INNOVATION DRIVERS AND BARRIERS IN THE NIGERIAN CONSTRUCTION INDUSTRY

Abdulmuizz Olabayo Adebayo and Luqman Oyekunle Oyewobi
Department of Quantity Surveying, School of Environmental Technology, Federal University of Technology, Minna Niger state Nigeria.

ABSTRACT

The aim of the study is to assess innovation drivers and barriers in the Nigerian construction industry. The specific objectives are to: examine the drivers and barriers; identify means to establish innovation drivers; and proffer means to overcome innovation barriers in the Nigerian construction industry. Structured questionnaires were administered to experienced professionals which includes; Project Managers, Architects, Quantity Surveyors, Builders and Engineers of the sampled construction firms within Abuja and registered with the Federation of Construction Industry (FOCI). The data obtained were subjected to descriptive and inferential analyses using tables and RII (Relative Importance Index). The major drivers of innovation from the study are client innovative demand, productivity increase, design trend, subsides for innovative application and materials and improve effectiveness while the main barriers to innovation are lack of understanding of the benefits of innovation, cost of innovation and perception that the industry is doing well without innovation. Innovation has been found to be driven by the actions of clients and challenges thrown up by emergent crises on construction projects. The main barriers to innovation from the study are lack of understanding of the benefit of innovation, cost of innovation and perception that the industry is doing well without innovation. The construction industry will function better and improve the built environment when more of innovative drivers are put into play allowing little or no barrier to hinder the efficiency and effectiveness of innovation.

Keywords: barrier, construction, driver, improvement, innovation.

INTRODUCTION

Construction industry plays an important role towards the social and economic development of countries worldwide (Abdullateef and Seong, 2017). The industry promotes social progress by generating employment for a large number of people. It provides basic infrastructure for the efficient functioning of the society (Ogunbayo *et al*., 2010). Moreover, the construction industry has been criticized because of its low productivity and quality in comparison with other industries. One of the main reasons for this situation is because the industry suffers from poor adoption of innovation (Winch, 2003). Innovation can be described as the process of transforming an idea into a sellable good or service, or it could be the outcome of improvement on an existing goods or service (Benmansour and Hogg, 2012). It can also be described as an idea, or a technique or a process, which may be new or old that is applied to the production of goods or services in a distinct way, thereby adding value to a system, process or product (Ozorhon *et al*., 2010). However, it is very essential to seek for improvement in all areas of construction activities as it contributes extremely to the Gross Domestic Product (GDP) of most developed and developing countries. The industry has the potential of improving its size, market share and profitability, and innovation holds the key to that effect. Damanpour and Schneider (2010) added that innovation is very vital to achieve competitive advantage and to ensure survival of firms in the industry. According to Blayse and Manley (2010) the higher the levels of innovation in the construction industry, the greater the likelihood that it will increase its contribution to economic growth. In addition, engineering and construction firms in the industry need to innovate in order to win, improve productivity and quality of projects. In order to manage

innovation, we have to understand the industry as a whole and how innovation affect the Nigerian construction industry, how a new idea will have a value-added impact on firms in the industry. This motivates to study the major innovation drivers and barriers in the Nigeria construction industry and means to establish innovation drivers and overcome innovation barriers in the construction industry. The specific objectives of this study are to: examine the drivers and barriers to innovation in Nigerian construction industry; identify means to establish innovation drivers in the Nigerian construction industry; and proffer means to overcome innovation barriers in the Nigerian construction industry. Construction industry has faced increasing sophistication, which is driven by societal demands and environmental pressures for safe, high-quality, and sustainable construction (Napoleon and John, 2016). Against this backdrop of challenges, construction industry face serious pressure to innovate (Napoleon and John, 2016). Due to lack of known research related to the innovation performance of construction sector in literature, this research hereby fills the noticeable gap by focusing on drivers and barriers of innovation in the construction industry.

