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**Green Distribution Systems and Performance of Building and
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Green Distribution Systems and Performance of Building and Construction Manufacturing Firms in Kenya

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Abstract

Purpose: This study seeks to establish the relationship between green distribution systems and performance of building and construction companies in Kenya. Green logistics management is strategies that reduce the environmental and energy footprint of freight distribution, which focuses on material handling, waste management, packaging and transport. Green logistics consists of all activities related to the eco-efficient management of the forward and reverse flows of products and information between the point of origin and the point of consumption whose purpose is to meet or exceed customer demand green logistics activities include measuring the environmental impact of different distribution strategies, reducing the energy usage in logistics activities.

Methodology: This study adopted a cross-sectional research design approach. The target population was 900 employees drawn from the 54 building and construction manufacturing firms in Kenya. The sample size was 270 respondents which was determined through purposive sampling targeting departments in the 54 companies. Primary data was collected using a questionnaire. Quantitative data was analyzed through descriptive statistics (mean, standard deviation) and inferential statistics (ANOVA, P-value, t-test).

Findings: The findings revealed that green distribution systems significantly influenced the performance of the building and construction manufacturing firms in Kenya. The study concluded that through embrace of green distribution systems, performance of the manufacturing firms was obtained.

Unique Contribution to Theory, Policy and Practice: Embracing green logistics among other sustainable business practices among the organizations remains a blueprint for the government as one of the sustainable development goals. One of the ways that this can be achieved is through green distribution systems which would ensure sustainable flow of distribution of goods and services.

Keywords: *Green Distribution systems, green logistics, building and construction manufacturing firms, Firm Performance*

1.0 INTRODUCTION

1.1 Background of the Study

In measuring the environmental effects of logistics, it is important to distinguish first-order and second-order impacts (Paola & Susan, 2015). The first-order environmental impacts are those directly associated with freight transport, warehousing and materials handling operations. Second-order impacts result indirectly from these logistics operations and take various forms with the growing awareness of the importance of the environment condition; many governments have rules and legislations concerning the implementation of green logistics. Pressure that comes from the regulations and legislations considered to be one of the most crucial among reasons for practicing green supply chain (Murutu, 2016).

Freight transport and logistics operations are key to the quality of life and vital for the European Union competitiveness in performance and general environment management basically been influenced by the management green logistics. It is the backbone of the economy making the links between the different stages of production chains and allowing service delivered with consideration of environmental preservation through the green logistics initiatives. Road freight transport is the dominant mode of goods movement across the European Union it represents cost effective and flexible mode (Handfield, 2018). Its dominance especially in South East Europe (SEE) countries may also be attributed to the lower requirements for infrastructure, standards, and legal framework. However, road transport exhibits significant weaknesses contributing to considerable CO₂ emissions, due to the logistics technology been used and reverse logistic management (United Nations, 2012).

Ballot and Fontane (2010) define sustainable distribution practices as those that reduce carbon dioxide, are economically viable and will bring about a better quality of life for the earth's future inhabitants. According to Shang and Marlow (2005) green distribution practices range from changing the way distribution centres and vehicles are powered to implementing greater transparency regarding the environment and distribution practices. As environmental concerns increase, the integration of environmental issues into the supply chain studies have become a thriving subfield. Green Distribution Systems is a function that oversees, coordinates and facilitates various transport and transport related activities. That allows consumer goods, building and construction material moved to the site for use with minimum impact to environment and its surrounding (Daugherty, 2011).

Fleet management system is a function which allows transportation companies to minimize the risks associated with vehicle investment, improve efficiency, productivity and reduce their overall transportation and staff costs (Vamshidhar, 2013). Fleet management system helps the company to remove any possibility for drivers to misuse company's fuel spend. Fleet management system are of great use when it comes maintenance of your vehicle as it can enable you to set up custom maintenance alerts for regular tire or engine check-ups and low battery issues (Daugherty, 2011).

Maintenance addresses the basic things that could cause a problem in vehicles if they are not properly maintained (Ballot & Fontane, 2010). The logistician or FM develops an inspection check-list to be used by all drivers as a guide. Each day, the first driver to use a vehicle will inspect the vehicle using the check-list. Periodically organise a test drive each vehicle and report on its condition and also ensure that normal/regular service has been done for all vehicles;

Alexander and Martin (2013) indicate that vehicle life-cycle assessment a master vehicle inspection and servicing schedule is drawn up for one year a wall chart is recommended. This chart can show road tax renewal, annual inspection dates. Vehicle servicing is a compromise between inadequate attention, resulting in progressive deterioration in condition and the ensuing serious consequences, and too much attention, which is costly and unnecessary.

