

**SUPPLY-CHAIN QUALITY MANAGEMENT AND BUILDING MATERIAL
INDUSTRY PERFORMANCE IN NORTH-CENTRAL NIGERIA PROJECTS:
A SYSTEMATIC LITERATURE REVIEW**

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ABSTRACT

Construction materials are fundamental inputs to the activities and products of the construction industry worldwide. Over 70% of construction execution cost is spent on materials and equipment at aggregate economic level. The building materials manufacturing industry subsector of the Nigerian Construction industry unfortunately have a paltry market share of about 37% while the remaining 63% share of the market is based on importation. Studies show that the relatively poor share of indigenous building material manufacturers' products is attributable to perceived poor quality, low demands for products, and poor commercial status, thus, leading to a higher patronage of materials from foreign counterparts. This study aims at evaluating the relationship between project supply-chain quality management and the performance of building material industry in selected states of North-central Nigeria. The study employed a systematic literature review approach to undertake global case studies using the requisite keywords. Study's results revealed an existence of a strong positive relationship between project supply-chain quality management and building materials manufacturing industry economic performance, owing to improved customer satisfaction, increased patronage of locally manufactured building materials, enlarged knowledge sharing, enhanced profitability and overall economic/financial prosperity of Nigerian building materials manufacturing industries. The study concludes that supply-chain project quality management is a winning strategy and formidable tool for business competitive advantage in a post pandemic era. The study recommended the adoption of project supply-chain quality management for improved economic/ financial performance of Nigeria's building materials manufacturing firms.

Keywords: building materials industry, economic performance, project supply-chain, quality management.

JEL Classification: L60, L61, L74, M11

1. INTRODUCTION

Construction materials form the basis for the construction industry worldwide, and over 70% of the total execution cost is expended on materials and equipment (Patel & Vyas, 2011). Building materials is a major input resource required for the successful erection of virtually every building and engineering infrastructure (Akanni, 2006; Udosen & Akanni, 2010). The construction industry of any region, country or state plays a crucial role in its economic development especially in the

provision of housing infrastructures of sorts with attendant employment potentials (Oladinrin, et al., 2012). Notably, the building industry subsector of the construction industry is the engine room of Nigerian economy as it accounts for about 60 percent of Nigeria's capital investment, and by this, regarded as the construction industry's growth catalyst (Akanni et al., (2014). Construction project activities inherently consume large amount of building materials which in turn produces the required aesthetics, functionality, life span, and also helps in the timely completion of projects (Patel & Vyas, 2011; Idowu & Winston, 2018). The materials used in building construction are broadly classified into natural and synthetic materials. Natural building materials are naturally occurring. They include but not limited to water, laterite, sharp sand, chippings, timber, stones, and bamboo. Whereas, the man-made or industrially processed materials include but not limited to reinforcement rods, fabricated steel and metal sheets, cement, paint, glass, ceramics, tiles, electrical wires, pipes, plastics, aluminum, etc (Ambrose et al., 2019; Irabor, 2019; Adese & Olajide, 2021; Anosike, 2021; Okpalaobi et al., 2022).

The products of the construction industry are as good as their input materials. Recent decades have been marked with many incidences of construction failures, arising principally from unwholesome deployment of input material resources and components (Chendo & Obi, 2015). The fatalities arising from construction infrastructure failure and building collapses have had a debilitating social and economic impacts, thus amounting to a colossal loss of lives and unprecedented resource wastages (Okorie & Adindu, 2020; Kingori, et al., 2021). The poor quality of building materials of local industrialists has adversely retarded growth of the building material manufacturing industry in Nigeria (Sholanke et al., 2015). Oke (2006), states that poor quality materials contributed to more than 45% of building collapses in Nigeria. Observably, Obot & Archibong (2016), declares that the recurrent issues and preponderance of building collapses in many parts of Nigeria, has necessitated a plethora of researches by practitioners and scholars alike aimed at improving the quality of building materials from indigenous manufacturing firms. Knowledge of improved production techniques is key in order to curtail the incidences of building failures and improve the performance of the industry through use of quality building materials and components in the construction delivery chain. Studies by Ashaka & Wanogho (2021), avers that human capital is a growth determinant in production systems. The role played and importance placed on building materials such as cement, granite, steel reinforcement, roofing sheets, etc in the construction delivery cannot be undermined in the achievement of the desired performance standards in the nations' building industry (Ehizemhen et al., 2020; Akinbobola et al., 2021; Abubakar & Omotoriogun, 2022). The Nigeria building materials industry therefore faces challenges and knowledge gaps that prevent favorable competition with their foreign counterparts (Muhammed et al., 2022). Research by Olarenwaju, et. al (2022), asserts that institutional quality in the process of industrialization was fundamental to socio-economic transformation of nations. Thus, the management of quality is a key process of project management and constitutes a prime knowledge area that leads to the institutionalization of quality policy, objectives, responsibilities and its implementation (Project Management Institute, 2019). Supply Chain Management (SCM) is a quality management model integrated into businesses and manufacturing for the purpose of achieving required product demand and satisfaction (PMI, 2007). The whole essence of project supply-chain-management is therefore to help project management stakeholders in delivering specified products within required time, cost and quality. Thus, the performance of building materials manufacturing industries as the input-source for a construction supply-chain quality management is fundamental (Kusar et al., 2008); and underpins this research.

