International Journal of Academic Research in Business and Social Sciences
2016, Vol. 6, No. 7
ISSN: 2222-6990

Inventory Management Practice and the Performance of the Unit of Vaccines and Immunizations in the Minstry Health, Kenya

Samuel Okanda
PhD. Candidate Jomo Kenyatta University of Agriculture and Technology, Kenya
School of Entrepreneurship, Procurement and Management, Nairobi, Kenya

G. S. Namusonge
Professor Jomo Kenyatta University of Agriculture and Technology, Kenya
School of Entrepreneurship, Procurement and Management, Nairobi, Kenya

Esther Waiganjo
Senior Lecturer Jomo Kenyatta University of Agriculture and Technology, Kenya
School of Entrepreneurship, Procurement and Management, Nairobi, Kenya

DOI: 10.6007/IJARBSS/v6-i7/2236 URL: http://dx.doi.org/10.6007/IJARBSS/v6-i7/2236

ABSTRACT
The performance of the public health sector in Kenya has been a major concern to the Kenyan people. Good health is a prerequisite for enhanced economic growth and poverty reduction and a precursor to the realization of Kenya Vision 2030's social pillar goal. The country is confronting numerous gaps in health outcomes like high infant mortality rate caused by neonatal problems. Therefore, the purpose of this study was to determine the influence of inventory management practice and the performance of the unit of vaccines and immunizations in the Ministry of Health, Kenya. The study adopted mixed research design using both quantitative and qualitative approaches. The target population of the study was 244 from the Unit of Vaccine and Immunizations (UVIS) headquarter KEMSA depot and warehouse staff, Nairobi, Mombasa, Kisumu, and Busia counties. The study used random sampling to pick a sample size of 74 respondents. Data was collected using questionnaire. Descriptive statistics was used aided by Statistical Packages for Social Sciences version 24 to compute percentages of respondents' answers. Inferential statistics multiple regression analysis was applied to examine the relationship between the research variables. The results showed that there is strong positive correlation between inventory management and the performance of the unit of vaccines and immunizations. Hence, buffer stock, optimal inventory level, collaborations with key stakeholders, continuously monitor inventory levels, stocks transfer/replenishment orders and procurement plan if adopted can improve the performance of the unit of vaccines and immunizations.

INTRODUCTION

Health care has become a critical issue in the world, along with the increased concerns for medical errors, patient safety, and spiraling up medical costs, many researchers have stressed the importance of effective SCM in the healthcare industry (Chan, Chan, Lau, & Ip, 2008; Kumar, Ozdamar, & Zhang, 2008; Mustaffa & Potter, 2009). Healthcare services involve comprehensive and complex systems that treat and prevent diseases, including medical consumables, laundry and cleaning, medical exercise equipment, home-care products, information systems, wheelchairs, vehicle fleet management, and general materials (Gattorna, 1998).

In Kenya vaccination and immunization is done by the ministry of health through the Unit of Vaccines & Immunization Services (UVIS). It became effective from 1st July 2007, and represents the Ministry of Health's new direction in the coordination of immunization services for the general public. The Unit of Vaccines & Immunizations Services (UVIS) has grown from the original Kenya Expanded Program on Immunization (KEPI) but has extended scope to consolidate all vaccination services previously coordinated by other divisions within the Ministry of Health. The mandate of UVIS is to coordinate vaccination services for all vaccine preventable diseases through the provision of guidelines and selected priority vaccines and related biological (sera, immunoglobulin). Also UVIS is to advice on immunization schedules for all age cohorts in line with the Kenya Essential Package for Health (NHSSP-II 2005-2010). Vaccines are very sensitive biological products; they lose their potency if they are subjected to temperatures beyond the recommended ranges. Proper forecasting, procurement, handling, storage and distribution of vaccines are vital in order to provide effective vaccines to protect children from vaccine preventable diseases. To reap the maximum benefits from vaccines, a strong and efficient vaccine supply chain must be in place.

The goal of Kenya's Vision 2030 for the health sector is to provide equitable and affordable health care at the highest affordable standards to her citizens. Good health is a prerequisite for enhanced economic growth and poverty reduction and a precursor to the realization of Kenya Vision 2030's social pillar goal (Government of Kenya, 2007). The Constitution of Kenya 2010 under the Bill of Rights provides for access to equitable health care as a right to every Kenyan. Despite the relative good performance in health indicators, there are numerous gaps in health outcomes. In fact, the country is not likely to achieve some of the Millennium Development Goals by 2015. At 488 per 100,000 live births, Kenya's maternal mortality ratio is high, mainly due to a number of factors that include low levels of delivery at 43 percent through health institutions. Moreover, despite increasing use of contraceptives, the total fertility rate has been stagnating at around five births per woman for the last 10 years (Kenya Demographic and Health Survey 2009). According to Kenya Demographic and Health Survey (2009), child mortality remains high in Kenya. The less than 5 years mortality rate is estimated at 74 per 1000 live births, while infant mortality is 52 per 1000 live births. The main causes of death amongst children are neonatal problems at 26 percent, diarrhea at 20 percent, pneumonia at 16 percent and malaria at 11 percent.

