An Appraisal of Computer Software Used By Builders in the Nigerian Construction Industry

I.M. Oyemogum[1], E. C. Ndame[2], K. J. Nansak[3]

[1,2 &3] *Department of Building, Faculty of Environmental Sciences, University of Jos, Nigeria*

ABSTRACT
There have been attempts in the past in appraising the computer software used in some of the professions of the building industry; however very little has been done in appraising the software used by Builders. It will be disadvantageous not to look closely at software used by Builders, owing to the fact that the Builder is at the epicenter of the building industry. In view of the foregoing, this research seeks to appraise the computer software used by Builders in Nigeria using Jos and Abuja metropolis as a case study. The following objectives were set out to achieve the aim; find out the Software used by Builders; level of awareness of these software amongst Builders; which software is used the most by Builders; find out hindrances to the adoption of building software; find out the latest building software used by Builders in Nigeria. The questionnaire which is the major instrument for data collection was designed and administered to respondents within the study area in hardcopy and electronic format using Google forms. Data collected from questionnaires (hardcopy and online questionnaires) were summarized, analysed and presented together. The Relative Importance Index (RII) was used to determine the relative importance of some key factors. The study established that 92% of Builders within Jos and Abuja metropolises are aware of the existence of at least one computer software package while 78% can use between 1 to 4 building software. Microsoft Excel was discovered to be the most used software by Builders within the study area, followed by AutoCAD, Microsoft Project, Orion, and SketchUp. QBuild, Technosoft Estimator, Health and Safety Xpert, Artlantis and BIM health and safety software are the latest software amongst Builders. The major challenge hindering the adoption of computer software in Nigeria is; Nigerian Educational Institutions don't adequately train Builders in the use of building related computer software. The study concludes that the level of computer software usage amongst Builders is low compared to their very high level of awareness of these software.

Keywords: Software, Microsoft, Questionnaire

I. INTRODUCTION

ICT over the years has developed and become a significant part of most human activities and professions like Banking, Medicine, Security, Agriculture, Construction etc. UNESCO in 2002 defines ICT as the combination of Informatics technology with other, related technologies, specifically communication technology. Informatics is the science of dealing with the design, realization, evaluation, use, and maintenance of information processing systems, including hardware and software UNESCO (2002).

The computer is an electronic device that accepts data, stores and processes it according to predefined set of rules or programs and gives out results. These set of rules or programs is known as Computer Software. The computer can be categorized basically into two major components; Hardware and Software. Hardware are the physical and tangible parts of the computer while Software are sets of instructions or programs that direct the operation of the computer. The computer software or simply software is a generic term that refers to a collection of data or computer instructions that tell the computer how to work. The computer software can be categorized into System and Application software.

A registered Builder is a person who has received an approved standard of professional training and practice in building and found competent after due examination and his/her name is entered into the register of the Council (NIOB, 2018). 'The Council' refers to the Council of Registered Builders of Nigeria (CORBON). Therefore, one cannot be a professional builder in Nigeria unless he holds a valid license or registration issued by Council of Registered Builders of Nigeria (CORBON) Ogunbiyi (2014).

Sect.13.12.4 of NBC (2016) states the major duty of a Registered Builder is "management

of the execution of building works including the supervision of artisans and tradesmen".

II. LITERATURE REVIEW

Several studies have been carried out to find out the extent to which ICT has been embraced or is used in the Nigerian construction industry. Most of these studies' target is generic in nature, that is studying the entire construction industry. The studies generally focused on the application of ICT in the Nigerian construction industry. Studies like "The Impact of ICT on Professional Practice in the Nigerian Construction Industry" done by Oladapo in 2006. The study found out that while core architectural, engineering and quantity surveying functions (like drawing, engineering design and preparation of bills of quantities respectively) have been largely computerized, data and document management is still done in the traditional way in most cases. In Gambo (2017), a research conducted about a decade later from that of Oladapo (2006); still shows that ICT hasn't gain significant acceptance in the construction Industry. He stated that both individual and corporate access to and ownership of ICT is still at the lowest ebb. Amusan et al (2018) agreed with the low level of ICT penetration within the industry stating some challenges hindering the adoption of ICT as inadequate knowledge about the profit of ICT investment, high cost of employing professionals, lack of staff with appropriate skill and knowledge in ICT and cost of training professionals. Owolabi & Olufemi (2018) found out that technical know-how and the fear of virus attack contribute adversely to the effective application of ICT in the Nigerian construction industry.