Historical overview of innovation discourse

The word innovation entered English texts in the mid-1500s from the Latin verb 'innovare' meaning renew, alter or make new (Abadi, 2014). Innovation history as it is regarded today (i.e. a success factor for businesses) has been through a progressive process throughout classical economic history. According to Abadi (2014) innovation was a deviant behaviour and considered as a strong barrier to social, religious and political norms. Innovation was a desirable behaviour only if it could sustain the status quo. Any changes outside the norms and interests of the corporate body, the state of religion or church were classed as deviance and the term innovation would be used to describe that behaviour. Even for practical technological developments, the term innovation would not be considered to describe the action. The Oxford English Dictionary from 1500s to 1800s has negative quotations from institution of Christian religious contexts to Shakespeare and law dictionaries to scientific articles (Abadi, 2014). In the 19th century, innovation changed from a taboo and deviant social behaviour into something positive. In 1939, Joseph Schumpeter initiated a new understanding in his book 'Business Cycles', of innovation as a driving force in economic growth in the United States in particular and in the West more generally.

Innovation in the construction industry

The contribution of the construction sector to the growth of the economy cannot be overstated. The performance of the sector has significant implications on the economy as a whole. Yet, the sector has often been criticised for delivering products and services which fall short in quality and fail to meet client expectation of price certainty and assured delivery (Lu and Sexton, 2012). This has prompted many calls for performance improvement (Egan, 2011; Fairclough, 2010; Latham, 2014). Innovation has been identified as an important means for improved performance in a rapidly changing business environment (García and Calantone, 2012). In the construction professional services environment, successfully creating and managing knowledge provides an important means of creating value although this value creation has been called into question by clients (Lu and Sexton, 2012). The need for improvement is also being driven by the quest for more flexibility that enables firms to respond to conflicting expectations and demands from clients (Koch and Bendixen, 2010). Innovation provides a means for firms to differentiate their services in order to stay ahead of competition. Profit maximisation has also been identified as an

important driving force behind efforts at innovation by construction firms (Lim and Ofori, 2014). The need for more innovation is further underscored by the fact that firms that engage in innovation tend to out-perform those that do not (NESTA, 2009).

Drivers of Innovation in the Construction Industry
Specifically, the factors that drive innovation in the construction industry are many, Bossink (2015) classified them into four distinct categories namely: environmental concerns, technological knowhow, knowledge sharing and boundary spanning. These four distinct categories were further subdivided by (Owolabi *et al.*, 2019) into the following drivers of innovation in the Nigerian construction industry: Clients with innovative demands, developments in ICT, design trends, productivity increase, reduction in cost, improved effectiveness, environmental sustainability, government regulation, subsides for innovative application and materials, competitive advantage, improved quality, environmental sustainability, stimulation of research, programmes promoting, product evaluating institution, market trends and opportunities, empowerment of innovation champions, creation of knowledge network, changing business environment, technology advances, recession aftermath, government incentives, programmes promoting access to technology, empowerment of innovation leaders, governmental guarantee for innovative firm and innovation stimulating regulation

Barriers to innovation in the nigeria construction industry
According to Benmansour and Hogg (2012), certain factors have been identified from literature as hindrances to innovation in the construction industry, they are highlighted as follows: lack of understanding of benefit of innovation, perception that the industry is doing well without innovation, cost of innovation, belief that innovation is risky, short term thinking, lack of resource/capacity, government regulation, lack of skillful brainstorm facilitation, lack of focus, lack of support, lots of idea, no delivery to market, cultural issues, politics, constantly shifting priority, lack of shared vision, lack of collaboration, lack of spare-time to develop new ideas, lack of urgency, stagnating mind, no clear process, not adopting emerging technology, unwillingness to acknowledge and learn from past, risk aversion, lack of leadership, type of organization structure and no creative thinking.

Means to establish innovation drivers in the Nigerian construction industry
Tolga *et al.* (2013) identified the following means to establish innovation drivers in his research: Performance, risk & knowledge management; integration around the product and service, flexible 'performance based' form of standard, information sharing & cooperation, management to advocate innovative ideas, comprehensive reward and incentive system, professional qualification and training, continuous re-examine the desires of clients, hiring new graduates and introducing them to new technologies, critical management and technical support, collective learning & knowledge creation, social collaboration & networking, creation of collaborative arrangements with industry initiated research with emphasis on performance and sustainability and manufacturers and suppliers should educate contractors on the benefits of modern available materials.

