

## **Supply Chain Management and Construction Project Delivery: Constraints to its Application**

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### **ABSTRACT**

Supply chain management (SCM) is a production based project delivery approach that has come to stay and help streamline all the experiences of extensive delays and abandonment that have bedeviled the Nigerian construction industry. The objectives of this study were to identify and evaluate the constraints to the application of SCM in the delivery of construction projects. The study adopted an exploratory research design method of investigation consisting of both quantitative and qualitative methods. A purposive and convenient sampling technique was deployed in selecting the sample size using the Krejcie and Morgan method. A semi-structured interview, multiple case study, personal observation and questionnaire survey was carried out among four (4) construction firms located in Abuja, Lagos and Rivers State respectively. The questionnaires were used as the primary data collection instrument after they were pre-tested using a pilot study for validity and reliability. The data collected were analyzed using Severity Index (SI) and Cronbach's Alpha reliability with the aid of SPSS 17.0 version as well as a Microsoft excels programmed software. The study found that out of the 403 responses gotten on the twenty four (24) factors identified as constraints to the application of SCM in construction project delivery. The followings were identified as the most significant constraints; Lack of the understanding of SCM concept (SI=50.76), unclear strategic benefits (SI=50.52), dearth of trust within and outside an organization (SI=50.31), lack of a common standard for collaboration (SI=49.32) and failure to broaden the SC vision beyond procurement or product distribution (SI=48.12). The study recommends that a forum be created through workshops, conferences, face-to-face interactions to aid in understanding what the concept is all about. The study further recommends that effort should be made by the professionals, contractors, subcontractors and the likes to adopt the SCM techniques in the delivery of their construction projects to schedule, cost and quality objectives.

**Keywords:** supply chain management, construction supply chain management, construction projects, severity index, Nigerian, case study.

## Introduction

Organizations are getting aware of the need to identify, understand and manage their supply chains within their organization as well as co-operate with other sister organizations in a bid to successfully manage all issues within their supply chain (Charter, Kielkiewicz-Young, Young, & Hughes, 2001). Supply chain according to Tiwari, Sheperd, and Pandey (2014) is defined as a network of organizations or entities that are tied through an upstream and downstream linkage via the different processes and activities with a view to producing valuable products or services for their end users. The supply chain within the context of a construction project as opined by (Ahmed, Azhar, & Ahmad, 2002) can be said to be a scenario where the client comes first, this is closely followed by the designer, contractor, specialist contractors/subcontractors/suppliers thus forming a cluster of supply chains. Certain demands can be seen to flow down the chain in the form of information such as project briefs, drawings, schedules, work orders with goods and materials flowing in the opposite direction. Xue, Wang, Shen, and Li (2007) opined that construction supply chain is not a chain of construction businesses with business to business relationships, but rather a network of multiple organizations and relationships comprising the flow of information, material, services or products as well as flow of funds between the client, designers and suppliers.

The key goal of SCM is to bring down inventory to the barest minimum and regulate supplier's interaction along the production line more effectively. (Cutting-Decelle, *et al.*, 2007). The objective of SCM is to be able to get the right products in the right quantities, at the right moment with minimal cost. Furthermore, such objectives could be converted into a precise area of interest like flexibility, delivery, reliability, effective lead/delivery time and minimum inventory. Delivery reliability and delivery times according to Cutting-Decelle *et al.* (2007) are aspects of customer service which relies heavily on flexibility and inventory. As a result of the benefits derived from the application of SCM principles by the manufacturing and production sectors, few construction firms are beginning to see the need to adopt and inculcate SCM principles and ideas into their activities to help address problems associated with adversarial, inter-organizational purchaser-supplier relationships as evident in most construction project related activities. According to (Akintoye, McIntosh, & Fitzgerald, 2000; Saad, Jones, & James, 2002), SCM in the construction industry is still at its infancy stage and its importance to the construction industry and projects are unquantifiable. SCM can be adduced to be an epitome of evolutionary and cumulative innovation which is said to have emanated from the internal programmes of an organization by reducing waste and adding value with the sole aim of improving overall effectiveness of the entire supply chain (SC).

SC comprises of firms and organizations contributing to the delivery of a high-quality standard project or service to its client. Benton and McHenry (2010) opined that Japanese manufacturers had a tight grip over their SCs with the aid of *keiretsu*, which literarily means, a business partner that relies on cooperation, coordination and control to competitively position business and

industry norms. Its application in the United States of America according to Benton and McHenry (2010) resulted to the concept of SCM. A lot of firms in the construction industry are keying into the lessons learned from the manufacturing industry. Most of them are now implementing six sigma, lean thinking and a lot of other initiatives to drive home their construction projects to fruition, but this is not the case with Nigeria specifically and other developing countries of the world in general.

