the performance of Commercial Government Entities.

Further, the results revealed that there was a very strong relationship between perpetual inventory system and the performance of Commercial

Government Entities in Kenya ($r = 0.815$, p value $=0.002$). The relationship was significant since the p value 0.002 was less than 0.05 (significant level). The findings were in line with the findings of Dobson, Pinker and Yildiz, (2017) who indicated that there is a very strong relationship between perpetual inventory system and the performance of Commercial Government Entities. The results also revealed that there was a very strong relationship between ABC inventory model and the performance of commercial Government entities in Kenya ($r = 0.835$, p value $=0.001$). The relationship was significant since the p value 0.001 was less than 0.05 (significant level). The findings were in line with the findings of Filippini and Forza (2016) who indicated that there is a very strong relationship between ABC inventory model and the performance of commercial Government entities.

Table 6: Pearson Correlation Coefficients

		Organization Performance	Just-In Time	EOQ Model	Perpetual Inventory System	ABC inventory Model
Organization Performance	Pearson Correlation	1				
	Sig. (2-tailed)	(2-				
	N	39				
Just-In Time	Pearson Correlation	.811**	1			
	Sig. (2-tailed)	.000				
	N	39	39			
EOQ Model	Pearson Correlation	.810**	.297	1		
	Sig. (2-tailed)	.001	.060			
	N	39	39	39		
Perpetual Inventory System	Pearson Correlation	.815**	.382	.281	1	
	Sig. (2-tailed)	.002	.070	.076		
	N	39	39	39	39	
ABC inventory Model	Pearson Correlation	.835**	.199	.195	.280	1
	Sig. (2-tailed)	.001	.079	.081	.071	
	N	39	39	39	39	39

** . Correlation is significant at the 0.01 level (2-tailed).

Regression Analysis

The study applied multiple regression analysis to determine the significance of the relationship between all the independent variables and the dependent variable. Regression analysis was conducted as one of the inferential statistic and the findings were as summarized in subsequent sections in tables 7, 8 and 9. The essence of regression analysis was to establish the effect of inventory management strategies on performance.

The results of the regression model summary findings indicated the coefficient determination of R square was 0.754, which was interpreted to mean that 75.4% change in performance in commercial Government entities in Kenya is explained by these the four determinants such as inventory management strategies. This can be deduced that inventory management strategies had strong and positive relationship with performance of commercial Government entities in Kenya. The implication of this finding to the study is that apart from the identified inventory management strategies, there are other factors that affect performance.

Table 8 gave the findings on the Analysis of Variance (ANOVA) that was conducted at 5% level of significance. The findings of the study showed a number of items including the value of F critical, F calculated and the p-value showing significance. From the findings, it was seen that F calculated was 26.077 with p-value of .000 which was less than 0.05 while the value of F critical (at degrees of freedom 4, 34) is equivalent to 2.65. Thus, it can clearly be deduced that $F_{\text{calculated}} > F_{\text{critical}}$, and therefore the overall regression model was significant in estimating the relationship between the variables determinants and performance of commercial Government entities in Kenya.

The findings on regression beta coefficients of the study with the P-values showing levels of significance were as shown in Table 9. From the overall regression coefficient, the findings indicated that when other factors are kept constant, from the model, performance of Commercial Government

Entities in Kenya would be at 5.739. A unit change in JIT would lead to 0.609 unit increase in performance of Commercial Government Entities in Kenya. From the findings, the study noted that of Just-in Time had ($\beta = 0.609$, $p < 0.05$) and thus it had a positive and significant effect on the performance of Commercial Government Entities in Kenya. This finding was in line with Kamakia (2015) who noted that the widespread adoption of just-in-time (JIT) inventory principles undoubtedly makes production operations more efficient, cost effective and customer responsive. Companies' effectively implementing JIT principles have substantial competitive advantages over competitors that have not. According to Christopher (2015), JIT is cost effective and can help reduce waste. It also alleviates high scups, high inventory levels, long lead times, ensures high quality of purchased items, administrative efficiency including fewer suppliers, simplified communication and receiving activities, reduced inspection and lean stocks (Lysons & Farrington, 2016).

