EFFECT OF REVERSE LOGISTICS ON PROCUREMENT PERFORMANCE AMONG STATE CORPORATIONS IN KENYA: CASE OF KENYA MEDICAL SUPPLIES AUTHORITY

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ABSTRACT

The general objective of the study was to determine effects of reverse logistics on procurement performance among state corporations, case of Kenya Medical Supplies Authority. Public procurement is subjected to dynamic changes and trends of the market and interests because of growing government expenditure and funding from development partners. Cost effective management of the procurement process can significantly influence the growth and development of the Kenyan economy. A survey conducted by Synovate on procurement performance in outsourcing efforts among state corporations, 66 percent of the logistics efforts was considered failure and 34 percent was considered successes. The study was guided by the following research objectives: to determine the effect of third party logistics; to establish the effect of information management; to assess the effect of lean agile manufacturing; and to evaluate the effect on waste management in procurement performance in Kenya Medical Supplies Authority. The study will adopt a descriptive survey employing cross sectional survey design aimed at establishing the effects of reverse logistics on public procurement performance among state corporations in Kenya. The design seeks to capture both qualitative and quantitative aspects. The target population of this study were 240 employees in Kenya Medical Supplies Authority, as at 31st May 2015. The sampling Frame will consist of managing director, employees in accounts department, employees in purchasing, transport and warehouse departments since they have accurate information on the topic under study. A sample of 150 respondents were picked using stratified random sampling techniques based on strata in the management level. Data was collected using a structured questionnaire. Completed questionnaires were edited for completeness and consistency, checked for errors and omissions and then coded and analyzed qualitatively and quantitatively. Multiple Linear Regression Analysis was used to determine the relationship between the variables and the procurement performance of state corporations in Kenya. The coefficient of determination (R-Square) resulting from the linear regression was used to determine the goodness fit of the model. From the findings the respondents agreed that third party logistics, information management, lean agile manufacturing and waste management affect procurement performance of Kenya Medical
Supplies Authority. 3PL help concentrate firm’s resources to their core-competence and creating value by having flexibility and adaptability against changing market environment. The study recommend practices should be improved on provision of dependable services, quality outsourced services, reduction of fuel consumption, sharing of information through information technology, reduction of pollutant emissions and prequalification of suppliers that are aware of environmental issues

**Key Terms:** Information Communication Technology, Information management, Lean agile Manufacturing, Reverse Logistics, Third Party Logistics, Waste management

**Background of the Study**

Public procurement is subjected to dynamic changes and trends of the market and interests because of growing government expenditure and funding from development partners. Cost effective management of the procurement process can significantly influence the growth and development of the Kenyan economy (Mburu, Nyaboke, Osoro and Amemba, 2013).

Public procurement is an important function of governments for several reasons; the sheer magnitude of procurement outlays has a great impact on the economy and needs to be well managed. Indeed, in all countries in the world, estimates of the financial activities of government procurement managers are believed to be in the order of 10% –30 % of GNP (Callender & Mathews, 2010). These levels of expenditure alone provide sound reasons for analyzing the performance of public procurement operations at all levels. It is the government activity most vulnerable to waste, fraud and corruption due to the size of the financial flow involved. The overriding objective of a state’s public procurement system is to deliver efficiency and value for money in the use of public funds, while adhering to national laws and policies (OECD, 2011).
According to Kariuki and Waiganjo (2014), the competitive environments have led to short product life cycle for many goods, this has led to complex environmental challenges especially in developing countries. Reverse logistics plays a major role in addressing reducing waste and protecting the environment not only in Kenya but also worldwide. Reverse logistics is a series of five processes that begin from authorization of returns, transportation, auditing, product disposition and creating information system to track returns (Trebilcock, 2011). Reverse logistics is a fundamental process to recover reusable for gaining additional revenue which inherently reduces cost of goods (Mollenkopf & Weathersby, 2013)

**Global Perspective on Procurement Performance**

Public procurement is a significant activity in the developing world that purchases of their government accounts for approximately 5.1 percent of their combined national outputs’ (Evenett & Hoekman, 2005). Operating in an increasingly interconnected world, leading companies perceive competition as global and are moving to implement an integrated strategy worldwide. Global competitors are learning to develop and manufacture products that can be introduced and marketed simultaneously in many countries. In doing so, they are sourcing technology, materials, and components from sites and suppliers located throughout the world (Marshal, 2011).

According to Slone, et al., 2007, fast ongoing changes in global business environment have introduced new kinds of challenges and opportunities to companies’. Companies that beat the competition on procurement performance also achieve significantly better financial results. According to a survey conducted by PriceWaterHouseCoopers (2013) procurement managers across the globe need to step up to their top management and claim their rightful place as one of the major elements in the success or failure of their company.
Regional Perspective on Procurement Performance

Kabay (2003) contends that an efficient public procurement system is vital to the advancement of African countries and is a concrete expression of their national commitments to making the best possible use of public resources. In Uganda, procurement and disposal planning are central to proper procurement management. Public Procurement and Disposal of Public Assets (PPDA) Regulation 96(1) provides that a user department shall prepare a multi-annual, rolling work plan for procurement based on the approved budget, which was submitted to the Procurement and disposal unit to facilitate orderly execution of annual procurement activities (Hines, 2014).

