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ABSTRACT

The purpose of the study was to investigate the effect of reverse logistics on performance of plastic bottling firms in Mombasa County. The objectives of the study are to determine the effect of reuse practices, recycle practices, remanufacturing practices and repackaging practices on performance of plastic bottling firms in Mombasa County. The study adopted cross-sectional survey research design. The choice of this design is due to its ability to portray the relationship that exists in the study variables using data collection over a short period of time. The study target population was 227 management staff and subordinates drawn from finance, operations and procurement in 27 plastic bottling firms in Mombasa County. A sample size of 145 respondents was selected by use of Slovins formula. The study utilized primary data collected using structure Likert scale questionnaires designed as per the study variables. The researcher used 'drop-and-pick-later' method to administer questionnaires to the respondents. Collected data was analyzed by employing descriptive and inferential statistics as the data analysis techniques. The regression results showed that reverse inventory management, reverse transportation, recycling and logistics information system has moderate significant effect on procurement performance of plastic bottling firms. The study also concludes that the plastic bottling firms registers empty returns as part of inventory supplement thus procurement savings. The firms have automated and digitized inventory processes and that they have invested in inventory model to manage returns. The empty bottles return earmarked points are sparsely dotted. Further, results show that high standards are ensured during sorting of used bottles for recycle and that these firms have established plastic bottles ccollection points which are convenient to customers. The study concludes that the firms core functions are integrated by logistics information systems. The researcher recommends that the management of plastic bottling firms should put measures and structures in place to ensure maximum empty returns as they were found to lead to procurement costs savings. To enhance efficiency, the plastic bottling firms should digitize and where necessary automate inventory processes for ease of management. The returned bottles should be collected back to the firm frequently and the companies should opt for own fleet of transportation so as to ensure efficiency in the process of returns transportation.

Key Words: *Reuse, Recycle, Remanufacturing, Repackaging, Reverse Logistics*

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INTRODUCTION

Rapid population growth and technological advancements worldwide have resulted in an enormous rise in the production and consumption of products with short lifespans (Illias, 2016). Increased consumption and mass manufacturing have led to a demand for raw materials, endangering the availability of vital raw material sources and contributing to the growing number of landfills (Van Wassenhove & Bessiou, 2017). Due to this phenomena, companies now need to develop and implement strategies that can effectively and efficiently handle problems that arise throughout the procurement process (Tseng & Hung, 2016). In addition, the dynamic nature of the modern corporate environment has compelled companies to always look for methods to enhance their operations by cutting costs and streamlining workflows.

In the United States the plastic bottles market is estimated to grow at a steady rate, owing to increasing consumption and industrial applications of plastic-made containers. According to the Plastics Industry Association (PLASTICS), the demand for plastic bottles continues to expand in the United States. For instance, in 2017, the total volume of bottled water consumed in the United States was 13.7 billion gallons, which was an increase of 7.4% from 2016. This approximately translates into an average of 36.3 gallons of water consumption per person. Plastic packaging has been witnessing an increasing inclination from consumers over other products, as plastic packages are light in weight and easier to handle. Similarly, even the major manufacturers prefer to use plastic packaging solutions, owing to their lower cost of production.

Other big companies such as GE, IBM and 3M have developed a mature system of reverse logistics. They collect and recycle the returned goods for decreasing the loss generated by the return policy. Philips reduced the returned products by over 500,000 units and saved billions dollars through enhancing the management of returned goods since 1998. HP and Epson produced the cartridges which can be refilled. After Volvo disassembled the returned goods, some plastic and metal are sold, while some components were remanufactured for assembling the vehicles for secondary market. In China, reverse logistics has grown rapidly. Shanghai Baosteel recycled the disposal steel. Lenovo cooperated with APLL logistics for recalling and handling the returned goods.

Autry (2005) notes that in 2010, there were more than 1,000 different items recalled from the marketplace by various U.S. government regulatory agencies from manufacturing firms. Among others, these included recalls for toys, pharmaceuticals, consumer electronics, medical devices and automotive parts. The reasons for the recalls ranged from issues with packaging and warning labels to hazardous conditions created by the products. In addition to fines and penalties from regulatory agencies, there is a greater potential liability from lawsuits and the impact on company sales from bad press. Minimizing all of these potential risks from recalled products is a major driver behind the need to develop a comprehensive reverse logistics program to reduce costs and enhance profitability of firms. The weakness of this study is that it did not address issues of reverse logistics practices in large scale manufacturing firms.

In Africa, environmentally sound end-of-life management of plastic waste through recycling and energy recovery is still in an early stage in many African countries. For instance, UPS has successfully adopted reverse logistics to minimize the environmental impact by allowing consumers to reuse boxes to ship items. UPS also has recycling services, where they pick up goods that are no longer needed and responsibly dispose them. H&M accepts used clothing at all of their stores worldwide. The clothes can be any condition or brand, and H&M uses the clothing they've collected to create an all-recycled clothing line (Van Wassenhove & Bessiou, 2017). This type of reverse logistics chain allows all types of consumers to get involved with the brand, even if they didn't

purchase their garment from H&M. By collecting old distributed products, clothing companies like H&M, G-Star Raw, and other retail companies reuse the products and transform the old components into new material, reducing both waste and costs of production.

The industry of plastics in Kenya is well-developed and manufactures products by using polypropylene, polyvinyl chloride (PVC), polyethylene, and polystyrene. Kenya National Bureau of Statistics (2017) reports that in Kenya there are in excess of 140 formal organizations engaged in plastic goods production. The firms produce plastic products ranging from PVC pipes and fittings, bottles, packaging shoes, plastic bags, crates, containers and household wares. Many plastic firms produce plastic bottles for packaging of their own products such as water, soft drinks, hard drinks, medicines, oil and many others, while others engage in plastic bottle production as their main economic activity (Laosirihongthong, Adebanjo, & Tan, 2016).