To address the continued high morbidity and mortality in children under the age of five years, the Government of Kenya has adopted the Integrated Management of Childhood Ilnesses strategy that encourages an integrated approach towards providing prevention and

management of the five major childhood illnesses both at the health facilities and at home. This is in addition to immunization that has contributed to the significant reduction in the prevalence of common childhood diseases. The Expanded Program on Immunization (EPI) program plans to achieve over 90 percent coverage nationally and at least 80% in all districts / sub-counties by 2015. The cost of vaccine alone for a fully immunized child (FIC) currently stands at $18. This will increase to $25 with the introduction of the Rotavirus vaccine and Inactivated polio Vaccine (IPV) in 2014 (Effective Vaccine Management Assessment, 2013).

Problem Statement

Globally there is persistent shortage or stock out of vaccines and this is realized regionally, nationally and locally. In Kenya for example, there has been shortage of Bacille Calmette-Guerin (BCG) vaccine that protects children against TB and meningitis from October 2015 to January 2016. Kilonzo reported that "shortage of vaccines to end as 1.3 million doses arrive on Friday" (2016, p. 2) and Odhiambo reported that "hospitals turn away mothers as shortage of vaccines bite" (2016, p. 22). These vaccines are procured centrally and supplied from the source to the various regions, nationals to the communities where they are consumed.

The performance of the public health sector in Kenya has been a major concern to the Kenyan people. Good health is a prerequisite for enhanced economic growth and poverty reduction and a precursor to the realization of Kenya Vision 2030's social pillar goal (Government of Kenya, 2007). The country is confronting numerous gaps in health outcomes. In fact, the country is not likely to achieve some of the Millennium Development Goals by 2015. At 488 per 100,000 live births, Kenya's maternal mortality ratio is high, mainly due to a number of factors that include low levels of delivery at 43 per cent through health institutions (Kenya Government Publisher, 2015). Effective Vaccine Management Assessments (EVMA 2013); Vaccine Management Guidelines (2003) and Performance Monitoring Handbook (2013) pointed out that some of the key areas that limit the performance score of the Unit of Vaccines and Immunization and required to be improved is the clearing of vaccines through the customs which takes between 3 to 10 days long and can put the vaccine at risk. During vaccine ordering and supply, staffs do not implement minimum, reorder and maximum stock levels, as a result, several incidents of over stocking and stock-outs have occurred. Thus, it is important to look into the inventory management practice that can improve healthcare organizational performance (Sukati, Hamid, Baharun & Huam, 2011).

Objective of the study

The objective of this study was to determine the influence of inventory management practice and the performance of the unit of vaccines and immunizations in the Ministry of Health, Kenya.

Hypothesis

H_1There is a positive significant influence of inventory management practice and the performance of the unit of vaccines and immunizations in the Ministry of Health, Kenya**.**

Literature review

This study was anchored in resource-based view and competitive advantage theories.

Resource-Based View Theory (RBV)

The RBV of the firm regards the firm as a collection of resources and capabilities that may culminate in enhanced performance (Wernerfelt 1984). Resources, which may be tangible (e.g., technology) or intangible (e.g., knowledge), and may be combined to create capabilities that determine how firms react to various internal and external threats and opportunities (Wernerfelt 1984; Barney 1991). The RBV theory examines the impact of organization resources and capabilities on competitive advantage that leads to overall organizational performance. Based on Ray et al.'s (2004) study, the resources and capabilities that are not conditioned into sustaining activities and business processes will not have positive impact on an organizational performance. Capacity and resource management is one of the SCM practices dimension studied in this framework. Capacity and resource management is defined as management capacity and resources of service that are organized effectively and operated efficiently at optimal level (Baltacioglu, Ada, Kaplan, Yurt, & Kaplan, 2007). The main contribution of the RBV as a theory that developed in the strategy discipline is that it considers the involvement of other disciplines, such as economics, industrial organization, and organization science.
This theory is important in this study because the UVIS need to coordinate all staff, materials and equipment to ensure that there is smooth flow of drugs right from the suppliers, through the organization and to the consumers. This will avoid shortages of drugs in the vaccination centres. Therefore, by integrating RBV theory into this study's framework, service SCM practices for public healthcare organization should have positive impact on the organizational performance if the resources and capabilities are conditioned into sustaining SCM practices.

Competitive Advantage Theory

Competitive advantage is necessary to satisfy customers by fulfilling customers request (Wang *et al*., 2011). It is what you can do better than all your competitors or market players to delight your customers. It enables organizations to have a head start in the market and it can lead to market expansion. Demand management is defined as managing and balancing customer demand by keeping updated demand information (Baltacioglu *et al*., 2007). Customer relationship management is defined as maintaining and developing long-term customer relationships by developing information continuously and understanding what customers want. Therefore, a more important aspect in which the presence of competitive advantage in supplier industries could influence the creation of one in the downstream industries is the provision of coordination on the part of the former in terms of linkages with the value chains of the latter (Michael, 1990).
Perhaps the most important benefit of home-based suppliers, however, is expressed in the process of innovation and upgrading. It refers to a mutual influence between firms and their suppliers. On the one hand, suppliers help firms to perceive new methods and opportunities to apply new technology. A spur to innovation could, on the other hand, be given from firms to

their suppliers by influencing suppliers' technical efforts in a direction of testing new developments and ideas. Other factors such as exchange of R&D, joint problem solving or transmitting of information through suppliers to different firms contribute to the establishment of a fast pace of innovation within the entire national industry (Michael, 1990).

