

Impact of Inventory Management on the Effectiveness of Supply Chain Management Practices in the Public Sector, A Case Study of Ministry of Finance

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Abstract: The main objective of the study was to assess factors affecting the effectiveness of supply chain management practices in Kenyan public sector with, specific reference to the Ministry of Finance. The study's specific objective being; to establish the effect of inventory management on the effectiveness of supply chain management practices. The study adopted a descriptive case research design and the study population comprised of 120 management staff working at the Ministry of finances' procurement, finance and administration departments. A stratified random sampling technique was employed to select a sample size of 60 respondents. Questionnaires were used as the main data collection instrument. Descriptive statistics data analysis method was applied to analyze numerical data gathered using closed ended questions aided by Statistical Package for Social Sciences (SPSS). Pearson correlation was carried out to establish the relationship between the research variables. Inventory management was also found to have a strong positive correlation with effectiveness of SCM practices ($r = 0.915$). The study recommend implementation of EOQ inventory management methods for and IT based SCM systems.

Keywords: Economic order quantity, Enterprise resource planning, Inventory management, Procurement, Supply Chain Management, Warehousing.

1. INTRODUCTION

Supply chain management encompasses the planning and management of all activities involved in sourcing, procurement, conversion, and logistics management. It also includes the crucial components of coordination and collaboration with channel partners, such as suppliers, intermediaries, third-party service providers, and customers. In essence, supply chain management integrates supply and demand management within and across organizations (Lysons, 2008).

SCM is an interconnected process of buying, storing, utilizing and disposal, as such it closes the gaps and addresses the whole cycle of procurement from demand management, acquisition management, logistics management, disposal management, risk management and regular assessment of performance. Each link in the SCM chain is given equal prominence, and value is added at each stage of the process (Caines, 2005).

The planning and buying phase gives prominence to the linkage of the acquisition of goods and services to departmental objectives, professionally managing the bidding process, and meeting contractual obligations timely. The storing phase focuses on issues such as timing of delivery and methods of receiving, storing and re-ordering. The usage phase deals with various aspects of logistics and asset management, matching the right product for the right purpose, maintenance and control of the assets, consumption control, and most importantly, contract management. Finally, in the disposal phase issues such as the timing and method of disposal are considered (Patterson, 2005).

Public sector institutions collectively spend billions of shillings each year on procuring goods and services, and yet pay

little attention to managing and maintaining the assets procured. Contracts entered into for professional and other services, on the other hand, are either poorly managed or not managed at all. Government departments typically over-pay for assets and then seldom maintain or account for them effectively. Asset management has traditionally been limited to control of inventory. Thefts and losses are often not quantified owing to defective inventories, records, and poor systems of control. To compound matters, departments don't plan or budget properly for acquisition and replacement of assets, and don't penalize service providers for non-performance, late delivery and defective quality (Harrison, 2006).

1.1 Ministry of Finance

The Ministry of Finance derives its mandate from the Constitution of Kenya, Cap VII Sections 99-103 which provides for authorization of budgetary and expenditure management of government financial resources. In addition, Parliament, over the years has enacted 49 Acts to which the Ministry of Finance is a custodian thereby adding more responsibilities to the Ministry (Ministry of Finance Kenya, 2011).

The functions of the Ministry of Finance are strategic in several ways. As a main function, the Ministry is charged with the responsibility of formulating financial and economic policies. It is also responsible for developing and maintaining sound fiscal and monetary policies that facilitate socio-economic development. These responsibilities makes the Ministry strategic and central to the country's economic development, as all other sectors of the economy look upon the Ministry to create an enabling environment in which they can operate effectively and efficiently. The Ministry regulates the financial sector which is central to the development of the country and on which all other sectors depend for investment resources. The ministry's mission is to be an institution of excellence in economic and financial management. The ministry's vision is to pursue prudent economic, fiscal, and monetary policies and effectively coordinate government financial operations for rapid and sustainable development of Kenya (Ministry of Finance Kenya, 2011).

