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Effect of Technology on Internationalization of Construction Business in Nigeria

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ABSTRACT
This research work empirically explored Effect of technology on Internationalization of Construction Business in Nigeria. The objectives of this study were to identify ICT application areas and the level of adoption of ICT by construction companies in Nigeria, to identify trends in technology transfers into Nigeria's construction and management industry, to examine the costs, benefits and risk factors of technology adoption, to analyse measures that could enhance technology transfers. The survey design was used to explain, explore and describe the variables. The population includes contractors, experts, concerned agencies and relevant stakeholders in Nigeria. The sample size consists of 500 persons. Data collected were collected from primary sources. The data collected from the questionnaires was analyzed using the Ordinary linear regression. From the analysis of the data, the findings revealed that technology adoption are important in determining internationalization of construction business in Nigeria, it brings about efficiency and effectiveness in the building industry. It would provide stakeholders with headway to attaining project goals and would certainly results in adequate benefits at every part of project execution. Following the findings, it was recommended that Implementation of technology in construction industry in Nigeria should be adequately pursued; contractors, engineers, architects should embrace technology application by purchasing relevant software and equipment. Thus, in the light of the foregoing, this study reliably concludes that technology in construction industry will bring positive impact in Nigeria generally, starting from massive infrastructural facilities to increase in GDP and FDI.

Keywords: technology, internationalization, construction industry, Nigeria

I. INTRODUCTION

Small-scale construction firms that are facing several new and evolving challenges that tends to limits their ability towards successful delivery of construction projects dominate the Nigerian construction industry (Bilau, Ajagbe,Bustani and Sholanke, 2009;Abdullah et al., 2012), thus, their productivity and performance remain relatively low due to cost and time overruns coupled with poor workmanship (Bilau, Ajagbe, Bustani and Sholanke, 2009; Osotimehin, Jegede, Akinlabi and Olajide, 2012). In a world of scarce resources and economic growth, the welfare of society is associated with long-term improvement in productivity and performance of local contracting firms, which eventually raises the standard of living and allow local firms to compete effectively in the international arena (Pekuri,Hapasalo, and Herrala, 2011).

The quest to remain afloat and competitive in this digitalised world and advancement in Information & Communication Technology have made digital transformation a hot debate topic for the moment and as adriving force for innovation and transformation for industries around the world (Ganguly, 2015;Onyia, 2014; Olukayode and Adeyemi, 2011). Regrettably, the construction industry which is often one of the key sectors of any economic is grappling with lots of challenges. When compared to many other industries globally, the construction industry has been traditionally slow at technological development. It has not also undergone any major disruptive changes; and has not widely applied advances in processes such as "lean". As a result, efficiency gains have been meagre.

Philip and Thompson (Phillip and Thompson, 2014) stressed that the future of construction industry is facing a high degree of complexity, extreme competition and uncertainty with respect to the outcomes of climate change, availability of resources and the disruptive nature

of innovation. Changes in owners' demands and more complex facilities require new approaches in both design and construction (Tatum, 1989). These scenarios require innovative approach, unfortunately, construction industry globally is perceived to be non-innovative and there is much room for improvement. It has even been argued that the higher the levels of innovation in the construction industry the greater the likelihood that it will increase its contribution to economic growth (Blayse and Manley, 2004). It is widely accepted that promotion of innovation and innovative thinking is a pre-requisite to any competitive advantage (Asad, Fuller, Pan and Dainty, 2005).

A continuum of survey exists which studies the level of application of technology in construction industries of various countries in recent times. Most of the survey had been carried out in developed economies, although attempts have been made to carry out thesurvey in developing and emerging economies such as South Africa in 1999 (Arif and Karam, 2001), Nigeria in 2005 (Oladapo, 2007). Their studies however revealed that the digital divide between emerging economies such as Nigeria and the developed world is closing up as more and more computer facilities are becoming accessible. However, the study also indicated that modern and advanced information and communication facilities such as internet, intra/extranet, virtual reality tools are grossly inadequate. Oladapo (2007) investigated the use of ICT in the Nigerian construction industry. The result showed that the industry professionals are increasingly becoming more computer literate. Most of the respondents acquire knowledge of ICT through private lessons and only a very few were thought in schools. The main constraints to the use of ICT were inadequate and erratic power supply, high cost of hardware and software and lack of sufficient jobs.Adejimi and Iyagba (2005) compared E-construction technology for integrating building processes between Nigeria, Canada and the Nordic countries. Their study however revealed that the digital divide between Nigeria and the developed world is closing up as more and more computer facilities are becoming accessible. However, they also indicated that modern and advanced information technology facilities such as internet, intra/extranet, virtual reality tools, tele/video conferencing, construction robots etc are grossly inadequate.

