

INFLUENCE OF SUPPLY CHAIN COMPLEXITY MANAGEMENT STRATEGIES ON STORES PERFORMANCE OF NATIONAL HOSPITALS IN KENYA: A CASE STUDY OF KENYATTA NATIONAL HOSPITAL

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ABSTRACT

This paper sought to assess the influence of complexity management in the area of supply chain management on stores performance of Kenyatta National Hospital, Kenya. Reducing or eliminating unnecessary complexities in supply chain has been a goal of most of the organizations in the modern era. To achieve this, organizations ought to manage the necessary complexities in their operational systems and prevent any additional unnecessary complexities in the entire supply chain process. In the context of hospitals, to complete the process of reducing the complexities, physical commodities and information about medical products and services typically passes to a variety of different parties, including suppliers, insurance firms, hospitals, distributors, community buying organizations and multiple regulatory agencies. Nevertheless, by fostering flexibility in the supply chain for healthcare, hospitals and medical practices within their enterprise will generate major cost-reducing opportunities. The study therefore addressed the gap by analyzing the influence of supply chain complexity management strategies on stores performance of national hospitals in Kenya. Specifically, the study sought to examine the influence of stock auditing, variety reduction and lean six sigma on stores performance of Kenyatta National Hospital Nairobi, Kenya. The paper was anchored on; resource-based view theory, the theory of empirical control, and the theory of quantities of economic order. A case study approach was used while the target population were 6000 employees of Kenyatta National Hospital Nairobi. A stratified random sampling approach was used in determining the sample size population which was arrived at 154. A questionnaire was used to collect the primary data which was analysed using both descriptive and inferential statistics. The study findings revealed that reporting and communication of fresh strategies employed in controlling stock enhance result achievement from change creativities; stock simplification contributes to reduction of product price and obsolescence risks and that information technology is a key driver for leveraging supply chain complexity in stores performance of national hospitals. In conclusion, supply chain complexity management strategies have significant influence on stores performance of national hospitals in Kenya while variety reduction work to realize the importance of stock standardization leading to reduced paperwork and that much complexity has been managed through involvement of electronic data interchange.

Keywords: Supply Chain Complexity Management, Supply Chain Management, Stock Auditing, Variety Reduction, Information Technology, Stores Performance, Kenyatta National Hospital.

1.0 INTRODUCTION

1.1 Background of the Study

Supply chain management has emerged as one of the most important success factors in dealing with the new market local environment rising complexity (Serdarasan, 2016). Despite the fact that supply chain management is a mature

discipline, the complexity of real supply chains has increased dramatically over the last two decades due to the dynamic interaction of a wide variety of systems, actions, and structures, which awareness has become critical for achieving an economical gain in the market (Abanyai, Bányai, & Illés, 2017). A complex system is usually a structure built on multiple components that cooperates with each other in a complicated way. A complex structure contains characteristics such as: major connections, too many elements, being non-linear, convergence and limiting contradictions. Supply chain is incredibly dynamic.

According to Choi and Krause (2014), a supply chain can be implemented in three separate sections, albeit complex: supply chain processes, network configuration, and managing constituents. The term "downstream complexity" refers to a dynamic complexity level and a definition of downstream market industrial facilities. The number of consumers, the heterogeneity of their needs, the mean of product life cycles, and demand variability are all relevant factors in the growth of downstream complexities.

Dynamic complexity and a definition of organizational facilities in relation to demands are used to assess supplier complexity. The number of contacts with suppliers that must be managed, the time that must be waited for delivery, supplier reliability, and the range of finding sources are all potential factors that can contribute to the growth of supplier complexity (Bozarth & Bicheno, 2016). Internal complexity of an organization is described as dynamic complexity and a summary of manufacturing units found in products, procedures, control systems, and company coordination. The number of divisions, the number of covered goods, different industrial processes, and the stability of industrial scheduling are all potential factors in the growth of an organization's internal complexity (Vachon & Klassen, 2015). Demand instability is a major source of supply chain dynamic uncertainty. Since activities that rely on the level of demand, such as supply chain, may have a variety of results.

