EFFECT OF INVENTORY MANAGEMENT ON PERFORMANCE OF THE EDUCATION SECTOR IN KENYA

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Abstract: The study sort to determine the effect of inventory management on performance of the education sector in Kenya. The study adopted census survey to collect data from all the 100 supply chain officers in the Ministry of Education headquarters in Nairobi forming the target population. The study adopted a descriptive study to collect data from all the 100 respondents using structured questionnaires. Data collected was analyzed using Quantitative data analysis techniques involving use of descriptive and inferential statistics. Inferential statistics included use of multiple linear regression model and bivariate correlation. Results were presented in form of frequency distribution tables and pie charts. Qualitative data was analyzed through content analysis and presented in continuous prose form. The study was governed by three theories; inventory theory, stock diffusion theory and inventory and production theory. The effect of inventory management: Economic Order Quantity Management, Just in Time Replenishment, Materials and Requirements Planning and Inventory Control on the performance of the education sector in Kenya was deduced from the results of the study. The Inferential statistics revealed that there existed a strong positive and statistically significant relationship between the variables; economic order quantity, Just-in-Time replenishment, Materials and requirements planning and inventory control and the performance of the education sector in Kenya. Study results established that the Ministry had invested in systems to manage and keep track of inventory. The findings revealed that inventory control helped the Ministry to achieve maximum performance in terms of service delivery. The study established that there is a great need to ensure that stock levels are managed effectively at the Ministry using the Economic Order Quantity to avoid stock out. The study concluded that Just-in-Time replenishment needed to be revived with a view of ensuring that the Ministry maintains the required inventory and recommended that the management at the Ministry plan for various materials' requirements embracing proper inventory control practices to ensure quality products in the store.

Keywords: Economic Order, Quantity Management, Just in Time Replenishment, Materials, Requirements Planning, Inventory Control, Core Competencies, Productivity, Service Delivery, Organizational Performance.

I. INTRODUCTION

According to Pound, Bell and Spearman (2014), inventory management is the practice overseeing and controlling the ordering, storage and use of components that a company uses in the production of the items it sells. Inventory management is a continuous practice of overseeing and controlling quantities of finished products for sale. A business's inventory is one of its major assets and represents an investment that is tied up until the item sells. Inventory management is effectively carried out under a well-defined and monitored inventory system. An inventory system is the set of policies and controls that monitor levels of inventory and determine what levels that should be maintained, when stock should be replenished, and how large orders should be (Jcobs et al, 2011). Wakhungu (2010) observed that since the early of 90s, the Kenyan public organizations have been undergoing transformations that seek to modernize and restructure their management models, aiming efficiency and quality in service delivery, with optimization of public spending. Ombati

(2010) adds that public institutions began to incorporate management methods from private sector. Process innovation in the public sector still focuses largely on improvements related to the elimination of bureaucracy and simplifying processes. As stocks are a substantial portion of the assets of organizations, they are a potential factor in the optimization of public resources used, and in cost reduction (Martins and Alt 2011). However, knowing how and when to replenish each material, considering possible variability to which the organization is subject, becomes an extremely complex task, since the lack of an essential material may do more harm to the organization than the maintenance of a minimum stock of the same.

Inventory control can be done through introduction of different measures to prevent the institution from incurring unnecessary losses made by different departments. Measures which can be put in place for example stock-taking which is the accounting of stock at every end of the month, to record the lost and available stock. Making proper supervisions on sites during construction of buildings to avoid theft of materials by workers. Shortcomings inherent in these concepts and techniques, their application in real business life should have an effect in firm performance (Koh et al., 2007). Building on this intuition, our purpose in the present paper was to investigate the relationship between inventory management practices and company performance with specific focus on the public sector. The purpose of the study was to find out the effect of inventory management in the Ministry of Education. Efficiency in government ministries is the central term used in assessing and measuring the performance of organizations (Mueller, 2006). Government officers holding authority to incur expenditure are advised to maintain up to date inventory and stock control records. Further they are charged with the following responsibilities: Making optimum use of available funds, eliminating delays in supply, ensuring no deterioration of stocks in stores, minimizing distribution costs, maintaining security in stores, avoiding unnecessary tying of cash in form of stocks and should not hold stocks for more than six months unless they are for specific projects.

