INFLUENCE OF SUPPLY CHAIN MANAGEMENT PRACTICES ON PROJECT PERFORMANCE OF SELECTED CONSTRUCTION FIRMS IN LAGOS, NIGERIA

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Abstract

Achieving construction project performance in terms of project quality, profitability, on-time project delivery among others, supply chain management has been one of the major determinants. However, ineffective and poor deployments of supply chain management practices have resulted to poor quality project and deteriorate most construction project performance among construction firms in Lagos, Nigeria. This study therefore examined the influence of supply chain management practices (supply chain collaboration practice, green supply chain management practice, information sharing practice and customer relationship management practice) on construction project performance in Lagos, Nigeria. The study employed survey research design, sample size of 298 using Cochran sample size determination with multi-stage sampling technique as well as multiple regression method of analysis. The items used to measure the study variables are reliable and valid since Cronbach'sAlpha range between 0.772 to 0.832 with the KMO of greater than 0.5. Finding revealed that supply chain management practices have positive and significant influence on construction project performance of selected construction firms in Lagos, Nigeria (F-stat = 98.422; Adj.R² = 0.658; p<0.05). The study concludes that supply chain management practices influence construction project performance of selected construction firms in Lagos, Nigeria. The study recommends that construction firms should create a database on supplier chain activities such as delivery schedules, complaints, quality management processes in order to seal all loopholes that may create opportunities for undermining of supply chain management practices as well as increase quality supply chain and procurement process, thus enhancing project performance.

Keywords: Supply chain; Managementpractices; Construction project performance; Nigeria; Regression model

1. INTRODUCTION

The construction industry is a significant contributor to national economic growth and social development (Boadu, Wang &Sunindijo, 2020), and studies have shown a strong positive association between the rate of growth of the construction industry and the rate of macroeconomic growth of developing countries (Anaman&Osei-Amponsah, 2007). It is observed that the Nigeria's

construction sector is important because of its capacity to lead the economy of Nigeria as exemplified in its annual growth rate in comparison with GDP growth rate (Oladinrin, Ogunsemi&Aje, 2012). In spite of the contribution of the sector to national economic growth, concerns have been expressed over the performance of the sector in certain areas. For instance, observe that although the construction industry sector is a significant one, it still lags behind in some critical performance area. For instance the sector has been criticized for its high rate of corruption, time and budget overruns, poor quality, environment, health and safety records (Van Wyk, & Chege, 2004).

The failure to achieve stated performance indicators among construction companies has been a major concern for both scholars and professionals in the construction industry. This concern derives partly from the fact that the construction industry is a major contributor of economic functions and growth. Globally, construction companies have encountered several challenges that hindered their performance in project delivery. These challenges include increase in global competition among construction companies, high interest rates, inaccurate stock count, unstable structure and incorrect calibration, as well as weather and environmental conditions(US Bureau of Statistics, 2020). Construction companies in Germany have also recorded poor construction project performance due to unchanged culture in their supply chain management system (Federal Statistical Office, 2020).Similar concerns about performance are also observable in Africa. For instance, South

African construction companies have been hindered from attaining expected project performance due to poor performance of the supply chain management units (CIDB, 2015). In Nigeria, factors such as scope creep, ineffective supply chain system, inadequate funding, poor quality control and kickback, have, to varying degrees, impacted on construction project performance (Saad, 2018).In Kenya, there are cases of construction project failures in terms of failure to meet the cost, schedule and quality expectations, and these has undermined and jeopardized the growth, development and achievement of the Kenyan vision 2030 (Kenya National Bureau of Statistics, 2019).

In recognition of the vital role of the construction sector in national economic development, there have been unsuccessful attempts to address construction project failures, for instance through improved project planning, resource management and variations control (Kimondo, Mutuku & Winja, 2016). Construction companies depend on other organizations in their supply chains, therefore, their survival and achievement of targeted project performance, depends to a great extent on the efficiency of the supply chain members. According to Amade, Akpan, Ubani, and Amaeshi (2016), supply chain management (SCM) is a production based project delivery approach that could help in minimizing experiences of extensive delays and abandonment that is prevalent in the Nigerian construction industry. Although, a study by Oludare,Okunola and Oluseye (2018) concluded that the management of construction supply chain has great impact on profitability and expectations on cost, time, quality and risk reduction of projects. The study by Abahand Adamu (2017) established that majority of construction companies in Nigeria lack strategic measures of achieving sound construction supply chain management, and this impacts negatively construction companies project performance.

