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Impact of Logistics Management Practices on Construction Firms' Performance in Abuja, Nigeria

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Abstract

Construction projects are characterized by a unique element of temporariness as production is carried out at the final place of consumption with new production sites in each new project. This uniqueness indicates that logistics in construction needs to be managed in a more dynamic way to and from sites. Unfortunately, the Nigerian construction industry faces challenges of corporate logistics leading to delayed and inaccurate information, incomplete services, slow and inefficient operations, and a high product damage rate. The study therefore assessed the impact of a set of logistics activities on construction firms' performance in Abuja with a view to enhancing project delivery. The study adopted a quantitative research approach using the survey research design. Structured questionnaires were used to collect data from 327 logistics officers of construction firms registered with Corporate Affairs Commission, Abuja at a response rate of 30.58%. Analysis of data was undertaken using descriptive statistics such as percentage, frequency counts and Mean Item Score (MIS); and inferential statistics such as Spearman Rank (rho) correlation analysis with the aid of IBM 23.0 SPSS software. The study identified thirteen (13) logistics management activities, of which ones adopted the most were "Order Processing" (MIS = 4.48), "Replenishment" (MIS = 4.40) and "Dispatching" (MIS = 4.40). The logistics management activities adopted the least were "Tracking" (MIS = 3.62) and "Transportation" (MIS = 3.48). The study also identified nine (9) Key Performance Indicators required in testing logistics management practices, out of which the most important ones were "Quality" (MIS = 4.53) and "Serviceability" (MIS = 4.50). It was also revealed that there exists a strong, positive and significant relationship between the adoption of combined logistics management activities and construction firms' performance in Abuja ($r = 0.568$; $p = 0.000$). The study concludes that the impact of a set of logistics activities on construction firms' performance in Abuja is significant and can enhance the delivery of construction projects. It was therefore recommended that in order to enhance the level of adoption of logistics management practices, construction firms should develop a mechanism that will be based on reduced delays in material delivery, minimization of disruptions caused by material shortages or logistical bottlenecks and maintenance consistent progress on construction projects.

Keywords: construction firms, impact, logistics management, performance, practices

1. Introduction

Completing construction projects in a timely manner with their numerous constrains requires the skillful integration of many aspects. One of these aspects, which plays a crucial role in ensuring that construction projects are completed successfully, is labour productivity. Construction project sites are impacted by several factors that affect the efficiency of a workforce by reducing their overall productivity. Such a loss of efficiency interferes with the performance of an entire project, and reduces management's chances of meeting project quality, budget, and time objectives (Oluwajana *et al.*, 2022). Conversely, by increasing overall productivity through improving labour force productivity, construction companies would reap many more benefits from their projects. One of the most obvious causes of lost productivity is the poor management of materials, equipment, and tools—or "logistics management". Hence, construction logistics can be defined as "the management of the flow of materials, tools, and equipment (and any related object) from the point of discharge to the point of use or installation (Almohsen and Ruwanpura, 2013). Bringing together and coordinating the management of these three vital components between the project's principal parties would increase productivity substantially. On a construction site, these components must be properly managed in order to ensure a project's success (Almohsen and Ruwanpura, 2013). Ineffective management, on the other hand, will result in conflicts between these aspects. These conflicts will ultimately cause project delays, and cost overruns.

Furthermore, construction projects are characterized by an element of temporariness as production is carried out at the final place of consumption (Ekeskär and Rudberg, 2016), with new production sites in each new project. This differs from other industry contexts where the place of consumption is decoupled from the place of production and the production facilities are, to a greater extent, fixed in their location. These differences indicate that logistics in construction needs to be managed in a more dynamic way as the project conditions will dictate how logistics is carried out on-site (Spillane *et al.*, 2013; Spillane and Oyedele, 2017) as well as to and from sites (Ghanem *et al.*, 2018; Ying *et al.*, 2021). At the same time, construction is material intensive and according to Scholman (1997), 60%–80% of the

gross work involves purchased materials and services and approximately 40% of the project cost is made up of logistics costs (Jang *et al*., 2003). Therefore, this suggests that logistics management should be a priority in the construction industry. However, according to Petter and Mats (2023), logistics management has traditionally been approached in an ad hoc manner by construction projects and not as an opportunity to improve the construction projects' performance. Instead, construction projects have solved their daily logistics activities on a day-to-day basis (Ying *et al*., 2018; Petter and Mats, 2023). Hence, the need for new technological approach.

The need to develop and utilise new technology globally has made the construction industry undergo fundamental transformations, in order to raise the levels of firms' performance and to compete globally (Mohammed and Ali, 2016; Preidel and Borrmann, 2015). The logistics technology used in order processing operations in the Nigerian construction industry is outdated, ineffectual, and often overlooked, due to its weak contributions to project performance (Yahaya *et al*., 2020). According to Bengtsson (2019), these technologies are required at every stage of the logistic process, in order to increase the efficiency and effectiveness of the process, so that projects will be completed within budget, schedule and the anticipated quality. Dim *et al*. (2015) believed that some design teams, contractors and suppliers have little knowledge of recent technologies and logistics tasks in construction. Therefore, identifying the appropriate tasks and their relevant technologies in the construction industry would help integrate and facilitate the processes of logistics management practices (Polacco, 2016).

Unfortunately, in the construction industry, the general problems that arise in corporate logistics include delayed and inaccurate information, incomplete services, slow and inefficient operations, and a high product damage rate. The consequences are an inability to provide inter-linked services, high operating costs, a rate of high inaccuracy, and a lack of flexibility in responding to changing demand requirements (Appiah, 2021). This is due to the fact that logistic technologies for effective and efficient 'order processing operations' in the areas of tracking, shipping, replenishment, dispatching and holding of inventory are deficient in the Nigerian construction industry, when compared to manufacturing and retailing sectors (Isah *et al*., 2021). Thus, the research problem statement is "the construction firms suffer poor performance in the project delivery due to inefficiencies and ineffectiveness in current logistics management practices". This is confirmed to have a significant effect on the performance of the construction sector.