Thai (2004) argued that the Ministry of Education, being a government institution is no exception in the execution of the above functions for purposes of accountability, confidence, fairness, transparency and value adding for the interest of the clients and the country in general. In the recent past the Ministry has experienced chronic stock out and delay in distribution of education stationary and resources to respective institutions around the country. This has impacted negatively on its performance and general decline in rendering of its services. In Brazil for example, the public service has been undergoing serious transformation that are aimed at modernizing its structure, management as well as service delivery (Bravo and Mariano (2006). This transformation is geared towards process innovation in the public sector and largely focuses on improvement related to the elimination of bureaucracy and simplifying process. Graman and Magazine (2006) argued that the cost of holding inventory, extensive product proliferation and the risk of obsolescence, especially in rapidly changing markets, make the expense of holding large inventories of finished goods excessive and that high demand items naturally have safety stock assigned to them, but in many organizations there are so many very-low-demand items that keeping any stock of these items is unreasonably expensive, so they argue that companies must now provide good service while maintaining minimal inventories. EI (2009) opined that financing Education for all is one of the major challenges facing most developing countries in sub-saharan Africa since most governments depend of donor funding which in most cases comes with strings attached. This poor funding has a serious ripple effect on delivery of quality education and even in running of the entire education sector. Inventory management represents an important development for the purchasing process (Neef, 2011).

In Kenya, Godana & Ngugi (2014) found that Kenol Kobil Limited was experiencing crisis related to inventory management, which was hindering effective management of stores. However, they established that information technology, distribution channels, staff competency and material handling were significantly influencing inventory management performance. In the Ministry of Internal Security, Ng'ang'a (2013) found that delays in procurement of goods, frequent stock outs and uncertain change of prices were some of the effects of a long bureaucratic procurement procedure. According to the study, inadequate and untimely dispatch of funds had a significant effect on inventory management performance. The study also revealed that unavailability of stationeries/stores records, lack of specific time or date for posting stores records and lack of adequate qualified and well-trained staff hinders effective inventory performance. The Ministry of Education is one of the 21 Ministries in the Government of Kenya and is at Jogoo House. The Ministry of education is headed by the Permanent Secretary as the overall accounting and authorized officer and the Minister who provides overall political leadership. Under them is the Education secretary in charge of the technical staff and Director of Administration who heads the non-technical staff. For ease of administration, the Ministry is divided into

the following Directorates: -administration; directorate of Basic Education; quality assurance and standards; policy and planning; secondary and tertiary education; and adult and continuing education. The overall goal for the government for the year 2012 was to reduce illiteracy by increasing access to education, improving the transaction rate from primary to secondary school and raising relevance of education. (Kenya Vision 2030). The specific strategy for the ministry involves: Integrating early childhood into primary education, Reforming Secondary curricula, Modernize teacher's training, Strengthening Partnership with private sector (Kenya Vision, 2030).

Budgetary increment in both the recurrent and development expenditure of the Ministry of education vote is a clear indication of the government's commitment to promote and participate in the provision of integrated and high-quality education to all Kenyans. Despite all this government's efforts of ensuring quality and affordable education to all, problems of under-stockings, high ordering costs and high over-stocking costs keep on recurring in the Government Ministries. These are indicators of inefficiency on the part of inventory management. Inventory management is a process of ensuring the right level of stock is maintained to satisfy the customer economically. The researcher intends to review and assess the management of inventory in Government Ministries with specific reference to Ministry of Education Headquarters. Inventory management plays a critical role in overall service delivery in government institutions (Cannella and Ciancimino, 2010). Whereas there are various inventory methods and techniques that can be deployed by organizations, none of them has been proven to single handedly deliver desired results. The Kenyan government is committed itself to provide basic education for all by undertaking free primary and secondary education thereby increasing the number of children who can access education especially those from poor backgrounds. However, the program has been faced with numerous challenges which are largely associated with policy decisions especially with regards to inventory management. According to Otachi (2008), the education sector has been dodged with claims of inefficiency, poor service delivery which is occasioned by slow pace of delivery of goods and services critical in running the sector at all levels.