Stores performance involves ensuring that all activities put in place to enable that customer have the needed product or service are working as intended. It involves management of the roles of buying, production and delivery to satisfy the consumer needs and operational needs of consumers taking use of the drug (Miller, 2015). The administration of the stores is mostly interested in determining the scale and location of stored items. To order to maintain the normal and scheduled path of development against the unexpected disruption of running out of supplies, stores facilities are needed at different locations within a plant or within several locations within a supply network. For efficiency to be realized, the scope of stores management must involve managing the replenishment lead time, replenishment of goods, returns and defective goods and demand forecasting, carrying costs of inventory, asset management, physical inventory, available physical space, demand forecasting, inventory valuation, inventory visibility, future inventory price forecasting and quality management (Ogbo et al., 2017).

1.2 Statement of the Problem

Akiko (2014) observed that Kenyatta National Hospital continues to suffer hardship in monitoring the flow of inventories in the stores, making the hospital less responsive to cases of stock out. Efforts by the Kenya's Ministry of Health and its partners to provide the hospital with health commodities (medicines and medical logistics) to meet the requirements of clients, these commodities are often wrongly managed, resulting to lack of realization of the intended goals. Stock out of crucial pharmaceuticals in the hospital has led to hasty buying. Instances of inaccurate recording of data information is evident where stock control ledgers and stock balances have discrepancy which is an indication of inability to manage the flow of inventory (GOK, 2017).

Supply chain management in the health sector is more complex as it involves obtaining medical and related resources, managing the supplies, and delivering medical supplies and services to health facilities and in some instances directly to the patients (Khurana, 2017). With uncontrolled levels of complexity in medical supply chains of Kenyan National Hospitals, systems of operation are becoming less predictable (Manuj & Mentzer, 2017). Previous evidence has shown that complexity management strategies are crucial to achieving better stores performance of an enterprise in an optimal and successful way (Halley & Beaulieu, 2017; Williams & Lin, 2016; Frizelle & Woodcock, 2015). In the context of Kenya and KNH in particular, there exists scant evidence of the supply chain complexity management and how it has impacted the stores performance, hence the subject of the study.

1.3 Am of the Study

The overall aim of this paper was to analyze the influence of supply chain complexity management strategies on stores performance at Kenyatta National Hospital Nairobi, Kenya.

1.4 Specific Objectives of the Study

1. To examine the influence of stock auditing on stores performance of Kenyatta National Hospital Nairobi, Kenya.

2. To determine the influence of variety reduction on stores performance of Kenyatta National Hospital Nairobi, Kenya.
3. To assess the influence of information technology on the stores performance of Kenyatta National Hospital, Nairobi, Kenya.

1.5 Research questions

1. To what extent do stock auditing influence the stores performance of Kenyatta National Hospital Nairobi, Kenya?
2. How do variety reduction influence stores performance of Kenyatta National Hospital Nairobi, Kenya?
3. How does information technology influence stores performance of Kenyatta National Hospital Nairobi, Kenya?

2.0 LITERATURE REVIEW

2.1 Theoretical Framework

2.1.1 The Resource Based View (RBV) Theory

Proposed by Penrose (1959), the theory notes that turning a competitive short-run advantage into a continuous competitive advantage allows such commodities to be heterogeneous in nature and not completely elastic in nature. Effectively this turns into useful commodities that without much work are neither completely imitable nor replaceable. If such conditions hold, the capital bundle will bring the businesses above average. Barney (2011) suggests that the approach to RBV has developed from a new, affluent viewpoint to one of the most influential and powerful hypotheses to define, understand and forecast organizational relations. RBV theory attempts to explain how interest produces development (Zhu & Kraemer, 2002). The RBV hypothesis relates increase in firm results to useful capital or packages of capital (Barney 2011). ICT indirectly generates profit for the organization when it impacts other tools or processes which in turn contribute to increased results and thus competitive advantage. The use of intermediate-level dependent variables at the business cycle, organization, or project level can also be especially useful to researchers (Lockett & Thompson, 2004).