Consequently, based on the outcome of their study of construction supply chain management (CSCM) in Nigeria, (Moneke & Echeme, 2016) recommended that construction stakeholders embraced CSCM, which they considered a key focus area in global competitive market. This view is supported by claims that the declining project performance experienced by most construction companies in developing economies is due to lack of effective and efficient supply chain management (Makori, Magutu, Omai & Akello, 2016; Al-Werikat, 2017). The Nigerian construction industry lacks a proper knowledge and appreciation of the influence of supply chain management on project quality (Oludareet al., 2018). This poor preparedness in adopting sound construction supply chain management practices in their planning and processes by Nigerian construction companies has led to increases in project cost, sub-standard project delivery, delay in time schedule, loss of revenue (Abah & Adamu, 2017), project quality and delivery (Moneke&Echeme, 2016; Ojo,Mbohwa&Akinlabi, 2014), inefficient information flow, excessive inventory, poor customer service, loss of revenues, misguided capacity plans, ineffective transportation, and missed production schedules (Oludareet al., 2018).

Consequent to the above submission, there have been attempts by scholars and researchers to explain this. It has been observed that that a lack of adequate understanding of supply chain management concept and its strategic benefits to an organization, as well as lack of trust are among the factors that affect the adoption and application of SCM by Nigerian construction industries (Amadeet al., 2016). Other sources such as (Abah & Adamu, 2017) blame the low adoption on poor infrastructure, unstable socio-political environment, and corruption. Although earlier studies (See Voordijk & Vrijhoef, 2003; Alam, Bagchi, Kim, Mitra, &Seabra, 2012; Jadid & Idrees, 2013; Krishnakumar & Kuriakose, 2016; Gor & Pitroda, 2018) had investigated the effect of supply chain management on firm performance and project quality delivery, they did not assess performance indices such as supply chain

collaboration practice, green supply chain management practice, information sharing practice and customer relationship management practice and how they affect construction project performance among construction companies. Therefore, there is a gap in knowledge, which this study aims to fill, through the study of the influences of supply chain management practices (information sharing practice and customer relationship management practice) on construction project performance in Lagos State, Nigeria.

2. LITERATURE REVIEW

Following from the definition of a supply chain as the alignment of firms that brings products or services to market (Lambert, Stock &Ellram, 1998), supply chain management has been described as "an integrated approach starting from planning and control of materials, logistics, services, and information-flows from suppliers through manufacturers or service providers to the end customer" (Fantazy, Kumar & Kumar, 2010). Modern supply chain management practice encompasses sound partnership with the supplier, the outsourcing processes, compression of cycle time, continuity of process flow, and sharing of technology and information(Ibrahim & Hamid, 2014).It has been noted that supply chain management, by efficiently integrating stakeholders (suppliers, manufacturers, distributors and customers) through and upstream and downstream processes, contributes substantially in the enhancement of the long-term performance of firms and the supply chain as a whole by (Oludareet al., 2018). pointed out that a major advantage of supply chain management practice is that it represents a significant change in business management practices and an effective route through which firms attain improved performance and competitive advantage.

The term construction project performance, according to inferences from existing studies, refers to an executed project that satisfies the schedule (time), budget (cost), and quality requirements of stakeholders(Olawale& Sun, 2010; Kimondo, Mutuku & Winja, 2016; Kimondo, 2017). Another source, Egwunatum (2017), notes that construction project performance not only describes a project that has satisfied both time and cost objectives of the project, but that which maintains and promotes pleasant relationships among the project stakeholders. In this study, it is conceptually described in terms of time delivery, project quality, budgeted costs, safety and client satisfaction.

The impact of supply chain management on construction project quality and time delivery have been undertaken in so many studies. Some of these studies used regression analysis to establish that supply chain management system (supply chain integrations, physical flow integration, financial flow integration, and information flow integration) has a positive and significant effect on construction project performance(Won Lee, Kwon Ik Whan& Severance, 2007; Robb, Xie & Arthanari, 2008; Kurien & Qureshi,2011; Krishnakumar & Kuriakose, 2016; Kimondo, 2017; Gor & Pitroda, 2018). The study byAl-Werikat (2017) which evaluated how supply chain management practices affected the market competition of construction companies, showed that construction supply chains play major roles in construction market competition. Construction supply chain management practices improve competitiveness of enterprises, increase their profits, and enhance their control over the different factors and variables within the project.