This empirical study therefore, aims at evaluating the existence of positive relationship between project supply-chain quality management and performance of building material industry in selected states of North - Central Nigeria region.

2. LITERATURE REVIEW

2.1 Supply-Chain Management Concept

Supply-chain according to Mensah, et al. (2014), comprises those processes involved in ensuring an organization achieves efficiency in the management of her product and /service supplies. The management of supply-chains comprise a thread of downstream and upstream processes that involves a network of several organizations aimed at ushering products and services to customers or end-users efficiently and effectively. Supply chain management (SCM), thus involves a coordinated approach for the movement of materials from source suppliers to end users (Abdullahi et al., 2022). Mentzer (2001), cited in Abdullahi et al. (2022), also views supply chain management as a structured process that relates business functions within and across the supply chain to enhance individual and collective organizational performance. Operationally speaking, supply chain management seeks to efficiently integrate the several suppliers, manufacturers, warehouses, and retailers for a coordinated distribution of manufactured products at the right place, within scheduled time, and optimal cost budgets (Shafiei & Tarmost, 2014). Nilipour-Tabatabaei, et al. (2012), asserts that local building material manufacturers needs to craft a sound and workable supply-chain policy if they must compete with their foreign counterparts effectively and win sustainably along the lines of flexibility, cost and quality of their products; improved customer relations and service delivery (Oguche, 2018), superior quick-time deliveries for products ordered (Barata et al., 2018), attainment of productivity and business efficiency (Bortolini et al., 2019), minimized transport, logistic, and warehousing costs (Deng et al., 2019), reduced indirect and direct costs (Kashani & Baharmast 2017; Gorane & Kant 2017).

2.2 Review of Building Materials in Nigeria

Developing countries have in recent years attached priority to private sector performance improvement (Kabir, 2022). The activities of the construction industry are vast and its infrastructures accelerates local development, employment creation and economic efficiency (Oladinrin et al., 2012). Onyegiri & Ugochukwu (2016), identified the building materials which have been adopted locally, even before civilization which are, clay, timber, straw, rock and thatch; they were mixed together and applied using local tools and methods, erected houses, town halls, markets, community centers and so on. Efficiency of operations with respect to production techniques, technological innovation, management and labour skills are key to the economic performane of industries (Ogunbadejo & Zubair (2022). Furthermore, studies by Okungbowa & Abhulimen (2021), revealed that industrial performance can be improved by the use of advanced technology as it tends to enhance labour productivity. A review by Ugochukwu et al. (2014), reveals an increasing demand and dependence on import-based building materials in comparison to locally produced materials in Nigeria and this is the primary reason for the decline in the growth and quality of locally manufactured building materials. Oladapo & Oni (2012), Ugochukwu et al. (2014), Ruya et al. (2017) and Muhammed et al. (2022) highlighted poor quality of product capacity and cost of production, low diversity, technological and innovative production, low

aesthetic value and poor finishing, and lack of standard specifications and regulations as reasons for the poor patronage of locally manufactured building materials in Nigeria. Findings by Ugochukwu et al. (2014) revealed that locally produced materials in Nigeria, accounts for 37% of total materials in the market against 23% for the imported ones, while the balance 40% represents a combination of local and imported. Mbamali & Okotie (2012), asserts that importation enhances globalization, international trade, specialization, and comparative advantage. However, it is worthy to note that Nigeria's dependence on imported building materials pose certain threats to the economy and sustainable existence of the building manufacturing industry. The following are such threats as reviewed by Idoro (2009), Mbamali & Okotie (2012), Ugochukwu, et al. (2014), Adeyemi, et. al. (2020), Ukolobia & Oboro (2021);