In addition, previous studies have made lots of efforts to improve logistics management practices in the construction sector both internationally and locally. In line with the international domain, it has been reported that the current on-site construction process is hampered by inefficiencies and limited in terms of opportunities for technological innovation in Finland (Barkokebas *et al*., 2015). In addition, Adelwini *et al*. (2023) reported that poorly managed logistics have been found to lock up almost 70% of a company's entire current assets, impacting both its operational and overall performance. It could also open large gaps in internal controls, exposing manufacturing organisations to financial risks, such as theft and fraud schemes, production and delivery delays, numerous faulty products, and wasteful product shortages in Nigeria (Ogah *et al*., 2022; Orobia *et al*., 2020). Furthermore, in the Nigerian context, researches conducted by Fadiya (2012) and Bhandari (2014) on logistics management have focused on transportation, forecasting, effectiveness or efficiency in logistics supply chain and so forth in Nigeria. There is, however, hardly any focus on logistics technology, especially in the use of order processing technology for improving construction logistic processes. This therefore leaves a wide gap in the Nigerian construction logistics processes (Dim *et al*. 2015; Fatnani and Malik, 2015; Polacco, 2016). Impliedly, the technological aspect of construction logistics, especially the order processing, is over-looked, and little is understood in the Nigerian construction industry. In order to fill this gap. This study sets out to assess the impact of a set of logistics activities on construction firms' performance with a view to enhancing project delivery using Abuja as the study area. Abuja was chosen as the study area because it is the capital city of Nigeria where both indigenous and multinational construction companies execute most of their projects in Nigeria (Kadiri *et al*., 2014). This is because a reasonable number of construction activities take place in Abuja. This was due to the fact that Abuja experiences rapid population increase and new developmental projects daily as a result of rapid urbanisation and rural-urban migration. This leads to constant increase in demand for shelter for both residential and commercial purposes.

In view of the above backgrpound, it is necessary to assess the impact of a set of logistics activities on construction firms' performance in Abuja with a view to enhancing project delivery. In order to achieve this aim, this study examined the current level of adoption of logistics management activities by construction; barriers to the adoption of logistics management activities for improved performance of construction firms; drivers for enhancing the adoption of logistics management activities for improved performance of construction firms; and relationships between a set of logistics activities and construction firms' performance in Abuja.

In the light of the fourth objective of this study, as well as review of related literature relating to it, the following pair of hypotheses have been formulated in order to address the problem and achieve the aim of the study:

H_0: *Logistics activities do not have a significant relationship with construction firms' performance in Abuja.*

H_A: *Logistics activities have a significant relationship with construction firms' performance in Abuja.*

2. Literature review

2.1 Adoption of logistics management activities by construction firms

Logistics can be defined as the process of planning, operating and controlling and managing of resources of supply chain, from original point to the point of destination, such as raw material gathering and distribution for example delivering goods to the correct location at the right time, in a right amount of quantity and quality and at a reasonable price (Mohd *et al*., 2018). In addition, Lundesjo (2015) added that there are five elements ("five right") that needed to be considered to define logistics that are right place, time, quality, quantity and price. Therefore, to define logistics is seen to vary. However, the fundamental of logistics is concerning on goods movement and storage, that includes the information flow throughout the supply chain.

In addition, logistics management can be defined as the process of strategically managing the procurement, movement and storage of materials, parts and finished inventory (and the related information flows) through the organisation and its marketing channels in such a way that current and future profitability are maximized through the cost-effective fulfillment of orders (Kabadurmuş, 2019). Unfortunately, over the last years, construction industry's performance, especially in developing nations, has deteriorated in the Logistics Performance Indicators. According to Kabadurmuş (2019), firms in the logistics industry are worried about global economic recession as it affects the volume of trade and thus performance of the sector. Moreover, they also see technological advancement and improvement in infrastructure as the most important factors that can contribute to their competitive position.

Managing construction projects requires an integrated process to ensure that they are completed on time, within budget, and according to the contract specifications. Labour force productivity enhancement, which typically reduces costs and increases productivity, requires key activities for a successful and efficient logistics management. In view of this, Appiah (2021) provided a brief account of and described the key activities involved in logistics management. These key activities are: Network Design; Order Processing; Procurement; Materials Handling; Inventory Management; Packaging and Labeling; Storage/Warehousing; and Transportation.

Before the COVID-19 virus, the logistics sector and most other industries were slowly or gradually adopting new technologies. Due of the strong restrictions placed on the movement of people and commodities, the pandemic severely impacted the operations of logistics companies. Technology adoption in the sector was accelerated to encourage the development of a robust and effective supply chain system to address the issues brought on by the epidemic. Adopting new technology helps with global logistics management by improving supply chain productivity, lowering operational costs, and decreasing errors (Orji *et al*., 2020; Tu, 2018).

In line with the findings of past studies, Isah *et al*. (2021) found that logistic technologies for effective and efficient 'order processing operations' in the areas of tracking, shipping, replenishment, dispatching and holding of inventory are deficient in the Nigerian construction industry, when compared to manufacturing and retailing sectors. This suggests low-level adoption of logistics management activities in the construction sector.

The logistics management is in charge of ensuring that materials arrive on time and in the correct quantities for the construction project (Lundesjö, 2015). One of the major functions of construction logistics is material and resource deliveries to and from site. The other important function of construction logistics management amongst others is to ensure the efficiency of construction projects' on-site operations by managing logistics activities such as planning, storage, materials tracking, waste management, and managing on-site processes related to physical flows (Ghanem *et al.*, 2018; Ying *et al*., 2018). This is supported by Jang *et al.* (2003) and Thunberg *et al*. (2017) who found that construction logistics can be a catalyst to manage on-site issues and enhance communication and collaboration amongst construction supply chain partner.

2.3 Barriers to adoption of logistics management activities on performance of construction firms

Improving logistics management in construction project is becoming more challenging as the construction industry is getting more complex than what we have had then. However, the construction industry is left behind as compared to other industry such as manufacturing and retail industry. The logistics issues in construction project have hindered its performance thus the construction project goals (time, cost, and quality) cannot be achieved (Mohd *et al*., 2018).

The major problems of construction logistics, according to Isah *et al*. (2021), include the following challenges: technology, standard, patent, cost, infrastructure, and Return on Investment (RoI). These challenges can adversely affect the performance of construction projects. Therefore, managing the flow of materials, assuring their quality, checking the quantity, allocating the storage areas, coordinating the overall process, triggering the orders, and updating the participants are major obstacles in construction logistics management.

Appiah (2021) revealed that the failure in adoption of new and emerging technological approach as well as integrating it into the logistics management system is the most contributing factor affecting logistics management in the construction industry. On a general level, Appiah (2021) identified five (5) factors serving as barriers to the adoption of logistics management in the construction industry. These barriers are: Inefficient Planning, Scheduling and

Procurement process; Communication and flow of information; Ineffective Inventory management; Failure to adopt new and emerging Technology; and Ordering Process.