1.2 Statement of the Problem

In Kenya, over seventy percent (70%) of public sector organizations experience supply chain management challenges and this negatively affects effective delivery of services (Edward, 2008). The ministry of finance was ranked 7th in performance, according to the performance contracting secretariat (2010) report. As a strategic ministry in charge of financial policy formulation and implementation in public sector, the ministry was supposed to do better. This is also despite the passage of the Public Procurement and Disposal Act of 2005, meant to structure the public procurement sector. In spite of having many SCM studies undertaken by Goldstein (2006), Harmon (2010), Harrison (2006), Peters (2004), Martin (2006), Edward (2008) and Clerk, 2003), none of the studies have drawn much emphasis on how public sector organizations should improve the effectiveness of the supply chain management practices. Hence this has created a knowledge gap amongst procurement and logistics practitioners in public sector organizations. To fill the gap and facilitate enhanced effectiveness in SCM practices, the studies' main purpose was to assess factors affecting the effectiveness of supply chain management practices in Kenyan public sector with a specific reference to the Ministry of Finance.

2. LITERATURE REVIEW

Supplier and customer relationship is defined as a set of firms' activities in managing its relationship with customers and suppliers to improve customer satisfaction and synchronize supply chain activities with suppliers, leverage suppliers capability to deliver superior products to customers. SCM suggests that firms need to integrate with suppliers and customers to achieve financial and growth objectives (Tan, 2001). Stank (2001) reveal that industry leaders increasingly build competencies to integrate with suppliers and customers and find that these competencies lead to supply chain excellence.

Inventory management is the process of efficiently overseeing the constant flow of units into and out of an existing inventory (Whand, 2000). This process usually involves controlling the transfer in of units in order to prevent the inventory from becoming too high, or dwindling to levels that could put the operation of the company into jeopardy. Competent inventory management also seeks to control the costs associated with the inventory, both from the perspective of the total value of the goods included and the tax burden generated by the cumulative value of the inventory.

Information and Communication Technology (ICT) is a technology such as computers, software, peripherals and internet connections infrastructure required to support information processing and communication functions (Miller, 2005). Lack of application of ICT on supply chain management functions affects effective execution of supply chain functions and this leads to poor interchange of information between the suppliers and the procuring entity.

Distribution system involves the methods employed to facilitate the movement of ordered products/services from the suppliers to procuring entity and from procuring entity to various organization departments across the country (Patterson, 2005). Application of poor distribution systems leads to long lead times and this influences most public sector entities to suffer from stock out costs. There lacks an effective computerized distribution systems that links the supplier with the procuring entities and this affects effective delivery of the ordered items. Distribution is core operational function of the supply chain that affects movement of goods and services from the source up to the end customers.

Training is the process of enhancing the skills, capabilities and knowledge of employees for effective execution of procurement functions (Abraham, 2009). Effective SCM requires managers to have an understanding of supply chain dynamic and an ability to use information based tools. (Lee, 2000) contended that information visibility throughout a supply chain will not bring significant impact if companies do not have capabilities to utilize the information in effective ways. Hence, companies need to consider the skills requirements and education when integrating their value adding activities with their partners.

2.1 Objectives

The main objective of the study was to assess factors affecting the effectiveness of supply chain management practices in Kenya public sector, a case study of the Ministry of Finance. The main factors from the above review can be broadly classified into supplier relationship, inventory management, information technology, training and distribution. Therefore, the study identifies factors that influence effectiveness of the supply chain classifying them as independent and dependent. Independent will be the factors that influence positively or otherwise or to an extent the organizations ability to achieve or otherwise to improve the supply chain effectiveness.

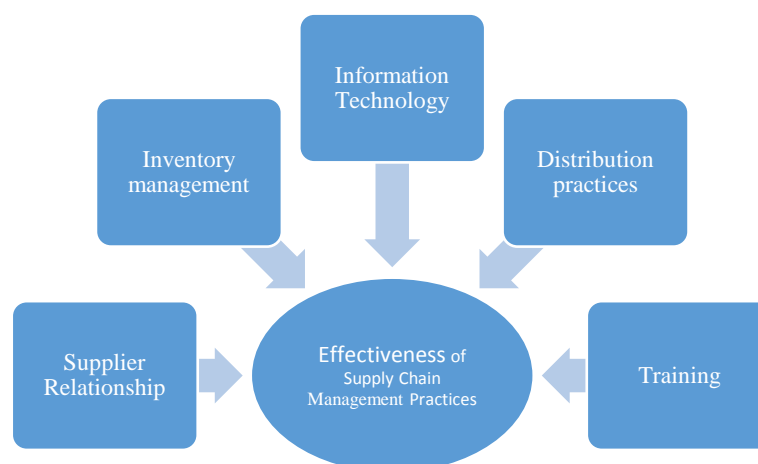


Figure 2.1 Conceptual Framework

This paper present one of the independent variables namely effect of inventory management on the effectiveness of supply chain management practices. Further, the study also includes the variables that constitute inventory management such as EOQ, lead time, warehousing and reports. The study answers the question; *how does inventory management affect the effectiveness of supply chain management practices?*