### **Statement of the Problem**

The construction industry possesses some degree of similarity with the manufacturing sector in so many ramifications. Its processes and products are unique and complex. Their degrees of similarities ranges from high complexity and uncertainty, consumer influence on product, fragmented state of its processes, complex network of stakeholders involving many organizations as well as relationships (Aloini, Dulmi, Mininno, & Ponticelli, 2012). As stated by (Nawaz & Ikram, 2013), despite the contribution of the construction industry, its performance and potentials has been affected by a myriad of problems ranging from wastage of construction materials, re-works, scraps and stakeholder's dissatisfaction amongst others. Most tools and techniques currently used to address some of the aforementioned problems are outdated and have outlived their usefulness as such. Most of the firms within the Nigerian construction industry have been bedeviled with difficulty in delivering value to their customers on time (Amade, 2012a; Ayangade, Wahab, & Alake, 2009; Ayodele & Alabi, 2011). There have been cases of customer dissatisfaction resulting from the inability of products and services delivered by the firms to aptly meet the needs and expectations of end users. A major criticism facing the Nigerian construction industry according to Aibinu and Jagboro (2002) is the growing rate of delays in project delivery. In China, the construction industry is still bedeviled with cases of low productivity, low quality projects, and low profitability (Pheng and Shang 2011). The industry is so diverse, and unstable, susceptible to fluctuating demand cycle, uncertain production condition, project specific, product demand and most specifically a diverse range of skills and personnel. These have really affected the industry, thus creating obvious problems in general. Delays according to Fugar and Agyankwa-Baar (2010) often results to schedule and cost overruns, disputes, litigation and total abandonment of construction projects and this are a major problem facing the Ghanaian construction industry.

The construction sector according to Hope (2012) is known for lagging behind in the area of information technology, discrimination, traditionalistic tendencies, and reluctance to accepting SCM principles. The drive to change and bring in innovation in the construction industry was articulated by the U.K. government sponsored report known as the Latham's and Egan's report of 1994 and 1998 respectively. In a nutshell, the Egan's report recommended innovation as a way to procure in most construction projects. The Latham's report on the other hand was more focused on relationships within the SC via efficient communication and information sharing.

In Nigeria for instance, there seems to be a dearth of research in the application of SCM (Saka and Mudi 2007) techniques specifically to construction projects and the industry (Ojo, Mbohwa, & Akinlabi, 2013) in general. From the available literature, Oisamoje and Areloegbe (2014) were the only authors who were able to carry out a study on SCM related to the petroleum sector in Nigeria. In this work, we intend to find out in detail the reasons for the slow adoption of this innovative ideology of SCM within the Nigerian construction industry and its projects.

### **Research Questions**

With the above stated problem statement, the research question below was raised.

(i) What are the factors constraining the application of SCM in the Nigerian construction industry?

### **Review of Related Literature**

SCM is a concept that originated from the manufacturing (Vrijhoef & Koskela, 1999) and logistic (Chen & Paulraj, 2004) industries. Chen and Paulraj (2004) opined that the origin of SC concept has its inspirations from the fields of quality revolution, materials management and integrated logistics, interest in industrial markets and networks, and the ideas of increased focus as well as influential industry-specific studies. With the increasing need to decrease costs, increase quality of products and improved level of customer service in the 1980's, and coupled with the intense global competition, this gave rise to the emergence of SCM concept (Manu, 2014). Its initial signs were perceived from the just in time (JIT) delivery system as part of the Toyota Production System (TPS) (Vrijhoef & Koskela, 1999). The JIT system was set to regulate the supplies of the Toyota Motor Factory just in the right small amount and at the right time. The main aim of the JIT system was to decrease inventory minimally and to regulate the supplier's interactions with the production line effectively and efficiently.

Ahmed *et al.* (2002) defined SC as a network of facilities and distribution options that distributes out the function of procurement of materials, transforming the materials into intermediate and finished products while distributing the finished products to the users. SC's can occur in the services, manufacturing organizations, although the level of complexity of each chain may vary between industries and firms.

Saad *et al.* (2002) in their own view stated that SCM can be seen as an example of evolutionary and cumulative innovation that is always seen to have emanated from internal programmes that are aimed at improving overall effectiveness. The main focus of SCM according to Saad *et al.* (2002) is not limited to the internal efficiencies of an organization alone, but has increased to include methods of eliminating waste and adding value within the SC. Chen and Paulraj (2004) opined that SCM seeks to improve on performance via the better use of internal and external capabilities in order to form a seamlessly coordinated SC thereby elevating inter-company

competition to inter-SC competitors. The construction industry according to Wirahadikusumah and Abduh (2010) is characterized by a lot of fragmentations that negatively affects the sector in terms of low productivity, cost and schedule overruns, adversarial relationships resulting into claims and unwarranted litigations. These fragments have been adjudged to be the major factors impeding the performance of the Industry.