Scholars have conducted research in the field of inventory management. Bai and Zhong (2008) established that inventory management was crucial for most organizations especially small and medium enterprises because of their limited resources. The study concluded that proper inventory management enhances a firm's competitive strength and profitability due to minimized costs, and customer satisfaction. Kitheka (2010) demonstrated that inventory management automation improved the performance of supermarkets. Automation led to improved customer service delivery levels and reduced operational costs. Nyambere (2015) studied inventory management practices and productivity of large manufacturing firms in Nairobi. The study concluded that inventory management practices positively affected the productivity of large manufacturing firms in Kenya. It is clear from the research findings that no research exists on the effect of inventory management on the performance of the education sector in Kenya thus a clear knowledge gap. It is in this regard that this study sought to assess the effect of inventory management on the performance of the Ministry of Education in Kenya.

II.   METHODOLOGY

This research used a descriptive study to obtain information about the status of inventory management in the education sector in Kenya. Mugenda and Mugenda (2008) explain that a descriptive study is used to minimize bias and optimize on the reliability of data. The study population consisted of all the 100 supply chain officers in the Ministry of Education headquarters in Nairobi. The study sought to establish the effect of inventory management on the performance of the education sector in Kenya. The study adopted a census study to investigate the effect of Economic Order Quantity Management, Just in Time Replenishment, Materials and Requirements Planning and Inventory Control on the performance of the education sector in Kenya. Data was collected using closed-ended questionnaires consisting of questions that were accompanied by a list of all possible alternatives for the respondents to select an answer that best describes their situation to save time during data collection exercise. Questionnaires were used to retrieve demographic information and the opinions of the 100 respondents about how the independent variables influenced the dependent variable. Data collected from the respondents at the Ministry of education formed the primary data while information collected from journals, books and reports formed the secondary data. Questionnaires were served to the respondents and later collected after responding. Questionnaires were then categorized according to the respondents' demographic information and general information. The study conducted a pilot study to test the structuring of the questions in the

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questionnaires. 30 procurement officers at the Ministry of Foreign Affairs and International Trade were issued with questionnaires to test the reliability of the data collection instrument to avoid fatigue of the sample subjects (Mugenda & Mugenda, 2008). The research instrument was validated by collecting and analyzing data to assess its accuracy. **The** questions were examined to ascertain the content and criterion validity of the instrument by the supervisors and other professionals in the field as content experts to provide content validity as a consultant. This ensured content validity by evaluating the questions, statements and optional responses in the questionnaire to ascertain relevance and clarity (Mugenda & Mugenda, 2003). The questions in the research instrument were adjusted as recommended by the consultants on their suitability before issuing the questionnaires for the final data collection exercise. The research instrument was pre-tested to determine its reliability by checking the structure, wording and sequence of the questions.

30 questionnaires were piloted by issuing them to randomly selected respondents at the Ministry of Foreign Affairs and International Trade. The questionnaires were coded and responses input into statistical program for social sciences (SPSS) version 22 which was used to generate the Cronbach's reliability coefficient. Cronbach's Alpha (α) was used to measure internal consistency of the research instrument in this study. 0.7 Cronbach's Alpha (α) was used as a threshold of reliability (Mugenda & Mugenda, 2008). Data collected from the respondents was cleaned, tabulated, coded and analyzed to deduce relationships between the variables using the statistical program for social sciences (SPSS) software version 22. Analyzed data was presented using tables and charts. Frequency distribution tables and percentages were used in the study to capture the characteristics of the variables. The study employed the inferential statistics; multiple linear regression and bivariate correlation to analyze the relationship between the dependent variable and the independent variables. The independent variables in the study were: economic order quantity, just in time replenishment, materials requirements planning and inventory control while the dependent variable was performance of the education sector in Kenya. This study used frequency distribution tables, graphs and pie charts to present data and deduce the relationship between the variables. Multiple linear regression was used to determine the relationship between the independent variables: economic order quantity, just in time replenishment, materials requirements planning and inventory control and how they predicted the performance of the education sector in Kenya. The multiple linear regressions equation that was used in the model was:

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

Where:

Y= Performance

β_0 = Constant Term,

X_1= Economic order quantity

X_2= Just in time replenishment

X_3= Materials requirements planning

X_4= Inventory control

In the model, β_0 = was the constant term while the coefficients β_i i = 1.......4 was used to measure the sensitivity of the dependent variable (Y) to unit change in the predictor variables X_1, X_2, X_3 and X_4. ε was the error term which was used to capture the unexplainable variations in the model.