2.2. Supply Chain Management

The concept of supply chain management (SCM) was introduced in the early 1980s (Harland, 2006). Since then, a substantial body of academic knowledge has been developed on this very broad topic. SCM is understood to be a set of practices for managing and coordinating the transformational activities from raw material suppliers to ultimate customers

(Heikkilä, 2002). It has also been viewed as an organizational response by companies to pressures in their environment (Cravens, 2006). Finally, SCM considered is a long-term oriented, inter-firm arrangement or alliance, involving intermediate or hybrid cooperative relationships (Baden, 2004).

Economic theory defines supply chains as multistage and multidirectional systems of autonomous decision makers. The set-up and management of such systems is the result of a social negotiation process among the interested parties regarding specific norms and standards (Halldórsson, 2007). As a result, close cooperation evolves as economically independent but otherwise mutually connected business entities seek to harmonize their individual courses of action. Such cooperation is based on strategically oriented trust alliances and is the result of an efficient division of labour and specialization (Grant, 2006).

Supply chain business process integration involves collaborative work between buyers and suppliers, joint product development, common systems and shared information. According to Lambert and Cooper (2000), operating an integrated supply chain requires a continuous information flow. However, in many companies, management has reached the conclusion that optimizing the product flows cannot be accomplished without implementing a process approach to the business. The key supply chain processes stated by Lambert (2004) are: customer relationship management, customer service management, demand management style, order fulfillment, manufacturing flow management, supplier relationship management, product development and commercialization and returns management.

2.3. Inventory Management

Storey, (2006) contended inventory management practices is a key component of supply chain management and application of inventory management methods that do not obey the principle of economic order quantity lowers the effectiveness of organization SCM practices. Emberson (2007) argued that balancing the various tasks of inventory management means paying attention to three key aspects of any inventory. The first aspect has to do with time. In terms of materials acquired for inclusion in the total inventory, this means understanding how long it takes for a supplier to process an order and execute a delivery. Inventory management also demands that a solid understanding of how long it will take for those materials to transfer out of the inventory be established. Knowing these two important lead times makes it possible to know when to place an order and how many units must be ordered to keep production running smoothly (Godsell, 2006).

Calculating what is known as buffer stock is also key to effective inventory management. Essentially, buffer stock is additional units above and beyond the minimum number required to maintain production levels. For example, the manager may determine that it would be a good idea to keep one or two extra units of a given machine part on hand, just in case an emergency situation arises or one of the units proves to be defective once installed. Creating this cushion or buffer helps to minimize the chance for production to be interrupted due to a lack of essential parts in the operation supply inventory (Harrison, 2006).

Cooper (2005) affirmed that lack of application of Economic Order Quantity in inventory management practices increases the total cost of ordering and holding stock and this lowers the effectiveness of organization Supply Chain Management practices. Long lead time and poor warehousing procedures also lowers the effectiveness of organization Supply Chain Management functions

Stock (2010) affirmed that inventory management is not limited to documenting the delivery of raw materials and the movement of those materials into operational process. The movement of those materials as they go through the various stages of the operation is also important. Typically known as a goods or work in progress inventory, tracking materials as they are used to create finished goods also helps to identify the need to adjust ordering amounts before the raw materials inventory gets dangerously low or is inflated to an unfavorable level.

Boyer (2010) added that inventory management has to do with keeping accurate records of finished goods that are ready for shipment. This often means posting the production of newly completed goods to the inventory totals as well as subtracting the most recent shipments of finished goods to buyers. When the company has a return policy in place, there is usually a sub-category contained in the finished goods inventory to account for any returned goods that are reclassified as refurbished or second grade quality. Accurately maintaining figures on the finished goods inventory makes it possible to quickly convey information to sales personnel as to what is available and ready for shipment at any given time.