The studies by Yap and Tan (2012); (2014)used multiple regression analysis to examine the effect of service supply chain management practices on organizational performance and supply chain performance effectiveness, and established that supply chain management practices such as integration, information sharing, customer and delivery management, supplier management and speed of responsiveness, have positive and significant influence on organizational performance.

These studies also established that supplier's chain management practices have a significant positive effect on supply chain performance effectiveness. The study by Thatte, Rao and Ragu-Nathan (2013) tested the relationships between supply chain management practices, supply chain responsiveness, and competitive advantage using structural equation modeling and revealed that supply chain responsiveness has a direct positive impact on competitive advantage of a firm, with a higher level of SCM practices leading improved supply chain responsiveness and enhanced competitive advantage of a firm. The conclusion from the study by (Huang, Yen & Liu, 2014) that empirically re-examined the relationship between supply chain integration and the supplier's performance under uncertainty, and Khurana and Ricchetti (2016)that investigated how sustainable supply chain management affected business performance revealed that supply chain integration has a positive and significant relationship with suppliers' performance. It has also been empirically shown that supply chain management positively affects product quality, firm performance and on time delivery of products/services(Khurana&Ricchetti, 2016; Hiller Connell &Kozar, 2017; Shen, Li, Dong & Perry, 2017; Köksal, Strähle, Müller &Freise, 2017; Oelze, 2017).

This study is underpinned by the resource-basedview (RBV)theory of firm competitiveness. The RBV theory analyzes and interprets internal resources of the organizations and emphasizes resources and capabilities in formulating strategy to achieve sustainable competitive advantagesanalyzes and interprets internal resources of the organizations and emphasizes resources and capabilities in formulating strategy to achieve sustainable competitive advantages (Wernerfelt, 1984; Barney, 1986;Penrose, 1995). The work Joyce and Winch, (2004) observes that a firm uses its resources (physical capital, human capital, and organizational capital) to establish strategies that would improve its overall efficiency and performance by providing a link between the heterogeneous resources inherent in the organization, the mobility of the resources within the particular industry and the strategic or competitive advantage enjoyed by an organization. The RBV theory appears to suggest that the variance in firm performance is explainable by the strategic resources (core competence, network flexibility and absorptive capacity) held by the firm, and firms that can combine their resources in unique waysare likely to have an advantage over competing firms that are unable to do so. Consequently, Knudsen (2003) notes that owning scarce resources and assets, and excelling in core competencies and capabilities, enable firms to achieve a market advantage and gain sustained competitive advantage.

Existing studies suggest that the link among supply chain management, resources and performance is premised on the resource-based view (Won Lee, Kwon IkWhan& Severance, 2007; Krishnakumar &Kuriakose, 2016; Gor&Pitroda, 2018). The work (Carter, Kosmol& Kaufmann, 2017) suggests that supply chain practices could facilitate the acquisition of strategic resources in factor markets.It is also inferable from existing works on RBV that integration by specific asset investments enables partnering firms to build a mutually beneficial competitive advantage because of their rare, valuable, non-substitutable, and difficulttoimitate nature. Furthermore, supply chain collaboration is hinged upon the notion of resource complementarily or the need for particular resources, therefore, investments in relation-specific assets, substantial knowledge exchange, combining complementary and scarce resources or capabilities, supply chain practices can create unique products, services or technologies. For instance, through information sharing, internal integration, vertical integration and external integration, firms can acquire resources that can improve the sustainable supply chain performance of construction industry (Bohnenkamp, 2013).