The adoption of green distribution systems presents an opportunity for manufacturing and construction industries to competently respond to the escalating expectation of the international community for resources conservation and to achieve environmental performance profitably by meeting the customer lead time using the right transport technology (Tamulis & zalgiryte, 2012). Environmental performance, which is related to reduction in emission, waste, and pollution incurred from logistic activities, and operational performance, is concerned with improvement in product development and delivery (Mohammad, 2015). Other than internal activities such as product development and manufacturing processes, managing physical product flows is considered essential for environmental protection from the logistics and international business perspectives (Terra, 2017).

A green image is favourable for transport performance in construction industries, particularly those with export and local orientation, to gain acceptance in the global market. By adopting Green logistics management there can spill-over effects nurturing customer preference for related products and services with avoidance for environmental incidents and the consequential legal costs and fines (Hazen & Hanna, 2011). While Green distribution systems promotes such actions as product return and recycling services for their products can be managed through the organisation reverse logistics initiatives.

1.2 Statement of the Problem

Building and construction manufacturing firms in Kenya have been known to be critical economic pillar with immense contribution to the GDP and the overall job creation (GOK, 2018). Despite the merit surrounding the building and construction manufacturing firms in Kenya, the firms have continually recorded a surge decline in performance over the past five years (KAM, 2017). According to KAM report (2017), most of the manufacturing companies in building and construction sector recorded over 15% decline in their annual turnover while the sector lost over 2.8% of its market share between 2013 and 2017. According to KAM (2020), in the period between 2015 and 2019, close to 45% of the building and construction manufacturing firms had recorded over 26% increase in their annual operational costs, with costs related to supply chain and logistics practices taking up to 48% of these costs. Empirical

studies have found that green distribution systems are integral in enhancing organization performance (Sinambela, Azizah, & Putra, 2022; Le, 2020; Hutomo, Haizam, & Sinaga, 2018). These studies have however focused on varied contexts and may not be generalized to a Kenyan context. This motivated the need for this study to assess the role of green distribution systems on the performance of building and construction manufacturing companies in Kenya.

1.3 Objectives of the Study

- i. To examine the effect of green distribution systems on performance of building and construction manufacturing firms in Kenya.

1.4 Research Hypotheses

1. H_A: Green distribution systems has a significant effect on the performance of building and construction manufacturing firms in Kenya

2.0 LITERATURE REVIEW

2.1 Theoretical Review

The study was informed by the theory of scientific management by Fredrick Taylor. The theory upholds on the need for organizational managers to embrace scientific means to run their daily operations of management (McKinnon, 2012). Building and construction manufacturing firms need to have proper operational planning, control, process design, quality control, cost accounting, and even fitting a job to a person. This is meant to enhance effectiveness and efficiency in the operations. For the supply chain processes, having an appropriate distribution system that is eco-friendly ensures that the distribution of goods is well-aligned to the emerging focus on eco-friendly operations. A management that upholds green distribution systems is keen to utilize scientific management, where decisions are made to secure the environment and minimize pollution (Muma et al., 2014).

