International Journal of Sciences, Engineering & Environmental Technology (IJOSEET), 2(2): 10-16, 2017
ISSN 0794-9650

www.repcomseet.org

Impact of Information Communication Technology on Building Construction Project Delivery in Nigeria.

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Abstract-*The research explored various ways Information Communication Technology (ICT) had impacted on the construction project delivery in Nigeria, with emphasis on ICT tools available to the professionals in the building and construction industry. This was with a view to deepening the use of the ICT innovation so as to achieve increased project delivery performance in respect of the major metrics of measurement - cost, time and quality of end product. 70 Questionnaires were distributed to respondents comprising of contractors, consultants and academics, which provided empirical data for the analysis with statistical tools employed for the analysis. The result obtained indicated that some internal factors, such as; the type of business (whether contracting, consulting or academic), chief executive officers, senior managers' perception of the benefits of ICT and the years of computer literacy of function arises significantly, which correlated with the level of ICT use in the industry. However, the main uses of ICT in the industry were word processing, internet communications, and costing, work scheduling and drawing. The top five constraints to the use of ICT as revealed were irregular power supply, high cost of software and hardware, fear of virus attack, lack of sufficient jobs and legal barriers. Other constraint was due to the fact that both individuals and corporate access to and ownership of ICT are still at the lowest ebb. Therefore, the level of impact of the ICT in the Nigerian construction industry was abysmally low and efforts to sensitize the stakeholders on the need to imbibe and embrace the use of the ICT in the Nigeria construction project delivery should be improved upon.*

Keywords: ***Computer Literacy, Construction Industry, Information Communication Technology, Professionals, Project Delivery, Stakeholders Perception.***

1.0 Introduction

The advent of computer and the advancement in chip technology paved the way for tremendous development in information gateway. For instance, the quantity surveying profession is at the centre of management of construction resources, and cost is an indispensable construction resource. Other resources depend and converge on it. As such cost must be managed effectively. Computer has promised to be a veritable tool in all phases of human endeavor. Thus it expected that its usefulness to the construction cost manager be beyond controversy.

The global economic dynamism and growing use of ICT in the major sectors is a welcome development. All over the world, the technology has been having a major impact on economic development (Idowu, 2010).

In this era of IT, the building / construction industry ought to have left the old traditional method which involves the use of manual equipment for construction works and its attendant problems – time and cost overrun and at time poor quality jobs; to an improved and more standard method by using the ICT tools during construction process for more effective delivery of the project.

This study seeks to assess the effect of the use of Information Communication Technology on the performance of construction project delivery in Nigeria. Specific Objectives Of The Study Include: To

identify the uses of ICT in the construction industry; to identify specific ICT tools used during the design and construction activities; to determine the benefits of ICT on project delivery in construction industry; to examine the constraints to the use of ICT in construction industry.

Previous literature exists on the introduction of computer, relevance of information technology to the industry. Among others are Oladapo, (2006), Oyenuga (2007); most of which are about ten years old. The gap identified is on the industry's performance as the best of manual operations still end in time and cost overrun and avoidable despites.

It is in light of these observations that this study attempts to appraise the impact of ICT on building / construction industry projects performance in term of time cost, quality and as an agent of effective change in the building / construction industry in order to improve intra and inter communication among the different sectors to achieve increased productivity and effective delivery.

Due to time and financial constraints, the study is delimited in scope to building / construction industry within Lagos State and Osun State. Reason for this is that most of the construction, consulting firms in Nigeria are concentrated in Lagos, while Osun State is a fair representation of the country side States.

2.0 Information Communication Technology in Nigeria

2.1 Meaning and Scope of ICT

The Construction Sector: Is defined as an innovative sphere incorporating a wide range of knowledge entities and enterprises, involved in design, site preparation, construction supply lines and construction of buildings, building elements and steel work, building installation and joinery, maintenance and repairs. (Oladapo, 2006) and (Harvard, 2000)

ICT: May simply be defined as the technologies which enable and support the fundamental processes for the capture, storage, manipulation, communication and delivery of data and information on different context such as engineering, technological, organizational, social and cultural domains. It is the technology required for information processing by making use of electronic mechanisms and computer software to convert, store, protect, transmit and retrieve information. (Idowu, 2010).

IT: Is indeed a compromise, limited to those industries which facilitate by electronic means the processing transmission and display of information and it excludes some industries which create the information such as makers of video and movies.

Since the industrial revolution, humanity has met with a vast number of inventions and new trends. The theoretical and technical know-how have increased rapidly. ICT has become a subject of great concern to mankind and indeed for the sustainability of the all forms of development. Indeed it is now believed that information technology is the cement that holds the future of mankind together or better still, ICT is today acknowledged as the cement of creativity and innovation for nation building, economic growth and sustainable leadership (Uwaje 2007), (Trible & Warzawski 1998).