Conceptual Model

Consequent to the identified gap in construction project performance and the recognition of the influence of supply chain practices on firm overall project performance in terms of competitive advantage in project quality, time delivery, profitability among others, this study established conceptual model as shown in **Figure 1** below.
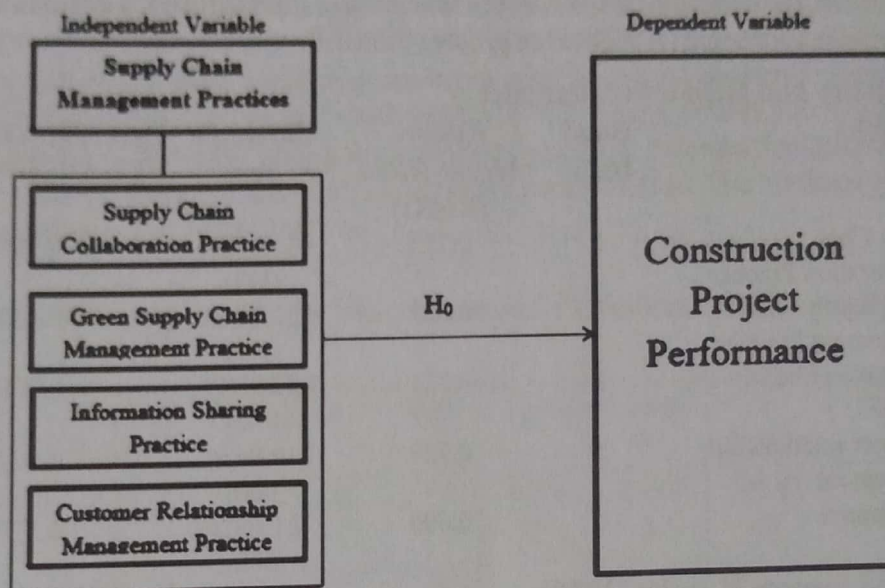

Figure 1: Conceptual Model (2020)
Source: Developed by the Researcher

3.   METHODOLOGY

This study has made fundamental assumptions by way of hypothesis. The hypothesis proposed is that: H_0:supply chain management practices have no significant influence on construction project performance of selected construction companies in Lagos State, Nigeria.

In order to test this assumption, the study adopted a survey research design aimed at exploring the link between supply chain management practices and construction project performance of selected construction companies in Lagos State. A multi-stage sampling technique was employed, and structured questionnaire was used to obtain data from top and middle strategic managers of quoted construction companies in Lagos State, Nigeria. A sample size of 298 was calculated from a population of 568 using Cochran's formula for sample size determination (Cochran, 1977).

$$n = \frac{NZ^2 pq}{d^2\ N-1\ +Z^2 q} \qquad (1)$$

Where:

n is the sample size

N is the population (total number of staff in selected construction companies = 568

Z is 1.96 at 95% confidence interval

p is degree of variability = 0.5 (50%)

q is 0.5 (1 - p)

d is 50% level of precision = 0.05

Substituting 568 into equation (1) and solving gives a sample size of 229. A further 30% (69) of this figure was added to compensate for non-responses in line with the advice by Israel (1992). Therefore, a total of 298 questionnaires were administered.

3.1 Reliability and Validity of Results

The results of the validity and reliability analysis of the test instrument are shown on table 1. The construct validity of the research instrument was established through a confirmatory factor analysis. Average Variance Extracted (AVE) value greater than 0.5

Table 1: Validity and Reliability Statistics

S/N	Variables	No of Items	Kaiser-Meyer-Olkin (KMO)	Bartlett's Test	Average Variance Explained (AVE)	Cronbach's Alpha
1.	Supply Chain Collaboration Practice	5	0.715	681.678(0.000)	0.799	0.780
2	Green Supply Chain Management Practice	5	0.632	582.321(0.000)	0.843	0.832
3	Information Sharing Practice	5	0.721	623.987(0.000)	0.709	0.784
4.	Customer relationship management	5	0.729	710.943(0.000)	0.822	0.772
5.	Performance	5	0.690	721.632(0.000)	0.731	0.791

Source: Field Survey Results (2020)

3.2 Model Specification

According to Salvatore and Reagle (2002), and Weiss (2012), when the intention of an analysis is to establish a causal relationship between two or more variables, regressions (more specifically multiple regression) is required. The suitability of multiple regression analysis in a study such as this is discussed in (Rencher, 2003; Aczel & Sounder pandian, 2009). In view of the above, **equation (2)** below proposes a multiple regression model to predict the relationship between the dependent variable (project performance, Y) and the independent variables (supply chain collaboration practice, x_1; green supply chain management practice, x_2; information sharing practice, x_3; customer relationship management, x_4).