Appiah (2021) described these barriers further from the viewpoint of the fact that the failure in adoption of new and emerging technological approach as well as integrating it into the logistics management system is the most contributing factor affecting logistics management in the construction industry. With regards to the survey conducted, findings from the study therefore accentuate that the integration and incorporation of new and emerging Technology in logistics management in the construction industry goes a long way to have impact or influence on all the other factors enumerated in the analysis. Technology facilitates communication and the flow of information among the various personnel's and stakeholders involved in logistics management and its supply chain. Information technology integration enhances quality, reduces time and costs, enhances competitiveness and generates future growth. Information technology sharing also aids in swift and smooth accomplishment of inventories aiding in fast decision making. Technology also promotes and facilitates more frequently the Planning, Scheduling, Procurement and Ordering processes which contribute to effective and timely supply logistics in the construction industry. Technology also helps managers in redesigning of strategy to add more value to resources when the need arises.

Adekunle and Isokpan (2021) focused their research on antecedents and obstacles relating to the use of technology in logistics management and draw appropriate business implications. The rationale for focusing on logistics is motivated by the high logistics costs associated with transporting items to their destination, which can be reduced using the appropriate technology. According to Pimentel *et al.* (2022), with growing environmental concerns, reverse logistics (RL) assumes a significant role in the sustainability of the construction industry to the extent that it can contribute to mitigating some of the negative environmental impacts related to its activity. However, there are several barriers hindering the adoption of logistics management. These barriers, according to Pimentel *et al.* (2022) are: lack of financial incentives to incorporate recycled materials, lack of knowledge about RL, lack of technical support, standard codes and regulations in favor of using recycled materials, lack of information sharing, cooperation and coordination among entities of the supply chain, current buildings have not been designed for deconstruction, and lack of construction and demolition waste management and recycling infrastructures.

Rabiu (2023) emphasized that logistic management is an essential component of any construction site. The challenges that the construction industry faces are primarily related to poor logistics management, which has a variety of effects on the project. Some of these barriers are highlighted as: Transportation cost; Late delivery of materials and components; and Storing materials on site. Stressing further Rabiu (2023) reported that most of the materials used on construction sites are not manufactured on site but are procured from other places and transported to site. Transportation is a key factor that affects the efficiency of material logistics. Late delivery of materials and components could be as a result of several factors including people, policies and procedures. It could also be as a result of lack of experience of the procurement officer or inability to understand specification in vendor's quotation. Storing material on site can also have some negative impact on project outcomes. Materials can be damaged by weather, moving equipment or people. Efficient material logistics will require the use of innovative techniques like Just in Time (JIT) in order to minimize the negative impacts of storing materials on site.

2.4 Drivers for adoption of logistics management activities on performance of construction firms

According to Chileshe *et al.* (2016), to facilitate the development of an indexing system, thus enabling the retrieval and coding of interview data, there are several logistics management drivers required to be put into consideration. These drivers have been grouped into six categories. These are: Economic, Product and technology, Legislation, Customer, Industry and market, and Corporate citizenship. El Korchi and Millet (2011) grouped logistics management drivers into three categories, such as: Economic, Environmental and Social. Many economic drivers of logistics management adoption have been reported in past studies (Aidonis *et al.*, 2008; Hiete *et al.*, 2011). Cost savings due to less usage of virgin materials; reduced transportation and disposal costs; and revenue generated by the sale of salvaged materials were among the main economic drivers (Saghafi and Teshnizi, 2011; Hiete *et al.*, 2011).

According to Lundesjo (2011), consolidation centres have much advantage for construction sites. Such as: reduces freight traffic to site by up to 70%, increases productivity of site labour by 30 minutes per day leading to a 6% productivity gain and reduces onsite waste by 7-15% through less material damage and shrinkage. As it was stated here; efficient logistics management in construction projects can be achieved by applying construction consolidation center and through this, site congestion reduction, increase of productivity and reducing of material wastage; will be achieved. Demand smoothing is a way of looking on the project activities in the entire chain and identifying whether the performance can be "smoothed" to decrease transport resourced, materials and labour needed to carry out the activity. It helps to identify peaks and gaps in the materials needs over a time period (Lundesjo, 2011).

The major environmental driver of logistics management implementation is the possibility of reversing the negative impacts of construction activities on the environment (Chileshe *et al.*, 2016). Implementation of logistics management complies with environmental regulations and makes organisations self-compliant (Densley and Davison, 2012). It

encourages the usage of less virgin raw materials in buildings and less energy for the transport of goods, and generates less waste (Denhart, 2010). In addition, logistics management diverts construction and demolition waste from landfill so they can be more appropriately used (Bleek, 2013). A recent study by Bouzon *et al*. (2015) showed that the salience of environmental, social and regulatory drivers is on the rise; however, they are not yet considered important in countries with restricted regulations.

With regard to social drivers for logistics management implementation, new jobs could potentially be created due to deconstruction. Local communities could become involved in the logistics management supply chain, also benefiting from improved health conditions due to less pollution (Chileshe *et al*., 2016). Companies implementing logistics management practices would improve their image, a crucial point for the construction industry which currently suffers from a poor public image. However, the motivation of companies to meet environmental requirements and enhance their green image largely rests on local circumstances and the social values prevalent in the community.

In order to ensure that the logistics in construction project is more efficient, it should be designed in the most efficient way to meet the client's requirements (Mohd *et al*., 2018). To achieve this, it should be targeted to focus on the following factors: Number of suppliers; Involvement of supplier at the design stage; Communication; Tracking facilities on site; Performance measurement; and Cost transparency. Reporting further, Mohd *et al*. (2018) stated that the number of suppliers should be rationalized by decreasing its number. This will ensure that the delivery material will be more efficient. Rationally, a chain with a fewer number of suppliers is easier to manage thus logistical barrier can be reduced. In addition, a clear understanding of implication of design, components and choices of material is very crucial. The success of the logistics in construction holistically indicates the success of each phase in logistics management. Technology has brought changes in construction industry that improves previous construction industry practices and method of construction that acquires large amount of labour, time consuming, prone to error. Proper performance measurement should be implemented to benchmark and maintain the performance of construction logistics (Mohd *et al*., 2018).

In the contribution of Rabiu (2023), it was reported that the drivers are factors that promote successful logistics management practices in construction industries for effective construction projects. In the light of this, Rabiu (2023) identified several drivers for adoption of logistics management, such as: Information and Communication Technology (ICT) Systems; Just-In-Time delivery (JIT); Construction Consolidation Centre (CCC); Demand smoothing; On-site marketplaces; Pre-assembled and offsite fabrication; Third party logistics; and Applying integrated/systematic construction logistics. Reporting further Rabiu (2023) submitted that ICT Systems are used to keep track and monitor materials through entire supply chain process (starting from production place until it is used or installed onsite). Tag systems was used to manage material deliveries with the help of different sort of information technology (bar code). Then Radiofrequency identification (RFID) is used for reading of tags or barcode of that material on site for checking the material. The tag system, having relatively low cost, allows the monitoring of material to the point of final use and can offer detail information about how is it going on site. It helps to know easily how much material was used and how much material is left in the store.