Saad *et al.*(2002) opined that innovation is most often precipitated by a network of relationships between firms, subcontractors and public institutions instead of within organizations. According to Saad *et al.*(2002), the procurement approaches in the construction industry came to being in the 1960s with certain characteristics exhibiting the relationships with the stakeholders (clients, consultants, contractors, subcontractors) in the way collaborate. While Latham and Egan in their respective reports, recommended how the construction sector can change its tide towards the most efficient destination of efficiency in the SC through partnering arrangements and innovative approaches (Egan, 1998; Latham, 1994). Latham and Egan further recommended that the construction industry must adopt SCM techniques which *ab initio* has been applied in the manufacturing industry and has been proven to have increased productivity, reduce time, increase cash flows, while also minimizing risks.

In a typical building and construction industry, designing, contracting and supplying parties in the SC work together in a consistently and dynamic form creating different projects (Voordijk & Vrijhoef, 2003). They further stated that in a typical traditional construction environment, various contractual engagements are entered into between the various parties until the entire project is consummated. This scenario, that is, the CSC, is akin to an extended enterprise in which all the firms or parties viz; project developer, architect, engineering firms, contractors, subcontractors and suppliers virtually operate as different business units representing the individual business functions like marketing, design, engineering, component manufacture, supply, assembly and delivery.

According to Oladapo (2006), the Nigerian construction industry consists mostly of small and medium sized indigenous firms and their large sized foreign counterparts making up the minority. The minority foreign firms constitute about 5 percent of the entire contractors within the formal sector while controlling 95 percent of the market share leaving the remaining 5 percent to the small and medium sized indigenous firms. The industry produces about 70 percent of the nation's fixed capital formation, yet its performance within the economy has been dismally low. (Abdulsalam, Faki, & Dardau, 2012; Idrus & Sodangi, 2010). The modern/innovative/non-conventional methods of procuring construction projects in Nigeria are not strange, even though the methods came into being in Nigeria in the early nineties, (Amade, 2012a; Dada & Oladokun, 2012; Oyedele, 2013) their adoption into the industry has not seen the light of the day as many of them fail during their conception stage. The construction industry in Nigeria today is bedeviled by incidence of project collapse, substandard products, high cost of procurement and abandonment. The problems according to Ayangade *et al.* (2009) stemmed

from the non-adherence to procurement procedures. Idrus and Sodangi (2010) further opined that the country's level of decline in terms of client's satisfaction was as a result of poor quality performance and problems associated with schedule and cost overruns. In Nigeria, the most widely used method is the traditional procurement method, otherwise known as the design bid build method (Amade, 2012b; Dada, 2013). Due to the criticisms trailing the continued use of the design bid build method of procurement in Nigeria, its use has continued to dominate the country's procurement process irrespective of the criticisms.

Researchers and practitioners alike within the built environment industry have veered into applying SCM philosophy with a view to making the industry function effectively and efficiently (Khalifan, McDermott, & Asad, 2004). Khalifan *et al.*(2004), further opined that the main driver behind the adoption of SCM philosophy was a result of the successes recorded in the industry like the manufacturing and service sectors. According to the Department for Business, Innovation and Skills [DBIS] (2013), the Latham's report, "Constructing the Team" which was published in 1994 as a result of the downturn in the construction industry recommended the adoption of SCM principles towards enhancing the behavior and performance of the industry with particular reference to matters related to unfair conditions, payment and dispute resolution processes.

The views of Akintoye *et al.*(2000) was further corroborated by Saad *et al.*(2002) who opined that despite the existence of barriers to the implementation of partnering ideas in construction, a good number of practitioners in the industry have started moving towards the adoptions of SCM. Hope (2012) opined that with the desire to alter and promote innovation within the construction industry was hatched in the Latham's and Egan's reports.

### **Constraints to the Adoption of SCM in Construction**

The construction industry has been adjudged by different scholars to have been slow in the adoption of SCM principles which has proven to have worked perfectly in the manufacturing and service sectors (Akintoye *et al.*, 2000; Saad *et al.*, 2002; Viswanadham & Kumar, 2006). Even though the Egan's report stated that SCM principles could prove to be rewarding in the construction industry by way of improving quality and efficiency if properly deployed, there still hasn't been any deployment or application of the concept so far. A lot of factors appear to have contributed to the slow and limited deployment of the principle. Akintoye *et al.*(2000) in their study identified the following factors as key to the non deployment of SCM in the construction industry. They include; dearth of top management commitment, unclear strategic benefits, partners low level of commitment, lack of understanding of the SCM concept, dearth of appropriate information technology, lack of the appropriate organizational structure in supporting the system. While Benton and McHenry (2010) identified the following barriers to CSCM as; fear of loss of control, inability to share information on project, extent of the project's complexity, lack of understanding of the client, deficiency of mutuality, myopic strategies. While