2.1.2 Deterministic Inventory Model

Deterministic inventory model is one of the basic strategies that businesses use to establish inventory reserve figures with a goal of maintaining consistency, simplification of products and standardization (Croom & Jones, 2010). If demand is generally unknown, the deterministic model of inventory management is used to assess the optimal inventory of a particular item. In this inventory model, inventory is built at a constant rate to meet a specified or agreed requirement. Dai and Kauffman (2001) suggest that a deterministic situation is one where parameters of the system can be precisely ascertained. This is also recognized as a condition of consistency, because it is understood that whatever is ascertained will certainly unfold the same way. The significance of this model is that a reduced uniform order-quantity decreases the total inventory which allows higher orders and higher shipping costs per month. It refers especially to hospitals that work with perishable products and aim to reduce the costs of resource control (Beamon et al., 2006).

2.1.3 Theory of economic order quantity (Wilson's EOQ Model)

Developed by Harris and Yet Wilson (1913), Economic order quantity (EOQ) is the stock volume which minimizes the total cost of holding stocks and the costs of ordering them. EOQ occurs only if the demand for a good is steady over the year and any new order is fulfilled in full until the supply hits zero (William, 2007). EOQ is used to calculate the optimal number of commodity units to purchase so that the overall expense involved with buying, shipping and processing the commodity is minimized. The criteria needed for the solution are the average demand for the year, the production cost for each item, the fixed cost for placing the order and the cost of storage for each item each year. The EOQ model assumes that the purchasing cost is constant, the production rate is constant, the lead time is set, the buying price of the item is constant, i.e. no discount is possible, the replenishment is made immediately, the whole shipment is shipped at once (Periasamy, 2009).