Inventory Management Practice

Inventory Management is a process to define right inventory levels at various nodes within a supply chain network to minimize stock out; wastage of material due to expiry; optimize investment in inventory and storage facilities as per the available budget. The process also involves creation of replenishment order plans & initiation of stock transfers (Vaccine Management Guidelines, 2003; Performance Monitoring Handbook, 2013). Objective of Inventory Management process is to maintain right inventory levels at all nodes and ensure that there is no stock out as well as minimum wastage of resources due to expiry / excess stock levels. This is done by defining right planning parameters, continuously monitoring inventory levels /expiry and initiating stocks transfer/replenishment orders at regular time intervals.
Inventory has also been a subject in the debate on supply chain resilience, which has been of increasing interest in recent years; particularly as the 'leaning-down' of companies and global sourcing have increased supply chain risks (Christopher & Peck, 2004). It is recognized that international supply chains may be particularly vulnerable owing to such factors as the geographic area covered, the transport modes used, political/border factors and environmental issues (Prater *et al*., 2001). Whilst risk mitigation strategies may contain many elements, the use of inventory is generally recognized as one possible tool. For example, Chopra and Sodhi (2004) list 'increase inventory' as a risk mitigation approach, whilst Christopher and Peck (2004) state that 'the strategic disposition of additional capacity and/or inventory at potential "pinch points" can be extremely beneficial in the creation of resilience within the supply chain'.

Inventory Management plays a decisive role in the enhancement of efficiency and competitiveness of business enterprises. Therefore, there is increased need for business enterprises to embrace effective inventory management practices as a strategy to improve their competitiveness (Rajeev, 2008). Effective inventory management entails holding an appropriate amount of inventory. Too much inventory consumes physical space, creates a financial burden, and increases the possibility of damage, spoilage and loss. On the other hand, too little inventory often disrupts business operations, and increases the likelihood of poor customer service (Dimitrios, 2008). Prudent inventory management requires the analysis of the costs of maintaining certain levels of inventory as there are costs involved in holding too much stock and there are also costs involved in holding too little hence the need to put in place an effective stock management system to ensure reliable sales forecasts (Atrill, 2006).
Alade, Sharma and Sharma (2004) discussed Supply Chain (SC), which involves the configuration, coordination, and improvement of sequentially related set of operations in establishments, integrates technology and human resource capacity for optimal management of operations to reduce inventory requirements and provide support to enterprises in

pursuance of a competitive advantage in the marketplace. The paper addresses the structures of supply chain management (SCM) and the activities involved in SCM decisions that help promote profound improvement in efficiency and effectiveness in business operations. In broader context, the paper examines the types of activities involved in SCM decisions; the dynamics of the traditional SCM, the complementarities of technology in achieving effective management of operations through enablers of electronic data interchange (EDI) and quick response (QR) disciplines to implement Just-in-Time (JIT) management techniques; and integrated SC and inventory control as it relates to capacity imbalances and transaction costs. (Alade, Sharma, & Sharma, 2004

Research Methodology

The study adopted mixed research design using both quantitative and qualitative approaches. The target population of the study was 244 from the UVIS headquarter, KEMSA depot and warehouse staff, Nairobi, Mombasa, Kisumu and Busia counties. The study used random sampling to pick a sample size of 74 respondents. Data was collected using questionnaire. Descriptive statistics was used aided by Statistical Packages for Social Sciences version 24 to compute percentages of respondents' answers. Inferential statistics multiple regression analysis was applied to examine the relationship between the research variables.

Research findings and Discussion

Response Rate

The study targeted a sample of 74 respondents, who were official staff in the headquarter of UVIS, Central Vaccines Store, Kepi County nurses, Kepi County Logisticians, Sub-county EPI Coordinators, KEMSA depot staff and KEMSA Central Warehouse staff. A total of 66 self-administered questionnaires were filled out of the expected 74 yielding a response rate of 89%. This good response rate was attributed to the data collection procedure, where the researcher personally administered questionnaires and waited for the respondents to fill, and picked the filled questionnaires.