Equally, Callendar & Mathews (2010) argues that the procurement departments of public entities in Tanzania are faced with the problem of not having enough information about the procurement procedure, its inputs, outputs, resource consumption and results, and are therefore unable to determine their efficiency and effectiveness. This implies that such a problem requires establishment of clear procurement procedures and performance standards. Performance standards when adopted can provide the decision-makers in the procurement department with unbiased and objective information regarding the performance of the procurement function.

Countries like South Africa and Egypt have adopted e-procurement as a widely preferred option and it is believed that besides improving efficiencies it has also given businesses a better chance to reach the unexplored markets (Movahedi, Lavassani & Kumar, 2009). Through e-procurement businesses have reduced their high-spending on their manufacturing costs and have had positive impact on their profitability in such way as now with the aid of web-based portals or exchanges many businesses can easily post their requirements or request for quotations (RFQs) online and in turn they get quotations from suppliers around the world without any hassle giving them so many options to choose the best and in most cost-effective one (Ballou, 2009).
Kenya Perspective on Procurement Performance

According to Shiati et al (2014), the Kenyan government is a major buyer of goods and services in the country, it does this through various public institutions spread out all over the country and as public institutions play a significant role in value addition, creation of employment, demand for goods and services and contribution to the national wealth. The procurement process must conform to the laid down regulations.

According to Mburu et al (2013) Procurement in the Kenyan public sector plays a major role in the utilization of government resources and achievement of the economic development agenda of Kenya. Cost effective management of the procurement process can significantly influence the growth and development of the Kenyan economy.

Reverse Logistics

Reverse logistics expanded from the knowledge of supply chain management specifically in closed loop supply chain (Guide & Wassenhove, 2013) and green supply chain management (Hervani, Helms & Sarkis, 2005). Khor and udhin (2012) stipulated in their article that of late, one of the environmental issues that are gaining centre stage is waste management. This cost-related operation has become more complex due to rapid growth of electronic waste or e-waste that is composed of hazardous substances which presents negative risk to environmental health when they are disposed via landfill and incinerators. Reverse logistics is described as responsible product disposition on used product and packaging which are collected from customers and/or reversed back to supplier (Eltayeb & Zailani, 2009).

Reverse logistics encompasses the logistics management skills and activities for reducing, managing and disposing of wastes companies using reverse logistics consider: adaptation of their
supply chains to maximize the usage of recycled products and materials from different sources, establishment of recycling, reusing, remanufacturing programmes for wastes reduction, development of reverse capabilities for taking back products from customers and usage of third parties services (Rodgers et al., 2012)

**Procurement Performance**

Increasing the effectiveness, efficiency and transparency of public procurement systems has become an ongoing concern of governments and of the international development community (OECD, 2006). Measuring performance is a graceful way of calling an organization to account and in public sector performance measurement, accountability is the central concern (Heinrich, 2007)

Public procurement is the process whereby public sector organizations acquire goods, services and works from third parties. It includes much that supports the work of government and ranges from routine items (stationery, temporary office staff, furniture or printed forms), to complex spending areas (construction, Private Finance Initiative projects, aircraft carriers or support to major change initiatives (OGC, 2014).

Performance measurement; the process of quantifying the efficiency and effectiveness of actions (Neely, 2005) has received increasing interest since the late 1980s (Osborne & Gaebler, 2012; Saiz, Bas & Rodriguez, 2007). Efficiency can be measured from the purchasing organization’s context where the personnel, management, procedures, policies, and information system issues are considered (Van Weele, 2010). Measuring performance of government draws a considerable amount of attention from professional associations, scholars and practitioners (Holzer & Kloby, 2005). Traditionally, performance measurement has involved management accountants with
budgetary control and the development of purely financial indicators such as return on investment (Chenhall, 2007).

However, in today’s work environment, there are increasing trends of relying on non–financial measures to assess the performance of organizations. Performance measurement has now gone beyond input and process into other sensitive areas. Politt & Bouckaert (2014) considered the shift of measurement systems beyond input and process into the more politically and methodologically sensitive area of assessing effectiveness as ‘difficult and controversial’. According to Kim, Chan & Yoon (2007), the traditional performance measurement system inhibits the improvement of critical dimensions such as quality, flexibility and delivery. For a performance measurement system to be regarded as a useful management process, it should act as a mechanism that enables assessment to be made, provides useful information and detects problems, allows judgment against certain predetermined criteria to be performed and more importantly, the systems should be reviewed and updated as an ongoing process (Ong & The, 2008).

According to Beamon (2009), supply chain performance (including public procurement) can be measured based on cost measures, costs and activity measures, cost and customer responsiveness measures, customer responsiveness measures and flexibility. From another context, Chan et al (2013) argued that there is still a lack of integration between the existing performance measurement methods and practical requirements for supply chain management.