The JIT logistics were developed by the Japanese automobile manufacturer system Toyota as an essential part of The Toyota Production System. The basis of this system is the absolute elimination of waste (Rabiu, 2023). It is the mechanism of continuous supply of right quantity of material at right quality, in right time and at right place. In this case there is no as such onsite storage is needed. Therefore, risk of material damage and loss, site congestion and safety issue will be minimized.

On-site marketplaces method is the way allowing the trade worker to bring their products on construction site and stored daily used materials (such as screw, bolts, drill bits, nuts, saw blades and etc. in a temporary ware house. Prefabrication is a good method for smoothing construction logistics. Because of all the components used for building construction is produced in factory and transported to the construction site for assembly. It ensures better quality, less material wastage, minimizes labour force cost, reduces onsite congestion and reduces construction time, lower amount of errors and decreases transport cost (Rabiu, 2023). Third party logistics is a way of involving the third person, rather than supplier and consumer in the logistics system for making better logistics system. The main purpose of such companies is to create safe, clean and work-efficient working place by efficient and better planed logistics. A systematic approach to construction logistics has led to the emergence of a dedicated logistics contractor who assumes the single point responsibility to integrate all the essential support services associated with construction project (Sullivan *et al*., 2010).

2.5 Relationships between logistics activities and construction firms' performance

Several studies have analyzed the relationship between factors influencing logistics activities and critical success factors of construction project delivery and came up with varying propositions. According to Chileshe *et al*. (2016), implementing logistics management in construction could yield approximately 85 per cent of the materials used in a project through salvaging materials from old buildings destined for demolition. Similarly, the cost savings of a project

as a result of using salvaged materials is in the range of 30-50 per cent. Nevertheless, the initial cost of deconstruction would be approximately 21 per cent higher than that of traditional mechanical demolition. In addition, Chileshe *et al*. (2016) reported that the revenue from reuse and resale of salvaged materials and the reduction of disposal cost would make construction 37 per cent cheaper.

Thote *et al*. (2017) claimed that the construction industry contributed to the economic growth of the nation. Proper logistics can minimize disruptions caused by material shortages or logistical bottlenecks. This can contribute to maintaining consistent progress on construction projects, supporting critical success factors like maintaining continuous workflow and preventing project delays.

Appiah (2021) identified several effects of logistics activities on the performance of construction firms. These effects are as follows:

i. Logistics management results in cost reduction and profit maximization; this is primarily due to improved material handling, Safety, speedy and economical transportation, optimum number and convenient location of warehouses.
ii. Inbound logistics helps in the efficient flow of manufacturing operations, due to on-time delivery of materials, proper utilization of materials and semi-finished goods in the production process;
iii. Logistics provide, maintain and sharpen the competitive edge of an enterprise by increasing sales through providing better customer service, arranging for rapid and reliable delivery and also avoiding errors in order processing;
iv. Logistics management helps in developing effective communication system for continuous interface with suppliers and rapid response to customer enquiries; and

Appiah (2021) stressed further that the above effects are a by-product of logistics management. A major headache of production management and financial management is how to ensure effective sound inventory management but such headache is cured by logistics management. Logistics management therefore helps to drive up revenue, improves customer service, and adds to the company's good reputation and brand, which in turn creates new and more business. With more visibility into the supply chain there is the opportunity to save costs in operations, by controlling inbound funds, keeping inventory at the right level and organizing the reverse flow of goods. Therefore, there is a significant and positive relationships between logistics activities and construction firms' performance.

Rabiu (2023) observed that effective logistics system can impact the success of construction projects by ensuring timely and efficient material delivery, inventory management, and supply chain coordination can influence project timelines and costs, thereby aligning with critical success factors like on-time completion, cost control, and quality assurance. It was suggested further that efficient logistics management can contribute to cost control in construction projects. Proper coordination of transportation, inventory, and procurement can lead to cost savings by reducing waste, minimizing stockpiling, and optimizing resource allocation. Logistics activities play a crucial role in ensuring that construction materials are delivered to the project site on time. Delays in material delivery can lead to project schedule disruptions, which in turn might impact critical success factors such as meeting project deadlines and milestones (Rabiu, 2023).

3. Research methodology

This study adopted a survey research design. In view of this, the quantitative research approach was adopted for the study. The study did this by using structured questionnaire for data collection. The study's population is composed of the construction firms registered with the Corporate Affairs Commission (CAC) with Abuja's business address. In view of this, the study considered the construction professional in-charge of logistics management in each of these construction firms. These construction professionals are: Architects, Builders, Civil Engineers, Services Engineers and Quantity Surveyors. From the list of CAC, the total number of the construction firms registered with CAC and operate in Abuja is 2219 (CAC, 2024). This study adopted the simple random sampling technique for the selection of 327 respondents based on Krejcie and Morgan (1970) Table. Therefore, the sample size for the study was 327 which is the representative sample size from a population size of 2219 as suggested by Krejcie and Morgan (1970) Table. Structured questionnaire was adopted for collecting data in this study from professionals based on a five-point Likert scale format. The questionnaire contained five (5) sections (A - F). The first section (Section A) of the questionnaire collected data relating to respondents' profile. The other sections (A - E) addressed issues relating to the objectives of the study respectively. The questionnaires were distributed to 327 logistics officers of construction firms registered with CAC in Abuja, out of which 100 copies of questionnaires were returned and used for data analysis. This gives a response rate of 30.58%. This is perhaps due to the fact that logistics management practice among construction professionals is rare. Howevere, the response rates for past studies in construction related subject matters are within the range of the response rate achieved by this study. Ankrah (2009) who had a response rate of 15.42% reported that the response rate norm for postal questionnaire surveys is 20 – 30%. Others are Kheni (2008) and Ikpe (2009) with response rates of 32.42% and 15.8% respectively. In addition, 15.72% was the response rate in the study of Agumba and Haupt where

questionnaires were both self – administered and administered by mail. This justifies that the response rate in this study is adequate.