Means to overcome innovation barriers in the Nigerian construction industry
Tolga *et al*. (2013) also identified the following means to overcome innovation barriers in his research: subsidising innovations, regulations, improved communications, information, integration and training, support during innovation process, understand & discuss the legitimacy of innovative practice, continuous learning, organizational learning & knowledge management, cultivate an innovation culture, enhancing technical capabilities and encouraging employee ideas, identification of clear benefits of the use of ICT, enabling interactive environment and IT-related applications with short learning curves.

RESEARCH METHODOLOGY
This paper adopts the use of quantitative data obtained with structured questionnaire. The questionnaire was administered to experienced professionals which includes; Project Managers, Architects, Quantity Surveyors, Builders and Engineers of the sampled construction firms who have acquired a minimum of 5 years working experience in the construction industry. The sample units for this study were drawn from the list of registered construction firms with the Federation of Construction Industry (FOCI) in Abuja. Since the population size is small, the sample size for the study was taken as the population size which is the number of the construction firms registered with FOCI in Abuja (25). From each of the sample unit, five experience professionals were selected with the use of random selection table. The total numbers of One Hundred and Twenty-Five (125) copies of questionnaires were administered to the respondents, out of which 89 copies were retrieved giving a response rate of 71%. The data obtained were subjected to both descriptive statistics using tables to present results and inferential statistics using RII (Relative importance index) to rank in order of importance.

$$\text{RII} = \frac{\Sigma W}{A \, X \, N} \text{ ---------------------- (1)}$$

Where: Σ = Summation, W = the weights of every one of the factors given by respondents and it was in the range of (1 - 5), (A=5) the largest value of weight (i.e. Highest factor) and finally N refers to the Total number of respondents.
Decision Rule for Data Analysis:
RII value within $0.81 - 1.00$ is asses to be very Important
RII value within $0.61 - 0.80$ is asses to be Important
RII value within $0.41 - 0.60$ is asses to be fairly Important
RII value within $0.21 - 0.40$ is asses to be less Important
RII value within $0.00 - 0.20$ is asses to be least Important
Source: Shittu *et al.,* (2015)

RESULTS AND DISCUSSION
This study gathers information about the respondents. It includes the respondent's construction firm, designation of respondent in the organisation, respondent years of experience in the construction industry, and their familiarity with innovation.

Table1 shows that out of 89 respondents, 48(54%) works with Small scale construction firms, while 41(46%) works with medium scale construction firms in Abuja.

Table 1: Classification of Respondents Firms

	Frequency	Percentage
Small Scale Construction Firm	41	46.1
Medium Scale Construction Firm	48	53.9
Total	**89**	**100.0**

Table 2 shows that 11(12%) of the respondents were Architects, 24(27%) were Engineers, 21(24%) were Quantity Surveyors, 20(22%) were Builders, 13(15%) were Project Managers. This shows that the majority of the respondent are Engineers.

Table 2: Designation of Respondents

	Frequency	Percentage
Architect	11	12
Engineer	24	27
Quantity Surveyor	21	24
Builder	20	22
Project Manager	13	15
Total	**89**	**100**

Table 3 shows that 25(28%), 38(42%), 20(23%), 5(6%), and 1(1%) were within the range of 1-5yrs, 6-10yrs, 11-15yrs, 16-20yrs, and above 21 years of experience in construction industry respectively.

Table 3: Respondents Years of Experience

	Frequency	Percentage
1 – 5yrs	25	28
6 – 10yrs	38	42
11 – 15yrs	20	23
16 – 20yrs	5	6
21yrs and above	1	1
Total	**89**	**100**

Table 4 shows that 9(10%) has very low familiarity with innovation, 20(22%) has low familiarity with innovation, 21(24%) were averagely familiar with innovation, 35(39%) have high familiarity with innovation, while 4(5%) have very high familiarity with innovation.

