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RESEARCH ARTICLE OPEN ACCESS

Reverse Logistics and Construction Sector Performance

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Abstract
The concept of reverse logistics in the construction sector is the movement of products and materials from the end user to the manufacturer/recycler or to a new construction site. The objective of this study is to determine the role of reverse logistics on the performance of construction sector, with the aim of promoting this concept among industry stakeholders and the wider construction industry. Through a quantitative analysis, the study was carried out using questionnaire as the main data collection instrument. First, the trend of research and terminology related with reverse logistics is introduced. Second, it unearths the main advantages and barriers of reverse logistics in construction while providing some suggestions to harness the advantages and mitigatethese barriers. Finally, it provides a future research direction based on the review

Background of Study

Introduction

The concept of reverse logistics has been intensively applied inthe manufacturing sector, however its uptake in the construction industry is limited (Kibert, 2012). Despite the interest in re-use, recycling and general sustainability concerns, the sector has not fully exploited the potential of reverse logistics network that is connected to the traditional forward logistics (Ballou, 2007). This is in the backdrop of construction industries famously being the largest contributor of waste to landfills (Manowong, 2012) adversely affecting urban and socio-economic environment (Tam et al., 2014).Implementing reverse logistics has proven to be an effective strategy to make organizations more competitive in the manufacturing sec-tor (Lau and Wang, 2009). Additionally, environmental regulations inevitably lead organizations to embrace reverse logistics principles in their businesses (Hosseini et al., 2015). Furthermore, organizations also implement in response to consumer demand and to boost its environmental image (Bai and Sarkis, 2013). Hence, adopting reverse logistics has become essential for manufacturing organizations in today's business environment (Bai and Sarkis, 2013). Similarly, empirical evidence has proved that reverse logistics frameworks developed for the manufacturing industry would be just as beneficial for other industries, including construction (Chinda, 2013 and Poon, 2014).

Conventional logistics (forward logistics) represent the activities of organizing, managing and controlling the flow of materials from the points of raw materials extraction up to its use in a construction site (London, 2007). Supply chain management in the construction context has been described as 'the network of facilities and activities that provide customer and economic value to the functions of design development, contract management, service and material procurement, materials manufacture and delivery, and facilities management' (Love et al., 2004). Albaloushi and Skitmore (2008) defined supply chain management for the construction industry as 'all construction processes from the initial demands by the client/owner through design and construction, to maintenance, replacement and ultimate demolition of projects'. According to (Tennant &Fernie, 2014) SCM in the construction context is of vital importance since the

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commercial exchange of goods and services in a construction project typically account for approximately 75%–90% of the total project cost'. Forward logistics primarily involves movement of materials from the point of origin towards consumption points.

Statement of the problem

The need to adopt reverse logistics in the construction sector is driven by three distinct areas of environmental sustainability, economic reasons and social requirements (Jaillon& Poon2014).Economic concerns represents the ever escalating cost of both labour and materials thus affecting the overall budget of the construction projects.

Construction sector is the fourth largest economic activity in Kenya contributing GDP growth of over 850 billion Kenya Shilling in the year 2021.Over the past two years, the world has been experiencing significant supply shortages and delays. Indeed, after months of dealing with the impact of the pandemic, supply chains have also been rattled by the ongoing conflict between Russia and Ukraine. This supply chain crisis has had a severe impact on many industries. Due to the pandemic, businesses often shut down or faced a shortage of workers. This, in turn, affected the production and trade of many key products and resources. A survey showed 94% of Fortune 1000 companies experienced supply chain disruptions from the pandemic. Months later, the conflict in Ukraine exacerbated the increase in commodity prices that had already been observed during the pandemic. It has also led to increase in transportation costs due to rising fuel prices and airspace bans (KAM, 2022).

In the light of the above, this study seeks to address the knowledge gap by investigating the contribution of reverse logisticsto the performance of construction sector in Kenya.

Objective of Study

The objective of this study is to underscore the role of reverse logistics on the performance of construction sector in Kenya.

Significance of the Study

Construction sector is the third largest economic activity in Kenya contributing to over 1 trillion Kenya shillings in the financial year 2020-2021.The has been occasioned by numerous construction project hat have been undertaken by both private firms and government. The focus has majorly been on construction of roads, railway lines, residential and commercial buildings as well as irrigation infrastructure projects (KNBS, 2021).

This study will provide a solid platform for underscoring the pivotal role of reverse logistics in streamlining the performance of logistics sector in Kenya and beyond. The findings of this research will provide key insights to the industry stakeholders on how they can leverage on reverse logistics to make construction sector more responsive to customer ever changing requirements.