2.2 Conceptual Framework

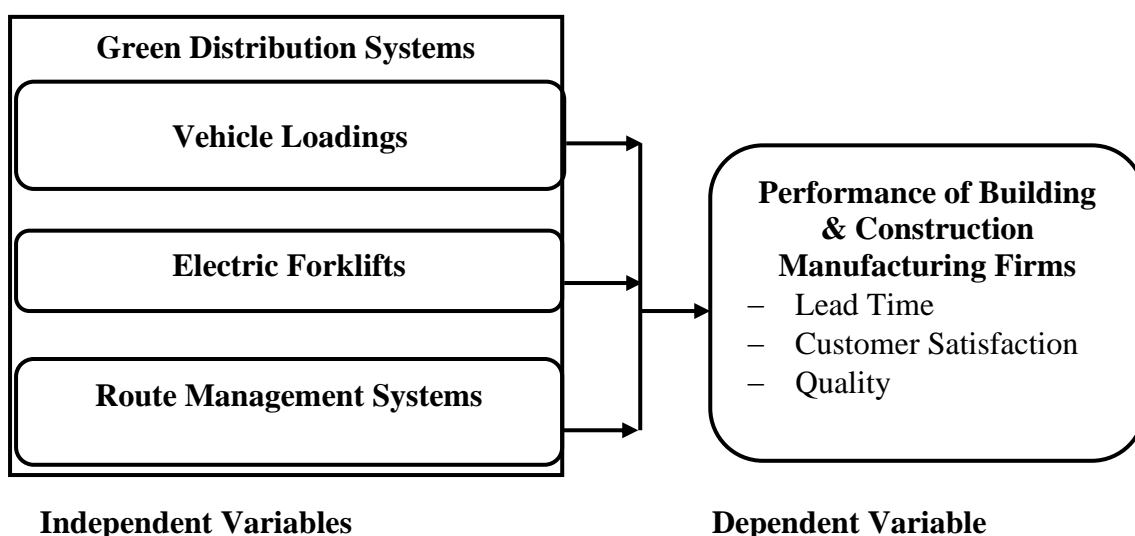


Figure 1: Conceptual Framework

2.3 Review of Empirical Literature

Daugherty (2011) in a review on logistics and supply chain literature found that dynamic green distribution systems enable carrier fleet operators to respond to changes in demand, driver and vehicle availability, and traffic network conditions. These systems are essential to take advantage of real-time information made possible by technological advances in location, communication, and geographic information systems, and to realize improvements in industry productivity and customer responsiveness.

The study established that the truckload carrier fleet operations, in which each assignment involves a vehicle moving a single load from the load origin to the load destination. The problem studied involves the management of a set of assets, namely a fleet of vehicles and a pool of drivers, to provide service to a set of customer load origins and destinations, distributed over a typically wide geographic region, on continued basis, over time. Ignoring the distinctions of company-owned and owner-operator fleets, it is assumed that the vehicle fleet (and driver pool) is under the operational control of a central authority, referred to as the dispatcher. The dynamic green distribution systems of interest are intended to support the decisions that must be made by the dispatcher, often under considerable time pressure. The study recommend that Shippers call a carrier requesting that a vehicle be available at a pickup location on a specific day and time to carry a load to a specific destination. The carrier (dispatcher) must decide quickly whether to accept a request to move the load. Assuming the carrier has accepted the load, a vehicle and driver moves the load from its origin to its destination.

3.0 RESEARCH METHODOLOGY

3.1 Research Design

The study used a cross-sectional research design. This design incorporates collection and analysis of cross-sectional data which according to Kothari (2014); enables intensive collection of in-depth data for the purpose of responding to the research questions. The cross-sectional research design will therefore be adopted to enable the use of a linear and multiple regression model to assess the relationship between green packaging and performance building and construction manufacturing firms in Kenya.

3.2 Target Population and Sampling

The target population for the study comprised of the building and construction manufacturing firms registered with under the Kenyan Association of Manufacturers. As of December 2020, there were 54 building and construction manufacturing firms registered under KAM. The firms deal with manufacture of building and construction materials and accessories including cement, glassware, steel and iron materials, precast and ready-mix concrete, and quarry construction and building materials.

The sampling frame was the 54 building and construction manufacturing firms in Kenya, as enlisted by the Kenya Association of Manufacturers. The unit of observation was the employees from the 54 building and construction manufacturing firms companies. According to KAM, the firms have employed over 6,000 employees. However, there are 900 senior management and administrative staff in the sector. These were the target population for the study from which the target population was obtained.

The study used a census to identify the units of analysis. This is where all the 54 building and construction manufacturing companies were included in the study. A purposive sampling was used to identify the units of observation, where the heads of 5 key departments involved the logistics processes and related activities were purposively selected. This implies that in every firm, 5 respondents were drawn, making the sample size to be 270 respondents which is 30% of the target population (900).

3.3 Data Collection and Analysis

This study used primary data which was collected using a structured questionnaire. The questionnaire was deemed appropriate due to its ability to collect a wide range of data and cover a high number of respondents within a reasonable period of time. The questionnaire was administered both manually (physically) and through online means. Descriptive statistics such as frequency distributions and percentages were used to summarize basic features of the data in the study. Inferential statistics were used to test the hypothesis through the following regression model:

$$Y = \alpha + \beta_1 X_1 + \varepsilon$$

Where:

Y = Performance of Building and construction manufacturing firms

α = the Constant

β_1 = the coefficient of the independent variable

X_1 = Green Distribution System

ε is the error term

4.0 FINDINGS AND DISCUSSIONS

4.1 Response Rate

The study had a sample of targeted 270 respondents drawn from building and construction manufacturing firms in Kenya. A total of 270 questionnaires were issued to the respondents in their areas of work and others through online means. Out of the 270 issued questionnaires, 228 were dully filled and returned back for analysis. This represented a response rate of 84.4%. According to Saunders and Thornhill (2009), when a response in a social science study with a sample size of over 100 respondents is more than 60%, it means the study has obtained adequate number of respondents to draw conclusions and represent the views of the

sampled population. The response of 84.4% was therefore concluded to be adequate in this study.