2.2 Advent of ICT in Nigeria

According to Babaniyi and Afolalu (2010), The first ICT initiative in Nigeria started in the 1950s with focus on print and electronic media. Thereafter, no major policy or other outcome was achieved because of strict government control. The full awareness of the importance of ICT was absent. The Nigeria telecommunication industry is now over 100 years old, but it was only in 1999 that the National Policy or telecommunication was launched. National policy on information technology followed in 2001, along with the establishment of the natural Information Technology Development Agency, (NITDA) under the Ministry of Science and Technology (Dada and Sesan, 2003) Nigeria, of course is one of the countries in Africa that have benefited from support of the United Nations economic commission for Africa in the area of National Information and Communication Infrastructure (NICI) policy.

In Nigeria, the ICT space is still a twin – with a clearly fast paced telecommunication sector and a growing (albeit underserved) Information Technology Sector with reports often citing Nigeria's Telecommunication Market as one of the fastest growing, globally,

The key players in the development of ICT in Nigeria are: Nigerian Communication Commission (NCC), National Space Research And Development Agency (NASRDA), The Private Telecommunication Companies such as MTN, Airtel, Globacom, Etisalat, Visafone, O-Net, etc:

The realization of challenges in the technological development towards enhanced information and communication technology in the industry led to the successful launching of Niger Sat. There is no doubt that info-tech has come to stay in the world of ours. The need to apply it in all our daily life is imperative to our sustainable development. The tone appears set for a bright future in Nigeria.

2.4 Uses Of ICT In The Building / Construction Industry

According to Bamisile (2004), Adenike (2007), Abimbola (2007), Construction is a team work. It has been acknowledged that the process of building an edifice or any other engineering and construction is the collaborative responsibility of various professionals. All over the world, the trend is that of specialization, this is because better performance, effective delivery, high productivity and cost effectiveness could best be achieved through specialization. It is important to note that the involvement of all these specialized professionals under the delivery of building / construction project process is aimed at solving the demand of complexity of design and modern construction awareness on the part of the client Based on this background, the common traditional practice/ methodology of the building construction process have really faced extinction since the adoption of the ICT in most developing nation such as Nigeria:

Architect: This new technology has changed architectural endeavors and the areas of use are summarized as follows: Automated design and documentation; electronic support for project administration; support for presentation and marketing of design through rich media software tools, including 3D Images; electronic documentation management; use of CAD technology in automating existing work process; among other values which ICT has added to the beauty of architectural profession in the building industry. (Arif and Karam (2001).

Quantity Surveyor: As a design team member in building / construction processes, ICT has enhanced the performance of the quantity surveying. It has transformed all the tedious traditional procedure in the preparation of feasibility studies, taking-off and billing, constructional cost details, reviewing of budgeted project cost, interim valuation, financial analysis, final account, e.t.c. The potential use and benefits of the adoption of ICT by the Q.S are enormous. (Oladapo, 2006).

2.5 The Consulting Engineers and Builders

The consultant engineers were among the first to adopt the IT in the building / construction industry with the structural engineers being ahead of the service engineers. The potential application of the computer technology as adopted by the consultant engineers are summarized – support for calculation in analyzing and designing specialist calculation tools; use of computer based workflow management and document management; email to send and receive CAD drawing files internally and externally e.t.c.

2.6 Principal And Specialist Contractors

The process involved in general contracting (principal contractor) and specialist contracting (subcontractor) are essentially the same. The only difference between the two is that the specialist contractors are one tier lower than the principal contractor in the supply chain. The potential application of ICT, for all practical purposes, are the same for the two. Electronic tendering; efficient and more accurate estimation and tendering; better project planning using 3D(and 4D) modeling for simulation as well as better resources management using project and scheduling software; better inventory management and reduce cost, e.t,c. (Osofiso, 2007), (Doherty, 1997) and (Harvard, 2000).

2.7 ICT Tools Available For Use In The Construction Industry

Today, partially all project information are entered into software tools or generated by computer program and presented in different format used in many industries including the Building and Construction Industry. These software tools range from general purpose ones such as: Mechanical, Architectural Computer Aided Design (CAD) and firm specific customized programmes. And understanding the building / construction industry and the nature of communication between its several sectors players – architects, quantity surveyor, engineers, etc.; is an essential prerequisites in analyzing the role of IT in an effective way.

Computer: The computer is an electronic machine that can store, organize and find information, do calculation and control other machines. One of the most valuable features of all computer softwares is the speed and ease of reporting a large amount of data in excellent format and this makes a significant contribution of reducing time to take decision- support of the control process.