A reliability test was undertaken to validate the research instrument before the main data analysis was done. This was done with the use of Cronbach's Alpha reliability test. According to Pallant (2013), the Cronbach's Alpha of values above 0.700 and this suggests very good internal consistency reliability for the scale. This is considered acceptable for data to be reliable. Therefore, it was observed that the Cronbach's alpha coefficient was 0.805 which was greater than 0.70 recommended (Pallant, 2013). Most of the Inter-Item Correlation Matrix values were above 0.50 which falls within the threshold of 0.2 to 0.4 suggested by Pallant (2013). In view of this, the research instrument and the data collected were valid and reliable.

After conducting the reliability test, analysis of data was carried out using descriptive statistics such as percentage, frequency counts and Mean Item Score (MIS); and inferential statistics such as Spearman Rank correlation analysis. Frequency counts and percentage were used to analyse respondents' profile while MIS and Spearman Rank (rho) correlation analysis was used to analyse data with respect to the study's objectives. The formula used for calculating MIS values for data analysis is expressed as Equation 1 while the decision rule adopted for the MIS analysis are summarized in Table 1.

$$MIS = \frac{\Sigma W}{N} \quad (1)$$

Where: Σ = Summation, W = Weight, and N = Total

MIS is being ranked from 1.00 to 5.00

Table 1: Decision rule for MIS analysis

Scale	MIS Cut-Off Point	Interpretation			
		Level of Importance	Level of Adoption	Level of Severity	Level of Significance
5	4.01 - 5.00	Extremely Important	Very High	Extremely Severe	Extremely Significant
4	3.01 - 4.00	Very Important	High	Very Severe	Very Significant
3	2.01 - 3.00	Important	Fair	Severe	Significant
2	1.01 - 2.00	Less Important	Low	Less Severe	Less Significant
1	0.01 - 1.00	Least Important	Very Low	Least Severe	Least Significant

Source: Adapted and Modified from Shittu *et al*. (2021) and Shittu *et al*. (2022)

For the Spearman Rank correlation, the decision rules for the nature of correlation state that if coefficient of correlation (r) = 0.10 to 0.29, then there is small amount of correlation; if r = 0.30 to 0.49, then there is medium amount of correlation; and if r = 0.50 - 1.0, then there is large amount of correlation between the variables, as opined by Pallant (2013).

4. Results and discussion

4.1 Respondents' profile

The profile of these respondents is presented in Table 2. It is shown in Table 6 that the respondents comprise of a mix of all professionals relevant in decision-making in logistics management with the required level of academic qualifications; professional qualification; and years of experience in construction projects logistics management practices.

Table 2: Respondents' profile

PROFILE	STATISTICS	
Profession of Respondents	Frequency	Proportion (%)
Architects	15	15
Builders	17	17
Civil Engineers	34	34
Services Engineers	29	29
Quantity Surveyors	5	5
Respondents' Highest Academic Qualification	Frequency	Proportion (%)
Higher National Diploma (HND)	7	7
Bachelor's Degree (BSc/BTech)	54	54
Master's Degree (MSc/MTech)	34	34
Doctoral Degree (PhD)	5	5
Respondents' Professional Qualification	Frequency	Proportion (%)
MNIA/ARCON	7	7
MNIOB/CORBON	54	54
MNSE/COREN	34	34
MNIQS/QSRBN	5	5

Respondents' Years of Experience	Frequency	Proportion (%)
1-5 Years	8	8
6-10 Years	35	35
11-15 Years	38	38
16-20 Years	14	14
Above 20 Years	5	5
Involvement of Respondents in Construction Projects Logistics Management Practices	Frequency	Proportion (%)
Yes	87	87
No	13	13
Total	100	100

4.2 Adoption of logistics management activities by construction firms

The results presented in Table 3 revealed that the logistics management activities adopted the most were "Order Processing" (MIS = 4.48), "Replenishment" (MIS = 4.40) and "Dispatching" (MIS = 4.40). The logistics management activities adopted the least were "Tracking" (MIS = 3.62) and "Transportation" (MIS = 3.48). In addition, it was shown that the logistics management activities that were very high ranged from "Order Processing" to "Packaging and Labeling' (MIS = 4.48 – 4.12), while the logistics management activities that were high ranged from "Inventory Management" to "Transportation' (MIS = 3.93 – 3.48). On the average, the level of adoption of all the logistics management activities by construction firms in Abuja were very high (average MIS = 4.04).

Findings from past studies differ from the findings of this study in this area. This is because past studies found that over the last years, construction industry's performance, especially in developing nations, has deteriorated in the Logistics Performance Indicators (Kabadurmuş, 2019; Orji *et al*., 2020). In addition, Isah *et al*. (2021) also found that logistic technologies for effective and efficient 'order processing operations' in the areas of tracking, shipping, replenishment, dispatching and holding of inventory are deficient in the Nigerian construction industry, when compared to manufacturing and retailing sectors. This suggests low-level adoption of logistics management activities in the construction sector as reported by past studies. In view of this, adopting new technology will help with global logistics management by improving supply chain productivity, lowering operational costs, and decreasing errors.

Table 3: Adoption of logistics management activities adopted by construction firms

Code No.	Logistics management activities adopted by construction firms	MIS	Rank	Interpretation
B2	Order Processing	4.48	1st	Very High
B10	Replenishment	4.40	2nd	Very High
B11	Dispatching	4.40	2nd	Very High
B1	Network Design	4.35	4th	Very High
B4	Materials Handling	4.12	5th	Very High
B6	Packaging and Labeling	4.12	5th	Very High
B5	Inventory Management	3.92	7th	High
B7	Storage/Warehousing	3.82	8th	High
B3	Procurement	3.70	9th	High
B9	Tracking	3.62	10th	High
B8	Transportation	3.48	11th	High
	Average MIS	***4.04***		***Very High***

4.3 Examining the barriers to adoption of logistics management activities on performance of construction firms

The results highlighted in Table 4 revealed that the most severe barriers to adoption of logistics management activities on the performance of construction firms were "Transportation Cost" (MIS = 4.32) and "Scheduling and Procurement Process" (MIS = 4.30). The least severe barriers to adoption of logistics management activities on the performance of construction firms were "Return on Investment (RoI)" (MIS = 3.79) and "Late delivery of materials and components" (MIS = 3.69). In addition, it was shown that the barriers to adoption of logistics management activities on the performance of construction firms that were extremely severe ranged from "Transportation Cost" to "Lack of communication, information sharing, cooperation and coordination among entities of the supply chain" (MIS = 4.32 – 4.06), while the barriers to adoption of logistics management activities on the performance of construction firms which were very severe ranged from "Patent" to "Late delivery of materials and components" (MIS = 3.99 – 3.69). On the average, all the barriers to adoption of logistics management activities for improved performance of construction firms in Abuja were extremely severe (MIS = 4.06).