Table 4: Respondents Familiarity with Innovation

	Frequency	Percentage
Very Low	9	10
Low	20	22
Average	21	24
High	35	39
Very High	4	5
Total	**89**	**100**

Table 5 shows five (4) very important drivers of innovation in the Nigerian construction industry ranging from client with innovative demand (RII = 0.83), productivity increase (RII = 0.83),

design trend (RII = 0.82), subsides for innovative application and materials (RII = 0.82) and improved effectiveness (RII = 0.81). Other drivers of innovation in the Nigerian construction industry which are Market Trends and Opportunities, Competitive Advantage, Development in ICT, Improved Quality, Changing Business Environment, Empowerment of innovation champions, government regulation, Environmental sustainability, Stimulation of research, Market pull, Creation of Knowledge network and Recession aftermath with RII of 0.78, 0.77, 0.76, 0.76, 0.76, 0.74, 0.71, 0.70, 0.70, 0.69, 0.69, 0.65 and 0.64 respectively are shown to be important. Government guarantee for innovative firm, Programmes Promoting Access to Technology, Empowerment of Innovation Leaders, Government Incentives, Innovation Stimulating Regulation, Product Evaluating Institution, Programmes promoting and Cost Reduction with RII of 0.60, 0.59, 0.59, 0.58, 0.55, 0.53, 0.47, and 0.43 respectively are shown to be fairly important. Averagely all the identified drivers of innovation in the Nigerian construction industry are important with average RII of 0.68.

Table 5: Drivers of Innovation in the Nigerian Construction Industry

S/No.	Drivers of Innovation	RII	Rank	Decision
1	Clients with innovative demand	0.83	1st	Very Important
2	Productivity Increase	0.83	2nd	Very Important
3	Design Trends	0.82	3rd	Very Important
4	Subsides for Innovative Application and Materials	0.82	4th	Very Important
5	Improved Effectiveness	0.81	5th	Very Important
6	Technology advances	0.78	6th	Important
7	Market Trends and Opportunities	0.77	7th	Important
8	Competitive Advantage	0.76	8th	Important
9	Development in ICT	0.76	9th	Important
10	Improved Quality	0.76	10th	Important
11	Changing Business Environment	0.74	11th	Important
12	Empowerment of Innovation Champions	0.71	12th	Important
13	Government Regulation	0.70	13th	Important
14	Environmental Sustainability	0.70	14th	Important
15	Stimulation of Research	0.69	15th	Important
16	Market Pull	0.69	16th	Important
17	Creation of Knowledge Network	0.65	17th	Important
18	Recession Aftermath	0.64	18th	Important
19	Governmental Guarantee for Innovative Firm	0.60	19th	Fairly Important
20	Programmes Promoting Access to Technology	0.59	20th	Fairly Important
21	Empowerment of Innovation Leaders	0.59	21st	Fairly Important
22	Government Incentives	0.58	22nd	Fairly Important
23	Innovation Stimulating Regulation	0.55	23rd	Fairly Important
24	Product Evaluating Institution	0.53	24th	Fairly Important
25	Programmes promoting	0.47	25th	Fairly Important
26	Cost Reduction	0.43	26th	Fairly Important
	Average RII	**0.68**		**Important**

Table 6 shows three (3) very important barriers to innovation in the Nigerian construction industry, which includes Lack of understanding of the benefit of Innovation (RII of 0.84), Cost of Innovation (RII = 0.83), Perception that the industry is doing well without innovation with

(RII of 0.81). The remaining listed barrier to innovation in the Nigerian construction industry are shown to be important with RII of 0.80, 0.80, 0.79, 0.79, 0.79, 0.78, 0.76, 0.76, 0.76, 0.75, 0.73, 0.72, 0.70, 0.70, 0.69, 0.68, 0.68, 0.67, 0.65, 0.65, 0.63, 0.61, and 0.61 respectively. Averagely all the identified barriers to innovation in the Nigerian construction industry are important with average RII of 0.73.