Ahmed *et al.*(2002) identified the following reasons responsible for the slow growth of SCM in construction. They include; inability to develop measures for monitoring alliances, failure to broaden the SC vision beyond procurement or product distribution to include other business processes, dearth of trust within and outside a firm. Viswanadham and Kumar (2006) opined that certain hurdles exist as impediments to SCM implementation in the construction industry. The notable ones include; differences in work cultures of stakeholders, improper scheduling requiring flexibility in operations, short-term project thinking. Wong, Tsoi and Cheung (2004) identified obstacles against the implementation of SCM in construction as; lack of appreciation of other's performance, discouraged innovation, deficiencies of the procurement system, lack of common standard for collaboration, ignorance on the contributions and needs of subcontractors and suppliers, resistance on greater contribution, high cost amongst others.

### **Research Methodology**

This study adopted an exploratory research design approach in answering the research questions accurately. In a nutshell, this study specifically adopted the survey method as well as the case-study alternative for the research. Walker (2002) opined that case study methods are meant to provide credible representations of a reality thereby providing the reader a sense of being physically present. The research involved a population of project management practitioners in the study area. The following categories of participants were involved in this study. Multinational/private construction companies. Participants include consultants, clients and contractors and other professionals from the above mentioned categories of firms. The target respondents included project managers, quantity surveyors, architects, engineers, builders, etc.

The sample were selected conveniently and purposefully to capture the required group of respondents in the population. Convenience sampling is a method of selecting research participants based on the convenience of the investigator. Thus, the researcher's years of practical work experience in construction project related activities was an added advantage in the selection of the participants. The location for the study is Abuja, Lagos and Port-Harcourt where most of the construction and consulting firms we deemed fit to guide us in this study.

Quantitatively, sample size for this study was determined using the Krejcie and Morgan's table for determining sample size from a given population (Krejcie & Morgan, 1970).

This research involved two types of data, secondary and primary data, to help the researcher to obtain the required information during data gathering process from the construction firms. Primary and secondary data are considered comprehensive sources due to their roles in helping the researcher provide the basic information during secondary data. In this study, questionnaires were used in collating data from the sampled respondents using the face-to-face method. While also a semi-structured interview session was carried out in the course of data collection at the four (4) case study organizations used for the study. In this study both closed-ended and open-ended questionnaires were used for the purpose of facilitating data collection and analysis using

the five-point Likert scale was employed to explore the respondent’s opinions in relation to the questions posed in the study. Personal visit to the targeted companies was carried out by the researchers. The personal visits took place in the aforementioned areas.

In analyzing the data Cronbach’s Alpha was used to measure internal consistency of the results. Cronbach’s alpha is one of the most popular reliability statistic used for measurement of reliability of scale. Cronbach’s alpha ( $\alpha$ ) is given by the formula;

$$\alpha = \frac{k}{k-1} \left( \frac{\sigma_y^2 - \sum \sigma_i^2}{\sigma_y^2} \right) \dots\dots\dots(1)$$

where  $k$ = number of items,  $\sigma_y^2$  = variance of the sum of all items; and  $\sigma_i^2$  =variance of the  $i$ th item. Aiyetan (2010); Amade (2016) opined that a Cronbach’s value of 0.50 to 0.70 is regarded as adequate proof of internal consistency. In this study, Cronbach’s Alpha coefficient was calculated using SPSS version 17.0. While Severity Index (SI) was also used to analyze the factors constraining the adoption/application of SCM in the delivery of construction projects. SI is a method used in ranking factors. This non parametric technique aggregates the weight and frequency score of each factor and was measured using the formula as stated by (Oladapo, 2006; Oyewobi & Ogunsemi, 2010; Oyewobi *et al.*, 2011)

$$S.I = \left( \frac{\sum_{i=1}^{i=n} [w_i f_i] \times 100}{n} \right) \dots\dots\dots(2)$$

Where:  $f_i$  is the frequency of response,  $w_i$  is the weight for each rating (= rating in scale/number of points in a scale), and  $n$  is the total number of responses.  $n$  is the valid number of respondents. Severity Index Analysis was chosen because of its ability to provide a meaningful interpretation of ranks among factors. In this study, SI was calculated using a Microsoft excel programmed software.

**Data Presentation and Analysis of Findings**

The study population consisted of four (4) construction firms. Questionnaires were self-administered to the professionals in the construction firms. The following number of questionnaires was distributed based on the sample size earlier determined. In a nutshell, out of the 487 questionnaires distributed, 403 were filled and returned thus giving us a response rate of 82.75%.



**Reliability and validity tests**

The internal consistencies of each item in each category of the questions on the factors constraining the adoption/application of SCM in the Nigerian construction industry were determined using the Cronbach’s alpha coefficient. The Cronbach’s alpha has been adjudged to be appropriate in determining the reliability and validity of data. The table below shows the value of the internal consistency of the various items under study using SPSS version 17.0.