4.2 Green Distribution Systems

The study sought to assess the influence of green distribution systems on the performance of building and construction manufacturing firms in Kenya. Green distribution was assessed in terms of vehicle loadings, electrical forklifts and decentralized production. The respondents were asked to indicate their level of agreement or disagreement with specific statements drawn from these aspects, based on a 5-point Likert's scale. Strongly Disagree (SD) represented 1, Disagree (D) was 2, Neutral (N) = 3, Agree (A) = 4 and Strongly Agree (SA) = 5. Table 1 shows the findings. The findings concur with those by Bechtsis *et al.* (2017) who established that among the major challenges that were facing building and construction manufacturing firms was lack of more effective distribution systems that were innovative and eco-friendly. Agyemang *et al.* (2018) established that though adoption of distribution systems that are strategic and friendlier to the environment, customer satisfaction is enhanced, while achieving cheaper, effective and timely deliveries to the customers.

Table 1: Descriptive Statistics on Green Distribution Systems

Statements	Mean	Std. Dev.
Our company consolidates loads to avoid sub-optimal use of transportation	2.65	1.26
Our company pools together Less-Than-Load (LTL) cargo when distributing to ensure maximum use of trucks	3.02	1.22
The vehicle loadings in our organization are arranged based on the customer locations for easier delivery	2.74	1.25
The firm has vehicle management systems to ensure optimal utilization of vehicle capacities	2.81	1.19
Our company has sought certification of its delivery vehicles to ensure their compatibility with environmental policies	2.96	1.12
Less congested routes are preferred when making deliveries to our customers	2.87	1.13
Routes with sequence delivery stops are preferred in our company for easier distribution	3.07	1.15
Our company has a demand responsive system where goods are delivered out of expressed demand	2.81	1.25

The company has systems of sharing demand data with the suppliers to help 2.72 1.33
synchronize supply with demand

4.3 Descriptive Results on Firm Performance

The study sought to find out the opinions of the respondents regarding the performance of their respective organizations. They were asked to indicate their level of agreement or disagreement on specific statements on organizational performance based on a 5-points Likert's scale. As the findings on Table 2 portray, the respondents disagreed that their respective companies had drastically reduced the rate of customer returns over the past five years (Mean = 2.68; standard deviation= 1.00) and that the cost of operations in their respective firms had reduced for the past five years (Mean = 2.50; standard deviation= 1.23). The results imply that the performance of the construction companies has not been effective, thus raising the need for green logistics to boast their cost saving, enhancement of quality and meeting customer satisfaction.

Table 2: Descriptive Statistics on Firm Performance

Statements	Mean	Std. Dev.
Our company has drastically reduced the rate of customer returns over the past five years	2.68	1.00
The cost of operations in our firm has reduced for the past five years	2.50	1.23
Our company has seen an increase in the sales revenue for the past five years	2.89	1.07
There are fewer customer complaints with regard to our products over the past five years	3.18	1.10

4.4 Correlation Analysis on Green Distribution Systems and Firm Performance

The study was set to establish the relationship between green distribution systems and the performance of building and construction manufacturing firms in Kenya, using correlation analysis. As the results on Table 3 reveal, the Pearson Correlation for the variable was 0.649, at a significant level of $0.000 < 0.05$. The results imply that the correlation between distribution systems and performance of building and construction manufacturing firms in Kenya is strong and significant.

Table 3: Correlation between Green Distribution Systems and Firm Performance

		Firm Performance	Green Distribution Systems
Firm Performance	Pearson Correlation	1	.649**
	Sig. (2-tailed)		.000
	N	228	228
Green Distribution Systems	Pearson Correlation	.649**	1
	Sig. (2-tailed)	.000	
	N	228	228

4.5 Hypotheses Testing

H_A: Green distribution systems has a significant effect on the performance of building and construction manufacturing firms in Kenya

The study sought to establish the influence of green distribution systems on the performance of building and construction manufacturing companies in Kenya. The model summary results are as shown in Table 4. As the results portray, the R² for the model is 0.422. This implies that 42.2% of the variation in the performance of building and construction manufacturing firms will be as a result of green distribution systems.