Table 6: Barriers to Innovation in the Nigerian Construction Industry

S/No	Barriers to Innovation	RII	Rank	Decision
1	Lack of understanding of the benefit of innovation	0.84	1st	Very Important
2	Cost of innovation	0.83	2nd	Very Important
3	Perception that the industry is doing well without innovation	0.81	3rd	Very Important
4	Risk Aversion	0.80	4th	Important
5	Lack of Resource/Capacity	0.80	5th	Important
6	Short Term Thinking	0.79	6th	Important
7	Type of Organisation Structure	0.79	7th	Important
8	Lack of Skillful brainstorm facilitation	0.79	8th	Important
9	Government Regulations	0.78	9th	Important
10	Belief that innovation is risky	0.76	10th	Important
11	Unwillingness to acknowledge and learn from past	0.76	11th	Important
12	No Clear Process	0.76	12th	Important
13	Not adopting emerging technology	0.75	13th	Important
14	Lack of Shared Vision	0.73	14th	Important
15	Lack of Leadership	0.72	15th	Important
16	Lack of Collaboration	0.70	16th	Important
17	Stagnating Mind	0.70	17th	Important
18	Lack of Urgency	0.69	18th	Important
19	Lack of Spare-Time to develop new Ideas	0.68	19th	Important
20	Politics	0.68	20th	Important
21	Constantly shifting Priority	0.67	21st	Important
22	No Creative thinking	0.65	22nd	Important
23	Cultural Issues	0.65	23rd	Important
24	Lack of Support	0.63	24th	Important
25	Lots of Idea, no delivery to market	0.61	25th	Important
26	Lack of Focus	0.61	26th	Important
	Average RII	**0.73**		**Important**

DISCUSSION OF RESULTS

Clients play an important role in driving innovation. They can exert pressure on the design and construction team to adopt innovative designs and construction methods so that they can have value for their money. The respondents ranked clients with innovative demand as the most important driver of innovation in the construction industry.

The most important barrier to innovation as perceived by the respondents was a lack of understanding of the benefits of innovation. An understanding of the benefits of innovation is a strong motivation for innovation without which striving for innovation will be nothing but an illusion. Cost of innovation was ranked as the second most important barrier to innovation. Innovation will require some level of expertise, absence of which might hinder innovation as described by (Ogunbayo *et al.,* 2010). Perception that the industry is doing well without

innovation was ranked as the third most important barrier to innovation. This is not surprising because once there is a lack of understanding of the benefits of innovation in the first instance, the potentials of innovation for improving the size, market share and profitability cannot be understood. Hence, stakeholders will believe that the industry is doing well without innovation. The implication of findings in the study encourages construction professional to innovate, and also enable them meet up with modern trends in the aspect of construction, which in turn increase the level of efficiency and effectiveness of the Nigerian Construction Industry towards service delivery. Nevertheless, innovation barriers aforementioned have constrained construction professionals from adopting modern technology in the industry.

CONCLUSION AND RECOMMENDATIONS

The construction industry in Nigeria is a vibrant market comprising of foreign and indigenous players. The industry can increase its size, market share and profitability by adopting innovative designs and construction methods. The drivers and barriers to innovation were assessed in this study. The major drivers of innovation from the study were clients with innovative demand, productivity increase, design trends, Subsides for Innovative application and materials and improved effectiveness. Innovation has been found to be driven by the actions of clients and challenges thrown up by emergent crises on construction projects. For firms to improve their innovation performance in response to these drivers, the study indicates that the most important strategy is to focus on relationships-building. The learning required for effective innovation is maximised via enhanced relationships and shared understandings, which give rise to knowledge multiplier effect and the development of collaborative advantage. The main barriers to innovation as perceived by the respondents from the study are lack of understanding of the benefits of innovation, cost of innovation and Perception that the industry is doing well without innovation. These barriers need to be revised and readjusted in order to overcome innovation hindrances by construction firms, so as to encourage firms to actively innovate continuously and consistently.

Based on this study the following essential recommendations are made
  i.   Nigerian government should provide favourable policies that will enable construction firms to innovate.
  ii. Construction firms should endeavour to send their employees to attend workshops, seminars and other training programs that will enlighten them on new ideas, modern technologies and how to apply them. This will benefit the construction firms and the construction industry as whole.

REFERENCE

Abadi, A. (2014). A study of Innovation Perception within the construction industry. *School of Mechanical, Aerospace and Civil Engineering university of Manchester.*

Abdullateef, O. and Seong, Y. T. (2017). *Roles of communication on performance of the construction sector.*

Afolabi, A. O., Oyeyipo, O., Ojelabi, R. A. and Tunji-Olayeni, P. F. (2017). *E*-maturity of construction stakeholders for a web-based e-procurement platform in the construction industry. *International Journal of Civil Engineering and Technology (IJCIET),* 8 (12).465-482.

Anderson, F. and Manseau, A. (1999). A System Approach to Generation/ Transmission /Use of Innovation in Construction Activities. *Paper Presented at the Third International Conference on Technology Policy and Innovation*: Global Knowledge Partnership Creating Value for the 21st Century.