As a result, they proposed a performance measurement method that would provide assistance for performance improvement in supply chain management and the performance should cover such areas; which are of (1) critical concern for supply chain common goals and strategies; (2) inter-influence and common concern among supply chain partners; and (3) concern for both internal partners and external customers.
Statement of the Problem

Despite efforts by the governments of developing countries, like Kenya and development partners like World Bank to improve performance of the procurement function, public procurement is still marred by shoddy works, poor quality goods and services (David, 2012). This has led public procurement performance declining at an alarming rate resulting to a decrease in global GDP to up to 14% (WB, 2013). The efficiency and effectiveness of the public procurement in Kenya had not been realized until the creation and enactment of the Public Procurement and Disposal Act of 2005. The adoption of the public procurement regulations that followed forthwith gave room for the improved realization of the attainment of five rights of purchasing that has promoted mutual coexistence between the procuring entity and suppliers as well (Mentzer & Flint, 2007).

Manufacturer’s product normally moves through the supply chain network to reach the distributor or customer. Any process or management after the sale of the product involves reverse logistics. If the product is defective, the customer would return the product (David, 2012). A survey by Synovate argued that poor performance as a result of lack of logistics efforts will continue to be witnessed among state corporations. Dunn and Bradstreet Barometer of Global reverse logistics (2000) reports that between 20% and 25% of all logistics relationships fail in any two-year period and half of the relationships will fail within five years due to lack of adequate strategy leading to low procurement performance.

Locally, a study by Pollock (2010), focused on improving their forward logistics activities; most have not treated the reverse logistics process with the same care and diligence afforded to traditional areas of logistics. Achieng (2011) indicated that most manufacturing and supply firms in Kenya often focus on forward logistics and as a result, they tend to overlook the importance of reverse logistics’ activities and its potential of improving the firm’s supply chain’s performance.
Recently reverse logistics has received increasing attention from both the academic world and Industries because of competition and marketing motives, direct economic motives and environmental concerns, as well as strategic and managerial implications. From the above studies, it is clear that there have been several researches conducted on reverse logistics and public procurement performance. This study therefore attempts to determine the effect of reverse logistics on public procurement performance in Kenya Medical Supplies Authority.

**Specific objectives**

i. To determine the effect of third party logistics on procurement performance among state corporations in Kenya.

ii. To establish the effect of information management in procurement performance among state corporations in Kenya.

iii. To assess the effect of lean agile manufacturing in procurement performance among state corporations in Kenya.

iv. To evaluate the effect on waste management in procurement performance among state corporations in Kenya.

**Theoretical Review**

There are several important theoretical perspectives applicable to effects of reverse logistics on procurement performance. Theories are formulated to explain, predict, and understand phenomena and, in many cases, to challenge and extend existing knowledge, within the limits of the critical bounding assumptions. The theoretical framework is the structure that can hold or support a theory of a research study. The theoretical framework introduces and describes the theory which explains why the research problem under study exists. The history of logistics can be traced to military...
logistics. Military Regiment uses mules for carrying cargo during WWII. Animals have been used for logistic purposes by different people throughout history, the Roman army in particular preferred mules over donkeys for their carrying capacity. The historical leaders Hannibal Barca, Alexander the Great, and the Duke of Wellington are considered to have been logistical geniuses (Scannell, Vickery, & Dröge, 2010).

History has shown that good logistical planning creates a lean and efficient fighting force. The lack thereof can lead to a clunky, slow, and ill-equipped force with too much or too little supply (Ketchen, & Hult, 2006).

This study was guided by the Resource Based View, Supply Chain Management Theory, Inventory management Theory and theory of diffusion of innovation. These are discussed below:

**Conceptual Framework**

A conceptual framework is an analytical tool with several variations and contexts. It is used to make conceptual distinctions and organize ideas. Strong conceptual frameworks capture something real and do this in a way that is easy to remember and apply. Isaiah Berlin recommended the use of conceptual framework as a metaphor of a “Fox” and a “Hedgehog” to make conceptual distinctions in how important philosophers and authors view the world. A general conceptualization diagram as shown below illustrates that procurement performance is the dependent variable and Third party logistics, information management, lean agile manufacturing, waste management are the independent variables.
Figure 1: Conceptual Framework
Third Party Logistics

A third-party logistics provider (abbreviated 3PL, or sometimes TPL) is a firm that provides service to its customers of outsourced (or "Third Party") logistics services for part, or all of their supply chain management functions (Mburu et al., 2013). According to the Council of Supply Chain Management Professionals, 3PL is defined as "a firm that provides multiple logistics services for use by customers. Preferably, these services are integrated, or bundled together, by the provider. Murphy & Wood (2008) continued to argue that in contrast, other definitions of 3PL arrangements involve a long–term perspective between buyer and seller and that the parties have a relationship. According to Delfman et al. (2013) a Logistics Provider (LP) is a provider of logistics services that perform all or part of a client’s company logistics function. The Ministry of Health and Social Services makes use of in-house logistics services, starting from procurement, ordering, warehousing (storage), transportation, inventory control (asset management), and information systems. According to Simchi-Levi, Kaminsky & Simchi-levi, (2007) the non-availability of supplies will have an influence on health care operations. The perception might be that health workers are failing to provide services as they are the closest to patients and ultimately responsible for the failure of the Ministry (Ministry of Medical Services, 2008). It can then also be concluded that the failure on the part of any logistics activities may have an influence on the operations of an organization.