Computer Hardware System: Oyenuga (2007) defines computer hardware system as the set of physical machines such as the C.P.U, the monitor, the various peripheral (mouse justice and keyboard) and storage device (hard disk, flash drive, floppy disk and compact disk) the printer and plotter. The CPU is measured in speed and capacity.

Computer Software: The computer software consists of the operating and application softwares. The operating software is the door to the computer system. It makes available all the various opportunities in the computer, manages the file system and keeps track of the various operating systems. The most common is the Ms Windows:

The Microsoft project software, Fax Machines, Microsoft Excel The Schedule, Estimating Software, Cost Control Software, The Internet, The Extranet, Digital Camera, The Scanner, Fax Machines (CME (DVD), 2006).

2.8 Prevailing Level of Use of ICT In The Nigerian Construction

According to Idowu (2010); though the use of ICT has assume increasing significance in Nigeria, the operational effectiveness of the creation has been far below expectation, if not disappointing, (Akinyosoye, 2001). It is quite evident that Nigeria at present lack innovation, capacity and capabilities in ICT software and hardware maintenance.

The effectiveness of ICT has been curtailed by some inefficiency in the system and deficiencies in infrastructure (Bidmus, 2004). These, coupled with the fact that most technology and technical-know-how ideas were imported, put a limitation on the operation capability and optimum capacity utilization of ICT in the Nigerian sectorial markets, be it financial or construction market. There is no doubt that automation requires huge financial commitment for both hardware and software, which are in most cases in foreign hard currencies. The managers must ensure they recover both acquisition and other maintenance costs, and generate enough returns to keep a float. Also, with comparative weak domestic base and currency, how do Nigerian construction stakeholders ensure fair share of the world business, so as to prevent total domination by the advanced economies and their multinational companies and a drain on the foreign reserve.

3.0 Materials And Methods

The design for this study is by field survey research while the instrument for collection of primary data is by structured questionnaire administration to respondents.

Sample Size and Statistical Method Of Analysis

The former refers to the listing of all the elements in the population from which sample is to be drawn. For the purpose of this study, purposive simple random sampling technique is used to select sample size of seventy (70) from the target population.

Out of the seventy (70) questionnaire distributed to relevant respondents, only forty were duely filled, returned and found worthy of analysis. The data collected through the administration of the questionnaire were being subjected to statistical tool analysis approach so as to enhance comprehension. The statistical tool employed in the analysis were mainly Percentile; Relative Importance Index RII and Ranking methods which were used as appropriate due to the nature of the data and response available. RII express by the formula / expression:

Where w = Weighting given to each factor by the respondents and ranged from 5 to 1
n = Number / Frequency o f Respondents
A= Highest weight (i.e in this case = 5)
N= Total number of respondents

$$RII = \sum \frac{wn}{AN} \qquad (0 \leq \text{Index} \leq 1)$$

The measure scale on the degree of significance means 5 = Highest / Most, while 1 =Lesst/ Never

4.0 Results And Discussion

Table 1: Types of respondent Organization

Types of business	No of Respondents	Percentage (%)
Contractors	20	50
Consultants	16	40
Academics	4	10
Total	40	100

Source : Field Survey (2014)

Table 2: Computer Software / Technology In Use In The Organizations

Software Technology	Percentage of Use	Ranking
Accounting Software, Word Perfect, Ms-Excel	49.18%	1
Architectural/Engineering software e.g. Corel-Draw, Auto- CARD, Archi-CAD, etc.	20.16%	2
Quantity Surveying softwares - Q/S Bills, Catpro, Qs-Elite, Win-Qs, Master Bill, Snape, etc.	19.08%	3
Presentation software, Ms Power-Point, Adobe-Page Maker, Ms Outlook, etc.	11.58%	4
TOTAL	100	

Source : Field Survey (2014)

Table 3: The Benefits Of Using ICT

Benefits	5	4	3	2	1	Total	RII	Rank
Enhanced Productivity	10	22	5	3	0	40	0.795	1
Improved Accuracy and Documentation	10	18	5	5	2	40	0.745	2
Enhanced Effective Delivery	7	10	9	10		40	0.630	3
Improved Time and Cost Performance	7	9	9	8	4	40	0.605	4
Improved Quality Performance	7	8	7	9	7	40	0.575	5
Increased Business Turnover	5	8	8	10	9	40	0.550	6
Enhance Decision Making	5	3	10	10	12	40	0.495	7

Source: Field Survey (2014)