III. FINDINGS

The target sample of the study was 100, out of which 92 were returned, representing a response rate of 92% which was very sufficient for the study (Mugenda & Mugenda, 2008). The study obtained a Cronbach's Alpha (α) coefficients for economic order quantity as 0.840; just in time replenishment had a coefficient of 0.857, materials and requirements planning had a coefficient of 0.719, inventory control had a coefficient of 0.882 while performance had a coefficient of 0.753 against the 0.7 used as a threshold of reliability (Mugenda & Mugenda, 2008). Table 1 below shows the bivariate correlation matrix for the study. The following observations were made. The findings in Table 1 show that there exists a strong positive correlation between performance and economic order quantity, (n=92, r = 0.647, p < 0.01), two tailed,

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implying that performance of the education sector is affected by EOQ acquisition procedures. The findings also show that there exists a positive moderate relationship between performance of the education sector and Just-In-Time replenishment (n=92, r = 0.533, p < 0.01). Study correlation results also show the existence of a positive moderate relationship between performance of education sector and materials and requirements planning (n=92, r = 0.403, p < 0.01). The findings further reveal that there exists a very strong positive relationship between performance of the education sector and inventory control as presented at (n=92, r = 0.708, p < 0.01).

Table 1: Correlation Coefficients

		Performance	EOQ	JIT	MRP	IC
Performance	Pearson Correlation	1	.647**	.533**	.403**	.708**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	204	204	204	204	204
EOQ	Pearson Correlation	.647**	1	.543**	.427**	.677**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	204	204	204	204	204
JIT	Pearson Correlation	.533**	.543**	1	.479**	.538**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	204	204	204	204	204
MRP	Pearson Correlation	.403**	.427**	.479**	1	.509**
	Sig. (2-tailed)	.000	.000	.000		.000
	N	204	204	204	204	204
IC	Pearson Correlation	.708**	.677**	.538**	.509**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	204	204	204	204	204

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

Table 2 below illustrates the model summary for the study. According to the table, the R Square value for all the independent variables was 0.565 indicating that the model can explain 56.5% of the variations in the performance of education at the ministry which could be attributed to unit change in the four independent variables.

Table 2: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.0.752[a]	.565	.905	.21410
a. Predictors: (Constant), economic order quantity, just in time replenishment, materials and requirements planning and inventory control				

Table 3 displays the Analysis of Variance (ANOVA) statistics for the study. According to the ANOVA results, the value of the calculated F-test (F_{cal}) is equivalent to 704.041 which is greater than the F-critical (4, 102) which was 3.92. This indicates that there is a significant relationship between the four independent variables and the dependent variable. Further, the p-value of 0.000 is less than the 0.05 level of significance meaning that there is a statistically significant relationship between the four independent variables and the dependent variable. This confirms goodness of fit.

Table 3: ANOVA Statistics

Model		Sum of Squares	Degrees of Freedom	Mean Square	F	Sig.
	Regression	129.087	2	32.272	704.041	.000
	Residual	13.385	90	.046		
	Total	142.471	92			

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Table 4 illustrates the beta coefficients for the multiple regression model of the study. The values of the constant and the coefficients enabled the generation of the following multiple regression model.

Table 4: Regression Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	0.529	.148		1.543	.124
Economic order quantity	.711	.078	.713	9.175	.000
Just in time replenishment	.338	.097	.253	3.472	.001
Materials and requirements planning	.293	.027	-.274	-10.704	.000
Inventory control	.616	.051	.647	12.061	.000

The following observations were made from the regression results. Firstly, a unit increase in economic order quantity would lead to a 0.711 increase in performance of education when all other independent variables are held constant. Secondly, a unit increase in just-in-time replenishment would lead to a 0.338 increase in performance of education when all other independent variables are held constant. Thirdly, a unit increase in materials and requirements planning would lead to a 0.293 increase in performance of education when all other independent variables are held constant. Lastly, a unit increase in inventory control would lead to a 0.616 increase in performance of education when all other independent variables are held constant. It is evident from the results that economic order quantity was the strongest determinant of the performance of education, followed by inventory control, Just-in-time replenishment and inventory control in that order.