Reliability and factor analysis for Inventory Management practise

On inventory management statements, the reliability and factor analysis results were as presented in table below. Each of the constructs was refined by utilizing principal component analysis on the initial items comprising each construct. Each principal component analysis extracted factors, and factor loadings greater than 0.5 were retained for each principal component extracted (Hair et al., 2010). To assess the factorability of items, the researcher examined this indicator (i.e. Kaiser Meyer-Olin Measure of Sampling Adequacy). For every EFA, it was found that manifest variables have KMO Measures of Sampling Adequacy above the threshold of 0.6 (Kaiser, 1974). Additionally, the reliability and internal consistency of the items constituting each construct was estimated. Table below indicates that the Cronbach's alpha value of all inventory management practice items remained as 0.786 since all the item had a factor loading value of more than 0.5 and there were no item which were removed. Scale refinement was assessed using item to total correlations analysis, with indictors with an item to

total correlation threshold of 0.3 and higher being maintained for further analysis (Hair et al., 2006).

Reliability and factor analysis for Inventory Management practise

Statements on inventory management practise.	KMO	Factor loadings	Overall Cronbach's Alpha	Item to total correlation
We hold appropriate amount of inventory as a risk mitigation approach.	0.755	.644	0.786	.476
We determine the optimal inventory level by use of stock levels e.g. maximum, re-order, minimum and hastening levels.		.616		.489
We build collaborations with our key stakeholders e.g. donors, suppliers, government/ministry of health, health facilities etc.		.792		.666
we continuously monitor inventory levels/expiry		.781		.599
we initiate stocks transfer/replenishment orders at regular time intervals		.809		.626
we define right planning parameters e.g. procurement plan, distribution plan and inventory requirements etc.		.808		.643

Analysis of Inventory Management practise

The study sought to establish the influence of inventory management practice on the performance of the unit of vaccines and immunizations in the Ministry of Health, Kenya. This objective was measured using opinion statements given with regard to inventory management practices and Unit of Vaccines and Immunizations capabilities.

Inventory management practice opinion statements

Respondents were asked to indicate the extent to which they agreed with inventory management practice opinion statements that are executed in the Unit of Vaccines and Immunizations. This was on a scale of not at all, small extent, moderate, large extent and very large extent. A result of the analysis is presented in table on page 13. The study established that majority of respondents (33%) indicated large extent that UVIS hold appropriate amount of inventory as a risk mitigation approach, 22% of respondents indicated very large extent, 17% of respondents indicated moderate, 14% of respondents indicated small extent and 13% of respondents indicated not at all. This result concurred with the study of Chopra and Sodhi

(2004), whilst risk mitigation strategies may contain many elements, the use of inventory is generally recognized as one possible tool. For example, Chopra and Sodhi (2004) list 'increase inventory' as a risk mitigation approach, whilst Christopher and Peck (2004) state that 'the strategic disposition of additional capacity and/or inventory at potential "pinch points" can be extremely beneficial in the creation of resilience within the supply chain'.

On determination of the optimal inventory level, majority of respondents (56%) indicated very large extent that UVIS determine the optimal inventory level by use of stock levels e.g. maximum, re-order, minimum and hastening levels, 32% of respondents indicated large extent that UVIS determine the optimal inventory level by use of stock levels e.g. maximum, re-order, minimum and hastening levels, 10% of respondents indicated moderate that UVIS determine the optimal inventory level by use of stock levels e.g. maximum, re-order, minimum and hastening levels and 2% of respondents both indicated small extent and not at all that UVIS determine the optimal inventory level by use of stock levels e.g. maximum, re-order, minimum and hastening levels. This result showed that UVIS hold optimum inventory levels to meet the needs of customers as the same time minimising cost of operations. This finding concurred with the study of Atrill (2006) that prudent inventory management requires the analysis of the costs of maintaining certain levels of inventory as there are costs involved in holding too much stock and there are also costs involved in holding too little hence the need to put in place an effective stock management system to ensure reliable sales forecasts. Also, Ross (2008) observed, the Economic Order Quantity (EOQ) model is an approach of determining the optimal inventory level that takes into account the inventory carrying costs, stock-out costs and total costs which are helpful in the determination of the appropriate inventory levels to hold.

Further, result showed that on collaborations with key stakeholders as majority of respondents (59%) indicated very large extent that UVIS built collaborations with their key stakeholders e.g. donors, suppliers, government/ministry of health, health facilities and many others, 24% of respondents indicated large extent that UVIS built collaborations with their key stakeholders e.g. donors, suppliers, government/ministry of health, health facilities and many others, 6% of respondents indicated moderate that UVIS built collaborations with their key stakeholders e.g. donors, suppliers, government/ministry of health, health facilities and many others, 8% of respondents indicated small extent that UVIS built collaborations with their key stakeholders e.g. donors, suppliers, government/ministry of health, health facilities and many others, and 3% of respondents indicated not at all that UVIS built collaborations with their key stakeholders e.g. donors, suppliers, government/ministry of health, health facilities and many others. This result showed that UVIS has built strong collaborations with its partners in the supply chain of vaccines. From the literature, today's business climate is changing rapidly and has become more competitive than ever. Businesses now not only need to operate at a lower cost in order to compete, but they must also develop their own core competencies to be distinguished from competitors and stand out in the marketplace. Enterprises are now competing globally and traditional barriers between industries are breaking down. Due to the above-mentioned market pressures and the issues involved in becoming more successful in the global market, all the SC players need to collaborate towards the same goals to be more profitable in the market and in providing a quality product in less lead time (Prakash & Chan, 2012).