Implementation of Economic Order Quantity model would lead to performance increase of 0.816 by Commercial Government Entities in Kenya. The study noted that economic order quantity model had ($\beta = 0.816$, $p < 0.05$) a p-value less than 0.05 and therefore it was significant. The findings were in line with Sremac, Tanackov, Kopic and Radovic (2018) who posit that the economic order quantity (EOQ) is the order quantity that minimizes total holding and ordering costs for the year. Economic order quantity enables organizations to plan their inventory replenishment on a timely basis such as monthly, quarterly, half yearly or yearly basis. It further gives a good indication of whether or not current order quantities are reasonable. According to Porteus (2017) the assumptions of inventory management model is that the firm knows with certainty how much items of particular inventories will be used or demanded for a specific period of time. Ballou (2015) argues that the use of inventories or sales made by the firm remains constant or unchanged throughout the period.

Perpetual Inventory system would increase performance of Commercial Government Entities in Kenya by 0.270 when there is unit increase in it. The findings of the study indicated that perpetual inventory system had ($\beta = 0.270$, $p < 0.05$) p-value which was less than 0.05 and therefore it was significant to the performance. According to Chołodowicz and Orłowski (2016) stock records are expected to maintain particulars of receipt, issues and balances remaining in stock for each individual item held in the storehouse from day to day. Customer service decreases due to more inaccurate stock information, more backordering, and more stock-outs. This excess inventory has increased annual carrying cost and increases the chance for product obsolescence (Christopher, 2015).

The study indicated that when all other variables are held constant, a unit change in ABC inventory model would result into 1.161 unit increase in performance of Commercial Government Entities in Kenya. The findings of the study indicated that ABC inventory model had ($\beta = 1.161$, $p < 0.05$) a p-value less than 0.05, and thus it was significant on the performance of Commercial Government Entities in Kenya. Zheng, et al (2017) noted that the ABC analysis categorizes products based on importance. Importance may come from cash flows, lead time, stock outs, and stock out costs, sales volume, or profitability. Once the ranking factor is chosen, break points are chosen for classes A, B, C and so

on. Baye (2017) argues that ABC system facilitates inventory control, over-usage, selective control and enables companies to concentrate on the most cost-effective areas. In addition, it eliminates unnecessary paperwork and reduces stock holding costs.

All the variables p-values were significant as all the values were less than 0.005 (at constant, JIT, Economic Order Quantity model, Perpetual Inventory System, ABC Inventory Model had .101, .000, .000, .012 and .000 respectively). This finding indicated that this variables significantly influence performance of commercial Government entities. Ngubane, Mayekiso, Sikota, Fitshane, Matsoso & Juan-Pierré (2015) recognized that a unit in ABC Analysis would lead to an increase in operational performance of Non-Governmental Organizations by a factor of 0.683 whilst a unit increase in Economic Order Quantity leads to an increase in operational performance of Non-Governmental Organizations by a factor of 0.702. On the other hand, a unit increases in Demand focus inventory leads to an increase in operational performance of Non-Governmental Organizations by a factor of 0.699. Inventory management strategies have been noted to significantly affect organizational performance to greater extent.

Table 7: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.868a	.754	.725	1.21952

Predictors: (Constant), ABC Inventory Model, Just in Time, Perpetual Inventory System, Economic Ordering Quantity Model

Table 8: Analysis of Variance

	Sum of Squares	Df	Mean Square	F	Sig.
Regression	155.127	4	38.782	26.077	.000 ^b
Residual	50.566	34	1.487		
Total	205.692	38			

a. Dependent Variable: Firm Performance

b. Determinants: (Constant), ABC Inventory Model, Just in Time, Perpetual Inventory System, Economic Ordering Quantity Model