The building industry, which is one of the subsets of the construction industry comprises majorly of seven professions; Architecture, Building, Engineering, Urban and Regional Planning, Estate Surveying and Valuation, Quantity Surveying, and Land Surveying. Therefore, generalizing the research on ICT in the construction industry as done in most researches conducted on this topic will not give a detailed and clear view of the state of ICT in the Industry. This study therefore seeks to focus on appraising software used by builders. It will be disadvantageous not to appraise and assess closely computer software used by builders, owing to the fact that the builder is at the epicenter of the building construction industry. The builder is responsible for coordinating activities that facilitates the incorporation of inputs of other

professionals (Kuroshi, 2015) towards the realization of a building project. In view of the foregoing, this research seeks to appraise the computer software used by Builders in Nigeria through the following objectives;
 i. To determine the level of awareness of building related computer software amongst Builders in Nigeria;
 ii. To determine which software is used the most by Builders in Nigeria;
 iii. To find out hindrances to the adoption of building related computer software by Builders in Nigeria;
 iv. To find out the latest building related computer software used by Builders in Nigeria.

III. METHODOLOGY

This study is a survey research which focuses on the appraisal of Computer Software used amongst builders (both registered and non-registered Builders) within Jos/Bukuru Metropolis, Plateau State and Abuja, the Federal Capital of Nigeria. The data for this research were primarily sourced from questionnaires. The questionnaires used are both hard copy and online or electronic questionnaires. Secondary data were sourced mainly from published and unpublished literatures. Hard copy questionnaire were personally and randomly administered to respondents by the researcher. The online questionnaires however were administered to the respondents through email and social media channels. The link to the questionnaire was sent directly to the respondents through WhatsApp, LinkedIn, Emails and Facebook. Among the online administered questionnaire, 46 responses were received while 31 responses where received from the ones administered in hardcopy. This brings the total number of responses received both hardcopy and softcopy (online) questionnaires to 77 responses.

The online questionnaire was created using Google Forms. The use of Google Forms was necessitated by the fact that it is free, easy to use and mobile friendly compared to other online survey tools like Survey Monkey, eSurv, Qualtrics etc. There is no restriction to the number of questions that can be asked using Google Forms online survey tool and no restriction on the number of respondents as well.

The data collected from questionnaires, both hardcopy and online questionnaires were summarized and presented using tables. The Relative Importance Index (RII) was used to determine the relative importance of some factors.

IV. RESULTS AND DISCUSSION

Table 1: Awareness of computer softwares amongst Builders in Nigeria

No. of Computer softwares	Respondents	Percentage
None (Not at all aware)	6	8%
1-4 (Slightly aware)	44	57%
5-8 (Somewhat aware)	21	27%
9-12 (Moderately aware)	3	4%
13 and above (Extremely aware)	2	3%
No response	1	1%
Total	**77**	**100%**

Table 2: Average number of building softwares Builders in Nigeria can use effectively

No. of Computer softwares	Respondents	Percentage
None	9	12%
1-4	60	78%
5-8	7	9%
9-12	1	1%
13 and above	0	0%
Total	**77**	**100%**

Table 3: Length of time Builders have been using building related computer softwares

Number of years	Respondents	Percentage
0-2 years	22	29%
3-5 years	30	39%
6-8 years	19	25%
9-11 years	1	1%
12 years and above	2	2%
No response	3	4%
Total	**77**	**100%**

Table 4: Computer Software application installation amongst Builders in Nigeria

Means through which building related Computer Softwares were installed	Responses	Ranking
I don't have any building related software	9	3
I bought my computer with the software	9	3

I ordered the software online	8	5
I bought the software in the market	34	2
Copied from Friend or family member	**41**	**1**
CORBON	1	6
Free download	1	6