On stocks transfer/replenishment orders, majority of respondents (50%) indicated very large extent that UVIS initiate stocks transfer/replenishment orders at regular time intervals, 27% of the respondents indicated large extent that UVIS initiate stocks transfer/replenishment orders at regular time intervals, 14% of the respondents indicated moderate that UVIS initiate stocks transfer/replenishment orders at regular time intervals, 6% of the respondents indicated small extent that UVIS initiate stocks transfer/replenishment orders at regular time intervals and 3% of the respondents indicated not at all that UVIS initiate stocks transfer/replenishment orders at regular time intervals. This result showed that UVIS initiate stock transfer/replenish orders at regular time intervals to ensure continuous generation and processing of customers.

With regard to procurement plan, majority of the respondents (48%) indicated very large extent that UVIS define right planning parameters e.g. procurement plan distribution plan inventory requirements, 25% of the respondents indicated large extent that UVIS define right planning parameters e.g. procurement plan distribution plan inventory requirements, 17% of the respondents indicated moderate that UVIS define right planning parameters e.g. procurement plan distribution plan inventory requirements, 6% of the respondents indicated small extent that UVIS define right planning parameters e.g. procurement plan distribution plan inventory requirements and 3% of the respondents indicated no at all that UVIS define right planning parameters e.g. procurement plan distribution plan inventory requirements. Overall, the result showed that inventory planning is an important tool in the UVIS. Procurement plan assist UVIS to determine their requirements in order to satisfy their customers. Also, a small number of respondents disagreed that UVIS do not plan their requirements.

Inventory Management practises.

Opinion statements	Not at all (%)	Small extent (%)	Moderate (%)	Large extent (%)	Very Large extent (%)	Mean	Std. deviation
We hold appropriate amount of inventory as a risk mitigation approach.	13	14	17	33	22	3.38	1.325
We determine the optimal inventory level by use of stock levels e.g. maximum, re-order, minimum and hastening levels.	2	2	10	32	56	4.38	.851
we build collaborations with our key stakeholders e.g. donors, suppliers, government/ministry of health, health facilities etc.	3	8	6	24	59	4.27	1.096
we continuously monitor inventory levels/expiry	0	0	8	33	59	4.52	.642
we initiate stocks transfer/replenishment orders at regular time intervals	3	6	14	27	50	4.14	1.082
we define right planning parameters e.g. procurement plan distribution plan inventory requirements etc.	3	6	17	25	48	4.08	1.097

Test of hypothesis

The researcher conducted regression analysis so as to establish the influence of inventory management practice and the performance of the unit of vaccines and immunizations in the Ministry of Health, Kenya. The hypothesis to test for this specific objective was:

> **H_1:** There is a positive significant influence of inventory management practice and the performance of the unit of vaccines and immunizations in the Ministry of Health, Kenya.

The linear regression model shows R^2= 0.439 which means that 43.9% change of performance of the UVIS in the ministry of health, Kenya can be explained by a unit change of inventory management practice. The result is shown in table below. Out of the results there is an indication that one unit change in inventory management practice translates to 43.9% change in performance of the UVIS in the ministry of health, Kenya. Therefore, inventory management practice has an influence on how UVIS perform.

Model Summary of inventory management practice

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.671[a]	.450	.439	.62177

a. Predictors: (Constant), Inventory management practice
b. Dependent Variable: Performance of the unit of vaccines and immunizations

Further test on ANOVA shows that the significance of the F-statistic (26.398) is less than 0.05 since p value, p=0.00, as indicated in table below. This implies that there is a positive significant relationship between inventory management practice and performance of the UVIS. This result agrees with Rajeev (2008) study that inventory management plays a decisive role in the enhancement of efficiency and competitiveness of business enterprises. Therefore, there is increased need for business enterprises to embrace effective inventory management practices as a strategy to improve their competitiveness and productivity.

ANOVA of inventory management practice

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9.131	1	9.131	26.398	.000[b]
	Residual	19.716	57	.346		
	Total	28.847	58			

a. Dependent Variable: Performance of the unit of vaccines and immunizations
b. Predictors: (Constant), Inventory management practice

Further test on the beta coefficients of the resulting model, the constant α= 0.192, if the independent variable of inventory management practice is held constant then there will be a positive performance of the UVIS in the ministry of health, Kenya by 0.192. The regression coefficient for inventory management practice was positive and significant (β = 0.631) with a t-value=6.460 (p-value<0.001). As shown in table below.

This implies that for every 1 unit increase in inventory management practice, performance of the UVIS in the ministry of health, Kenya is predicted to increase by 0.631 units and therefore H_1 is accepted.