1. Lack of fully developed industrial infrastructures
2. Lack of business-friendly environment
3. Gain of larger share of available projects by foreign companies
4. Erosion of balance of trade with import her than export
5. Leads to consequent professional service importation relative to exportation
6. Low opportunities for patronage of local professionals
7. Low opportunities for patronage of local
8. Stunted growth of local manufacturers owing to low patronage and unfair competition with better equipped and capitalized foreign counterparts
9. Elimination of indigenous Nigeria cultural identity in building methodologies
10. Technological obsolescence of local skills precipitated by construction dynamics

2.3 Systematic Literature Review of Related Studies

The Systematic literature review was based on a comprehensive database of previous studies that have interviewed and investigated firms both locally and globally on the interplay or nexus between the concept of supply-chain management with the following outputs, namely; project quality management, business profitability and inventory management. The literature search of the study was mainly from Academia Research with a comprehensive, diverse and broad database. The key search words used were "supply-chain management", "sustainable supply-chain management", "challenges of supply-chain management", "inventory management", "supply - chain Management in manufacturing", "supply-chain management in construction industry", "innovative supply-chain management" and "case studies of supply-chain management integration". The research revealed 69 studies, out of which five 5 studies were considered as the most relevant to the keywords of the current research which were subsequently reviewed in-depth. Abdullahi et al. (2022), review on Building Materials Supply-Chain Management and Housing Sector performance in the FCT, Abuja, Nigeria, aimed at examining the problems associated with poor supply-chain management and other problems related with the flow of building materials. The study revealed that material cost overestimation, sub-standard material supplies, work variations, and fluctuations in the cost of materials had the most impact. Abdullahi et al. (2022), study also showed that material wastages during transit owing to default in logistics, price instability, stiff building regulations constituted additional major factors. as some other factors. Furthermore, Adebisi et al. (2021) study, used SEM (Structural Equation Modelling) path analysis with the aid of Analysis of Moments Structures (AMOS) Graphics to ascertain the strength of the relationship between the latent constructs of SCM and the performance's constructs in their effort

to examine how optimal performance in firms’ operations are influenced by the supply-chain management activities of the manufacturing firms. On another development Albert, et al. (2021) study investigated the effect poor materials management (with particular emphasis on wastes, quality of work, and project profitability) has on construction projects executed in Nigeria’s capital city-Abuja, using a qualitative research methodology. Also, Falk’s (2018) doctoral research on supply chain management strategies in the manufacturing industry sought to investigate the strategies employed by supply chain managers to match the level of unsold inventory in the supply chain with consistent customer demands, using semi-structured, face to face interviews.

Table 2.1: Categories of Literature Case Studies

Author (Year)	Key Words	Research Type	Research Methodology	Industry Type/ Location
Abdullahi et al. (2022)	Supply Chain Management, Performance, Building Materials	Journal	Descriptive Statistics, Regression Analysis, Inferential Statistics,	Construction, FCT, Nigeria
Adebiyi et al. (2021)	Management of Supply Chains, Manufacturing organizations’, performance	Journal	Survey Research Design, Structural Equation Modelling with Path analysis	Manufacturing Firms, Lagos Nigeria
Albert et al. (2021)	Building Materials, construction industry, materials management	Journal	Qualitative research, an ordinal 3-point Likert scale	Construction Industry, FCT, Nigeria
Falks (2018)	Supply Chain Management, Inventory management, manufacturing industry	Doctorate Dissertation	Qualitative and quantitative research of case studies, face to face interview	Manufacturing Firms, Midwestern, United States of America (USA)
Clave (2017)	Challenges, Supply Chain Management, Flexibility	Master’s Thesis	Qualitative and quantitative research of case studies, face to face interview	Global Manufacturing Firms: chocolate & cocoa firm; Chocolate company; a gas & electric grill firm; a Speaker manufacturer; a Steel rack firm; a global pharmaceutical company

Source: Author, (2023)

3.0 RESEARCH METHODOLOGY

This study aims at evaluating if relationship exists between project supply-chain quality management and building material industry performance in Nigeria. The study employed a systematic literature review approach on related global studies in order to achieve this study's objective. Literature review according to Baumeister & Leary (1997); Tranfield, et al. (2003) and Snyder, (2019), entails a technique of retrieving, summarizing, and aligning related previous studies to help create an informed perspective especially on areas of knowledge, policy formulation as well as a credible source of evidence on a study. Additionally, a literature review allows several empirical studies' findings to be combined to create an area of understanding that can add value. This is similarly applicable in the studies of Oloruntoba & Olanipekun, (2021); Norberg & Johansson, (2021), and Muhammed et al. (2022).