Despite the plastic industry importing 20,000 tonnes of polyethylene terephthalate products annually and still growing, the industry is only able to achieve recovery rate of around 5 percent of the plastic bottles consumed (NEMA, 2018). The concept of reverse logistics is not novel in Kenya, however, nearly all plastic bottling firms have failed to adopt the practice thus missing on cost savings. The raw material procurement costs have increased due to changes in global markets and exchange rates a problem which could be solved through recycling, reuse and remanufacturing. This has necessitated need to research on reverse logistics and its effect on procurement performance.

Statement of the Problem

In this context, Kenya's output from the plastics bottlers industry rebounded near the end of the decade, with growth rates of 6% in 2018 and a staggering 16% in 2019–2020. However, the sector has only grown slowly since the release of COVID-19 in 2020 (KAM, 2022). Due to supply chain rigidity, an inability to control operating expenses, and a poor capacity to react to outside pressures and market shifts, a large number of businesses have either shut down or moved their operations abroad (Mogaka & Odari, 2021). This request for research on the impact of reverse logistics on the long-term viability of plastic bottling companies.

Numerous research studies on reverse logistics and performance have been conducted. The purpose of Wanjiku and Mwangangi's (2019) study was to determine how Kenya's food and beverage industry performs in relation to reverse logistics. A research on reverse logistics and the performance of Kenyan companies that manufacture food and beverages was conducted by Mutuku and Moronge (2020). In a research on the impact of reverse logistics procedures on the competitiveness of plastic packaging companies, Omwenga (2019) shown that standardized reverse logistics might provide a business with a competitive edge. Similarly, Wambaya, Oketchi, Namusonge, and Sakwa (2018) looked at the impact of reverse logistics on the Kenya Medical Supplies Agency's procurement performance and found a strong correlation. The previous one concentrated on public procurement, which is distinct from private company procurement.

Nevertheless, the evaluated studies have ignored other performance criteria in favor of evaluating reverse logistics performance only on the basis of economic performance. Furthermore, very little local study has been done to examine reverse logistics and how it affects plastic bottling companies' performance. Therefore, by attempting to comprehensively examine the impact of reverse logistics on performance within the context of plastic bottling companies in Mombasa County, Kenya, this study sought to close the gaps that have been found.

Objectives of the Study

The purpose of the study is to investigate the reverse logistics on performance of plastic bottling firms in Mombasa County. The specific objectives were;

- To establish the effect of reverse inventories management on performance

of plastic bottling firms in Mombasa County.

- To determine the effect of reverse transportation on performance of plastic bottling firms in Mombasa County.
- To examine the effect of recycling on performance of plastic bottling firms in Mombasa County.
- To find out the effect of reverse logistics information systems on performance of plastic bottling firms in Mombasa County.

Research Hypotheses

- H01: There is no significant relationship between reverse inventories management and performance of plastic bottling firms in Mombasa County.
- H02: There is no significant relationship between reverse transportation and performance of plastic bottling firms in Mombasa County.
- H03: There is no significant relationship between recycling and performance of plastic bottling firms in Mombasa County.
- H04: There is no significant relationship between reverse logistics information systems and performance of plastic bottling firms in Mombasa County.

LITERATURE REVIEW

Theoretical Review

Resource Based Theory of the Firm

Resource Based theory of the firm sprung from the major works published by Wernerfelt, Prahalad and Hamel, Barney, and others in the 1980s and 1990s. The Resource-Based View theory has two critical assumptions which are that resources must be heterogeneous and immobile. In this case, the first assumption is that capabilities, skills, and other resources possessed by the firm differ from one firm to the other. For instance, if the firms could possess a similar amount and mix of resources, they could not come up with varying strategies to compete with one another because what one firm can accomplish the other can too hence no competitive advantage can be realized.

Resource-based view theory assumes that competitive advantage can only be achieved by firms that can use a different set of resources. Secondly, the RBV assumes that the resources possessed by the firm are immobile and cannot be moved from one firm to the other. This immobility of resources makes it difficult for the organizations to copy competitors' resources hence failure to come up with similar strategies (Müller & Jugdev, 2016). Therefore, firms should develop reverse logistics capabilities in order to reduce costs and maximise their value offer (Olavarrieta and Ellinger, 2016; Dowlatshahi, 2015; Wong and Karia, 2016; Ramírez, Morales, and Jesús, 2016). Reverse logistics capabilities represent the internal capabilities and processes that a firm deploys to effectively implement its reverse logistics activities.

Firms in the plastic water bottling can decide to integrate reverse logistics practices into their operation so as to remain different from other rival firms who adopt negative environmental practices. When this happens, these firms potentially coin a market niche for its products and services. Eshikhati (2016) claim that integrating reverse logistics is best achieved via the creation of eco-friendly policies, investing in the right technology (equipment) and capability building of employees. The integration of key reverse logistics practices into a firm's operation serves as "bedrock" to achieve competitive advantage which will lead to growth in market share and subsequently higher profitability (Fortes, 2016). This theory was adopted for this study because it has been validated by other researchers (Guta 2016; Ndung'u, & Moronge, 2017) to analyze how the recycling technologies adopted by the firm can improve the firm's performance. The theory supports recycling variable.

Inventory Model

Inventory model is a mathematical model that helps business in determining the optimum level of inventories that should be maintained in a production process, managing frequency of ordering, deciding on quantity of goods or raw materials to be stored, tracking flow of supply of raw materials and goods to provide uninterrupted service to customers without any delay in delivery. Inventory models are used in predicting the demands on inventories and are classified as either deterministic or stochastic (Zappone, 2006). Deterministic models are models where the demand for a time period is known, whereas in stochastic models the demand is a random variable having a known probability distribution. These models can also be classified by the way the inventory is reviewed, either continuously or periodic.