Scope of study

This researched focused on the role of reverse logistics in enhancing the performance of construction sector in Kenya. The main variables of interest were reverse logistics as an independent variable and performance of construction sector as a dependent variable. The research was undertaken in all the construction companies in Nairobi County.

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Theoretical Framework

These are theories used to illustrate influence of user department's role on the procurement process in various institutions. The most common ones include; Systems theory, expectancy theory and institutional theory

The following two theories were used to illustrate the relationship that exists between reverse logistics and performance of construction sector. They include Systems Theory and Resource Based Theory.

Systems Theory

This theory was proposed by Ludwig von Bertalanffy in the year 1940. The theory holds the belief that an organization or an industry is an open system that interacts with its environment. This theory is concerned with interdisciplinary study of systems. A system can be viewed as a cohesive conglomeration of interconnected and symbiotic parts that are either natural or manmade. Every system is defined by its longitudinal and temporal boundaries, surrounded and influenced by its environment, described by its structure and purpose or nature and expressed in its functioning. In terms of its effect, a system can be more than the sum of its parts if it expresses synergy or emergent behavior. Changing one part of the system usually affects other parts and the whole system, with predictable patterns of behavior (Galbraith 1997). The goal of systems theory is systematically discovering a systems dynamic forces, constrictions, conditions and expounding principles that can be discerned and applied to systems at every level of nesting and in every field for achieving optimized equifinality (Davis, 1998).The systems theory underscores the importance construction sector and how it has an interdependent relationship with other sectors particularly logistics.

Resource Based Theory

This theory was proposed by Wernerfelt in 1980s and 1990s. The resource based theory standpoint argues that sustained competitive advantage is generated by the unique bundle of resources at the core of the firm (Corner and Prahalad, 2008; Barney 2010). Therefore resource based approach explains how business owners build their business from the resources and capabilities that they possessed or can acquire (Dollinger, 2008). The term resources was conceived broadly as anything that can be thought of as strength or a weakness of the firm (Wernerfelt, 2009). This theory addresses the central issue of how reverse logistics can be endowed with requisite inputs such as recycling, managing of returns,refilling of empties and after sale maintenance that can yield better performance for the construction industry. The theory further elucidates various inputs in reverse logistics that can be converted into valuable outcomes for economic transformation.

Conceptual Framework

Reverse logistics plays a critical role in driving the performance of the construction industry. This conceptual framework highlighted the key variables of study which included Reverse logistics and performance of construction industry.

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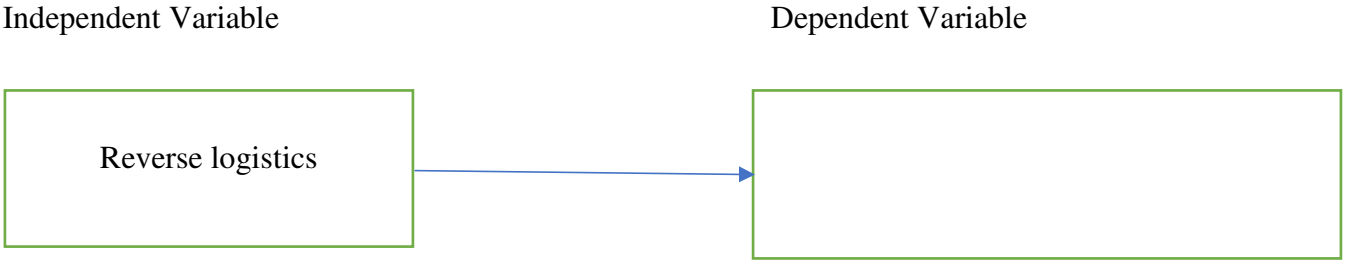

Reverse Logistics

Construction industry refers to the industrial branch of manufacturing that is concerned with general building, repairs, renovations, electrical installation, plumbing and maintenance of infrastructures. The construction industry is recognized as a sector with great contribution to the economic and social development of a country, particularly due to the number of direct and indirect jobs generated and its influence on several other sectors which produce materials, equipment, and services in its production process. It is usually one of the first sectors to signal a region's financial situation, in times of both exponential development and economic recession. The key players in supply chain for construction includes: engineers, architects, prime contractors, material suppliers and project owners (Crocker et al, 2012).