Third party logistics providers typically specialize in integrated operation (Mburu et al., 2013), warehousing and transportation services that can be scaled and customized to customers' needs based on market conditions, such as the demands and delivery service requirements for their products and materials (Guide & Van Wassenhove, 2013). Often, these services go beyond logistics and include value-added services related to the production or procurement of goods,
services that integrate parts of the supply chain. When this integration occurs, the provider is then called a third-party supply chain management provider (3PSCM) or supply chain management service provider (SCMSP). 3PL targets a particular function in supply management, such as warehousing, transportation, or raw material provision.

The most significant difference between a second party logistics provider and a third party logistics provider is the fact that a 3Pl is always integrated in the customs system. The 2 Pl is not integrated, in contrast to the 3Pl he is only an outsourced logistics provider with no system integration (Khor & Udhin, 2012). A 2Pl works often on call (e.g. express parcel services) whereas a 3Pl is almost every time informed about the workload of the near future. Another point that differs 2 and 3PL is the specification and customizing of services. A 2Pl normally only provides standardized services. 3Pl’s against it often provide services that are customized and specialized on the needs of their customer. This is possible by the long term contracts that are usual in the third party logistics market. So the if there are customized logistics services are needed the contracts in the 3PL segment have to be long term, because customizing always costs money. A cost effectiveness for the third party logistics provider is only given over longer periods of time with a stable contract and stable profits (Simchi-Levi, Kaminsky & Simchi-Levi, 2007). In contrast to that second party logistic services can’t be customized, concerning to the fluctuating market with hard competition and a price battle on a low level. And there we have another distinguishing point between 2PL and 3PL: Durability of contracts. 3 PL contracts are long term contracts, whereas 2Pl contracts are of a low durability, so that the customer is flexible in responding to market and price changes (Nteere, Ngeno & Namusonge, 2014).

A fourth party logistics provider has no own transport assets or warehouse capacity. They have an allocative and integration function within a supply chain with the aim of increasing the efficiency
of it (Baziotopoulos, 2008). The idea of a fourth-party logistics provider was born in the seventies by the consulting company Accenture. Firms are outsourcing their selection of third party logistics provider and the optimization process of the integration of these to a PL as an intermediary. That reduces costs and the 4PI have to have an overview about the whole logistics market to choose the ideal 3PI for all operative logistic activities (Simchi-Levi, Kaminsky & Simchi-Levi, 2007). For being able to provide such an ideal solution fourth party logistics providers need a good knowledge of the logistics branch and a good IT infrastructure. A fourth party logistics provider selects the 3PI providers from the market which are most suitable for the logistical issues of his customer. Unlike the allocative function of a 4PL in the supply chain, the core competence of a 3PI provider is the operative logistics.

**Information Management**

The importance of accurate information to achieving superior logistical performance has historically been underappreciated (Cooper, Lambert & Pagh, 2007). While many aspects of information are critical to logistics operations, the processing of orders is of primary importance. Failure to fully comprehend this importance resulted from not fully understanding how distortion and operational failures in order processing impact logistical operations (Donovan, 2006). Current information technology is capable of handling the most demanding customer requirements. When desired, order information can be exchanged between trading partners. The benefit of fast Information Flow is directly related to work balancing (Khor & Udhin, 2012). It makes little sense for a firm to accumulate orders at a local sales office for a week, mail them to a regional office, process the orders in a batch, assign them to a distribution warehouse, and then ship them via air to achieve fast delivery (Ballou, 2009). In contrast, Internet communication of orders direct from the customer, combined with slower, less costly surface transportation, may
achieve even faster and more constant delivery service at a lower total cost. The key objective is to balance components of the logistical system (Masella, & Rangone, 2010).

Forecasting and communication of customer requirements are the two areas of logistical work driven by information. The relative importance of each facet of operational information is directly related to the degree to which the supply chain is positioned to function on a responsive or anticipatory basis (Masella, & Rangone, 2010). This balance between responsiveness and anticipatory driven operations constitutes the basic paradigm shift taking place in 21st-century supply chain design. The more responsive the supply chain design, the greater the importance is of accurate and timely information regarding customer purchase behavior. In most supply chains, customer requirements are transmitted in the form of orders (Garver & Mentzer, 2009). The processing of these orders involves all aspects of managing customer requirements, including initial order receipt, delivery, invoicing, and collection. The logistics capabilities of a firm can only be as good as its order processing competency (Stank, Keller, & Daugherty, 2011).