2.2 Conceptual framework

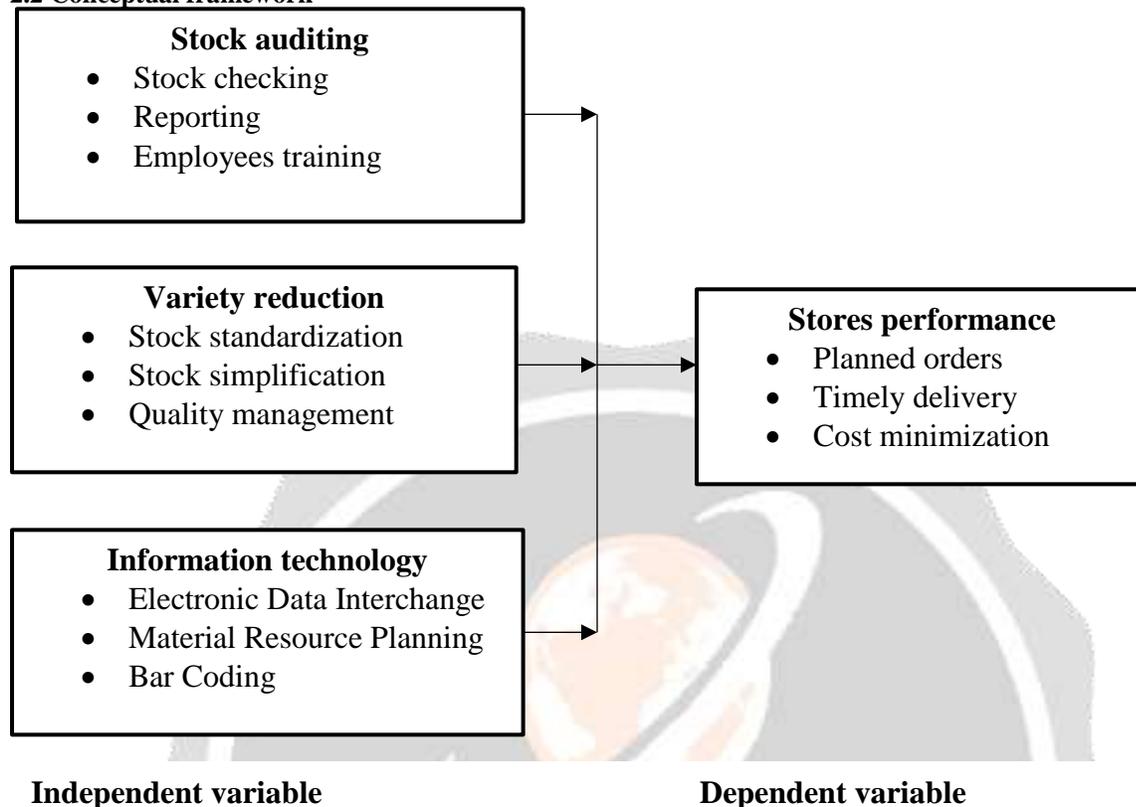


Figure 1 Conceptual framework

2.3 Review of Empirical Literature

Akintonye (2014) assessed the impact on the efficiency of German business companies of supply chain risk management strategies. The study's ultimate objective was to determine the impact of supply chain uncertainty management techniques on the German service firms' results. The thesis used descriptive research methodology where the data analysis utilized descriptive statistics and inferential analysis. The results concluded that management techniques for the supply chain challenge contributed to increased performance by German service providers. Other than supply chain risk management approaches, the research focused primarily on supply chain risk management.

Kiboko (2017) assessed the uncertainty control of supply chain processes and hotel activities in Nakuru, Kenya. The study's ultimate objective was to define the relationship between problem management approaches and operational success in hotels in Nakuru, Kenya. The study used descriptive research design. Descriptive statistics and regression analysis were used to analyze the data. The findings concluded that the predictor variable did not provide the degree of clarification about the relationship between supply chain uncertainty management approaches and hotel operating efficiency in Kenya significantly. The study focused mainly on the Nakuru County hotels while the new research focuses on the Kenya State Referral Hospitals.

Gitau (2016) analysed supply chain risk management on the results of the Nairobi County warehousing companies. The study's ultimate goal was to evaluate the impact of supply chain uncertainty on warehouse operating efficiency in Nairobi County. The research design applied was cross sectional descriptive census survey of 49 warehousing firms in Nairobi County. From the findings, it was clear that there was a significant relationship between supply chain complexities and operational performance. The study only focused on the warehousing firms in Nairobi County while the present study seeks to consider National referral hospitals in Kenya.

Lapide (2010) has completed a report on the dynamics of the supply chain. As a part of the problems of the supply chain as a value system, the research aimed to figure out the numerous issues facing organizations. The research

used a descriptive research design specific of it. The researcher concluded that the use of supply chain complexity management practices improved to a great extent efficiency of the service firms. The report further notes that by controlling the dynamics, companies have gained greater management over the supply chain. The research focuses on supply chain risk reduction techniques and not the difficulties that companies face as a result of uncertainty in the supply chain.

2.4 Research gap

Based on the literature review, it is evident that limited studies have been undertaken addressing the strategies of managing supply chain complexities that affects the stores performance in national referral hospitals in Kenya. This study will help shed light to the government's ministry of health on ways of maximizing stores performance and eventually health service provision.

3.0 RESEARCH METHODOLOGY

3.1 Research design

The study adopted a case study approach. A case study is commonly used because it allows for the qualitative analysis involving a complete observation of a social unit (Kothari, 2004).

3.2 Target Population

The target population for this study was the employees in the Kenyatta National Hospital: approximately 6000.

3.3 Sampling

The study used purposive sampling technique; where the departments were used as strata where the researcher collected data from. Only those departments related with supply chain were involved to ensure accuracy of data collection. These departments include procurement, finance, accounting, strategic management, project management and transport and logistics departments.

3.4 Data Collection

Primary data was collected by the use of questionnaire. The questionnaires were physically administered by hand to the respondents at their work place and given a period of two weeks to complete the questionnaires due to their tight schedules of employment.

3.5 Data Analysis

Both quantitative and qualitative data was analysed. Qualitative data was analysed using content analysis. Quantitative data was analysed using descriptive and inferential statistics. The main descriptive statistics captured included mean and standard deviation. The inferential statistics were based on a multiple regression model. The model output was captured in model summary, regression coefficients and ANOVA test.

4.0 RESEARCH FINDINGS AND DISCUSSIONS

4.1 Response Rate

Questionnaires were sent to 154 respondents but 124 responded. This represent 80.52%, which was considered adequate for analysis.