2.4 Empirical Review

The effectiveness of supply chain management practices in many organizations has been a center of debate amongst various procurement and logistics professionals around the world (Goldstein, 2006). According to Harmon (2010) many organizations supply chain management practices are characterized by high level of inefficiency and effectiveness and not much emphasis have been made to explore the key impediments affecting the same.

Hines (2004) found out that supply chain strategies require a total systems view of the linkages in the chain that work together efficiently to create customer satisfaction at the end point of delivery to the consumer. As a consequence costs must be lowered throughout the chain by driving out unnecessary costs and focusing attention on adding value. Throughout efficiency must be increased, bottlenecks removed and performance measurement must focus on total systems efficiency and equitable reward distribution to those in the supply chain adding value. The supply chain system must be responsive to customer requirements. Bowersok (2000) noted that in USA organizations that lacks IT systems like Enterprise Resource Planning and computerized distribution systems experiences high level of inefficiency and ineffectiveness of the organization supply chain management processes.

A study by Kenya Institute of Supplies Management (2010) found out that various ministries in Kenya have not embraced sound reforms in procurement and logistics functions hence creating unfavorable environment for effective execution of supply chain management functions. A study by Peters (2004) found out that many public sector organizations in Kenya have not effectively incorporated supplier relationship management and customer relationship management functions into the supply chain management function and this led to the development of poor relationship with suppliers and delivery of substandard services to the general public.

3. RESEARCH METHODOLOGY

The study adopted a descriptive case research design. The study population comprised of 120 management staff working at the Ministry of finance. The study purposely targeted this cadre since they are the one involved in execution of the ministry supply chain management activities and thus stands high chances of providing the study with reliable information on factors affecting effectiveness of supply chain management practices. The study applied a stratified random sampling technique to select a sample size of 60 respondents. Questionnaires containing both open ended and close ended questions were self-administered. The Statistical Package for Social Sciences (SPSS) computer software was used for analysis to generate data array that was used for subsequent analysis of the data. Pearson correlation was used to establish the relationship between the research variables.

4. RESEARCH FINDINGS AND DISCUSSION

4.1. Reliability Analysis

To determine the degree of data reliability, the gathered data was subjected to reliability analysis using Cronbach's alpha coefficient of reliability in order to find out if the obtained data was accurate and reliable. According to Zinbarg (2005), Cronbach's alpha is a coefficient of reliability that gives an unbiased estimate of data generalizability. The Table 4.1 indicates that the gathered data was reliable since the value of is 0.952. An alpha coefficient higher than 0.75 indicates that the gathered data has relatively high internal consistency and could be relied upon to determine the factors affecting the effectiveness of supply chain management practices in the ministry of finance.

Table 4.1 Reliability Analysis

Variable	Cronbach's Alpha Results
Inventory Management	0.952

4.2. Effect of Inventory Management on the effectiveness of organization SCM practices

The question was intended to find out if the employed inventory management practices affected the effectiveness of the organization supply chain management practices and the obtained findings were presented in table 4.2. Majority (90%) of the respondents indicated that the employed inventory management procedures affected the effectiveness of the

organization supply chain management practices and only 10% of the respondents who disagreed with the majority and expressed that the inventory management procedures did not affect the supply chain management practices. The respondents explained that application of inventory management methods that were not in tandem with the economic order quantity negatively affected the effectiveness of the organization supply chain management practices. This was in agreement with Storey, (2006) contended inventory management practices is a key component of supply chain management and application of inventory management methods that do not obey the principle of economic order quantity lowers the effectiveness of organization SCM practices.