Information flow identifies specific locations within a logistical system that have requirements. Information also integrates the three operating areas. Within individual logistics areas, different movement requirements exist with respect to size of order, availability of inventory, and urgency, (Larson, & Halldorsson, 2014). The primary objective of information flow management is to reconcile these differentials to improve overall supply chain performance. It is important to stress that information requirements parallel the actual work performed in Customer Accommodation, manufacturing support, and procurement. Whereas these areas contain the actual logistics work, information facilitates coordination of planning and control of day-to-day operations. Without accurate information, the effort involved in the logistical system can be misdirected (Parente, Pegels, & Suresh, 2012).
Logistical information has two major components: planning/coordination and operations. Converting data to information, portraying it in a manner useful for decision making, and interfacing the information with decision-assisting methods are considered to be at the heart of an information system (Herbert & Tage, 2013). Logistics information systems are a subset of the firm’s total information system, and it is directed to the particular problems of logistics decision making, (Masella, & Rangone, 2010). Inventories or order progress, exception reports that compare desired performance with actual performance, and reports that initiate action. Output can also be in the form of documents such as transportation bills of lading and freight bills (Ballou, 2009).

**Lean agile manufacturing**

Lean agile manufacturing refer to modern advances in production technology and manufacturing methodology that have led to reduced costs, quicker response time and improved customer service in manufacturing companies (Phelan, 2009). "Lean" and "agile" refer to two distinct concepts, but they share certain similarities. Deciding whether to design your processes to be lean, agile or both is an important first step in planning for a manufacturing business. In manufacturing theory, being both is often referred to as leagile (Sehgal, 2010). According to Martin Christopher, when companies have to decide what to be, they have to look at the Customer Order Cycle (the time the customers are willing to wait) and the lead-time for getting supplies. If the supplier has a short lead time, lean production is possible (Khor & Udhin, 2012). If the COC is short, agile production is beneficial. Agile manufacturing is a term applied to an organization that has created the processes, tools, and training to enable it to respond quickly to customer needs and market changes while still controlling costs and quality (Larson and Halldorsson, 2014).
An enabling factor in becoming an agile manufacturer has been the development of manufacturing support technology that allows the marketers (Masella & Rangone, 2010), the designers and the production personnel to share a common database of parts and products, to share data on production capacities and problems particularly where small initial problems may have larger downstream effects (Hervani, Helms & Sarkis, 2005). It is a general proposition of manufacturing that the cost of correcting quality issues increases as the problem moves downstream, so that it is cheaper to correct quality problems at the earliest possible point in the process. Agile manufacturing is seen as the next step after Lean manufacturing in the evolution of production methodology.

Lean and agile manufacturing are both ultimately focused on increasing business sustainability in the high-cost manufacturing sector. Both are answers to challenges faced by historical manufacturers, and both provide opportunities for smaller players to compete with larger, entrenched competitors (Simchi-Levi, Kaminsky & Simchi-Levi, 2007). Both concepts rely heavily on statistical analysis, computerized information systems and open communication between internal and external stakeholders. Because of this, both of these concepts are tied to modern advances in production technology and are perfectly suited to the tools and resources available to modern managers (Mallik, 2010). Lean and agile design considerations are both early stage planning decisions, influencing the way in which organizations are structured from the accounting system all the down to the factory floor.

Lean and agile processes each provide distinct benefits, which can be strengthened when the two methodologies combine. Lean manufacturing increases cash on hand by trimming expenses, while agile manufacturing increases revenue by being ready to serve a range of unexpected demands (Stank, Crum & Arango, 2009). Both concepts are also directly focused on competitiveness, which
is a constant concern in the global markets in which manufacturers compete. Lean manufacturing allows companies the flexibility to reduce prices or use price promotions to attract new business, while agile manufacturing allows them to maximize the number of sales opportunities.

**Waste management**

Waste management is a set of activities that include the following: collection, transport, treatment and disposal of waste; control, monitoring and regulation of the production, collection, transport, treatment and disposal of waste; and prevention of waste production through in-process modification, reuse and recycling (Hervani, Helms & Sarkis, 2005). The term usually relates to all kinds of waste, whether generated during the extraction of raw materials, the processing of raw materials into intermediate and final products, the consumption of final products, or other human activities, including municipal (residential, institutional, commercial), agricultural, and special (health care, household hazardous wastes, sewage sludge). Waste management is intended to reduce adverse effects of waste on health, the environment or aesthetics (Pegels & Suresh, 2012).

There are a number of concepts about waste management which vary in their usage between countries or regions. Some of the most general, widely used concepts include: Waste hierarchy - which refers to the "3 Rs" reduce, reuse and recycle, which classify waste management strategies according to their desirability in terms of waste minimization. The waste hierarchy remains the cornerstone of most waste minimization strategies (Kouvelis, Chambers & Wang, 2006). The aim of the waste hierarchy is to extract the maximum practical benefits from products and to generate the minimum amount of waste; the waste hierarchy is represented as a pyramid because the basic premise is for policy to take action first and prevent the generation of waste (Scannell, Vickery & Dröge, 2010). The next step or preferred action is to reduce the generation of waste by re-use. The next is recycling which would include composting (Heinrich, 2007). Following this step is material
recovery and waste-to-energy. Energy can be recovered from processes landfill and combustion, at this level of the hierarchy. The final action is disposal, in landfills or through incineration without energy recovery (Masella & Rangone, 2010). This last step is the final resort for waste which has not been prevented, diverted or recovered. The waste hierarchy represents the progression of a product or material through the sequential stages of the pyramid of waste management. The hierarchy represents the latter parts of the life-cycle for each product.