Inventory models answer the questions: When should an order be placed for a product? (Ozer& Wei, 2004) How large should each order be? The answer to these questions is collectively called an inventory policy. Companies save money by formulating mathematical models describing the inventory system and then proceeding to derive an optimal inventory policy. If the demand in future periods can be forecast with considerable precision, it is reasonable to use an inventory policy that assumes that all forecasts will always be completely accurate (Larsen & Marx, 2001). This is the case of known demand where a deterministic inventory model would be used. However, when demand cannot be predicted very well like in the case of goods reversal, it becomes necessary to use a stochastic inventory model where the demand in any period is a random variable rather than a known constant (Ozer & Wei, 2004).

Reverse logistics means that the company now has to deal with more inventories that anticipated some of which can be reused, recycled or destroyed altogether. In this study, the inventory model will provide insight into plastic bottling companies preparedness for reverse inventories and how this preparedness could affect their performance.

Systems Theory

Systems theory was postulated by Dunlop in 1958 and the theory has a perspective of an organization as complex set of dynamically intertwined and interconnected elements, including its inputs, processes, outputs, feedback loops and the environment in which it operates. The foundation of systems theory is that all the components of an organisation are inter-related, and that changing one variable might impact many others (Maignan, Hillebrand, & McAlister, 2012).

The organization is seen as being made up of interrelated parts known as subsystems. These subsystems work together to contribute to the survival and success of the entire organization (Chireke & Nwoka, 2015). They further state that a business organization is an open system where there is continual interaction with the broader external environment of which it is a part. According to Lozano and Valles (2013), system theory views organisational structure as the established pattern of relationships among the parts of the organisation, of particular importance are the patterns in relationships and duties. These include themes of; integration (the way activities are coordinated), differentiation (the way tasks are divided), authority (the structure of the hierarchical relationships), and administrative (the formalized policies, procedures, and controls that guide the organization) (Maignan, Hillebrand, & McAlister, 2012). Hyman (1975) criticised Dunlop's proposition and argued that each and every organisation is considered as a system of interrelated and coordinated processes. A well organised system can make it possible for a firm to adopt new business strategies to be able to move to a different competitive edge. This theory therefore is relevant to this study in the sense that reverse logistics information systems can integrate all the core processes of the firm to derive distinctive competence. The theory support logistics information system variable.

Conceptual Framework

A conceptual framework is a figure that shows the relationship between the dependent variable and the independent variable.

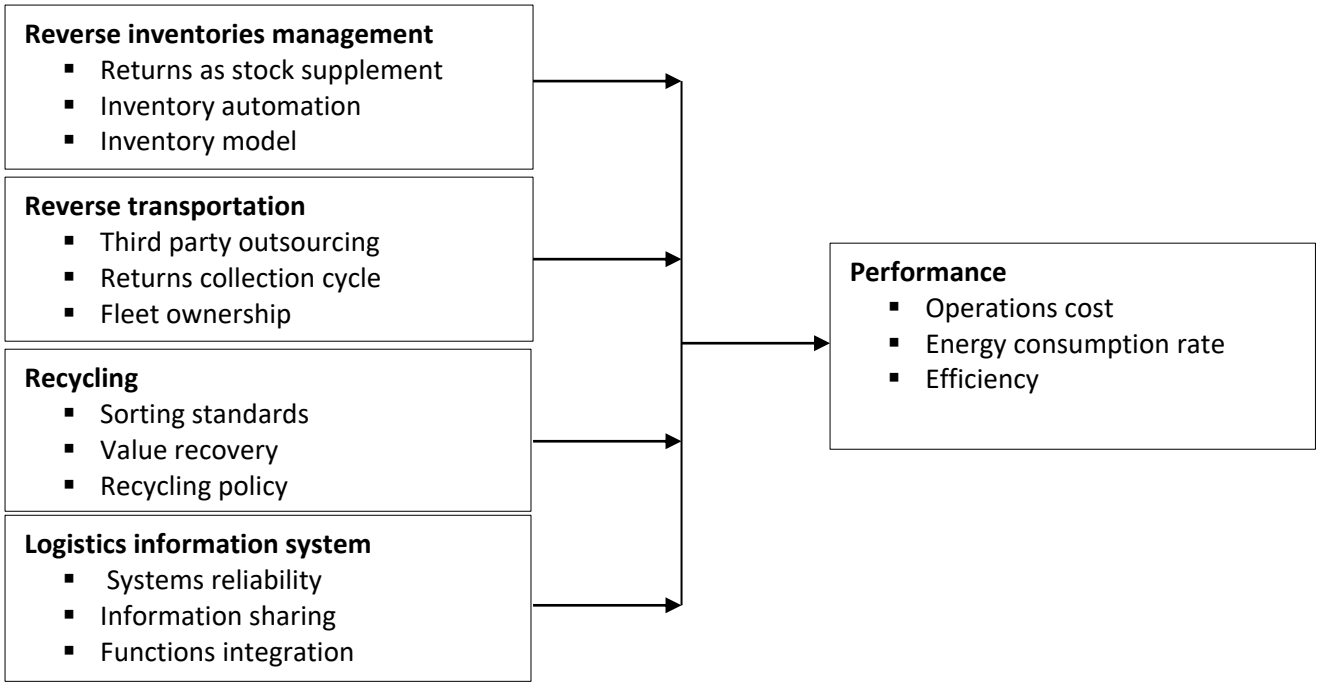

Figure 1: Conceptual framework

Review of Literature on Variables

Reverse Inventories Management

Inventory management is an important part in making all the decisions in handling the inventory in an organization such as activities to be carried out, policies of inventory management, and procedures in handling the inventory in order to ensure enough quantity of each item is kept in the warehouse at all times. Besides, the organization puts a lot of effort in controlling the inventory expenses through inventory management (Ferenčíková, 2014). Esther (2012) claimed that effective inventory management system will reduce the level of difficulties of operations which can lead to the success of an organization such as executing, administrating and scheduling of distribution and shipping network. Thus, improving the inventory management of an organization will greatly enhance the quality of the outcome of business performance.