Construction practitioners have traditionally considered the direction of flow of materials from the point of extraction up to its consumption. Even so, researchers have re-iterated that idealconstruction supply chain management should attempt to resemble the natural processesin which resources are consumed efficiently with no residualwaste (Kibert, 2014).

Construction Sector Performance

The construction sector has witnessed an increase in the volume of projects being undertaken all over the world. This trend is driven by positive economic growth, low interest rates and strong demand, revenues for the sector look set to continue an upward trajectory in the coming years.Anincreased level of output not only means lots of opportunities for growth and expansion across the construction sector, it also means increased pressure on supply chains.

Construction supply chains face several distinct challenges and risks when compared to other sectors, and without active management, projects can begin to drain resources, time and money. Every construction project is unique, and they will often involve teams of consultants, contractors and suppliers that only ever work together once. As a result, supply chains can include a wide array of procurement systems, organizations and disciplines. On larger, more complex projects responsibility can get lost further down the supply chain as you reach a large group of smaller suppliers. Knowing everyone in your supply chain and what they are doing daily can be difficult for management (Sassi, 2008).

METHODOLOGY

Research Design

This study employed descriptive research design since the design describes the characteristics of variables as they are. The descriptive research design is appropriate in the study because it aims at describing the relationship that exists between user departments and the procurement process.

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Descriptive research design enabled the researcher to clearly define the key parameters to measure and provided adequate methods for measuring with a clear definition of the population of study. It aims at obtaining complete and accurate information from the respondents (Mugenda and Mugenda 2003).

Population

The target population for this study was all the construction firms in Nairobi. The study population comprised 1200 employees drawn from construction companies in Nairobi who are registered with National Construction Autjority (NCA).

Sample and Sampling Technique

Owing to the homogeneousness of the population the study applied simple random sampling to select the sample size. The rationale behind selection of simple random sampling is because it gives an equal chance to every respondent in the target population to be selected for study thus minimizing on biasness as well as making it easy to generalize and gather the findings. The number of employees directly involved in the construction sector management among these companies is 1200. A sample size of 360 from a target population of 1200 employees was selected. This fulfilled the minimum threshold sample size suggested by Patton (2002) who recommended 30% of the target population as an adequate sample in a descriptive case study.

Research Instrument

The study employed questionnaire as the primary data collection technique. The questionnaires contained both open ended and closed ended questions. Questionnaires are operative instruments since they allow they allow the respondents to give much of their opinion as far as the research problem is concerned (Dempsey, 2008).According to Kothari (2006), Information obtained from questionnaires is free from any bias and influence from the researchers.

Data Analysis

The study generated both qualitative and quantitative data owing to the nature of the instrument to be adopted which includes both open and closed ended questions. Both quantitative and qualitative analysis was executed through descriptive statistics such as frequencies, percentages, mean, median and mode with the aid of statistical package for social sciences (SPSS) version 23.0.

Research Findings

Introduction

The objective of this study was to underscore the role of reverse logistics on the performance of construction sector in Kenya. Descriptive statistics were used to analyze the data which was collected through questionnaires. This included percentages, pie charts, graphs and tables.

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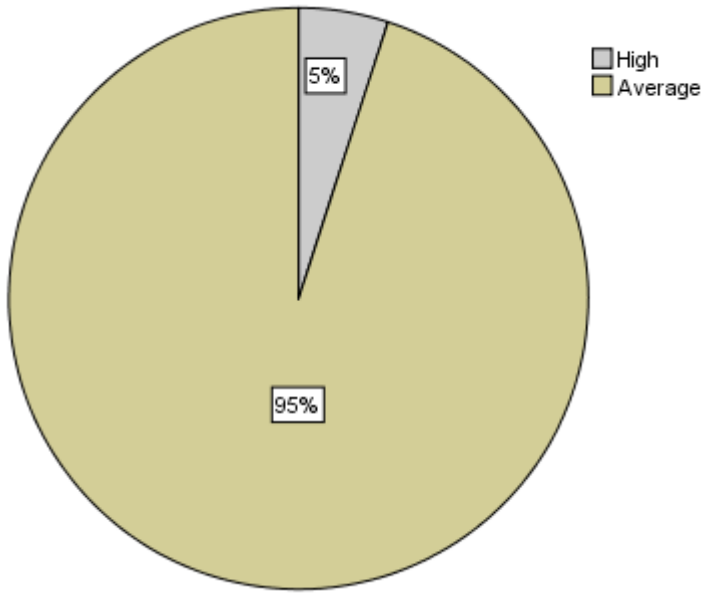
Table 4.1 Response rate

Response Rate	Frequency	Percentage
Response	330	91%
Non response	30	9%
Total	**360**	**100%**

Reverse Logistics

The study sought to establish the role of reverse logistics on the performance of construction sector in Kenya. Respondents were asked to indicate the key components of reverse logistics applied in their companies and the importance of each of the components in achieving the desired level of performance. The study established that 95% of the respondents rated high for each of the components and 5% rated average as shown in figure 4.4 .