4.2 Stock Auditing

The first objective of the study was to examine the influence of stock auditing on stores performance of Kenyatta National Hospital. The descriptive findings are as summarized in Table 1. As the results portray, stock auditing has been effectively embraced by the surveyed departments. These findings agree with Johnstone, (2017) who established that Inventory audits allow a company to escape inventory-related risks like: insufficient and obsolete storage, overly high stock prices, unreliable and missing storage reports, bad stock management and expired stock

Table 1: Descriptive Results on Stock Auditing

Statement	Mean	Std. Dev.
With a fully integrated software, stock checks control will be managed from each channel so that stock levels are kept up to date	4.23	0.69
Stock checking is frequently undertaken to ensure stock security	4.40	0.64
Timely reporting and communication of the new stock control strategies helps attain desired results from change initiatives	4.14	0.78
Our functional unit has a reporting schedule which is strictly followed by the stock controllers	3.50	0.61
Employees are trained to improve on their professional competencies	3.95	0.69

4.3 Variety Reduction

The second objective was to determine the influence of variety reduction on stores performance of Kenyatta National Hospital. The findings are as summarized in Table 2. The results revealed that variety reduction was effectively embraced by most of the surveyed departments at the Hospital. The findings are in line with those by Anisimova (2015) who established that variety reduction helps in achieving requirements such as work efficiency, pricing and obsolescence risks; prototype specifications and strengthen quality control in procurement through the basis of purchasing quality management systems.

Table 2: Descriptive Results on Variety Reduction

Statement	Mean	Std. Dev.
Stock standardization adoption has led to less paperwork and fewer requisitions and orders	4.21	0.64
Stock simplification contributes to reduction of product price and obsolescence risks	3.91	0.77
Variety reduction leads to adoption of newer techniques which can be used for better control of stocks	3.33	0.53
Because of large purchase quantities involved, favorable purchase contracts can be made.	4.22	0.63
Better inspection, quality control and quality standards can be defined more clearly.	3.43	0.51

4.4 Information Technology

The study sought to assess the influence of information technology on stores performance of national hospitals in Kenya. The descriptive analysis results are as shown in Table 3. The findings concur with those by Lapide (2018) who stated in his research on effectiveness of stock control in retail companies that enterprises investing in storage technologies accomplished controlled usage, cost savings and increased performance in store operations. Further, according to Sople (2017), streamlined use of barcodes in hospitals can help stock managers better distinguish their products, service consumers more effectively and efficiently and thus minimize stocktaking time and expenditures at the end of each fiscal year.

Table 3: Descriptive Results on Information Technology

Statement	Mean	Std. Dev.
Electronic data interchange adoption has enhanced hospital management of supplies	4.50	0.51
Our material resource planning systems or structures have been modified to support stock usage	3.16	0.64
Bar coding adoption enables the hospital to complete tasks more efficiently and effectively	3.91	0.77
We have completely automated inventory management function	3.51	0.95

4.5 Stores Performance

The study sought to establish the stores performance at the Kenyatta National Hospital. Table 4 shows the findings. below shows the established findings on stores performance, which was the dependent variable of the study. The results show that the stores performance at the hospital is in an average state. The findings concur with Walter (2017) who posited that integration of the healthcare supply chain is one of the stock management tools used to achieve efficiency in stores' operations. In an integrated stock system, the hospitals and the manufacturers can be able to share information and plan the orders, manage quality and achieve efficient customer service through the use of technologies.

Table 4: Descriptive Results on Stores Performance

Statement	Mean	Std. Dev.
Stock auditing adoption led to planned orders	4.32	0.69
The use of electronic data interchange has contributed to reduction of inventory costs in the hospital	4.06	0.60
Adoption of variety reduction has led to total quality management	4.20	0.79
Information technology contributes to efficiency in customer service	4.50	0.54

4.6 Correlation Analysis of the Study Variables

Table 5 shows the correlation results. As the results portray, the correlation between supply chain complexity management strategies and stores performance of national hospitals in Kenya was investigated using Pearson correlation. There was positive correlation between the study variables i.e. dependent and independent variables ($r > 0.2$, $p < 0.001$ all through). The extent of relationship between supply chain the variables varied from small to large. Stock Auditing ($r = .496$ Large extent), Variety reduction ($r = .395$, Medium extent) and Information Technology ($r = .265$, small extent)