The aim of reverse logistics is decreasing the inventory of returned products and parts as soon as possible and reducing the cost of inventory in reverse logistics through turning the returned products and parts to reusable products and parts which maximizes the values of returned parts and products. Therefore, that decreases tied-up money on inventory of returned products and parts and retrieve the value of returned products and parts as soon as possible (Sun, 2017).

Product returns happen and, therefore, it is important to maintain efficient flow and handling of customer returned merchandise. However, many operations totally lose control of this inventory. If the merchandise that comes back into stock is not controlled properly and then acted upon, it just sits (Tiwari, 2013). The storage and excess inventory costs, plus the loss of vendor credits is costly. But reclaiming assets through reverse logistics can be challenging. Companies willing to undertake reverse logistics flows face many hurdles including policies

regulating the transport of waste as well as the variability, in quality and quantity, of return flows. However, the cost of reverse logistics is by far the biggest challenge because it undermines the business case for the circular economy (de Brito, Flapper & Dekker, 2022). The cost of reverse flows is usually high, while comparably, the residual value of goods is usually low. Collection of goods is often expensive due to geographic dispersion. Transport cannot be fully efficient due to a lack of scale. Sorting is often expensive without local infrastructures. Yet the cost challenge, like most other hurdles, can be overcome.

Reverse Transportation

In logistics, transportation refers to the movement of everything from raw material to finished goods between different facilities in a supply chain. In transportation the trade-off between responsiveness and efficiency is manifested in the choice of transport mode. Fast modes of transport such as airplanes are very responsive but also costlier. Slower modes such as ship and rail are very cost efficient but not as responsive. Since transportation costs can be as much as a third of the operating cost of a supply chain, decisions made here are very important (Yu & Wu, 2010).

According to Pinna and Carrus (2012), the demand for transport in reverse logistics brings out a new market for the third-party logistics industries. As most companies have their transport systems built for forward logistics, others which are not necessarily suppliers can be contracted for reverse logistics. Outsourcing, third-party logistics and contract logistics generally mean the same thing (Tseng, Yue & Taylor, 2005). Traditionally, handled by the firms internally as support functions, logistics activities such as transportation, distribution, warehousing, inventory management, order processing, and material handling have been given low priority compared with the other business functions (Meade & Sarkis, 2012).

Recycling

The third practice of reverse logistics considered is recycling which entails disintegrating into component parts the used products with the aim of reprocessing those components into new or original form. In the case of plastic bottles, recycling means collection and separation of plastic bottles and other plastic wastes from the customers and injecting these plastic wastes into the conversion process of the manufacturers (Wong, 2016). The recycling process has its genesis from the litter bins where recyclable plastic waste is collected and transported to the manufacturer or converter from where they are sorted and reprocessed (Matter, Dietschi, & Zurbruegg, 2016).

Guta (2016) in their study relationship between reverse logistics practices and organizational performance, sought to establish the extent of adoption of elements of recycling reverse logistics practices. The correlation analysis which was found to be significant showed that the recycling reverse logistics practice has a strong correlation with organizational performance. Further, this reverse logistics practice has significant strong positive correlation with financial performance and market performance. The study recommends that management of East Africa Bottling Share Company (EABSC) should look at reverse logistics practice as a strategic method that can be used to achieve organizational performance.

Logistics Information Systems

Information systems (IS) play a substantial role in managing reverse logistics (RL) processes (Hazen, Huscroft, Hall, Weigel, & Hanna, 2014). In addition, the reverse logistics capabilities are linked directly with the trustworthiness of the company and become a part of the requirements for choosing the company to deal with it (Daugherty et al. 2005). Companies must make an effort to create and nurture capabilities which are unique and difficult to duplicate, which will help the company to gain a stable competitive advantages over other the competitors (Day, 2000). Thus, information system should be responsive and accurate to turbulences in the surrounding environment to be able to forecast as well as conciliate the fluctuation in customers' demand (Huscroft et al., 2013).

Ndeda (2014) studied logistics information systems and performance of international humanitarian organizations (IHOs) in Kenya. According to the study, the general trends on use of logistics information systems show that a majority of IHOs have implemented logistic information systems. In terms of timeliness, the study found out that majority of the respondent agreed that the systems had improved delivery planning and delivery lead times. On cost effectiveness, the study shows that the logistics information systems have enabled consolidation of procurement requirements hence making the procurement storage and transportation of goods and reducing the costs. The study concluded that logistics information systems positively impact on the performance of IHOs, considerably improving their efficiency and effectiveness.

Performance

Performance is the process of tendering efficiency and efficacy. It forms the single determinant of public procurement (Tas, 2020). The foundation for gauging firm's progression to achieving pre-stated goals and objectives is performance and as such procurement performance is an approach to control cost rather than objective by itself. Procurement performance is the measure of the degree to which firm's goals and objectives can be attained by the procurement function with the lowest possible cost (Van Weele, 2016). According to Trent and Monczka (2016) procurement performance is basically the outcome of effectiveness and efficiency.