The multiple linear regressions equation used in this model is:

$Y = 0.529 + 0.711X_1 + 0.616X_2 + 0.338 X_3 + 0.293 X4 + 0.148$

Where:

Y= Performance of education sector

In the model, $\beta 0 = 0.529$, is the constant term. The coefficients were calculated by SPSS version 22 and found to be: $\beta_1 = 0.711$, $\beta_2 = 0.616$, $\beta_3 = 0.338$ while $\beta_4 = 0.293$ and were used to measure the sensitivity of the dependent variable (Y) to unit change in the predictor variables X_1, X_2, X_3 and X_4. ε was the error term and was found to be 0.148. The error term captured the unexplainable variations in the model.

IV. DISCUSSIONS

The study sought to establish the effect of inventory management on the performance of the education sector in Kenya with a specific focus on the Ministry of Education. Specifically, the sought to determine how economic order quantity, just in time replenishment, materials requirements and planning and inventory control influence performance in education in the Ministry of education. The analysis of the data was carried out using SPSS version 22. Descriptive statistics generally revealed that majority of the respondents agreed to various aspects on Economic Order Quantity. Findings revealed that Economic Order Quantity had enabled the Ministry to plan for its inventory on a timely basis. The findings further revealed that the Ministry maintained levels of inventory that minimized inventory holding costs and ordering costs. Regression analysis revealed that economic order quantity had a positive significant effect on performance of the education sector in Kenya. Majority of the respondents agreed to a moderate extent that the various aspects on Just in Time Replenishment. Findings revealed that the Ministry ordered for items that arrived when needed, neither earlier nor later and that the Ministry used just in time replenishment to reduce the frequency of ordering. Regression analysis revealed that just in time replenishment had a positive significant effect on performance of the education sector in Kenya.

Generally, the study findings revealed that majority of the respondents agreed to a moderate extent that the various aspects on materials and requirements planning. Specifically, the findings revealed that materials and requirement planning enabled the Ministry achieve efficiency of information flow to a moderate extent. The findings further revealed that materials requirements planning had enabled the Ministry to reduce idle time to a moderate extent. Regression analysis revealed that materials and requirements planning had a positive significant effect on performance of the

education sector in Kenya. The study findings generally revealed that majority of the respondents agreed that the various aspects on inventory control. Results specifically revealed that the Ministry had invested in systems to manage and keep track of inventory.

The findings further revealed that inventory control helped the Ministry achieve maximum performance in terms of service delivery. Regression analysis revealed that inventory control had a positive significant effect on performance of the education sector in Kenya.

V. CONCLUSIONS

This study sought to establish the effect of inventory management on performance of the education sector in Kenya. Four key aspects of inventory management were considered ranging from economic order quantity, just in time replenishment, materials and requirements planning and inventory control. The findings revealed that economic order quantity influenced performance to a great extent, just in time replenishment to a moderate extent, materials and requirements planning to a moderate extent and inventory control to a great extent.

 The research findings indicated that there was a positive relationship between the variables. The study also revealed that 56.5% of the Ministry performance could be explained by inventory management. From this study, it is evident that at 95% confidence level, the variables produce statistically significant values and can be relied on to explain performance of the Ministry of Education, Science and Technology in Kenya. A positive effect is reported for all the inventory management under study hence influencing performance of the Ministry of Education, Science and Technology. The findings revealed that economic order quantity, inventory control, just in time replenishment and materials and requirements planning respectively influenced performance at the Ministry of Education, Science and Technology.

VI. RECOMMENDATION AND SUGGESTIONS

The following recommendations emanate from the research findings: There is a great need to ensure that stock levels are managed effectively at the Ministry using the Economic Order Quantity so that they do not hit a stock out. Just in time replenishment should also be revived with a view of ensuring that the Ministry maintains the required inventory only. Management at the Ministry of Education, Science and Technology should plan for various materials requirements in order to ensure warehousing and material handling costs are minimized. Proper inventory control practices should also be embraced at the Ministry in order to ensure quality products in the store.

This study is a milestone for future research in this area, particularly in Kenya. First, this study focused on the effect of inventory management on the performance of the education sector in Kenya using four parameters. Future research should therefore focus on how inventory management influences performance of private organizations with a keen focus on other parameters.

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