Table 5: Correlation Analysis of the Study Variables

		Stores Performance	Variety Reduction	Information Technology	Stock Auditing
Stores Performance	Pearson Correlation	1			
	Sig. (2-tailed)				
	N	124			
Variety Reduction	Pearson Correlation	.395*	1		
	Sig. (2-tailed)	.000			
	N	124	124		
Information Technology	Pearson Correlation	.265**	.469	1	
	Sig. (2-tailed)	.000	.000		
	N	124	124	124	
Stock Auditing	Pearson Correlation	.496	.347**	.666	1
	Sig. (2-tailed)	.000	.000	.000	
	N	124	124	124	124

4.7 Regression Analysis for The Study Variables

The regression coefficients results as shown in Table 6 revealed that a positive and significant relationship between study variables as supported by *p* values of .016, .017 and .032 for stock auditing, variety reduction and information technology respectively.

Table 6: Regression Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error			
1	(Constant)	4.312	.651	6.628	.000
	Stock Auditing	.117	.774	.941	.016
	Variety Reduction	.056	.580	.696	.017
	Information Technology	.008	.496	.948	.032

a. Dependent Variable: Stores Performance

4.8 Discussion of the Findings

Stock auditing was the most practiced stock security activity due to its reliability and accuracy. It was established that with entirely integrated software, it is easier to manage the consumption of stock from each channel necessitating up to date stock levels checks. Prompt reporting and communication of fresh strategies employed in controlling stock enhance result achievement from change creativities. Frequent training of stores employees improves their professional competency alongside enhancing stock controllers' ability to follow reporting schedule.

The study noted that stock standardization reduced the need for raising much requisitions and orders. Consequently, paper work has significantly reduced. Stock simplification contributes to reduction of product price and obsolescence risks. Information technology is a key driver for leveraging supply chain complexity. Despite the massive adoption of the use of bar coding, rarely do hospitals customize their material resource planning systems and structures to support stock usage. This has made it somehow difficult to achieve complete automation of inventory management function.

CONCLUSIONS

Supply chain complexity management strategies have significant influence on stores performance of national hospitals in Kenya. Specifically, the strategies include stock auditing, variety reduction and information technology. Frequent stock auditing keeps on check the stock levels, enhance the stock security, help monitor the workability of newly imposed stock management and control strategies and acts as a crucial instrument of improving stores employees' professional competencies.

Variety reduction work to realize the importance of stock standardization leading to reduced paperwork; stock simplification which contribute to reduction of product price and obsolescence risks. Moreover, consolidated purchase arrangements facilitate favorable contractual agreements.

Information Technology is an inevitable supply chain enabler. Much complexity has been managed through involvement of electronic data interchange which specifically manages the movement of the store's supplies. Bar coding has helped achieve efficiency in recording and inventory-related data capturing.

RECOMMENDATIONS

The stock auditing process ought to be well elaborated and a reporting schedule guiding it strictly followed by each functional unit as a way of promoting effectiveness in the hospital stores. Store workers should be well trained to improve on their professional competencies ranging from handling of the inventory management technologies to professional practices such as communication and reporting skills. Stock simplification practices such as setting minimum stock levels for each type of inventory will go a long way in speculating on the market price changes as well as mitigating inventory obsolescence risks. Additionally, there should be a working quality control function to better the inspection, quality control and standards checks clearly. Grouping of inventories should be fostered in an attempt to reduce on the varieties.

Inventory management technologies need to be customized so as to address supply chain complexity issues. Similarly, methods already proven to be efficient such as bar coding should be massively embraced for improvement of stores performance. The hospitals should also consider switching to complete automation of inventory control activity; which has efficiency at its center.