This study therefore, assesses findings in the previous related global studies in the area of project supply-chain quality management, to examine the relationship it has with the performance of building material industries in Nigeria.

4. DISCUSSION

Studies have shown that construction materials are key to infrastructure development, and its cost attributes with regards to total project costs, ranging between 50% - 60% (Kasim, et al., 2012; Kasim et al., 2013; Duiyong, 2014; Abhilin & Vishak, 2017). The cost of project logistics is in the neighborhood of 17% and 35% relative to material costs according to Duiyong et al., (2014) study, while the cost of transportation alone is within 39% and 58% threshold of the total cost of logistics going by studies conducted by Ying et al., (2014). Thus, the cost of transporting construction materials constitute the bulk of expenditure in construction contracting and this has become a crucial expenditure considering the dire need for prompt supplies of project material inputs vis - a -vis consequences of material shortages, late deliveries, material damages and associated wastages, storage constraints, etc, and their negative effects in the overall project supply and delivery chain. (Kasim et al., 2013; Abhilin & Vishak, 2017). Research by Vidalakis et al (2011); Alumbugu et al., (2020), show that major supply-delivery chain considerations that ensures seamless flow of materials from source of manufacture to the destination of material utilization and final integration into the works are key decisions which cannot be left to chance. As such, Ying et al., (2014), postulates that a significant material price rebate is achievable with a little discount in the cost of transportation. The relatively high demand on foreign manufactured materials and components compared to their local counterparts is a major challenge facing the growth and sustainable existence of local building manufacturers (Ugochukwu et al. 2014). Thus, studies by Oladapo & Oni (2012), Ugochukwu et al. (2014), Ruya et al. (2017) and Muhammed, et al. (2022), variously aver that poor quality, crude production methodology, low capacity utilization, poor product finishing, low durability, lack of value for money, lack of regulation and product standardization are unfortunately the major reasons for the poor patronage of locally made building materials in Nigeria. Supply-Chain Management (SCM) methodology has been variously employed as a tool for the planning and control of information flows, logistic procedures, and processes in the complex relationship regarding product supplies and distribution to customers and endusers (Chen & Paulraj ,2004; Kache & Seuring 2014). Observably, SCM has also in recent times become a popular global tool and competency with regards to organizational supply and distributive efficiency, effectiveness, and competitiveness amongst best of class (Frohlich & Westbrook ,2001; Ataseven & Nair, 2017). Studies by Christopher & Towill (2000), posits that the adoption of SCM strategy offers remarkable improvements in the areas of process efficacy,

lower inventory, enhanced customer satisfaction, improved quality of service delivery, cost optimality, and effectiveness of delivery. However, despite the numerous merits associated with SCM adoption, its challenges are also daunting regarding complexity, costs, vulnerability, and uncertainty amongst several others. Abdel-Basset, et al., (2018) opines that firms adopting SCM must develop integrative smart technologies to abate the challenges and in a manner that seamlessly allow information flows. Odunayo & Victor (2020); Silva, et al., (2020), and Musa & Ali, (2023), notes the possibilities of man-made or natural disruptions in virtually all SCMs, irrespective of their market niches, and product offerings, hence, the need to apply them cautiously.

5 CONCLUSION AND POLICY RECOMMENDATIONS

The literature results conclude that strong positive exists between project supply-chain quality management and building materials industry economic/financial performance. Improved product quality, better customer satisfaction, increased patronage of locally manufactured building materials, enlarged knowledge sharing, enhanced profitability were identified as major factors that lead to economic/financial performance of local building materials industries. The study recommended the need for improved corporate decisions and strategic planning especially on areas of supply-chain contract negotiation, placement, communication and information networking, product supply-delivery time enhancement, improved transport logistics, better warehousing and stockholding and improved inventory, reduced time-lapse between request-and response. The study literature findings therefore reveal that adoption of project supply-chain quality management would improve the economic performance of Nigeria's building materials manufacturing firms and position them on the path of sustainable growth and better competitiveness with regards to their foreign counterparts.

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