Knusden (2015) posits that procurement performance may be viewed in the scope of qualitative or quantitative assessment in an effort to attain efficiency, effectiveness and purchasing economies over a given time. Quantitative assessment is measured using metrics of placed orders quantity, lead time reduction, cost savings as well as administrative costs reduction (Kiruja, 2016). Vonderembse and Tracey (2016) assert that with a cost reduction in input prices, firms can competitively offer their ready goods in the market with competitive prices hence win business. Purchasing function performance measurement yields organizational benefits like quality improvement by suppliers, cost reduction, supplies assurances and improved performance. However, the current study narrows down to operational efficiency, energy savings and cost reduction as the performance measurement metrics.

Empirical Review

Several studies have been conducted on reverse logistics and performance. For instance, Sriyogi (2016) did a study on the factors affecting reverse logistics activities in liquified petroleum gas (LPG) firms in India. The study sought to develop a framework to implement activities of reverse logistics for the target LPG firms. The study adopted descriptive survey design and data was collected by use of questionnaire with both open ended and closed ended questions. Data was analyzed quantitatively and the results established that the key indicators of performance for LPG firms was fulfillment of order, lead time, stock carrying cost working capital ratio and volume flexibility.

A study by Agrawal and Chowdhary (2016) sought to investigate the effect of reverse logistics on the lifecycle of the product. Specifically, the study embarked to explain practices of reverse logistics on each individual stage of the product lifecycle. The study was quantitative in nature and adopted descriptive research design. Primary data was collected by use of structured questionnaires and data was analyzed by use of Statistical Package for Social Science version 19. The study findings showed that the reverse logistics strategy enablers were implementation of novel technology, strategic alliances, satisfaction of customers, eco-compatibility, knowledge management and value recovery.

Mutuku and Moronge (2020) did a study on reverse logistics and performance of Food and Beverage manufacturing firms in Kenya. The study adopted a descriptive research design approach. This study used probability sampling since the population and location of food and beverage manufacturing firms is known. Specifically, the study used stratified

random sampling in order to account for the uneven distribution of firms in various towns. Data was analyzed through descriptive statistical methods such as means, standard deviation, frequencies and percentage. The results revealed that there was a significant positive relationship between reverse logistics and firm performance.

Wainaina (2016) carried out a study to establish the reverse logistics practices and their effect on large scale manufacturing firms' profitability. The study targeted large scale manufacturing firms in Nairobi County. The study utilized survey design and primary data was collected by structured questionnaires. The data collection tool reliability was checked by Cronbach alpha index and collected data was analyzed quantitatively. The study results showed that reverse logistics adoption level was low among the manufacturing firms in Nairobi County. Also majority of the sampled manufacturing firms dispose waste in landfills and they lacked awareness on reverse logistics practices.

Kabergey and Richu (2016) carried out a study to investigate reverse logistics effect on operational performance. The study focused on sisal processing companies in Nakuru County. The study specifically studied the effect of reuse and product recovery on operational performance. The study results established that reuse of products positively affects firms' operational performance. Reuse also creates cost-benefit advantages to the sisal processing firms due to affordability of reused products. Efficiency is enhanced since material acquisition time is minimized.

Mwangangi (2016) carried out a study on Influence of logistics management on performance of manufacturing firms in Kenya. The study sought to investigate the moderating effect of logistics information system on the relationship between logistic management and firm performance. Based on the regression method, logistics information system construct was interacted with each independent variable and the finding showed that logistic information system significantly moderated the influence of logistics management on performance of manufacturing firms in Kenya. It implies that all independent variables when moderated by logistics information system do positively influence the performance of manufacturing firms in Kenya. The study recommends that managers in the manufacturing industry in Kenya should direct their firms' limited resources to investment of information management systems which presently amounts to significant influence on their firms' performance. Improvement on logistics information systems does influence the performance of primary functions of logistics management that is; transportation, inventory management, order processing and information flow and by extension influences firm performance.

METHODOLOGY

The study adopted descriptive research design. The population of this study consisted of 227 plastic bottling firms in Mombasa. According to Kenya Plex (2023) there are 27 registered plastic bottling firms operating in Mombasa County as of December 2022 (see Appendix V). The study employed multistage sampling which comprised of stratified random sampling technique whereby the target population was divided into different groups and those with similar characteristics were grouped in the same stratum then sample for the study was selected at random from each stratum using simple random sampling. The sample size was 145 plastic bottling firms in Mombasa.The study employed primary data. A structured questionnaire was used to collect the data from the respondents. The procedures of data collection involved getting authorization letter from JKUAT and from the relevant authorities. The questionnaire distribution was carried out by use of 'drop-and-pick later' technique. The study adopted Bartlett's sphericity test and expert opinion. The researcher used the most common internal consistency measure known as Cronbach's Alpha (α). Based on the fact that the questionnaires were quantitative, the data was analyzed through descriptive statistics (Mean and standard deviation)

and inferential statistics was computed through multiple regression and correlation analysis.

RESULTS

Descriptive Analysis

Reverse Inventory Management

The first objective of the study was to establish the extent to which reverse inventories management affect performance. They were required to do this on a 5 point Likert scale where 1 represented Strongly disagree while 5 represented Strongly agree. The results are displayed in Table 1:

Table 1: Reverse Inventory Management

	Mean	Std. Deviation
The organization factors returns as inventory supplement	4.29	.411
The firm has automated inventory processes	4.01	.728
The plastic bottling firm has inventory model to manage returns	3.46	.552
The organization has adequate capacity to receive and store returns	4.50	.639

From Table 1: it can be observed that respondents agreed to the statement that the organization factors return as inventory supplement as indicated by a mean of 4.29 and standard deviation of 0.411. The respondents agreed to the statement that the firm has automated inventory processes as shown by a mean of 4.01 and a standard deviation of 0.728. Further, the respondents were indifferent to the statement that the plastic bottling firm has inventory model to manage returns (mean=3.46). The respondents agreed to the statement that the organization has adequate capacity to receive and store returns as indicated by a mean of 4.50 with a standard deviation of 0.639. The findings support assertion by Sun (2017) whose study on inventory management in reverse logistics revealed that reverse inventory management has a positive effect on firm performance. The findings, however, differed with Diaz and Fu (2007) who found that the inventory requirements of reverse logistics can be very involving leading to more costs for the firms. Moffat (2002) also observed that such reversed inventory systems at times require sophisticated logistic system for ordering and delivering the parts.