REFERENCES

- Ábányai, T. Bányai, and B. Illés, "Optimization of consignment-store-based supply chain with black hole algorithm," *Complexity*, vol. 2017, Article ID 6038973, 12 pages, 2017.
- Akiko, G. (2014) Excess Inventory and Long-Term Stock Price Performance, *Journal of operations management*, Georgia Institute of Technology Atlanta, AG 30332
- Barney 2011 & Peteraf. (2013). *Business Research Methods* (12th Edition). New York: McGrawHill/Irwin
- Barney (2011). Collaborative management of inventory in Austrian hospital supply chains: practices and issues. *Emerald Journal*, 17(3).
- Beamon, B. & Kotleba, S. (2006). Inventory modeling for complex emergencies in humanitarian relief operations, *International Journal of Logistics: research and applications*, 9, 1 - 18
- Bozarth, A. & Bicheno, Z. (2016). *Supply chain management and performance: an empirical study*, University of Malaysia, Singapore
- Choi & Krause. (2016). Inventory modeling for complex emergencies in humanitarian relief operations, *International Journal of Logistics: research and applications*, 9, 1 – 18
- Croom, S. & Jones, A. (2010). E-procurement: *Key Issues in inventory control implementation and operation in the Public Sector*.
- Dai, Q. & Kauffman, R. (2001). An exploratory assessment, *a paper presented at the thirty-fourth annual Hawaii international conference on systems sciences, Hawaii*.
- Frizelle, C. & Woodcock, P. (2015). Supply chain inventory management and the value of shared information. *Journal of management science*. 46, 1032 – 1048.

- Government of Kenya, (2011). National Health Accounts, 2009/2010. Ministry of Medical Services and Ministry of Public Health and Sanitation. Health Policy Project, Futures Group. Devolution of healthcare in Kenya assessing county health system readiness in Kenya: a review of selected health inputs. July 2014.
- Halley, A. & Beaulieu, M. (2017). Mastery of operational competencies in the context of supply management. *Emerald Journal*, (14)1, 49-63.
- Johnstone, K. G. (2017). Risk Based Approach to Conducting Audit. South Western Cengage Learning.
- Khurana, (2017). Effect of inventory management on organizational effectiveness. *European Management Journal*, 3 (8), 52-76.
- Lapide, L. (2018). Stock management in service firms: forecast errors, *The Journal of Business Forecasting*, 1-2
- Lockett, A. and Thompson, S. (2004). ' Edith Penrose's contribution to the resource-based view: an alternative perspective. *Journal of Management Studies*, 41, 1, 193– 203
- Manuj and F. Sahin, "A model of supply chain and supply chain decision-making complexity," *International Journal of Physical Distribution and Logistics Management*, vol. 41, no. 5, pp. 511–549, 2011.
- Miller, (2015). Generalized queuing network analysis of integrated supply chains. *International Journal of Production Research*. 19(2) 255-266
- Office of the Auditor General, (2012) *Performance Audit Report of the Auditor-General Specialized Healthcare Delivery at Kenyatta National Hospital*
- Ogbo, R., Boone, T. & Stenger, A. (2017). The impact of inventory and flow planning parameters on supply chain performance. An Exploratory Study. *Elsevier Journal*, 12(2), 35-54
- Penrose, E. T. (1959). *The Theory of the Growth of the Firm*. New York: John Wiley
- Serdarasan, "A review of supply chain complexity drivers," *Computers & Industrial Engineering*, vol. 66, no. 3, pp. 533–540, 2016.
- Sople, V. (2017), *Logistics Management*, 4th Edition, Dorling Kindersley, India, PVT, London
- Periasamy, Y. (2009). Healthcare supply chain management in Malaysia: a case study. *Supply Chain Management: An International Journal*. 14(3): 234–243.
- Walter, D. (2017). *Global logistics and distribution planning: strategies for management* (4th edition), Kogan Page Limited, London
- Williams & Lin (2016). *The future of the healthcare supply chain. Healthcare financial management*. Journal of the Healthcare Financial Management Association. 62(4):66-9.
- William, (2007). *Pharmaceutical supply chains: key issues and strategies for optimization*. Computers and Chemical Engineering.28:929-41.

Vachon and Klassen. (2015). Collaborative management of inventory in Austrian hospital supply chains: practices and issues. *Emerald Journal*, 17(3).

Zhu & Kraemer, 2002. *The Theory and problems of Operations Management*. 2nd ed. Tata: McGraw Publishing Company Limited.