Coefficients of inventory management practice

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.192	.088		2.182	.033
	Inventory management practice	.631	.098	.671	6.460	.000

a. Dependent Variable: Performance of the unit of vaccines and immunizations

Inventory Management is a process to define right inventory levels at various nodes within a supply chain network to minimize stock out; wastage of material due to expiry; optimize

investment in inventory and storage facilities as per the available budget. The process also involves creation of replenishment order plans & initiation of stock transfers (Vaccine Management Guidelines, 2003; Performance Monitoring Handbook, 2013). The objective of inventory management process is to maintain right inventory levels at all nodes and ensure that there is no stock out as well as minimum wastage of resources due to expiry / excess stock levels and increase productivity of the organization. This finding of the study concurs with the reviewed literature in this study that inventory management increase the performance of the UVIS.

CONCLUSIONS AND RECOMMENDATIONS

Inventory management is a process to define right inventory levels at various nodes within a supply chain network to minimize stock out; wastage of material due to expiry; optimize investment in inventory and storage facilities as per the available budget. Based on the results of the study, the adoption of inventory management practice by the unit of vaccines and immunizations in Kenya could be concluded that this practice influence performance. The findings of the study showed that inventory management is practiced in the unit of vaccines and immunizations through buffer stock. The UVIS hold appropriate amount of inventory as a risk mitigation approach and determine the optimal inventory level by use of stock levels e.g. maximum, re-order, minimum and hastening levels. Also, the UVIS hold optimum inventory levels to meet the needs of customers as the same time minimising cost of operations. Further, it was noted that from the result the unit of vaccines and immunizations collaborate with key stakeholders e.g. donors, suppliers, government/ministry of health, health facilities. Thus, the study concludes that all the SC players need to collaborate towards the same goals to be more profitable in the market and in providing a quality product in less lead time.

In addition, the results showed that UVIS continuously monitor inventory levels and this is done in order to check the status of items physically, for example the expiry, damage and redundancy stock. It was also noted that, the UVIS initiate stocks transfer/replenishment orders at regular time intervals. However, this is done to ensure continuous generation and processing of customers. Moreover, the study showed that UVIS define right planning parameters e.g. procurement plan distribution plan inventory requirements. Procurement plan assist UVIS to determine their requirements in order to satisfy their customers.

Further, it was established that inventory management practice influence positively the performance of the unit of vaccines and immunizations. Hence, buffer stock, optimal inventory level, collaborations with key stakeholders, continuously monitor inventory levels, stocks transfer/replenishment orders and procurement plan if adopted can influence positively performance of the unit of vaccines and immunizations.

Although from the study findings it was noted that UVIS hold buffer stock for safety purposes, but this act increases the holding cost of inventory and thereby tying a lot of capital resources in the inventory. The UVIS should try to strike a balance between the cost of holding buffer stock and the cost of stock outs. But due to advance communications and computing facilities, UVIS should be operating on a zero-inventory level by adopting the Just In Time (JIT) technique.

However, this is possible with co-partnership with the supplier, and they should communicate on a real-time basis.

REFERENCES

Ada, E., Kaplan, M. D., Yurt, O., Kaplan, Y. C., & Baltacioglu, T. (2007). A new framework for service supply chains. *The Service Industries Journal, 27(2)*, 105-124.

Anderson, J. (2002). Evaluation in health informatics: social network analysis. *Computers in Biology and Medicine, 32*, 179-193.

Bales, W. (1997). *Measures of Purchasing Effectiveness . .* Arizona : Arizona State University.

Baltacioglu, T., Ada, E., Kaplan, M. D., Yurt, O., & Kaplan, Y. C. (2007). A new framework for service supply chains . *The Service Industries Journal, 27(2)*, 105-124.

Birou, L. (1993). International purchasing benefits and requirements and challenges . *International Journal of purchasing and supply 15(2)*, 22-25.

Boonitt, S., & Pongpanarat, C. (2011). Measuring service supply chain management processes: The application of the Q-sort technique. *International Journal of Innovation, Management and Technology, 2(3),*, 217-221.

Boute, R. N., Disney, S. M., Lambrecht, M. R., & Houdt, B. V. (2007). An integrated production and inventory model to dampen upstream demand variability in the supply chain. *European Journal of Operation Research (178)*, 121-142.

Breen, L., & Crawford, H. (2004). Improving the pharmaceutical supply chain: Assessing the reality of e-quality through e-commerce application in hospital pharmacy. . *International Journal of Quality & Reliability Management, 22 (6).*, 572-590.

Carmines, E. G., & Zeller, R. A. (1997). *Reliability and validity assessment. Quantitative Applications in the Social Sciences series 07-017.* Newbury Park, CA: Sage Publications.

Chan, F., Chan, H., Lau, H., & Ip, R. (2008). Critical success factors in managing global supply chains. *International Journal Manufacturing Technology and Management,* 15 (1), 28-44.

Chen, I., Paulraj, A., & Lado, A. (2004). Strategic purchasing, supply management and firm performance'. *Journal of Operations Management, 22.* , 505-523.

Cho, D. W., Lee, Y. H., Ahn, S. H., & Hwang, M. K. (2012). A framework for measuring the performance of service supply chain management . *Computers & Industrial Engineering,* 62(3), 801-818.