Reverse Transportation

The second objective of the study sought to establish the effect of reverse transportation on performance. Data was collected through the Likert-scale measuring the level of agreement of the respondents. The results are as presented in Table 2:

Table 2: Reverse Transportation

	Mean	Std. Deviation
The company has outsourced returns collection function to a third party	4.63	.658
The returns are collected and transported back frequently	4.18	.750
The company owns fleet of transportation modes to manage reverse transport needs	4.60	.913
The designated returns collection points are sparsely distributed	3.83	.857

From the findings, respondents agreed to the statement that the company has outsourced returns collection function to a third party as indicated by a mean of 4.63 and standard deviation of 0.658. The respondents agreed to the statement that the returns are collected and transported back frequently as shown by a mean of 4.18 and a standard deviation of 0.750. Further, the respondents agreed to the statement that the company owns fleet of transportation modes to

manage reverse transport needs (mean=4.60). Respondents agreed to the statement that the designated returns collection points are sparsely distributed as indicated by a mean of 3.83 with a standard deviation of 0.857. The findings agreed with Pinna and Carrus (2012) who established that the demand for transport in reverse logistics brings out a new market for the third-party logistics industries. Samson's (2018) study revealed that reverse transportation has a significant effect on performance of firm.

Recycling

The third objective of the study sought to determine the effect of recycling on performance. The results are presented in Table 3:

Table 3: Recycling

	Mean	Std. Deviation
We have policies guiding on used bottle conversion processes	3.44	.850
We ensure high standards in sorting used bottles for recycle	4.19	.678
We have established plastic bottles collection points which are convenient to customers	2.73	.931
We ensure value recovery during recycle process	3.96	.802

The results showed that respondents agreed to the statement that the firm has policies guiding on used bottle conversion processes as indicated by a mean of 3.44 with a standard deviation of 0.850. Further respondents agreed to the statement that they ensure high standards in sorting used bottles for recycle as indicated by a mean of 4.19 with a standard deviation of 0.678. However, respondents disagreed to the assertion that they have established plastic bottles collection points which are convenient to customers as indicated by a mean of 2.73 and standard deviation of 0.931. Respondents agreed to the statement that they ensure value recovery during recycle process as indicated by a mean of 3.96 and standard deviation of 0.802. The findings agree with a study by Singoei and Yusuf (2019) which established that product recycling was significant to performance of agro processing firms in Uasin Gishu County, Kenya.

Logistics Information System

The fourth objective sought to investigate the effect of logistics information system on performance. The results are on means and standard deviation presenting the level of agreement of the respondents on the given aspects of logistics information system. The results are as presented in Table 4:

Table 4: Logistics Information System

	Mean	Std. Deviation
The firm has information systems to mine returns data for decision making	2.52	.779
The company logistics information systems are reliable	3.63	.817
Information sharing between the final consumers and the company is effective	2.44	.895
The company core functions are integrated by logistics information systems	3.65	1.008

Results in Table 4: showed that respondents agreed to the statement that the firm has information systems to mine returns data for decision making as indicated by a mean of 2.52 and standard deviation of 0.779. Findings further showed that respondents agreed to the statement that the company logistics information systems are reliable as indicated by a mean of 3.63 and standard deviation of 0.817. The findings also showed that respondents agreed to the statement that the information sharing between the final consumers and the company is effective (mean = 2.44; std. dev. = .895) and that the company core functions are integrated by logistics information systems (mean = 3.65 and std. dev. = 1.008). The results are supported by Ismahane and Slimane (2021), whose study on

logistics information systems revealed a positive significant relationship with performance.

Regression Analysis

Reverse Inventory Management and Procurement Performance

In order to establish the effect of reverse inventory management on procurement performance, a regression model was run and the results are presented in the Table 5: below.

Table 5: Regression Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Reverse inventory management	0.425E-2	.733E-2	1.94103	0.042
Constant	1.638581	0.28688	5.71182	0.000
R-Squared	0.114528			
Adjusted R-squared	0.111709			
F-statistic	40.6133			
Prob(F-statistic)	0.000			

The results present the fitness of model used of the regression model in explaining the study phenomena. Reverse inventory management was found to be a satisfactory variable in explaining procurement performance. This is supported by coefficient of determination (R2) of 11.45% which implies that reverse inventory management explains 11.5% of the variations in the procurement performance. The findings support assertion by Sun (2017) whose study on inventory management in reverse logistics revealed that reverse inventory management has a positive effect on firm performance. The analysis of variance (ANOVA) results indicate that the model was statistically significant. Further, the results imply that the independent variable (reverse inventory management) is a good predictor of procurement performance. This was supported by an F statistic of 40.61333 and a p-value (0.000) which was less than the conventional probability of 0.05 significance level.

Regression of coefficients results in Table 5: shows that reverse inventory management and procurement performance is positively and significantly related (r=0.25E-2, p=0.000). The findings support assertion by Sun (2017) whose study on inventory management in reverse logistics revealed that reverse inventory management has a positive effect on firm performance.

Therefore, the specific model was; Procurement performance= 1.638581+0.25E-2 reverse inventory management.