Table 9: Regression Coefficients

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	5.739	3.408		1.684	.001
Just in Time	.609	.155	.415	3.923	.000
Economic Ordering Quantity Model	.816	.138	.739	5.892	.000
Perpetual Inventory System	.270	.102	.290	2.641	.012
ABC Inventory Model	1.161	.165	1.063	7.025	.000

a. Dependent Variable: Firm Performance

The results led to the following regression model:

$$Y = 5.739 + .816X_2 + .609X_1 + .270X_3 + 1.161X_4$$

Where, Y: Performance of commercial Government entities in Kenya, X₁: Just-In Time, X₂: Economic order quantity model, X₃: Perpetual Inventory System, X₄: ABC inventory Model,

β₀: y-intercept (constant)

CONCLUSION AND RECOMMENDATIONS

The study investigated the influence of just-in time, economic order quantity model, perpetual inventory system, ABC inventory model and performance of commercial Government entities in Kenya. From the findings the four variables had a positive and significant relationship with the performance of commercial Government entities. From the analysis, inventory management strategies were regressed against performance and 0.868 value of correlation was established showing a greater relationship between the independent and the dependent variables. This was also confirmed by the coefficient of determination of 0.75.4 which can be interpreted that out of the total, the 75.4% change in performance can only be explained by these four determinants such as inventory strategies. The implication of this finding was that apart from the identified inventory management strategies, there are other factors that affect performance.

Significance testing of variables was done *p*-value of 0.05 and it was established that the variables were statistically significant given the *p*-value of less than 0.05. From the findings, ABC inventory Model had

the largest beta coefficient followed by Just in time with *p*-value of less than 0.05. Thus, this study concluded that the four independent variables had significant influence on the performance of commercial Government entities in Kenya. The study noted that majority of the commercial Government entities in Kenya had adopted perpetual inventory system as their inventory management strategy. However, it was not highly effective in enhancing integration of all supply chain partners.

The study further revealed that the inventory management strategies were responsible for the change in performance indicators of commercial Government entities under study at a greater extend. The study established that the entities had recorded increase profitability, reduced inventory costs and increase in market share for the past five years due to investment in various inventory management strategies.

The study noted that JIT had been adopted among commercial Government entities in Kenya and it had the third largest regression beta coefficient that was significant. Based on this finding, the study recommends that information and communication managers (ICT) managers of the commercial Government entities in Kenya should improve on the functionality and effectiveness of the JIT system in place.

The results of the study were that economic order quantity model was adopted among the commercial Government entities in Kenya and it had the second largest regression beta coefficient which was significant. Thus, the study recommends

that supply chain managers of the commercial Government entities in Kenya should formulate relevant policies that guide economic order quantity model in their organization.

The findings of the study were that whereas the studied commercial Government Entities in Kenya had adopted perpetual inventory system, it had the least regression beta coefficient which was significant. Thus, the study recommends that when making decisions on inventory management strategies, the management and supply chain managers of the commercial Government entities in Kenya should pay least attention on perpetual inventory system since it does not greatly contribute towards performance.

The study further established that the commercial Government entities in Kenya had adopted ABC inventory model and it had the largest beta coefficient that was significant. In view of this finding, the study recommends that when making decisions on inventory management strategies, the supply chain managers of the commercial Government entities in Kenya should focus more on ABC inventory model so as to greatly influence performance of their institutions.

Commercial Government entities should hire experts to handle statistical formulas that integrate sales forecasts data to accurately calculate buffer

stock levels. This will help the entities in establishing adequate stock quantities. In addition capacity building and sensitization of the implementers should be carried out to ensure high level of adoption of the inventory management strategies by these entities.

Areas for Further Research

The present study focused on inventory management strategies and performance. More specifically, the study looked at Just in Time Inventory System, EOQ model, Perpetual Inventory system and ABC Inventory System and how they influence performance of commercial Government entities. Regression results indicated the value of R square as 0.754; this means that 75.4% change in organizational performance is explained by inventory management strategies employed. Thus, it can therefore be deduced that apart from inventory management strategies, there are other factors influencing performance which future researchers may focus on.

The study covered the commercial Government entities in Kenya. The study recommended that further studies should be conducted focusing on other firms like commercial banks operating in the private sector. In addition, further studies to be conducted relating inventory management strategies and other proxies like competitive advantage or growth aside from performance.

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