Technology implementation in construction results in significant changes and potential improvements in design and management processes within the organization. The proliferation of research on ICT barometers in construction on national and cross-national basis indicates increasing interest to investigate socio-technical aspects of software development and use in the Architecture, Engineering and Construction AEC sector. Therefore, digital transformation is more important now than before. We live in an era of transformation of technology in social values and the way work is done. In order to meet an increasing global and competitive environment, organisations are undergoing re-engineering, work process re-design, and other forms of restructuring. How the Nigeria construction industry is responding to this change is a subject of investigation.

Many construction companies in Nigeria are failing to adapt and respond to the complexity of the new technology-led business environment and tend to experience survival problems (Akande et al., 2018; Ojelabi, Afolabi, Oyeyipo, Tunji-Olayeni, & Adewale, 2018). Overall failure rates of construction project management in Nigeria (e.g., 32% in 2014) indicate problems in identifying appropriate project management practices for successful project delivery (Akande et al., 2018). Abandonment of failed construction projects on a mass scale constitutes one of the impediments to growth within Nigeria's economy (Adebisi, Ojo, & Alao, 2018). The general problem is poor coordination of complex tasks by Nigerian project managers leading to inefficient appropriate project management practices, resulting in a low rate of project completion within the nation's construction sector (Amusan et al., 2018; Oke & Aghimien, 2018).Although new technologies are available to improve project performance, scholars have identified that project managers in the Nigerian construction sector avoid their adoption (Akande et al., 2018; Ozumba & Shakantu, 2018). This technologyadoption avoidance has resulted in continued inadequate automated evaluation and monitoring of construction project performance in the Nigerian construction industry (Afolabi, Amusan, et al., 2018; Amusan et al., 2018). Although scholars have repeatedly documented the high rate of failed projects within the Nigerian construction sector due to poor coordination of complex tasks, a deeper understanding is needed on why construction project managers in Nigeria remain slow to adopt new technologies for improving decision-making processes and project success rates (Afolabi, Ojelabi, et al., 2018; Hamma-Adama et al., 2018). The specific problem is that the barriers to technology adoption by construction project managers in Nigeria to lower the rate of failed and abandoned construction

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projects remain poorly understood (Muhammad et al., 2018; Onungwa & Uduma-Olugu, 2017).

It is based on these premises that the paper seeks to investigate in details the effect of technology on internationalization of construction business in Nigeria. Oladapo (2006, 2007) had reported that the construction industry in Nigeria has during the past few years increased its use of ICT. However very little is known about the impact of the technology on the industry and the prospects for its widespread penetration of the industry. This is because very few reports exist of research in ICT in developing countries, including Nigeria (Pamulu and Bhuta, 2004). These served as a motivator towards carrying out this research work.Owing to the numerous problems encountered by construction companies from non-adoption to low level of implementation of ICT to the problems encountered even when it is adopted, the following research questions were formulated.

- What are the ICT application areas and the level of adoption of ICT by construction companies in Nigeria?
- Whatare the trends in technology transfers into Nigeria's construction and management industry?
- What are the costs, benefits and risk factors of technology adoption?
- What measures could enhance technology transfers?

The objectives of the study therefore are:

- To identify ICT application areas and the level of adoption of ICT by construction companies in Nigeria.
- To identify trends in technology transfers into Nigeria's construction and management industry.
- To examine the costs, benefits and risk factors of technology adoption.
- To analysemeasures that could enhance technology transfers.

II. METHODOLOGY

The research design used for this study is survey. The survey design was used to explain, explore and describe the variables. The population includes contractors, experts, concerned agencies and relevant stakeholders in Nigeria. The sample size consists of 500 persons; the sample form a good representation of the population. Data would be collected from both primary and secondary source. The primary data was collected through questionnaire administration.The questionnaire was divided into two parts (section A and B). The first part (Section A) contains socio-demographic variables such as: gender, age, educational status, and work experience. Multiple item scales will be used to measure each construct in this study. Section B of the questionnaire will be designed with the options of Strongly Agree (SA), Agreed (A), Neutral (N), Disagree (D) and Strongly Disagree (SD) which will be a 10 - item questionnaire. The respondents were requested to indicate their answers regarding each item based on a Five-Point Likert Scale with 1 scoring strongly disagree to 5 scoring strongly agree. The Five-Point Likert scale was used to measure the relationships between the variables. The secondary data was obtained from journals, textbooks and the internet. The data collected from the questionnaires was analyzed using the Ordinary linear regression.