In line with the findings of this study, past studies have discovered that major problems of construction logistics are more challenging as the construction industry is getting more complex than what we have had then. However, these problems serve are barriers which makes the construction industry to be left behind as compared to other industries

such as manufacturing and retail industry. In the long-run, these logistics barriers in construction projects have hindered its performance thus the construction project goals (time, cost, and quality) cannot be achieved (Mohd *et al.*, 2018; Appiah, 2021; Adekunle and Isokpan, 2021; Isah *et al.*; 2021; Pimentel *et al.*, 2022; Rabiu, 2023). Therefore, efficient material logistics will require the use of innovative techniques like Just in Time (JIT) in order to minimize the negative impacts of storing materials on site.

Table 4: Barriers to adoption of logistics management activities on performance of construction firms

Code No.	Barriers to adoption of logistics management activities on performance of construction firms	MIS	Rank	Interpretation
C12	Transportation Cost	4.32	1st	Extremely Severe
C8	Scheduling and Procurement Process	4.30	2nd	Extremely Severe
C6	Lack of financial incentives to incorporate recycled materials	4.27	3rd	Extremely Severe
C1	Failure to adopt new and emerging technology	4.25	4th	Extremely Severe
C4	Infrastructure	4.25	4th	Extremely Severe
C2	Lack of technical support, standard codes and regulations in favour of using recycled materials	4.16	6th	Extremely Severe
C10	Ineffective Inventory management	4.09	7th	Extremely Severe
C9	Lack of communication, information sharing, cooperation and coordination among entities of the supply chain	4.06	8th	Extremely Severe
C3	Patent	3.99	9th	Very Severe
C14	Storing materials on site	3.93	10th	Very Severe
C7	Inefficient Planning	3.88	11th	Very Severe
C11	Lack of knowledge about logistics management	3.87	12th	Very Severe
C5	Return on Investment (RoI)	3.79	13th	Very Severe
C13	Late delivery of materials and components	3.69	14th	Very Severe
	Average MIS	*4.06*		*Extremely Severe*

4.4 Examining the drivers enhancing adoption of logistics management activities on performance of construction firms

The results summarised in Table 5 indicate that the most significant drivers for the adoption of logistics management activities on the performance of construction firms were "Demand smoothing" and "Reduced transportation and disposal costs" (MIS = 4.58 respectively). The least significant drivers for the adoption of logistics management activities on the performance of construction firms were "Applying integrated/systematic construction logistics" (MIS = 3.60) and "Adoption of performance measurement" (MIS = 3.48). Furthermore, it was shown that the drivers for the adoption of logistics management activities on the performance of construction firms that were extremely significant ranged from "Demand smoothing" to "Effective communication" (MIS = 4.58 – 4.12), while the drivers for the adoption of logistics management activities on the performance of construction firms which were very significant ranged from "Involvement of supplier at the design stage" to "Adoption of performance measurement" (MIS = 3.92 – 3.48). On the average, all the drivers for the adoption of logistics management activities on the performance of construction firms in Abuja were extremely significant (MIS = 4.04).

Findings from past studies support the findings of this studies in this case. In line with this, past studies revealed that in order to ensure that the logistics in construction project is more efficient, it should be designed in the most efficient way to meet the client's requirements by putting certain drivers into consideration (Bouzon *et al.*, 2015; Chileshe *et al.*, 2016; Mohd *et al.*, 2018). In addition, Rabiu (2023) reported that these drivers promote successful logistics management practices in construction industries for effective construction projects. Therefore, this will ensure that the delivery material will be more efficient.

Table 5: Drivers for adoption of logistics management activities on performance of construction firms

Code No.	Drivers for adoption of logistics management activities on performance of construction firms	MIS	Rank	Interpretation
D13	Demand smoothing	4.58	1st	Extremely Significant
D2	Reduced transportation and disposal costs	4.48	1st	Extremely Significant
D14	On-site marketplaces	4.43	3rd	Extremely Significant
D10	Information and Communication Technology (ICT) Systems	4.40	4th	Extremely Significant
D11	Just-In-Time delivery (JIT)	4.40	4th	Extremely Significant
D12	Construction Consolidation Centre (CCC)	4.40	4th	Extremely Significant
D1	Cost savings due to less usage of virgin materials	4.35	7th	Extremely Significant
D4	Designing in the most efficient way to meet the client's requirements	4.12	8th	Extremely Significant
D6	Effective communication	4.12	8th	Extremely Significant

D5	Involvement of supplier at the design stage	3.92	10th	Very Significant
D7	Tracking facilities on site	3.82	11th	Very Significant
D3	Revenue generated by the sale of salvaged materials	3.70	12th	Very Significant
D16	Third party logistics	3.66	13th	Very Significant
D15	Pre-assembled and offsite fabrication	3.63	14th	Very Significant
D9	Cost transparency	3.62	15th	Very Significant
D17	Applying integrated/systematic construction logistics	3.60	16th	Very Significant
D8	Adoption of performance measurement	3.48	17th	Very Significant
	Average MIS	*4.04*		*Extremely Significant*

4.5 Determination of relationship between adoption of logistics management activities and construction firms' performance

In order to determine the relationship between the adoption of logistics management activities and construction firms' performance in Abuja, three different analyses were undertaken. Firstly, MIS was used to rank the perception of respondents on the level of importance of the key performance indicators (KPIs) required in testing logistics management practices. Secondly, MIS was also used to rank the opinion of respondents on the perceived effects of logistics activities on construction firms' performance. Thirdly, Spearman Rank Correlation (rho) analysis was used to determine the relationship between the adoption of logistics management activities by construction firms and the combination of KPIs required in testing logistics management practices (representing construction firms' performance) in Abuja. However, before conducting the Spearman Rank Correlation (rho) analysis, the suitability of the data for Spearman Rank (rho) correlation was tested.

4.5.1 Key performance indicators required in testing logistics management practices

The results of the MIS analysis used to rank the opinion of respondents on the KPIs required in testing logistics management practices by construction firms in Abuja are presented in Table 6. The results in Table 6 revealed that the most important KPIs required in testing logistics management practices were "Quality" (MIS = 4.53) and "Serviceability" (MIS = 4.50). The least important KPIs required in testing logistics management practices were "Cost Efficiency" (MIS = 4.17) and "Conformance" (MIS = 4.16). On the average, all the KPIs required in testing logistics management practices by construction firms in Abuja were extremely important (average MIS = 4.35).