Reverse Transportation and Procurement Performance

The second objective was to determine the effect of reverse transportation on procurement performance, a regression model was run and the results are presented in the Table 6: below.

Table 6: Regression Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Reverse transportation	0.511E-2	.227E-2	2.251	.0400
Constant	2.01541	0.29255	6.88922	0.000
R-Squared	0.02933			
Adjusted R-squared	0.02624			
F-statistic	9.48763			
Prob(F-statistic)	0.00225			

The results present the fitness of model used of the regression model in explaining the study phenomena. Reverse transportation was found to explain 3% of the variations in the dependent variable which is procurement performance. The analysis of variance (ANOVA) results indicate that the model was statistically significant. Further, the results imply that the independent variable (reverse transportation) is a good predictor of procurement performance. This was supported by an F statistic of 9.48763 and a p-value (0.00225) which was less than the conventional probability of 0.05 significance level. The findings however, agreed with Pinna and Carrus (2012) who established that the demand for transport in reverse logistics brings out a new market for the third-party logistics industries.

Regression of coefficients results in Table 6: shows that reverse transportation and procurement performance are positively and significantly related (r=0.511E-2, p=0.040). Samson's (2018) study revealed that reverse transportation has a significant effect on performance of firm.

Therefore, the specific model was; Procurement performance= 2.01541+0.511E-2 reverse transportation.

Recycling and Procurement Performance

The third objective was to establish effect of recycling on procurement performance, a regression model was run and the results are presented in the Table 7: below.

Table 7: Regression Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Recycling	.287E-2	.104E-2	2.759	.0001
Constant	1.9425	0.27214	7.13778	0.000
R-Squared	0.13157			
Adjusted R-squared	0.12881			
F-statistic	47.5728			
Prob(F-statistic)	0.0000			

The results present the fitness of model used of the regression model in explaining the study phenomena. Recycling was found to be a satisfactory variable in explaining procurement performance. This is supported by coefficient of determination (R2) of 13.16%. This means that recycling explains 13.16% of the variations in the dependent variable which is procurement performance. The results further mean that the model applied to link the relationship of the variables was satisfactory. The findings agree with a study by Singoei and Yusuf (2019) which established that product recycling was significant to performance of agro processing firms in Uasin Gishu County, Kenya.

Table 7: further, provides the results on the analysis of the variance (ANOVA). The results indicate that the model was statistically significant. Further, the results imply that the independent variable (recycling) is a good predictor of procurement performance. This was supported by an F statistic of 47.5728 and a p value (0.000) which was less than the conventional probability of 0.05 significance level.

Regression of coefficients results in Table 7: shows that recycling and procurement performance are positively and significantly related (r=.287E-2, p=0.0001). Therefore, the specific model was; Procurement performance= 1.9425+0.287E-2 recycling.

Logistics Information System and Procurement Performance

The fourth objective was to determine effect of logistics information system on procurement performance, a regression model was run and the results are presented in the Table 8: below.

Table 8: Regression Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Logistics information system	.506E-2	.199E-2	2.542	.0006
Constant	2.083992	0.291958	7.137989	0.000
R-Squared	0.018430			
Adjusted R-squared	0.015303			
F-statistic	5.895517			
Prob(F-statistic)	0.015741			

The results present the fitness of model used of the regression model in explaining the study phenomena. Logistics information system was found to be a satisfactory variable in explaining procurement performance. This is supported by coefficient of determination (R2) of 1.84%%. This means that logistics information system explains 1.84% of the variations in the dependent variable which is procurement performance. The results further mean that the model applied to link the relationship of the variables was satisfactory. The results are supported by Ismahane and Slimane (2021), whose study on logistics information systems revealed a positive significant relationship with performance.

The analysis of variance (ANOVA) results indicate that the model was statistically significant. Further, the results imply that the independent variable (logistics information system) is a good predictor of procurement performance. This was supported by an F statistic of 5.895517 and a p-value (0.0157) which was less than the conventional probability of 0.05 significance level.

Regression of coefficients results in Table 8: shows that logistics information system and procurement performance are positively and significantly related (r=.506E-2, p=0.0006). Therefore, the specific model was; Procurement performance= 2.083992+.506E-2 logistics information system.

Hypothesis Testing and Discussions

The first objective of the study sought to investigate the effect of reverse inventory management on procurement performance of plastic bottling firms in Mombasa County. Regression analysis conducted proved that there was a positively significant effect of reverse inventory management on the target variable as indicated by the values β_1 = 0.250, $p<0.05$. The study concludes that an increase in reverse inventory management by one unit would lead to a change in the procurement performance by 0.425 units. On hypothesis, since the p-value is less than 0.05, the null hypothesis that reverse inventory management has no significant effect on procurement performance of plastic bottling firms in Mombasa County is rejected.

The second objective of the study sought to investigate the effect of reverse transportation on procurement performance. Regression analysis conducted proved that there was a positively significant effect of reverse transportation on the outcome variable as indicated by the values β_2 = 0.511, $p<0.05$. The study concludes that an increase in reverse transportation by one unit would lead to a change in the procurement performance by 0.511 units. On hypothesis, since the p-value is less than 0.05, the null hypothesis that reverse transportation has no significant effect on procurement performance is rejected.

The third objective of the study sought to investigate the effect of recycling on procurement performance of plastic bottling firms in Mombasa County. Regression analysis conducted proved that there was a positively significant effect of recycling on the dependent variable as indicated by the values β_3 = 0.287, $p<0.05$. The study concludes that an increase in recycling by one unit would lead to a change in the procurement performance by 0.287 units. On hypothesis, since the p-value is less than 0.05, the null hypothesis that recycling has no

significant effect on procurement performance is rejected.