Table 4: Model Summary on Green Distribution Systems and Firm Performance

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.649 ^a	.422	.419	.42730

a. Predictors: (Constant), Green Distribution Systems

The Analysis of Variance (ANOVA) results are as shown in Table 5. As the results portray, the F-statistic for the variable is 164.710 at a significant level of 0.000<0.05. The findings imply that the model is statistically significant for predicting the relationship between green distribution systems and performance of building and construction manufacturing firms in Kenya.

Table 5: ANOVA Test Results on Green Distribution Systems and Firm Performance

Model		Sum Squares	of df	Mean Square	F	Sig.
	Regression	30.074	1	30.074	164.710	.000 ^b
1	Residual	41.264	226	.183		
	Total	71.338	227			

a. Dependent Variable: Firm Performance

b. Predictors: (Constant), Green Distribution

The regression coefficients for the relationship between green distribution systems and performance of building and construction manufacturing firms in Kenya are as shown in Table 6. As the results portray, the Beta coefficient for green distribution systems is 0.608. This implies that a unit change in green distribution systems would influence the performance of building and construction manufacturing firms by 0.608 units. The P-value for the model was $0.000 < 0.05$. This implies that the green distribution systems has a significant influence on the performance of the building and construction manufacturing firms in Kenya, hence the alternative hypothesis is accepted.

Table 6: Regression Coefficients on Green Distribution Systems

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	1.200	.148		8.113	.000
1	Green Distribution Systems	.608	.047	.649	12.834	.000

a. Dependent Variable: Firm Performance

4.6 Discussion

The study sought to assess the effect of green distribution systems on the performance of building and construction manufacturing firms in Kenya. The analysis of the descriptive statistics revealed that consolidation of loads as a strategy to avoid sub-optimal use of the

transportation was not effectively upheld in most of the manufacturing firms surveyed. The firms also did not pool together less-than-load cargo when distributing to ensure maximum use of trucks. Vehicle loadings in most of the building and construction manufacturing firms were not arranged based on the customer locations despite this being an effective way of easing and speeding-up the delivery process thus saving on costs and enhancing customer satisfaction. The firms lacked an effective way of ensuring use of lesser congested routes and having sequence stops routes preferred over routes with minimal delivery stops. The findings are a clear indication that the building and construction firms are not effective in embracing the green distribution systems. This is despite distribution through sustainable practices being an essential way that modern firms are using not only to save on operational costs but also to enhance efficiency and ensure proper lead-time reduction. The inferential analysis of the study model revealed that green distribution systems had a positive and significant effect on the performance of manufacturing firms in the building and construction sub-sector.

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The study concluded that green distribution systems had a significant and positive effect on the performance of the building and construction manufacturing firms in Kenya. The green distribution aspects such as use of vehicle loadings and embraces of electric forklifts and use of route management systems are essential ways of ensuring effective distribution that is time consuming and with minimal vehicle distance, thus reducing costs and environmental pollution. The study concluded that while most of the manufacturing companies in the building and construction sub-sector in Kenya face issues with route management and overall distribution and transportation challenges, the embrace of green distribution systems is minimal. This could be one of the aspects that may be leading to poor performance of the firms. The study further concluded that firm characteristics significantly moderated the relationship between green distribution systems and performance of the manufacturing firms.

5.2 Recommendations of the Study

The study recommends that the managers and other key stakeholders in the construction and building manufacturing firms steps up to adopt the green distribution systems as one of the aspect of green logistics. Distribution is one of the major activity in the logistics process, and accounts to a major share of the logistics and supply chain budget, especially in the manufacturing industry. Embracing sustainable distribution through vehicle loading systems, and route management systems, therefore, would play a significant role in promoting the effectiveness of distribution processes, thus enhancing firm performance.

Embrace of green logistics among other sustainable business practices among the organizations in the country remains a blueprint for the government as one of the sustainable development goals. The government therefore ought to incorporate policing and governance framework that provide guidance to the manufacturing firms on how to embrace green logistics as one of the sustainable practices. The government through key arms such as the

parliament should come up with policies that highlight the key green logistics practices to be adopted by the building and construction manufacturing firms. This will ensure that the firms have a clear and common direction towards incorporating aspects such as green packaging, reverse logistics, logistics innovation and green distribution systems to enhance performance.

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