Chong, A. Y., Chan, F. T., Ooi, K. B., & Sim, J. J. (2010). Can Malaysian firms improve organizational/innovation performance via SCM? . *Industrial Management & Data Systems,* 111(3), 410-431.

Chow, W. S., Madu, C. N., Kuei, C., Lu, M. H., & Tseng, H. (2008). Supply chain management in the US and Taiwan: An empirical study. *The international journal of Management Science,* 36: , 665-679.

Chow, W., Madu, C., & Kuei, C. (2005). A structural equation model of supply chain quality management and organisational performance. *International Journal of Production Economics,* 96 (3), 355-365.

Christiansee, E., & Kumar, K. (2000). ICT-enabled coordination of dynamic supply webs ; . *International Journal of Physical Distribution and Logistics Management,.* 30:(3/4), 268-285.

Christopher, M. (1998). *Logistics and supply chain management: Strategies for reducing cost and improving service.* London: Financial Times|Pitman Publishing.

Cohen, L., Manion, L., & Morrison, K. (2011). *Research Methods in Education.* London: Routledge.

Cohen, M., & Morrison, K. (2004). *Research Methods in Education, 6th Edition.* London: Rout ledge.

Cooper, D. R., & Schindler, P. S. (2008). *Business research methods. 8th edition.* Boston: Irwin/McGraw-Hill.

Crompton, H., & Jessop, D. (2001). *Dictionary of Purchasing and Supply.* London: Liverpool Business Review .

Earl, R. (2000). *The Basics of Social Research .* Belmont, CA : Thomson.

Effecive Vaccine Management Assessment (2013). *Findings and recommendations of the assessment team.* Kenya, nairobi

Fawcett, S., Waller, M., & Fawcett, A. (2010). Elaborating the dynamic systems theory to understand collaborative inventory successes and failures . *The International Journal of Logistics Management ,* 21(3), 510-553.

Gaither, N., & Frazier, G. (2002). *Operations Management, 9rd .* Cincinnati, Ohio: South-Western Publishers.

Gattorna, J. (1998). *Strategic Supply Chain Alignment: Best Practice in Supply Chain Management .* Aldershot: Gower Publishing.

Gichuru, M., Iravo, M., & Arani, W. (2015). Collaborative supply chain practices on performance of food and beverage companies in Kenya. *International Journal of Academic Research in Business and Social Sciences,* 5(11), 17-31

Grover, V., & Malhotra, M. K. (1997). Business Process reengineering: A Tutorial on the Concept, Evolution, method, Technology, and Application. *Journal of Operations Management,* 15(3), 193-213.

Hariharan, S., Dey, P. K., Moseley, H. S., Kumar, A. Y., & Gora, J. (2004). A new tool for measurement of process-based performance of multispecialty tertiary care hospitals. . *International Journal of Health Care Quality Assurance,* 17(6), 302-312.

Hassini, E. (2008). 'Building competitive enterprises through supply chain management. *Journal of Enterprise Information Management,* 21(4), 341- 344.

Herzlinger, R. (2006). *Innovating in Health Care-framework.* Boston, MA: Harvard Business School Publishing.

Kaipia, R., Korhonen, H., & Hartiala, H. (2006). Planning nervousness in the demand supply network: an empirical study. *The International Journal of Logistics Management ,* 17 (1), 95-113.

Kenya Demographic and Health Survey (2014). *Key indicators*. Kenya, Nairobi

Khang, T. S., Arumugam, V., Chong, A. Y.-L., & Chan, F. T. (2010). Relationship between supply chain management practices and organisation performance: a case study in the Malaysia service industry . *International Journal Modelling in Operations Management* 1(1), 84-106.

Kiess, H. O., & Bloomquist, D. W. (2009). *Psychological Research Methods: A Conceptual Approach.* New York: Prentice Hall.

Kilonzo, E. (2016, January 6). Shortage of Vaccines to end as 1.3 million doses arrive on Friday. *Daily Nation*, p 2.

Kinoti, B., J. (2013). *Determinants of supply chain management ethical practices implementation in government ministries in Kenya*. Unpublished doctoral dissertation, Jomo Kenyatta University of Agriculture and Technology.

Koh, S. C., Demirbag, M., Bayraktar, E., Tatoglu, E., & Zaim, S. (2007). The impact of supply chain management practices on performance of SMEs. . *Industrial Management & Data Systems,* 107(1*)*, 103-124.

Kothari, C. R. (2004). *Research Methodology Methods and Techniques.* New Delhi: New Age Publishers.

Kumar, A., Ozdamar, L., & Zhang, N. (2008). Supply chain redesign in the healthcare industry of Singapore. *Supply Chain Management: An International Journal,* 13(2), 95-103.

Lambert, D., Cooper, M., & Pagh, J. (1998). Supply chain management: implementation issues and research opportunities. *International Journal of Logistics Management,* 9 (2), 1-19.

Lapide, L. (2002). You Need Sales and Operations Planning. *Journal of Business Forecasting casting, Summer*, 11–14.