III. DATA PRESENTATION AND ANALYSIS

First Objective

The first objective was to identify ICT application areas and the level of adoption of ICT by construction companies in Nigeria. To achieve this objective, the researcher formulated a null hypothesis;

H_0: There are low ICT application areas and low level of adoption of ICT by construction companies in Nigeria.

This analysis was carried out at 0.05, level of significance

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.701[a]	.491	.321	85.27128

a. Predictors: (Constant), TechnologyAdoptionLevel

From the result in table above, adjusted R square (.321) indicates that the additional input variables are not adding value to the model. This reveals that the constructed simple regression model of the independent variables (technology adoption level) account forapproximately 32% variance in the dependent variable (technology effect). Adjusted R Square and standard error of the estimate talk about the performance of model, however, standard error of the estimate 85.27128

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showed that the model has a lot of variability. The correlation coefficient (r=.491) indicate a negative association between technology effect and adoption level in Nigeria. The results on the Analysis of variance (ANOVA) for the model are shown in Table below.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	21042.424	1	21042.424	2.894	.187[b]
	Residual	21813.576	3	7271.192		
	Total	42856.000	4			

a. Dependent Variable: TechnologyEffect
b. Predictors: (Constant), TechnologyAdoptionLevel

The results of the analysis of variance (ANOVA), F (df 1, 3 = 2.894, P > 0.05), indicated a statistically insignificant impact of technology effect on technology adoption level, i.e. even with the positive effect technology can have on the industry, adoption level is still low. Based on this significant relationship, the coefficient for the Beta weight for the amount of standard deviation unit of change in the dependent variable was calculated. The results are as shown in the table below.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	3.021	68.586		.044	.968
	TechnologyAdoptionLevel	.970	.570	.701	1.701	.187

a. Dependent Variable: TechnologyEffect

The standardized coefficients reveal that: The independent variable technology adoption level value has strong positive effect on technology effect in construction industry.

Third Objective

The third objective was to examine the costs, benefits and risk factors of technology adoption. To achieve this objective, the researcher formulated a null hypothesis;

H_0: There are no costs, benefits and risk factors of technology adoption.

This analysis was carried out at 0.05, level of significance

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.943[a]	.889	.852	39.88369

a. Predictors: (Constant), TechnologyBenefits

From the result above, adjusted R square (.852) has moderate fit. This reveals that the constructed simple regression model of the independent variables (technology benefit) account for approximately 85% variable in the dependent variable (technology effect). Adjusted R square and standard error of the estimate talk about the performance of model, however, standard error of the estimate 39.88369showed that the model has a lot of variability. The correlation coefficient (r=.889) indicated a strong positive association between the technology benefits and technology effects in the construction industry. The results on the Analysis of variance (ANOVA) for the model are shown below.

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ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	38083.874	1	38083.874	23.941	.016[b]
	Residual	4772.126	3	1590.709		
	Total	42856.000	4			

a. Dependent Variable: TechnologyEffect
b. Predictors: (Constant), TechnologyBenefits

The results of the analysis of variance (ANOVA), F (df 1, 3 = 23.941, P < 0.05), indicated a statistically significant effect of technology benefit on construction industry. Based on this significant relationship, the coefficient for the Beta weight for the amount of standard deviation unit of change in the dependent variable was calculated. The results are as shown in the table below.

Coefficients[a]

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	27.863	23.141		1.204	.315
	TechnologyBenefits	.721	.147	.943	4.893	.016

a. Dependent Variable: TechnologyEffect

standardized coefficients reveal that: The independent technology benefit value has strong positive effect on construction industry.

IV. DISCUSSION

At the beginning of this research work, four research objectives were developed to direct the course of this study. From the analysis carried out it was found technology adoption are important in determining internationalization of construction business in Nigeria, it brings about efficiency and effectiveness in the building industry. It would provide stakeholders with headway to attaining project goals and would certainly results in adequate benefits at every part of project execution.

V. CONCLUSION AND RECOMMENDATIONS

This study has underscored effect of technology on internationalization of construction business in Nigeria. Findings from this research uncovered that technology adoption will help bring efficiency and effectiveness in the building sector such that Nigeria construction industry can reach international standard and there will be reduction in number of failed projects. Though implementation of technology in Nigeria is still minimal, relevant stakeholders need to see to its successful adoption.

Implementation of technology in construction industry in Nigeria should be adequately pursued; contractors, engineers, architects should embrace technology application by purchasing relevant software and equipment. Thus, in the light of the foregoing, this study reliably concludes that technology in construction industry will bring positive impact in Nigeria generally, starting from massive infrastructural facilities to increase in GDP and FDI.

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