Finally, the study sought to investigate the effect of logistics information system on procurement performance. Regression analysis conducted proved that there was a positively significant effect of logistics information system on procurement performance as revealed by the values $\beta_4 = 0.506$, $p<0.05$. The study concludes that an increase in logistics information system by one unit would lead to a change in the procurement performance by 0.506 units. On hypothesis, since the p-value is less than 0.05, the null hypothesis that logistics information system has no significant effect on procurement performance is rejected.

SUMMARY

The first specific objective was to examine the effect of reverse inventory management on procurement performance of plastic bottling firms in Mombasa County, Kenya. Descriptive results showed that respondents agreed that the organization factors return as inventory supplement and that the firm has automated inventory processes. The results revealed that the plastic bottling firm has inventory model to manage returns and that the organization has adequate capacity to receive and store returns. The regression results showed that reverse inventory management has moderate significant effect on procurement performance.

The second objective was to establish the effect of reverse transportation on procurement performance of plastic bottling firms in Mombasa County, Kenya. Descriptive results showed that respondents agreed that the company has outsourced returns collection function to a third party and that the returns are collected and transported back frequently. Results revealed that that the company owns fleet of transportation modes to manage reverse transport needs and that the designated returns collection points are sparsely distributed. Regression analysis results indicated that reverse transportation has a strong and positive significant effect on procurement performance.

The third objective was to assess the effect of recycling on procurement performance of plastic bottling firms in Mombasa County, Kenya. Descriptive results indicated that respondents agreed to the statement that the firm has policies guiding on used bottle conversion processes and that they ensure high standards in sorting used bottles for recycle. Respondents disagreed to the statement that they have established plastic bottles collection points which are convenient to customers. It was revealed that the firms ensure value recovery during recycle process. On regression results, recycling was shown to have positive and significant effect on procurement performance of plastic bottling firms in Mombasa County.

The fourth objective was to determine the effect of logistics information system on procurement performance of plastic bottling firms in Mombasa County, Kenya. Descriptive results showed that respondents agreed to the statement that the firm has information systems to mine returns data for decision making and that the company logistics information systems are reliable. Results also showed that respondents agreed to the statement that the information sharing between the final consumers and the company is effective and that the company core functions are integrated by logistics information systems. Regression results showed that logistics information systems had a positive and significant effect on procurement performance of plastic bottling firms in Mombasa County, Kenya.

CONCLUSIONS

The study concludes that reverse inventory management has a positive and significant effect on the procurement performance of plastic bottling firms. The study also concludes that the plastic bottling firms registers empty returns as part of inventory supplement thus procurement savings. The firms have automated and digitized inventory

processes and that they have invested in inventory model to manage returns. Plastic bottling firms also indicated to have enough capability and capacity to manage reverse logistics.

The study concludes that reverse transportation has a positive and significant effect on the procurement performance of plastic bottling firms. It is concluded that the plastic bottling firms have outsourced returns collection function to a third party. This saves them administrative and operational costs involved in the processes. Also the returns are collected and transported back frequently and the companies own fleet of transportation modes to manage reverse transport needs. The empty bottles return earmarked points are sparsely dotted.

The study concludes that recycling has a positive and significant effect on the procurement performance of plastic bottling firms. It is concluded the plastic bottling firms have developed policies to guide on used bottle conversion processes. Further, results show that high standards are ensured during sorting of used bottles for recycle and that these firms have established plastic bottles collection points which are convenient to customers. The firms have established measured to ensure value recovery during the reverse logistics process of recycling.

The study concludes that logistics information systems has a positive and significant effect on the procurement performance of plastic bottling firms. It is concluded that the plastic bottling firms possess information systems to mine returns data for decision making. Also these companies have logistics information systems are reliable and the information sharing between the final consumers and the company is effective. The study concludes that the firms core functions are integrated by logistics information systems.

RECOMMENDATIONS

The researcher recommends that the management of plastic bottling firms should put measures and structures in place to ensure maximum empty returns as they were found to lead to procurement costs savings. To enhance efficiency, the plastic bottling firms should digitize and where necessary automate inventory processes for ease of management. The firms should invest in stock management models to manage returns. As the empty bottles returns requires huge resources in terms of space, the firms should develop capabilities to utilize minimal spaces to receive and store returned bottles.

The researcher recommends that the plastic bottling firms management should consider outsourcing the function of returns collection to third parties who are informal hence less costly. This would enable the firms to concentrate their resources and efforts on the conversion process. The returned bottles should be collected back to the firm frequently and the companies should opt for own fleet of transportation so as to ensure efficiency in the process of returns transportation.

The researcher recommends that the management of plastic bottling firms should develop policies to guide on used bottle conversion processes. In addition, the firms should observe high standards during sorting of used bottles for recycle. This would minimize rejects in the systems and save on procurement costs. The study recommends that the plastic bottling firms should establish visible plastic bottles collection points which are convenient to customers.

The researcher recommends that the management of the plastic bottling firms should invest in robust and reliable information systems to enable them keep track of empty bottles returns and assist in informed decision making. The companies should have end-to-end systems which are connected to consumers through mobile apps so that they may maximize on empty bottles return. The information system would make it possible for sharing between the final consumers and the company. Further, the information system would help link core functions by integrating them in the firms.

Areas of Further Study

The study points to several intriguing paths for future research. First, future researchers should consider examining the effect of reverse logistics and performance of plastic bottling firms in other regions or contexts. Second, future researchers should consider utilizing the longitudinal survey to examine the effect of reverse logistics and procurement performance over a period to time. Third, future researchers should consider examining the moderating effect of environmental turbulence on the relationship between reverse logistics and firm performance in other sectors or contexts.

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