The second concept is the Life-cycle of a Product which begins with design, then proceeds through manufacture, distribution, use and then follows through the waste hierarchy's stages of reuse, recovery, recycling and disposal (Guide & Van Wassenhove, 2013). Each of the above stages of the life-cycle offers opportunities for policy intervention, to rethink the need for the product, to redesign to minimize waste potential, to extend its use (Kouvelis, Chambers & Wang, 2006). The key behind the life-cycle of a product is to optimize the use of the world's limited resources by avoiding the unnecessary generation of waste. The third is resource efficiency - the current, global, economic growth and development cannot be sustained with the current production and consumption patterns. Resource efficiency is the reduction of the environmental impact from the production and consumption of these goods, from final raw material extraction to last use and disposal. This process of resource efficiency can address sustainability (Torre, 2012).

Methodology

The study adopted a descriptive survey employing cross sectional survey design aimed at establishing the effects of reverse logistics on public procurement performance among state corporations in Kenya. The target population of this study were 240 employees in Kenya Medical Supplies Authority, as at 31st May 2015. A sample of 150 respondents were picked using stratified random sampling techniques based on strata in the management level. The sample size was
obtained by calculating the sample from the target population by applying Cooper and Schindler, (2013) formula.

\[ n = \frac{N}{1 + N(e)^2} \]

Where:  
- \( n \) = Sample size,
- \( N \) = Population size,
- \( e \) = Level of Precision.

At 95% level of confidence and \( P=5 \)

\[ n = \frac{240}{1 + 240 (0.05)^2} \]

\[ n = 150 \]

Data from questionnaires was summarized, coded, tabulated and analyzed. Editing was done to improve the quality of data for coding. Coded data will then be fed into the statistical package for social sciences (SPSS) version 21. This version of SPSS has been selected for analysis since it offers a more user friendly interface and can easily be linked with Microsoft office utility programs. Descriptive statistics such as mean, standard deviation was generated, each for the competitive strategies. They provide simple summaries about the sample and the measures. Together with simple graphics analysis, they form the basis of virtually every quantitative analysis of data. Descriptive statistics are typically distinguished from inferential statistics. With descriptive statistics you are simply describing what is or what the data shows.

Standard deviation represents the degree of variability in the responses. Multilinear Regression Analysis was used to investigate on the relationship between the variables and the procurement performance of state corporations in Kenya. The coefficient of determination (R-Square) resulting from the linear regression was used to determine the goodness of fit. R-square greater than 0.7 indicates a very good fit. P-values for the t-test statistics was used to determine the significance of the independent variables in the regression model. Those variables with a p-value less than 0.05
are significant in the equation. A simple regression model was used in determining the level of influence the independent variables have on dependent variable as shown below:

\[ Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \epsilon \]

Where:

\[ Y \] = procurement Performance of state corporations in Kenya

(Independent Variable)

\[ \beta_0 \] = Constant Term

\[ \beta_1, \beta_2, \beta_3, \beta_4 \] = Beta coefficients

\[ X_1 \] = Third party logistics
\[ X_2 \] = Information management
\[ X_3 \] = Lean agile manufacturing
\[ X_4 \] = Waste management

\[ \epsilon \] = Error Term

**Findings of the study**

**Correlation Test**

Multicollinearity is a measure of the existence of strong correlation between independent variables. The aim of the correlation test was to identify the association between reverse logistics on procurement performance of state corporations. Two independent variables are said to be correlated if their P-value is greater than 0.5 and as such one of the variables should be dropped from the model. As shown in table 1, none of the predictor variables had P-value> 0.5 thus multicollinearity and a four predictor variables model to forecast procurement performance of state corporations in Kenya.
Table 1: Pearson Correlation Correlations

<table>
<thead>
<tr>
<th>Predictors:</th>
<th>Third Party Logistics</th>
<th>Party Information management</th>
<th>Lean agile manufacturing</th>
<th>Waste management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Third Party Logistics</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information management</td>
<td>.112</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lean agile manufacturing</td>
<td>.233</td>
<td>.207</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>Waste management</td>
<td>.124</td>
<td>.030</td>
<td>.008</td>
<td>1.000</td>
</tr>
</tbody>
</table>

Determining How Well the Model Fits

This table provides the $R$, $R^2$, adjusted $R^2$, and the standard error of the estimate, which can be used to determine how well a regression model fits the data. The aim of the regression analysis was to identify the relationship between reverse logistics on procurement performance of state corporations in Kenya. Table 2 shows that there exist a very strong positive correlation between the predictors and dependent variables. Further coefficient of determination (the percentage variation in the dependent variable being explained by the changes in the independent variables) $R^2$ equals 0.7056; that is, Third Party Logistics, Information management, Lean agile manufacturing, Waste management explain 70.6 percent of the variation in procurement performance of state corporations in Kenya leaving 29.4 percent unexplained. The P-value of 0.003<0.05) implies that the model of procurement Performance of state corporations in Kenya is significant at the 5 percent significance.