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \varepsilon_i \qquad (2)$$

$$P = \beta_0 + \beta_1\, SCCP + \beta_2\, GSCMP + \beta_3\, ISA + \beta_4\, CRM + \varepsilon_i \qquad (3)$$

Where:
Y = Dependent Variable
X = Independent Variable
Y = Project Performance (PP)
X = Supply Chain Management Practices (SCMP)
x_1 = Supply Chain Collaboration Practice (SCCP)
x_2 = Green Supply Chain Management Practice (GSCMP)
x_3 = Information Sharing Practice (ISP)
x_4 = Customer Relationship Management (CRM)

β_0 = the constant of the equation
$\beta_1 - \beta_4$ = the coefficients of the independent variables
ε_i = Error Term;
The A *Priori* expectation for the study is that $\beta_1, \beta_2, \beta_3, \beta_4 > 0$

4. PRESENTATION OF RESULTS AND DISCUSSION OF FINDINGS

Out of the 298 questionnaires that were administered, 292 were returned, representing a response rate of 97.99%. The hypothesis model yielded a multiple coefficient of determination (R2) = 0.658, showing a strong positive correlation between supply chain management practices (supply chain collaboration practice, green supply chain management practice, information sharing practice and customer relationship management practice) and project performance. The summary of the multiple regression result is presented in **Table 2** below.

Table 2: Influence of Supply Chain Management Practices on Construction Project Performance

Model	B	Std. Error	Beta	t	Sig.	R^2	Adj. R^2	F-Value	Sig.	Durbin Watson
(Constant)	.647	.394		1.821	.102	0.782	0.658	98.422	0.000	1.923
Supply Chain Collaboration ractice	1.102	.041	.152	2.972	.021					
Green Supply Chain Management Practice	1.943	.023	1.032	3.954	.014					
Information Sharing Practice	.853	.011	1.130	2.984	.001					
Customer Relationship Management	1.654	1.063	1.743	0.274	.072					

The value of the adjusted coefficient of determination (Adj.R^2 = 0.658) shows that supply chain management practices (supply chain collaboration practice, green supply chain management practice, information sharing practice and customer relationship management practice) is explainable by only 65.8% of variation in project performance. The unexplained 34.2% of the variation in project performance, implies that there are other factors associated with project performance which were not captured in the hypothetical model.

Furthermore, the ANOVA result presented on **table 2** shows that overall, the explanatory power of the model is statistically significant with the F-ratio output of the model reporting a p-value of .000 (F=

98.422, p<0.05). This indicates that supply chain management practices (supply chain collaboration practice, green supply chain management practice, information sharing practice and customer relationship management practice) have positive and significant effects on project performance of selected construction companies in Lagos State, Nigeria. Therefore, the null hypothesis (Ho) that supply chain management practices have no significant influence on construction project performance of selected construction companies in Lagos State, Nigeria is rejected.

This result aligns with those of other existing studies (Kimondo, 2016; Kurien& Qureshi, 2011; Krishnakumar&Kuriakose, 2016; Gor&Pitroda, 2018; Lee, Kwon, & Severance, 2007; Robb, Xie, &Arthanari, 2008)which concluded that that supply chain management practices (supply chain collaboration practice, green supply chain management practice, information sharing practice and customer relationship management practice) positively influence constructionproject performance. The outcome also supportsearlier research findings that supply chain management positively affects quality, firm performance and on time delivery of construction projects (Connell &Kozar, 2017; Khurana, 2016; Köksal, Strähle, Müller &Freise, 2017; Oelze, 2017; Shen, Dong & Perry, 2017).

5. Conclusion and Recommendations

The study concludes, based on the result of the analysis carried out and supported by the conclusions of existing studies thatsupply chain management practices (supply chain collaboration practice, green supply chain management practice, information sharing practice and customer relationship management practice) influence construction project performance of selected construction companies in Lagos State, Nigeria. The study recommends that construction companies should create a database on supply chain activities such as delivery schedules, complaints, quality management processes in order to improve efficiency of their supply chains and procurement process, thereby, enhancing overall project performance. Construction companies are also encouraged to be improveon the implementation of supply chain management practices in their organisations, as this would boost project quality, success and time delivery.

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