Table 4: Constraint Factors To Mass Use Of ICT In Nigeria Construction Industry

Constraints	5	4	3	2	1	Total	RII	Rank
Inadequate and Erratic Power Supply	18	12	6	4	2	40	0.830	1
High Cost of Hardware and Software	16	13	6	5	0	40	0.800	2
Mass Illeteracy and Educational Factor	16	11	5	5	3	40	0.760	3
Lack of Sufficient Jobs	14	12	6	5	3	40	0.745	4
Feer of Virus Attack	11	18	3	4	4	40	0.740	5
Lack of Security	13	10	6	6	5	40	0.700	6
Low Return on Investment	12	6	8	8	6	40	0.650	7
Legal Barriers	10	10	5	6	9	40	0.630	8
Fear of Mass Job Loss due to Competerization	10	6	8	8	8	40	0.610	9
High Cost of Employing Computer Professionals	6	8	8	8	10	40	0.560	10

Source : Field Survey (2014)

Table 2, reveals that a large majority of all the respondents are performing word processing and spreadsheet function, resource and material scheduling and programme of work - are being carried out using computer (about 49.18%). Architects and Engineers that imbibe the use of specialized AutoCAD Software to achieve higher effectiveness post 20.16%.

Generally, the level of embrace of ICT among the professionals in the Nigerian Construction Industry is still at a very low ebb; yet some of them attest to the use of some simple and general purpose softwares such as – Accounting, Word Perfect, Ms-Excel. While only very few make use of specialized packages

such as – Corel-Draw, Auto-CAD, etc for Architects, Engineers and Builder's and QS-Bills, Master Bill, Catpro, Win-Qs, etc for Quantity Surveyors. Only the very large scale companies and consultancy use ICT fully.

Table 3, reveals that respondents appreciate the impact of ICT, even at this very low use of ICT industry with the following ranking of benefits: Enhances Productivity, Improved Accuracy and Documentation, Enhance Effective Delivery and Improved Time, Cost and Quality performance, among others.

The Quantity Surveyors, Engineer and Builders that have imbibed the use of ICT indicate high level of proficiency in using Microsoft Excel and Microsoft Word. They appear to be moderately proficient in the computer based communication media the E-mail and the Internet facilities.

Table 4 of the study equally reveals daunting challenges constituting constraints to massive embrace of ICT in the Nigerian Construction Industry include: Inadequate and erratic Power – Supply, High Cost of Procurement of Hardware and Software component; Mass Illiteracy and Educational Factor.

5.0 Conclusion

Information and Communication Technology has become the bed rock for national survival and development in a rapidly changing global environment. For ICT to make great impact on the performance of the Nigerian construction industry, there is an urgent need to device bold and courageous initiatives to address the daunting challenges on the path of its procurement and use in Nigeria.

Generally, the level of embrace of ICT among the professionals in the Nigerian Construction Industry is still at a very low ebb; yet some of them attest to the use of some simple and general purpose softwares such as – Accounting, Word Perfect, Ms-Excel. While only very few make use of specialized packages such as – Corel-Draw, Auto-CAD, etc for Architects, Engineers and Builder's and QS-Bills, Master Bill, Catpro, Win-Qs, etc for Quantity Surveyors. Only the very large scale companies and consultancy use ICT fully.

Even at this very low use of ICT industry with the following ranking of benefits: Enhances Productivity, Improved Accuracy and Documentation, Enhance Effective Delivery and Improved Time, Cost and Quality performance, among others.

Daunting challenges constituting constraints to massive embrace of ICT in the Nigerian Construction Industry include: Inadequate and erratic Power – Supply, High Cost of Procurement of Hardware and Software component; Mass Illiteracy and Educational Factor.

Considering the findings and conclusion of this study, the following suggestions become imminent:

The educational sector which is the basis for the upbringing of the future professionals, leaders, researchers, scientists, etc., needs to witness a great turn around which calls for cross fertilization of ideas as well as knowledge about the recent development in the world in real time. There is need to encourage and guide more investment entities both from home and abroad to enter into the ICT market. This will widen the horizon of importation of this technology capacity building – hardware and software as well as man-power training.

The professional bodies in the building/construction industry should intensify enlightenment campaign and ICT training workshops for their members.

Governments at the three tiers, educational institutions, consultancy and construction firms should inculcate, imbibe and intensify ICT training for their employees, operatives, students and others, to ensure large scale embrace and deployment of ICT in all the sectors of the economy.

While the efforts of government since year 2003 is considered encouraging, yet there is the urgent need to do more in pursuing more radical policies toward local assemblage or even outright production of ICT tools in the country. This will certainly bring down the amount of capital outlay and foreign exchange required four procurement, training and use of ICT by all professionals in the construction industry and even the layman on the street.

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