Li, S., Ragu-Nathan, B., Ragu-Nathan, T. S., & Rao, S. (2006). The impact of supply chain management practices on competitive advantage and organizational performance. *The International Journal of Management Science,* 34, 107-124.

Lin, C., Chow, W., Madu, C., Kuei, C., & Yu, P. (2005). A structural equation model of supply chain quality management and organisational performance. *International Journal of Production Economics,* 96 (3), , 355-365.

Lori, S. C., & Daniel, R. H. (2011). The moderating effect of supply chain role on the relatioshnip between supply chain practices and performance. *International Journal of Physical Distribution & Logistics Management,* 41(2), 104-134.

Mentzer, J., Keebler, J., Min, S., Nix, N., Smith, C., & Zacharia, Z. (2001). Defining supply chain management. *International Journal of Business Logistics, Vol. 22 No. 2*, 1-25.

Michael, P. (1990). *The Competitive Advantage of Nations.* New York: The Free Press, A Division of McMillan.

Morris, T. (2006). *Social Work Research Methods: Four Alternative Paradigms.* London: Sage Publication.

Mugenda, O., & Mugenda, A. (2003). *Qualitative and Quantitative approaches. .* Nairobi: Acts Press African for Technology studies.

Mustaffa, N. H., & Potter, A. (2009). Healthcare supply chain management in Malaysia: a case study. Supply Chain Management. *An International Journal, 14(3)*, 234-243.

Nachiamias, V. F., & Nachamias, N. D. (1996). *Research methods in the social sciences. {5th ed.}.* London: Arnold.

Odhiambo, E. (2016, January 8). Hospitals turn away mothers as shortage of vaccines bite. *Daily Nation*, p. 22.

Orodho, A. (2003). *Essential of Education and Social Science Research Methods. .* Nairobi: Mosoal publishers.

Otto, A., & Kotzab, H. (2003). Does supply chain management really pay? Six perspectives to measure the performance of managing a supply chain. . *European Journal of Operational Research* 144, 306-320.

Porter, M. (1990). *The Competitive Advantage of Nations.* London: Macmillan.

Porter, M. E. (1985). *Competitive Advantage.* New York: Free Press.

Prakash, A., & Chan, F. T. (2012). Inventory management in a lateral collaborative manufacturing supply chain: a simulation study. *International Journal of Production Research* 50(16), 4670–4685.

Ragu-Nathan, B., Ragu-Nathan, T. S., Rao, S. S., & Li, S. (2006). The impact of supply chain management practices on competitive advantage and organizational performance. *The International Journal of Management Science,* 34, 107-124.

Ragu-Nathanb, B., Ragu-Nathanb, T., Raob, S. S., & Li, S. (2004). The impact of supplychain management practices on competitive advantage and organizational performance. *The International Journal of Management Science*, 107 – 124.

Saunders, M., Lewis, P., & Thornhill, A. (2007). *Research Methods for Business Students .* London: Financial Times/ Prentice Hall.

Saxena, R. S. (2009). *Inventory Management: Controlling in a Fluctuating Demand Environment.* New Delhi: Global India Publications.

Sekaran, U. (2009). *Research Methods for Business: A Skill Building Approach, 4th Ed. .* United Kingdom: John Wiley & Sons.

Shaughnessy, J. (1997). *Research Methods in Psychology 4th Edition, , . .* Singapore: Mc Graw-Hill.

Simichi-Levi, D., Kaminsky, P., Simchi-Levi, E., & Shankar, R. (2008). *Designing and managing the supply chain.* New Delhi, India: Tata McGraw- Hill Publishing Company.

Smaros, J. (2012). *Lightning reactions! Using POS data in your supply chain to react faster to changes in demand!", White paper 11 September .* London: Rex Solutions .

Småros, J., Lehtonen, J., Appelqvist, P., & Holmström, J. (2003). The impact of increasing demand visibility on production and inventory control efficiency. *International Journal of Physical Distribution & Logistics Management ,* 33(4), 33-49.

Taylor, D., & Fearne, A. (2009). Demand management in fresh food value chains: a framework for analysis and improvement. *Supply Chain Management ,* 14 (5), 379-392.

Tracey, M., Lim, J., & Vonderembse, M. (2004). 'The impact of supply-chain management capabilities on business performance. *International Journal Supply Chain Management* 10(3-4), 179-191.

Tracey, M., Lim, J., & Vonderembse, M. (2004). The impact of supply-chain management capabilities on business performance. *International Journal Supply Chain Management* 10(3-4)*:*, 179-191.

Wiersma, W. (2008). *Research Methods in Education: An Introduction.* New York: Pearson Education.

Williams, B., Waller, M., Ahirec, S., & Ferrierd, G. (2014). Predicting retailer orders with POS and order data: the inventory balance effect. *European Journal of Operational Research ,* 32(3), 593-600.

Zacharia, Z. G., Nix, N. W., & Lusch, R. F. (2009). An analysis of supply chain collaborations and their effect on performance outcomes. *Journal of Business Logistics,* 30 (2)*,* , 101-12