**Table 1: Cronbach’s Alpha Coefficient**

| Reliability Statistics |            |
|------------------------|------------|
| Cronbach's Alpha       | N of Items |
| .943                   | 24         |

The Cronbach’s Alpha value for the factors constraining the adoption/application of supply chain management in the delivery of construction projects is 0.943. This is an indication that the instrument is perfect in terms of reliability and as such possesses an adequate proof of internal consistency. As rightly stated earlier on, a reliability value of less than 0.6 is usually adjudged poor, 0.6-0.7 acceptable, while over 0.8 is adjudged to be good (Aiyetan, 2010, Amade, 2016). The findings further states that higher Cronbach’s Alpha coefficient values indicates that the data generated are reliable as they possess a relatively high internal consistency and can be generalized to reflect opinions of all the respondents in the target/study area. The study hence deduced that all the twenty four (24) factors constraining the adoption/application of supply chain management in the delivery of construction projects are reliable and was later used for further analysis.

**Table 2. CONSTRAINTS TO THE ADOPTION/APPLICATION OF SUPPLY CHAIN MANAGEMENT IN CONSTRUCTION PROJECT DELIVERY**

| Factors                              | SA  | D   | N  | D  | SD | SI    | Rank |
|--------------------------------------|-----|-----|----|----|----|-------|------|
|                                      | 5   | 4   | 3  | 2  | 1  |       |      |
| The dearth of top management support | 136 | 121 | 64 | 44 | 38 | 44.46 | 9    |
| Unclear strategic benefits           | 197 | 130 | 42 | 19 | 15 | 50.52 | 2    |

|   |     |     |    |    |    |       |    |
|---|-----|-----|----|----|----|-------|----|
| Partners low level of commitment  | 118 | 108 | 73 | 57 | 47 | 42.06 | 11 |
| Lack of understanding of SCM concepts   | 211 | 116 | 34 | 29 | 13 | 50.76 | 1  |
| Dearth of the appropriate IT application  | 155 | 113 | 53 | 44 | 38 | 45.36 | 8  |
| Lack of the appropriate organizational structure in supporting the system             | 164 | 119 | 47 | 39 | 34 | 46.47 | 6  |
| Fear of loss of control   | 86  | 84  | 81 | 79 | 77 | 37.32 | 16 |
| Inability to share information on project   | 84  | 82  | 81 | 79 | 77 | 36.78 | 18 |
| Extent of the project's complexity  | 88  | 84  | 79 | 77 | 75 | 37.26 | 17 |
| Lack of understanding of the client   | 77  | 75  | 86 | 84 | 81 | 35.76 | 21 |
| Deficiency of mutuality   | 81  | 83  | 77 | 88 | 74 | 36.54 | 19 |
| Inability to develop measures for monitoring alliance                                 | 143 | 125 | 63 | 42 | 30 | 45.54 | 7  |
| Failure to broaden the supply chain vision beyond procurement or product distribution | 177 | 125 | 43 | 32 | 26 | 48.12 | 5  |
| Dearth of trust within and outside the  | 202 | 125 | 32 | 27 | 17 | 50.31 | 3  |

|   |     |     |    |    |    |       |    |
|---|-----|-----|----|----|----|-------|----|
| organization  |     |     |    |    |    |       |    |
| Differences in work cultures of stakeholders  | 110 | 103 | 81 | 60 | 49 | 41.22 | 12 |
| Improper scheduling requiring flexibility in operations   | 90  | 88  | 79 | 75 | 71 | 37.80 | 15 |
| Short term project thinking   | 75  | 72  | 89 | 80 | 87 | 35.31 | 24 |
| Lack of appreciation of other's performance   | 82  | 85  | 72 | 86 | 78 | 36.48 | 20 |
| Discouraged innovation  | 97  | 88  | 76 | 74 | 68 | 38.43 | 14 |
| Deficiencies of the procurement system  | 127 | 116 | 58 | 56 | 46 | 42.93 | 10 |
| Lack of a common standard for collaboration   | 189 | 118 | 54 | 23 | 19 | 49.32 | 4  |
| Ignorance on the contributions and needs of subcontractors and suppliers                                  | 104 | 96  | 78 | 67 | 58 | 39.90 | 13 |
| Resistance on greater contribution  | 74  | 80  | 80 | 84 | 85 | 35.49 | 23 |
| High costs  | 70  | 85  | 82 | 85 | 81 | 35.61 | 22 |
| Rating scale: SA=Strongly Agree (5), A=Agree (4), N=Neutral (3), D=Disagree (2), SD=Strongly Disagree (1) |     |     |    |    |    |       |    |

The results presented in table 2 indicate that the most significant constraint to the application of supply chain management in the delivery of construction projects is lack of understanding of SCM concepts. However, the results indicate that short term project thinking is the least significant constraint to the application of supply chain management. Lack of understanding of

SCM concepts, unclear strategic benefits and dearth of trust within and outside the organization are the top highest ranked constraints.