Table 6: Key Performance indicators required in testing logistics management practices

Code No.	Key performance indicators required in testing logistics management practices	MIS	Rank	Interpretation
E1.1	Quality	4.53	1st	Extremely Important
E1.6	Serviceability	4.50	2nd	Extremely Important
E1.15	Consistency	4.48	3rd	Extremely Important
E1.16	Use of assets	4.47	4th	Extremely Important
E1.9	Effectiveness	4.46	5th	Extremely Important
E1.2	Time	4.45	6th	Extremely Important
E1.10	Availability	4.44	7th	Extremely Important
E1.11	Productivity	4.39	8th	Extremely Important
E1.12	Utilization	4.33	9th	Extremely Important
E1.14	Agility	4.31	10th	Extremely Important
E1.8	Flexibility	4.27	11th	Extremely Important
E1.13	Outcome	4.27	11th	Extremely Important
E1.3	Reliability	4.22	13th	Extremely Important
E1.5	Technical Durability	4.20	14th	Extremely Important
E1.7	Cost Efficiency	4.17	15th	Extremely Important
E1.4	Conformance	4.16	16th	Extremely Important
	Average MIS	*4.35*		*Extremely Important*

4.5.2 Perceived effects of logistics activities on construction firms' performance

The results in Table 7 revealed that the most significant effect of logistics activities on construction firms' performance was "Delays in material delivery can impact critical success factors such as meeting project deadlines and milestones" (MIS = 4.55). The least significant effect of logistics activities on construction firms' performance was that "There is a significant and positive relationships between logistics activities and construction firms' performance" (MIS = 3.96). It was further revealed that the effects of logistics activities on construction firms' performance which are extremely significant ranged between "Delays in material delivery can impact critical success factors such as meeting project deadlines and milestones" and "Effective logistics system can impact the success of construction projects by ensuring timely and efficient material delivery" (MIS = 4.55 and 4.05), while the effects of logistics activities on construction

firms' performance which are very significant ranged between "Logistics management results in cost reduction and profit maximization" and "There is significant and positive relationships between logistics activities and construction firms' performance" (MIS = 3.99 and 3.96). On the average, all the identified effects of logistics activities on construction firms' performance in Abuja were extremely significant (average MIS = 4.24).

Table 7: Perceived effect of logistics activities on construction firms' performance

Code No.	Perceived effect of logistics activities on construction firms' performance	MIS	Rank	Interpretation
E2.13	Delays in material delivery can impact critical success factors such as meeting project deadlines and milestones	4.55	1st	Extremely Significant
E2.1	Proper logistics can minimize disruptions caused by material shortages or logistical bottlenecks	4.51	1st	Extremely Significant
E2.2	Proper logistics can contribute to maintaining consistent progress on construction projects	4.51	1st	Extremely Significant
E2.3	Proper logistics supports critical success factors like maintaining continuous workflow and preventing project delays	4.42	4th	Extremely Significant
E2.12	Delays in material delivery can lead to project schedule disruptions	4.34	5th	Extremely Significant
E2.11	Inventory management, and supply chain coordination can influence project timelines and costs, thereby aligning with critical success factors	4.31	6th	Extremely Significant
E2.7	Inbound logistics helps in the efficient flow of manufacturing operations	4.18	7th	Extremely Significant
E2.9	Logistics management helps in developing effective communication system for continuous interface with suppliers and rapid response to customer enquiries	4.16	8th	Extremely Significant
E2.8	Logistics provide, maintain and sharpen the competitive edge of an enterprise by increasing sales through providing better customer service, arranging for rapid and reliable delivery and also avoiding errors in order processing	4.13	9th	Extremely Significant
E2.10	Effective logistics system can impact the success of construction projects by ensuring timely and efficient material delivery	4.05	10th	Extremely Significant
E2.6	Logistics management results in cost reduction and profit maximization	3.99	11th	Very Significant
E2.4	Implementing logistics management in construction could yield approximately 85 per cent of the materials used in a project through salvaging materials from old buildings destined for demolition	3.98	12th	Very Significant
E2.5	There is significant and positive relationships between logistics activities and construction firms' performance	3.96	13th	Very Significant
	Average MIS	*4.24*		*Extremely Significant*

4.5.3Relationship between a set of logistics activities and construction firms' performance

The reliability test carried out between the adoption of logistics activities on construction firms' performance in Abuja shows no evidence of outliers with a scatterplot with the data points spread all over the place, suggesting a very high correlation. This shows that the data set is fit for Spearman Rank correlation analysis. Figure 1 shows the graph of the scatterplot of the relationship between the adoption of logistics management activities and construction firms' performance.

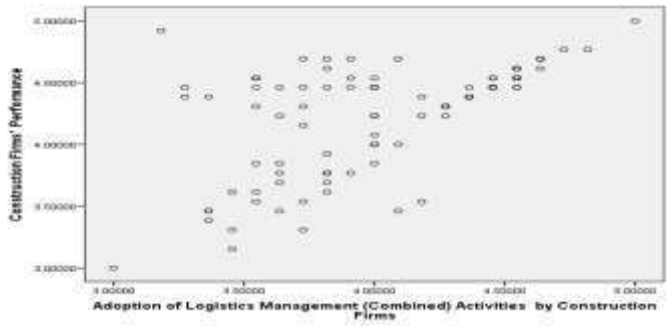

Figure 1: Scatterplot between the adoption of logistics management activities and construction firms' performance

Twelve (12) Spearman Rank (rho) correlation analyses were undertaken here. Correlation Analysis 1 – 11 were used to determine the relationship between each of the identified Logistics Management Activities adopted by construction firms and Construction Firms' Performanc**e**. The twelfth (12^{th}) correlation analysis was used to determine the relationship between a combination of the Logistics Management Activities adopted by construction firms and Construction Firms' Performanc**e**. The results of the Spearman Rank Correlation Analysis are presented in Table 8. In line with this, it was found that "Network Design", "Order Processing", Procurement; Materials Handling; Inventory Management; Storage/Warehousing; Transportation; and tracking (Correlation Analyses 1, 2, 3, 4, 5, 7, 8 and 9), each, have a positive and significant relationship with construction firms' performance in Abuja. The coefficient of correlation (*r*) value observed from the analyses ranged from 0.260 – 0.426. This shows that the strength of the correlation between the logistics management activities and construction firms' performance ranged between weak and slightly strong. Hence, there is a range of small and medium correlation between the variables in each of the analysis concerned (Pallant, 2013). The observed Probability (p) values ranged from 0.000 – 0.009 which were all less than the study's level of significance of 0.01. These indicates that each of these logistics management activities has significant relationship with construction firms' performance. Hence, the null hypothesis is hereby rejected, while the alternative hypothesis is accepted.