Table 2: Model Summary
<table>
<thead>
<tr>
<th>R</th>
<th>R Adjusted</th>
<th>Std. Error of R Square</th>
<th>R Square</th>
<th>F</th>
<th>df1</th>
<th>df2</th>
<th>Sig. F</th>
</tr>
</thead>
<tbody>
<tr>
<td>.840</td>
<td>.7056</td>
<td>.842</td>
<td>1.13044</td>
<td>.842</td>
<td>4.261</td>
<td>5</td>
<td>101</td>
</tr>
</tbody>
</table>


**Analysis of Variance**

ANOVA findings \((F (4, 185) = 4.261, p=.003 < .05)\) in table 3 shows that there is correlation between the predictors variables (Third Party Logistics, information management, lean agile manufacturing, waste management) and response variable (procurement performance of state corporations in Kenya) hence the regression model is a good fit of the data.

**Table 3: ANOVA**

<table>
<thead>
<tr>
<th>Model</th>
<th>sum of squares</th>
<th>df</th>
<th>mean square</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>21.780</td>
<td>4</td>
<td>5.445</td>
<td>4.261</td>
<td>.003</td>
</tr>
<tr>
<td>Residual</td>
<td>231.301</td>
<td>98</td>
<td>1.278</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>253.081</td>
<td>102</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), Third Party Logistics, Information management, Lean agile manufacturing, Waste management

b. Dependent Variable: Procurement Performance of state corporations in Kenya

**Coefficients of the Regression Equation**

A simple regression model was used in determining the level of influence the independent variables have on dependent variable as shown below:

\[
Y = 0.295 + 0.317X_1 + 0.207 X_2 + 0.150 X_3 + 0.048 X_4 + e
\]

Where;
Y = Procurement performance (Dependent Variable)

$\beta_0$ = Constant Term

$\beta_1, \beta_2, \beta_3, \beta_4$ = Beta coefficients

$X_1$ = Third Party Logistics

$X_2$ = Information management

$X_3$ = Lean agile manufacturing

$X_4$ = Waste management

$\epsilon$ = Error Term

Constant = 0.295, shows that if Third Party Logistics, Information management, Lean agile manufacturing, Waste management were all rated as zero, procurement Performance of state corporations in Kenya rating would be 0.295

$\beta_1 = 0.317$, shows that one unit increase in Third Party Logistics results in 0.317 units increase in procurement Performance of state corporations in Kenya other factors held constant.

$\beta_2 = 0.207$, shows that one unit increase in Information management results in 0.207 units increase in procurement Performance of state corporations in Kenya other factors held constant.

$\beta_3 = 0.150$, shows that one unit increase in Lean agile manufacturing results in 0.159 units increase in procurement Performance of state corporations in Kenya other factors held constant.

$\beta_4 = 0.048$, shows that one unit increase in Waste management results in 0.218 units increase in procurement Performance of state corporations in Kenya other factors held constant.
Table 4: Coefficients

<table>
<thead>
<tr>
<th>Predictors</th>
<th>B</th>
<th>Std. Error</th>
<th>Beta</th>
<th>t</th>
<th>sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>.295</td>
<td>.190</td>
<td>.243</td>
<td>1.553</td>
<td>.125</td>
</tr>
<tr>
<td>Third Party Logistics</td>
<td>.317</td>
<td>.069</td>
<td>.127</td>
<td>4.594</td>
<td>.008</td>
</tr>
<tr>
<td>Information management</td>
<td>.207</td>
<td>.072</td>
<td>.213</td>
<td>2.875</td>
<td>.005</td>
</tr>
<tr>
<td>Lean agile manufacturing</td>
<td>.150</td>
<td>.075</td>
<td>.059</td>
<td>2.120</td>
<td>.003</td>
</tr>
<tr>
<td>Waste management</td>
<td>.048</td>
<td>.072</td>
<td>.018</td>
<td>3.028</td>
<td>.015</td>
</tr>
</tbody>
</table>


This tests whether the Unstandardized (or standardized) coefficients are equal to 0 (zero) in the population. If \( p < .05 \) then, one can conclude that the coefficients are statistically significantly different to 0 (zero). The corresponding \( p \)-value respectively, indicates that all independent variable coefficients are statistically significantly different from 0 (zero), that is each independent variable is linearly related to the dependent variable. A four predictor model was used to forecast procurement Performance of state corporations in Kenya.
Summary of Findings

The study sought to establish the effects of reverse logistics on procurement performance among state corporations, case of Kenya Medical Supplies Authority. Descriptive statistics, Pearson product moment correlation and regression analysis were used to address the four objectives. A sample survey of 150 employees in Kenya Medical Supplies Authority in order to address the four research objectives. The data collection instrument was a structured questionnaire with variable measures anchored on a five point Likert scale. Explanatory data analysis, correlation analysis and regression analysis were done with the help of statistical package for social scientists (SPSS Version 21).