Benmansour, C. and Hogg, K. (2012). An Investigation into the Barriers to Innovation and their Relevance within the Construction Sector. In: Greenwood, D (Ed.), *18th Annual ARCOM Conference, 2-4 September 2012, University of Northumbria. Association of Researchers in Construction Management*, (2), 677-686.

Blayse, A. & Manley, K. (2010). Key influences on construction innovation. *Construction Innovation: Information, Process, Management*, 4(3), pp. 143- 54.

Bossink, B. A. (2015). *Effectiveness of innovation leadership styles*: a manager's influence on ecological innovation in construction project, Construction Innovation, 4 (4), 211-228, https://doi.org/10.1108/14714170410815105

Damanpour, F., & Shneider, G. (2010). The dynamics of the adoption of product and process innovations in organizations. *Journal of Management Studies*, 38(1), 45–65.

Egan, J. (2011). *Accelerating Change.* London: Rethinking Construction.

Fairclough, J. (2010). *Rethinking Construction*. London: Construction Task Force.

Garcia, R. and Calantone, R. (2012). 'A critical look at technological innovation typology and innovativeness terminology: a literature review', *Journal of product innovation management*, 19(2), pp. 110-132.

Koch, C. and Bendixen, M. (2005). Multiple Perspectives on Organising: Projects between Tyranny and Perforation, *Building Research and Information*, 33(6) 536-546.

Latham, M. (2014). *Constructing the team*. London: HSMO.

Lim, J. N. and Ofori, G. (2014). Classification of innovation for strategic decision making in construction businesses, *Construction Management and Economics*, 25(9) 963-978.

Napoleon, D. U. & John, A. (2016) The Role of Construction Small and Medium Enterprises (SMEs) in Economic Development being a paper presented at *46th National Conference/Annual General Meeting of the Nigerian Institute of Building, held at the University of Benin* 8th -12th August, 2016.

NESTA (National Endowment for Science, Technology and the Arts) (2009) Hidden Innovation, London: NESTA.

Ogunbayo, B. F., Ajao, A. M., Alagbe, O. T., Ogundipe, K. E., and Ogunde, A. (2018). Residents' Facilities Satisfaction in Housing Project Delivered by Public Private Partnership (PPP) in Ogun State, Nigeria*, International Journal of Civil Engineering and Technology (IJCIET),* 9 (1), 562-577.

Ojelabi, Rapheal A., Afolabi, A.O., Oyeyipo, O., Tunji-Olayeni, P. F. and Adewale, B. A. (2018). Data Exploration of Social Client Relationship Management (CRM2.0) Adoption in the Nigerian Construction Business. *Data in Brief*, 18. 1471 1476.

Owolabi, J. D., Faleye, D., Eshofonie, E. E., Olayeni P. T. and Adedeji, O. A. (2019). An Investigation into the Barriers to Innovation and their Relevance within the Construction Sector. In: Greenwood, D (Ed.), *18th AnnualARCOM Conference, 4 September 2002, University of Northumbria. Association of Researchers in Construction Management*, (2), 677-686.

Ozorhon, B., Abbott, C., Aouad, G. and Powell, J. (2010). Innovation in Construction A Project Life Cycle Approach, *SCRI Research Report*, Salford, England.

Seadan, G. and Nanseau, A. (2011). Public Policy and Construction Innovation, *Building Research and Information*, 96-182. *International Journal of Civil Engineering and Technology (IJCIET),* 8 (12).465-482.

Sexton, M. G. and Lu, S. L. (2012). 'Construction Innovation: Theory and Practice', *Construction Innovation and Process Improvement*, 45.

Shittu, A. A., Ibrahim A. D., Ibrahim, Y. M. and Adogbo, K. J. (2015). Assessment of Level of Implementation of Health and Safety Requirement in Construction Projects Execution by Small Firms in Abuja. In D. R. Ogunsemi, O. A. Awodele and Oke, A. E, (Eds) Proceeding of the 2nd*Nigerian Institute of Quantity Surveyors Research Conference* (RECON2).

Tolga, I. A., Deniz, A. I. and Attila, D. (2013). Analysis of Drivers and Barriers of Construction Innovation, *Istanbul Technical University, Project Management Center 34469 Maslak Istanbul Turkey.*