Also, in the results presented in Table 8, it was found that "Packaging and Labeling", "Replenishment", and Dispatching (Correlation Analyses 6, 10 and 11), each, have a positive and non-significant relationship with Construction Firms' Performance in Abuja. The coefficient of correlation (*r*) value observed from the analyses ranged from 0.111 – 0.158. This shows that the strength of the correlation between the logistics management activities and construction firms' performance is very weak. Hence, correlation between the variables in each of the analysis concerned is small (Pallant, 2013). The observed Probability (p) values ranged from 0.116 – 0.271 which were all greater than the study's level of significance of 0.01. These indicates that each of these logistics management activities in this case has a non-significant relationship with construction firms' performance. Hence, the null hypothesis is hereby accepted, while the alternative hypothesis is rejected.

In the twelfth analysis, as shown in Table 8, it was observed that there exists a strong, positive and significant relationship between the adoption of combined logistics management activities and construction firms' performance in Abuja. The positive correlation indicates that improvement in the adoption of logistics management activities by construction firms will result in the improvement in the performance of the construction firms. The correlation coefficient (*r* value) observed was 0.568 indicating strong degree of association between the variables. Hence, the correlation between the variables is large (Pallant, 2013). The probability (P_{value}) value of 0.000 observed was less than the level of significance adopted for the study (0.01). This implies a significant relationship between the variables. Therefore, the effect of the adoption of logistics management activities on construction firms' performance in Abuja is significant. Hence, the null hypothesis is rejected, while the alternative hypothesis is accepted. The results of the Spearman Rank correlation analysis are summarised in Table 8. The analyses showing significant relation between the variables indicate that the KPIs (i.e., "Packaging and Labeling", "Replenishment" and "Dispatching") related with construction firms are usually given little attention.

Table 8: Relationship between adoption of logistics management activities and construction firms' performance

Analysis No.	VARIABLES		OBSERVATIONS			INFERENCES	
	X_1	X_2	*r*	LOS	P_{value}	Strength of Relationship	Remark
1	Network Design	Construction Firms' Performance	0.426	0.01	0.000	Slightly Strong	SS
2	Order Processing	Construction Firms' Performance	0.260	0.01	0.009	Weak	SS

3	Procurement	Construction Performance	Firms'	0,475	0,01	0.000	Slightly Strong	SS
4	Materials Handling	Construction Performance	Firms'	0.330	0.01	0.001	Weak	SS
5	Inventory Management	Construction Performance	Firms'	0.389	0.01	0.000	Weak	SS
6	Packaging and Labeling	Construction Performance	Firms'	0.158	0.01	0.116	Very Weak	NS
7	Storage/Warehousing	Construction Performance	Firms'	0.395	0.01	0.000	Slightly Strong	SS
8	Transportation	Construction Performance	Firms'	0.403	0.01	0.000	Slightly Strong	SS
9	Tracking	Construction Performance	Firms'	0.370	0.01	0.000	Weak	SS
10	Replenishment	Construction Performance	Firms'	0.122	0.01	0.227	Very Weak	NS
11	Dispatching	Construction Performance	Firms'	0.111	0.01	0.271	Very Weak	NS
12	Adoption of Combined Logistics Management Activities	Construction Performance	Firms'	0.568	0.01	0.000	Strong	SS

KEY:
SS = Statistically Significant
NS = Not Significant
r = Correlation Coefficient
LOS = Study's Level of Significance
P_{value} = Calculated Probability Value

Findings from past studies agree with the finding of this study here. This is because past studies revealed that implementing logistics management in construction could yield approximately 85 per cent of the materials used in a project through salvaging materials from old buildings destined for demolition (Chileshe *et al.*, 2016; Appiah, 2021; Rabiu, 2023). Similarly, it was revealed that the cost savings of a project as a result of using salvaged materials is in the range of 30-50 per cent (Chileshe *et al.*, 2016; Appiah, 2021). Therefore, effective logistics system can impact the success of construction projects by ensuring timely and efficient material delivery, inventory management, and supply chain coordination can influence project timelines and costs, thereby aligning with critical success factors like on-time completion, cost control, and quality assurance.

5. Conclusions

It was found that "Order Processing", "Replenishment", "Dispatching", "Network Design", and "Materials Handling" are the logistics management activities mostly adopted, while the level of adoption of these logistics management practices by construction firms in Abuja is very high. It can therefore be inferred that construction firms in Abuja currently adopt logistics management practices in their organisation in order to meet their customer needs and sustain their performance. However, the major finding from the study revealed that the most significant perceived effects of logistics activities on construction firms' performance are "Delays in material delivery can impact critical success factors such as meeting project deadlines and milestones", "Proper logistics can minimize disruptions caused by material shortages or logistical bottlenecks" and "Proper logistics can contribute to maintaining consistent progress on construction projects". It was also shown that there exists a strong, positive and significant relationship between the adoption of combined logistics management activities and construction firms' performance. Therefore, effective logistics system can impact the success of construction projects by ensuring timely and efficient material delivery, inventory management, and supply chain coordination can influence project timelines and costs, thereby aligning with critical success factors like on-time completion, cost control, and quality assurance. The study therefore concludes that the impact of a set of logistics activities on construction firms' performance in Abuja is significant and this impact can enhance the delivery of construction projects.

The following recommendations were made based on the results and findings from the data analysis carried out for this study:

i. The construction firms in Abuja should focus more attention to making policies that will enable the organisation to give more priority to the order processing, replenishment, dispatching, network design, and materials handling while carrying out logistics management activities. This will enhance construction firms' level of adoption of effective logistics management practices.
ii. In order to mitigate the barriers to the adoption of logistics management practices, construction firms in Abuja should come up with proactive measures that will avoid high transportation cost, ineffective scheduling

and procurement process, lack of financial incentives to incorporate recycled materials, failure to adopt new and emerging technology and poor infrastructure.

iii. The management of construction firms in Abuja hould focus more attention on making policies that will empower workers to carry out their tasks to achieve effective demand smoothing, reduced transportation and disposal costs, competitive-advantaged on-site marketplaces, effective ICT systems, efficient JIT approach and effective construction consolidation centre.

iv. In order to enhance the level of adoption of logistics management practices, construction firms in Abuja should develop a mechanism that will be based on reduced delays in material delivery, minimization of disruptions caused by material shortages or logistical bottlenecks and maintenance consistent progress on construction projects. This will help to continuously enhance the positive and significant effect of logistics activities on construction firms' performance for effective project delivery.

v. In view of the limitations of this research, this paper recommends a further study to assess the impact of logistics management practices on individual performance indicators of construction firms/workers' productivity in Abuja.

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