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Construction Sector Performance

The study sought to find out how reverse logistics enhanced the performance of construction sector in relation to quality, operating cost,lead-time, profitability and waste management . The responses were as indicated below

Table 1.1

Construction Sector Performance	VS	S	No opinion	DS	VDS
Quality of Materials	0(0%)	13 (67%)	0(0%)	3 (13%)	0(0%)
Construction cost	0(0%)	2 (8%)	7 (33%)	11 (58%)	0(0%)
Project timeliness	0(0%)	16 (83%)	2 (8%)	2 (8%)	0(0%)
Operating costs	0(0%)	11 (58%)	5 (25%)	3 (17%)	0(0%)
Total lead-time	0(0%)	18 (92%)	2 (8%)	0(0%)	0(0%)
Overall profitability	5 (25%)	11 (58%)	2 (8%)	2(8%)	0(0%)
Ability to get stakeholder feedback	4 (20%)	7 (33%)	5 (27%)	4 (20%)	0(0%)
Waste management	0(0%)	11(58%)	2 (10%)	7 (33%)	0(0%)

Key: Key: VS (very satisfied), S (satisfied), DS (dissatisfied), VDS (very dissatisfied)

Conclusions and Recommendations

From the findings of this study, it can be concluded that reverse logistics is a critical driver of performance in the construction industry since it ensures efficient use of natural resources and encourages recycling as a way of not only saving on operating cost but also safeguarding the environment. Owing the massive waste generated by the numerous construction sites in the country, there is an increasing pressure from government and other stakeholders on the adoption of best practices to be adopted in order to minimize on the waste and possibly reuse some of the scrap materials.

Over the time reverse logistics has proven to be a sustainable practice that could offer numerouspaybacks to the construction industry if it is adopted in a pro-active manner. However, there still exists massive potential from reverse logistics that is yet to be unlockedby the industry stakeholders**.** From the study findings, it is clear that there is a need to have a very pragmatic approach on the key thematic areas of construction sector that urgently requires integration of reverse logistics in order for construction firms to remain competitive in the current volatile business environment.

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QUESTIONNAIRE

Part A: Employee Profile

The administration of this questionnaire is purely for academic purposes. The study seeks to determine the relationship between Reverse logistics and construction sector performance. All the information provided will be treated with utmost confidentiality. Answer all the questions as indicated by either ticking an option that applies or filling in the blanks.

SECTION 1: PERSONAL INFORMATION

Department…….…….

1. Age

a) 18 – 25 years ( )
b) 26 – 35 years ( )
c) 36 – 45 years ( )
d) Over 46years ( )

2. Academic/professional qualifications

a) Secondary ( )
b) Certificate ( )
d) Diploma ( )
e) Degree ( )
f) Advanced Degree (Masters Level) ( )

3. Working experience

a) Less than 2 years ( )
b) 3 – 6 years ( )
c) 7 – 10 years ( )
d) Over 10 years ( )

SECTION 2: Reverse logistics

4. Identify the main form of reverse logistics applies in your organization

Recycling ( )
Return management ( )
Refilling of empties ( )
After sale service ( )
Repair and rectification ( )

5. On a scale of 1 to 5, one representing lowest score and five highest score, indicate the importance of the following components of reverse logistics to your industry?

Reverse logistics	5	4	3	2	1
Rental and leasing					
Packaging management					
End of life recycling					
Refurbishing					
Return management					

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6. How can you rate your adoption of reverse logistics?

(Tick as appropriate)

5 Very Good	4 Good	3 Fair	2 Poor	1 Very Poor

SECTION 3: Construction Sector performance

7. On a scale of 1 to 5, 1 representing very dissatisfied and 5 very satisfied . (Tick as appropriate)

Industry Performance	5-Very satisfied	4- Satisfied	3- Indifferent	2-Dissatisfied	1-Very dissatisfied
Quality of materials used					
Cost of construction					
Project timeliness					
Operating costs					
Total lead-time for materials					
Overall profitability of projects					
Ability to get stakeholder feedback					
Waste management					

THANK YOU

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