### **Discussion of Results Findings**

The respondents were asked to indicate their opinion on the level of their agreement with the identified factors constraining the application of supply chain management based on their experience in their organizations. The findings are presented in table 2. The results presented in table 2 indicates that the most significant constraint to the adoption/application of supply chain management in the delivery of construction projects is lack of understanding of SCM concepts. However, the results indicate that short term project thinking is the least significant constraint to the adoption/application of supply chain management (Table 2). Lack of the understanding of SCM concept was identified as the most significant factor with a SI of 50.76 and ranked first. This was followed by unclear strategic benefits SI of 50.52, dearth of trust within and outside an organization SI of 50.31, lack of a common standard for collaboration SI of 49.32 and failure to broaden the SC vision beyond procurement or product distribution SI of 48.12 which were ranked second, third fourth and fifth respectively. The findings from the study corroborates that of Ahmed *et al.*(2002); Akintoye *et al.*(2010) and Wong *et al.*(2004) whom were of the opinion that one of the barriers to the implementation of successful SC partnership was poor understanding of the SCM concept, the absence of IT, and strategic benefits not being clear and specific. According to Benton and McHenry (2010), SCM offers a promise for the construction industry. Implementation difficulties often hinder effective exploitation of the ensuing benefits that should emanate from the success of SCM, but this has proved detrimental to any envisaged operational efficiency. Benton and McHenry (2010) further opined that on the basis of the envisaged barriers to SCM, the development of an integrated SC remains elusive. Most construction firms are not prepared to key into the new ways of doing business.

### **Conclusion and Recommendations**

The study specifically identified and evaluated factors constraining the application of SCM in the Nigerian construction industry. The study findings revealed that out of the twenty four (24) factors identified as constraints to the application of SCM in the Nigerian construction industry. The followings were identified as the most significant constraints; Lack of the understanding of SCM concept was identified as the most significant factor with a SI of 50.76 and ranked first. This was followed by unclear strategic benefits SI of 50.52, dearth of trust within and outside an organization SI of 50.31, lack of a common standard for collaboration SI of 49.32 and failure to broaden the SC vision beyond procurement or product distribution SI of 48.12 which were ranked second, third fourth and fifth respectively.

In conclusion, the most significant constraint to the application of SCM in the Nigerian construction industry are; lack of the understanding of SCM concept; unclear strategic benefits;

dearth of trust within and outside an organization; lack of a common standard for collaboration; and failure to broaden the SC vision beyond procurement or product distribution.

We recommend that a forum be created through workshops, conferences, face-to-face interactions if need be to help understand what the concept is all about. Without a concerted effort of this sort in place, the tendency to apply the concept into the delivery of construction projects would be a mirage. There is need for all and sundry to understand the technicalities underlying the concept. The next most significant constraint is unclear strategic benefits. There is need also to make serious clarification on the long term (strategic) benefits ensuing from the adoption of SCM in construction project delivery. Stakeholders in the industry, academics, professional associations and the likes should as a matter of necessity convey to organizations, contractors, construction firms on the benefits of deploying the concept giving the milestones achieved in the manufacturing sector where the concept originated from.

The issue of trust is critical to SCM application. Like we said earlier on, trust is the foundation on which collaborative tendencies like partnering and the likes thrive on. Adequate trust building should be developed within and outside an organization as this would help in moving the organization forward when they partner or collaborate in an effort to achieve their objectives.

The lack of a common standard for collaboration is also another constraint to the deployment of SCM. A framework for collaborative tendencies should be designed by construction firms in collaboration with their other counterparts for purposes of achieving SCM objectives. Most SCM related contractual engagements rely more on collaboration to thrive. A common standard should be designed by all professionals within the industry for purposes of facilitating collaboration amongst different firms so as to enable the professionals compete with their peers in the competitive world.

Failure to broaden SC vision beyond procurement or product distribution is another constraint to the adoption of SCM. We recommend that concerted effort be made towards enlightening the construction firms, professionals, etc that the SCM concept supersedes procurement of goods and services, purchasing and supply and or product distribution. When this is done, a clear distinct line would have been drawn to clearly specify what SCM entails. Researches, conference attendance and interactions with knowledgeable experts in the area would help a great deal in broadening and widening the ideas behind the SCM concept.