From the findings the respondents agreed that third party logistics affect procurement performance of Kenya Medical Supplies Authority. Specifically; 3PL help concentrate firm’s resources to their core-competence and creating value by having flexibility and adaptability against changing market environment. Respondents also pointed out environmental sustainability sharpening the focus on the need for innovative approaches of transport and logistics services and the institution is striving to reduce the negative environmental impact of the processes they carry out, while maintaining long-term profitability.

Inferential statistics showed that here was a positive significant linear relationship between third party logistics and state corporations performance in Kenya. This relationship had been illustrated by the correlation coefficient of 0.317 at 0.01 significance level. This implied that there was a positive relationship between third party logistics and procurement performance State Corporations in Kenya.
The study found out that high cost of deploying and maintaining IT tools hinders their implementation and use of information technology (IT) tools and procurement performance. The research also found that the current information technology in place is capable of handling the most demanding customer requirements and that there is a centralized and standardized management of key supplier’s information. Results also showed that information management had a positive weak significant linear relationship with State Corporations’ procurement performance with a Pearson correlation coefficient of 0.207 and P-value of 0.009. This implied that there was fairly positive correlation between information management and procurement performance of State corporations.

Result indicate that lean manufacturing allows the company the flexibility to reduce prices or use price promotions to attract new business and lean manufacturing increases cash on hand by trimming expenses, while agile manufacturing increases revenue by being ready to serve a range of unexpected demands. Other significant factors were; agile manufacturing allows companies to maximize the number of sales opportunities and lean agile manufacturing methodology in the institution have led to reduced costs and lean and agile manufacturing are both focused on increasing business sustainability in the high-cost manufacturing sector as well as production technology have led to quicker response time and improved customer service in manufacturing companies. There was a positive linear relationship between indirect practices and State Corporations’ performance. It was indicative that indirect practices had a weak positive significant linear relationship with State Corporations performance, with a Pearson correlation coefficient of 0.150 and a p-value of 0.002. This implied that there was fairly weak positive correlation between lean agile manufacturing and procurement performance of State Corporations.
The study found that Kenya Medical Supply Agency has adopted the Environmental Code of Practice for Packaging and Environmental Guidelines for Packaging (ECoPP) into systems, procedures and policies. The study also found that waste management performance has a greater use of reusable and recyclable materials and waste management performance reduce consumption of natural resources by minimising the amount of packaging material purchased and continuously increasing demand for recycled content in. The institution have stringent control, monitoring and regulation of production to prevention of waste production. The institution is responsible for applying the waste minimisation principles in procurements of business equipment, office requisites and janitorial products.

**Conclusions of the Study**

The following indicates the conclusion of each individual objective as per the findings.

It could be concluded that third party logistics affect procurement performance of Kenya Medical Supplies Authority. Specifically; 3PL help concentrate firm’s resources to their core-competence and creating value by having flexibility and adaptability against changing market environment. Respondents also pointed out environmental sustainability sharpening the focus on the need for innovative approaches of transport and logistics services and the institution is striving to reduce the negative environmental impact of the processes they carry out, while maintaining long-term profitability.

Based on the findings from the second objectives, the study may conclude out that high cost of deploying and maintaining IT tools hinders their implementation and use of information technology (IT) tools and procurement performance. The research also found that the current
information technology in place is capable of handling the most demanding customer requirements and that there is a centralized and standardized management of key supplier’s information.

Further, it could be concluded that lean agile manufacturing allows the company the flexibility to reduce prices or use price promotions to attract new business and lean manufacturing increases cash on hand by trimming expenses, while agile manufacturing increases revenue by being ready to serve a range of unexpected demands. Other significant conclusion are; agile manufacturing allows companies to maximize the number of sales opportunities and lean agile manufacturing methodology in the institution have led to reduced costs and lean and agile manufacturing are both focused on increasing business sustainability in the high-cost manufacturing sector as well as production technology have led to quicker response time and improved customer service in manufacturing companies. There was a positive linear relationship between indirect practices and State Corporations’ performance. It was indicative that lean agile manufacturing had a weak positive significant linear relationship with State Corporations performance, with a Pearson correlation coefficient of 0.150 and a p-value of 0.002. This implied that there was fairly weak positive correlation between lean agile manufacturing and procurement performance of State Corporations.

**Recommendations of the Study**

From the above conclusions, the following recommendations were arrived at:

The research institutions should strengthen their loop supply chain management by putting greater effort to the implementation of some key best practices. Specifically, the following practices should be improved on provision of dependable services, quality outsourced services, reduction of fuel consumption, sharing of information through information technology, reduction of pollutant
emissions, prequalification of suppliers that are aware of environmental issues, formal partnerships with suppliers, setting up a supply chain database, adopting third party logistics, operating with lean supply base, green supply chain management practices, supplier development, preparation of specifications with suppliers, development of procurement of recyclable material, reverse logistics and involvement of key suppliers in planning.

In addition, the research institutions should enhance their technological capacity so as to accommodate greater collaboration and information sharing between the institution and suppliers as well as internally.
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