Table 4.2 Effect of Inventory Management on the effectiveness of organization SCM practices

Response	Frequency	Percentage
Yes	43	90%
No	5	10%
Total	48	100%

4.3. Issues of inventory management

The study wanted to measure the rate at which the respondents agreed on different issues of inventory management practices. Using linkert scale of (5= strongly agree, 4 = agree, 3 = neutral, 2= disagree, 1 = strongly disagree), respondents were requested to indicate how they agreed on the issues of inventory management. The obtained findings were presented in table 4.3. A mean of 4.60 indicated that respondents agreed that Economic Order Quantity lowers the effectiveness of organization Supply Chain Management, a mean of 4.37 demonstrated that respondents agreed that Long lead time lowers the effectiveness of organization Supply Chain Management functions, a mean of 4.64 indicates that respondents agreed that the employed warehousing procedures affects the effectiveness of organization Supply Chain Management functions and lastly a mean of 4.66 indicates that respondents agreed that poor inventory recording affects the effectiveness of organization Supply Chain Management functions. These findings were in agreement by Cooper (2005) that lack of application of Economic Order Quantity in inventory management practices increases the total cost of ordering and holding stock and this lowers the effectiveness of organization Supply Chain Management practices. Long lead time and poor warehousing procedures also lowers the effectiveness of organization Supply Chain Management functions. The findings also supported Boyer (2010) that inventory management has to do with keeping accurate records of finished goods that are ready for shipment.

The table further indicates that the variance and standard deviation on all the factors was low and almost equal hence indicating that the respondents answered the questions in the same way and gave reliable and accurate answers on all the supplier relationship activities. This contended with findings by Joppe (2000) that a narrow difference between variance and standard deviation on respondent's answers is clear indication of reliability and accuracy of the respondents answers on issues surrounding the research problem.

Table 4.3 Issues of inventory management

Issues of inventory management	N	Mean	Std. Deviation	Variance
EOQ	48	4.6042	0.57388	0.329
Long lead time	48	4.375	0.73296	0.537
Warehousing	48	4.6458	0.60105	0.361
Inventory recording	48	4.6667	0.47639	0.227
Valid N (listwise)	48			

4.4 Relationship between SCM and inventory management.

The study subjected the gathered data to inferential statistical tool, thus correlation analysis. Correlation analysis is used to determine how strongly the scores of two variables are associated or correlated with each other. Correlation is measured using values between +1.0 and -1.0. Correlations close to 0 indicate little or no relationship between two variables, while correlations close to +1.0 (or -1.0) indicate strong positive (or negative) relationships (Hayes et al. 2005). It denotes positive or negative association between variables in a study. Two variables are positively associated when larger values of one tend to be accompanied by larger values of the other. The variables are negatively associated when larger values of one tend to be accompanied by smaller values of the other (Moore 2008).

In this study, Inventory management was found to have a strong positive correlation with effectiveness of SCM practices ($r = 0.915$). This correlation was found to be statistically significant at 0.01 significance level ($p\text{-value} = 0.000$).

Table 4.17 Correlation Analysis Results

Variables		SCM	Inventory
SCM	Pearson Correlation	1	.915**
	Sig. (2-tailed)		0
	N	48	48
Inventory	Pearson Correlation	.915**	1
	Sig. (2-tailed)	0	
	N	48	48

5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1. How does inventory management affect the effectiveness of supply chain management practices in the ministry?

The study found out that inventory management was a major factor that greatly affects the effectiveness of the organization's supply chain management practices ($r = 0.915$). The economic order quantity that were not in tandem with the economic order quantity principle lowered the effectiveness of the organizational supply chain management practices by increasing the cost of holding and purchasing the required inventory. This supported findings by Storey, (2006) that application of inventory management methods that do not obey the principle of economic order quantity lowers the effectiveness of organization SCM practices. The study noted that inventory management challenges were also influenced by application of manual inventory management procedures since there lacked computerized inventory management systems. The study noted that the organization lacked enough storage space for holding inventory awaiting distribution and cases of long lead times as result of poor sourcing strategies and logistics challenges disrupted the supply chain functions.

5.2 Conclusion

The effectiveness of supply chain management practices in the ministry of finance depended on application of effective inventory management methods. Application of inventory management methods that are not in line with the economic order quantity operational practices increase the inventory costs and lead to frequent cases of inventory shortages or surpluses hence, affecting the application of resources in the most optimal manner.

5.3 Recommendations

For the ministry to improve on inventory management methods, effective inventory management techniques that employ the principles such as economic order quantity (EOQ) should be embraced in all inventory management functions. The stores procedures should be automated and better storage and inventory handling facilities should be provided.

5.4 Suggestions for Further Studies

The study noted that there existed other factors like procurement regulations, quality standards and IT application that also had an impact on the effectiveness of the supply chain management functions which needs further research.

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