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## REFERENCES

- Abdulsalam, D., Faki, A.I. & Dardau, A.A. (2012). Impact assessment of incentive schemes for sustainable development of Nigerian construction industry. *Journal of Civil Engineering and Architecture*, 6 ( 9), 1194-1201.
- Ahmed, S. M., Azhar, S. & Ahmad, I. (2002). Supply chain management in construction. Scope, benefits and barriers. *Delhi Business Review*, 3 (1), 1-6.
- Aibinu, A. A. & Jagboro, G.O. (2002). The effects of construction delays on project delivery in Nigerian construction industry. *International Journal of Project Management*, 20, 593-599.
- Aiyetan, A.O. (2010). *Influences on construction project delivery time*. (A Doctoral thesis of the Faculty of Engineering, the Built Environment and Information Technology, Nelson Mandela Metropolitan University, South Africa).
- Akintoye, A., McIntosh, G. & Fitzgerald, E. (2000). A survey of supply chain collaboration and management in the UK construction industry. *European Journal of Purchasing and Supply Management*, 6, 159-168.
- Aloini, A., Dulmi, R., Mininno, V. & Ponticelli, S. (2012). A conceptual model for construction supply chain management implementation. In: *S.D. Smith (Ed.) Proceedings 28<sup>th</sup> Annual ARCOM Conference, Association of Researchers in Construction Management*. (pp 675-685) 3-5 Sept, 2012, Edinburgh, U.K.
- Amade, B. (2012a). An evaluation of factors constraining the implementation of public private partnerships in construction infrastructure projects in Nigeria. *International Journal of Science and Engineering Investigations*, 1 (9), 106-117.
- Amade, B. (2012b). Partnering mechanisms and the procurement of building construction projects delivery. *International Journal of Advanced Scientific and Technical Research*, 6 (2), 596-620.
- Amade, B. (2016). Constructability tools and techniques in use in the Nigerian construction industry. *PM World Journal*, 5 (2), 1-19.
- Ayangade, J. A., Wahab, A.B. & Alake, O. (2009). An investigation of the performance of due process mechanism in the execution of construction projects in Nigeria. *Civil Engineering Dimension*, 11 (1), 1-7.
- Ayodele, E. O. & Alabi, O.M. (2011). Abandonment of construction projects in Nigeria: Causes and effects. *Journal of Emerging Trends in Economics and Management Sciences*, 2 (2), 142-145.

- Benton, W. C. & McHenry, L.F. (2010). *Construction purchasing and supply chain management*. U.S.A.: Mc Graw-Hill Companies, Inc, ISBN:978-0-07-154886-1, MHID:0-07-154885-8.
- Charter, M., Kielkiewicz-Young, A., Young, A. & Hughes, A. (2001). Supply chain strategy and evaluation. *The SIGMA Project, R and D Report, January, 2001*.
- Chen, I.J. & Paulraj, A. (2004). Towards a theory of supply chain management: The constructs and measurements. *Journal of Operations Management*, 22, 119-150.
- Cutting-Decelle, A. F., Young, B.I., Das, B.P., Case, K., Rahimifard, S., Anumba, C.J. & Bouchlaghem, D.M. (2007). A review of approaches to supply chain communications: From manufacturing to construction. *Journal of Information Technology in Construction*, 12, 73-102.
- Dada, M.O. (2013). Client and contractor organization's assessment of design-bid-build procurement practice in Nigeria. *Civil Engineering Dimensions*, 15 (1), 1-10.
- Dada, M.O. & Oladokun, G.M. (2012). Analysis of critical success factors for public private partnerships in Nigeria. *Alam Cipta*, 5 (2), 13-26.
- Department for Business, Innovation and Skills (2013). Supply chain analysis into the construction industry-A report for the construction industrial strategy. *BIS Research Paper No. 145*. Retrieved from [www.gov.uk/bis](http://www.gov.uk/bis). October, 2013.
- Egan, J. (1998). Rethinking construction. *A Report of the Construction Task Force (The Egan Report) Department of the Environment, Transport and the Regions, London: HMSO*.
- Fugar, F.D.K. & Agyakwah-Baar, A.B. (2010) Delays in building construction projects in Ghana. *Australasian Journal of Construction Economics and Building*, 10 (1/2), 103-116.
- Hope, R. (2012). A vision for the future of construction: Supply chain management and integration (A Nottingham Trent University JCT Student Essay Competition). Retrieved from <http://www.google.com>.
- Idrus, A.B. & Sodangi, M. (2010). Framework for evaluating quality performance of contractors in Nigeria. *International Journal of Civil and Environmental Engineering*, 10 (1), 31-36.
- Industry Directions (2005). Supply chain performance: The suppliers role. *Executive Brief of the Industry Directions Inc, March 2005*. Retrieved from [www.industrydirections.com](http://www.industrydirections.com)

- Khalfan, M.M.A., McDermott, P. & Asad, S. (2004). Supply chain integration within construction: Related theories and concepts”. 191-200. Retrieved from <http://www.google scholar.com>
- Krejcie, R.V. & Morgan, D.W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, 30, 607-610.
- Latham, M. (1994). *Constructing the team. A Final Report of the Government/Industry Review of Procurement and Contractual Arrangements in the U.K Construction Industry*. Retrieved from <http://www.google scholar.com>.
- Manu, D. (2014). *Supply chain management practices in construction and inter-organizational trust dynamics*. (Doctoral Thesis of the University of Wolverhampton), U.K.
- Nawaz, T. & Ikram, A.A. (2013). Benefits and impediments in implementing total quality management in Pakistani construction sector. *European Journal of Business and Management*, 5 (4), 205-227.
- Oisamoje, M. D. & Areloegbe, H.A. (2014). Supply chain management and completion of petroleum projects in Nigeria. *European Journal of Logistics and Supply Chain Management*, 2 (1), 42-61.
- Ojo, E., Mbohwa, C. & Akinlabi, E. (2013). An analysis of green supply chain management in South Africa and Nigeria: A comparative study. International Conference in Integrated Waste Management and Green Energy Engineering (ICIWMGEE’ 2013) April 15-16, 2013, (pp 315-319) Johannesburg, S.A.
- Oladapo, A.A. (2006). The impact of ICT on professional practice in the Nigerian construction industry. *The Electronic Journal of Information Systems in Developing Countries*, 24 (2), 1-19.
- Oyedele, O. A. (2013). Construction project financing for sustainable development of Nigerian cities. FIG Working Week, Environment for Sustainability, (pp 1-17) Abuja, Nigeria. 6—10 May.
- Oyewobi, L.O. & Ogunsemi, D.R. (2010). Factors influencing reworks occurrence in construction: A study of selected building projects in Nigeria”. *Journal of Building Performance*, 1 (1), 1-20.
- Oyewobi, L.O., Ganiyu, B.O., Oke, A.A., Ola-Awo, A.W. & Shittu, A.A. (2011). Determinants of unethical performance in Nigerian construction industry. *Journal of Sustainable Development*, 4 (4), 175-182.



- Pheng, L. S. & Shang, G. (2011). The application of the just in time philosophy in the Chinese construction industry. *Journal of Construction in Developing Countries*, 16 (1), 91-111.
- Saad, M., Jones, M. & James, P. (2002). A review of the progress towards the adoption of supply chain management relationships in construction. *European Journal of Purchasing and Supply Management*, 8, 173-183.
- Saka, N. & Mudi, A. (2007). *Practices and challenges of supply chain management by building contracting firms in the Lagos metropolitan area*. In D. Boyd, (Ed) Proc 23<sup>rd</sup> Annual ARCOM Conference, 3-5 Sept, 2007, (pp 777-786) Belfast, U.K. Association of Researchers in Construction Management.
- Tiwari, R., Sheperd, H. & Pandey, R.K. (2014). Supply chain management in construction: A literature survey. *International Journal of Management Research and Business Strategy*, 3 (1), 7-28.
- Viswanadham, N. & Kumar, V. (2006). Design of competitive Indian construction supply chain networks. 153-192.
- Voordijk, H. & Vrijhoef, R. (2003). *Improving supply chain management in construction: What can be learned from the aerospace industry*. In D.J. Greenwood, (Ed) 19<sup>th</sup> Annual ARCOM Conference, 3-5 Sept, 2003, (pp 837-846) University of Brighton. Association of Researchers in Construction Management.
- Vrijhoef, R. & Koskela, L. (1999). *Roles of supply chain management in construction*. Proceedings of IGLC-7, 26-28 July 1999 at the University of California, (pp 133-146) Berkeley, CA, U.S.A.
- Walker, R. (2002). Case studies, case records and multi-media. *Journal of Education*, 32 (1), 109-127.
- Wirahadikusumah, R.D. & Abduh, M. (2010). *Reinforcing the role of owners in the supply chains of highway construction projects*. Proceedings of the First Makassar International Conference on Civil Engineering (MICCE 2010) (pp 1321-1328) March 9-10.
- Wong, P.S.P., Tsoi, J.N.Y. & Cheung, S.O. (2004). Identifying obstacles against implementation of supply chain management in construction. *Hong Kong Surveyor*, 15 (2), 12-22.
- Xue, X., Wang, Y., Shen, Q. & Li, X. (2007). Coordination mechanism for construction supply chain management in the internet environment. *International Journal of Project Management*, 25, 150-157.

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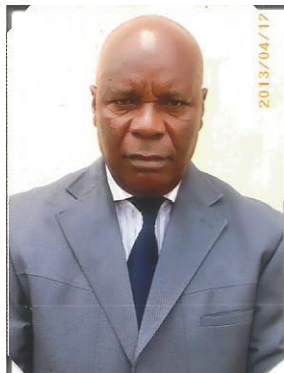


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