Table 5: Challenges to adopting computer softwares amongst Builders in Nigeria

S/N	Challenges to adopting computer softwares	SD (1)	D (2)	U (3)	A (4)	SA (5)	∑W	A	N	A x N	RII = $\frac{\sum W}{A \times N}$	Ranking
1	The cost of obtaining building related computer softwares is extremely high in Nigeria.	5	31	5	28	8	234	5	77	385	0.61	4
2	Nigerian Educational Institutions don t adequately train Builders in the use of computer softwares due to lack of equipment and qualified tutors in the use of computer softwares.	7	3	3	35	29	394	5	77	385	1.02	1
3	Epileptic power supply hinders the adoption of softwares amongst Builders in Nigeria.	12	19	5	27	14	243	5	77	385	0.63	3
4	Ignorance of the existence of these softwares hinders the Builders from adopting them.	7	7	8	40	15	280	5	77	385	0.73	2

Table 6: Computer software applications used the most by Builders in Nigeria

Computer Softwares	N (1)	R (2)	S (3)	O (4)	A (5)	∑W	A	N	Ax N	RII = $\frac{\sum W}{A \times N}$	Ranking
AutoCAD	4	6	17	22	26	285	5	75	375	0.76	2
Primavera	44	13	11	3	1	120	5	72	360	0.33	9
Microsoft Project	6	10	22	15	18	242	5	71	355	0.68	3
Revit Architecture	32	15	16	8	2	152	5	73	365	0.42	6
SketchUp	21	15	15	13	5	173	5	69	345	0.50	5
Microsoft Excel	5	8	6	19	34	285	5	72	360	0.79	1
ArchiCAD	37	14	15	2	3	133	5	71	355	0.37	7
Orion	29	12	6	13	14	193	5	74	370	0.52	4
Autodesk 3ds Max	43	17	5	5	2	122	5	72	360	0.34	8
STAAD Pro	53	13	5	2	0	102	5	73	365	0.28	13
QSCAD	54	13	5	2	0	103	5	74	370	0.28	13
QSPlus	55	11	4	3	1	106	5	74	370	0.29	12
WinQS	54	11	5	0	0	91	5	70	350	0.26	21
CAFM	56	11	4	1	0	94	5	72	360	0.26	21
ProtaStructure	51	13	5	3	2	114	5	74	370	0.31	11
Tekla Structural Designer	50	13	5	4	2	117	5	74	370	0.32	10
ETABS	50	12	4	1	0	90	5	67	335	0.27	17
RISA 3D	52	14	5	1	0	99	5	72	360	0.28	13
Robot Structural Analysis	57	9	5	2	0	98	5	73	365	0.27	17
MIDAS Engineering Software	57	8	4	2	1	98	5	72	360	0.27	17
SAP 2000	58	11	3	2	0	97	5	74	370	0.26	21
STAAD Foundation	57	8	5	2	0	96	5	72	360	0.27	17
Civil CAD	56	9	5	3	0	101	5	73	365	0.28	13
Cat Pro	58	7	6	1	0	94	5	72	360	0.26	21
Fastrack	59	9	2	2	1	96	5	73	365	0.26	21

Table 7: Latest computer software applications used by Builders in Nigeria

S/N	Latest Softwares	Response
1	QBuild	1
2	Technosoft Estimator	1
3	Health and Safety Xpert	1
4	Artlantis	1
5	BIM health and safety software	1

V. DISCUSSION

Table 1 shows that majority of Builders (92%) within Jos and Abuja metropolises are aware of the existence of at least one computer software package. However, the bulk of these Builders (57%) are only slightly aware of the existence of these software. They are only aware of about 1 to 4 computer software. 6 respondents (8%) are not aware of any computer software at all. Only 2 respondents (3%) are extremely aware of the software. This implies that most builders are slightly aware of the software's existence.

Table 2 shows that 9 respondents (representing 12% of respondents) cannot use any building related software package at all. Majority of respondents (60 respondents, representing 78%) can use between 1 to 4 building related computer software packages. Only 1 respondent can use 9 building related computer software packages and above. Thus, most builders can use at least 1 to 4 computer software.

Table 3 shows how long i.e the length of time Builders within Jos and Abuja metropolis have been using building related computer software applications. About 68% of respondents (52 respondents) have been using these computer software between 0 to 5 years. Only 28% of the respondents (22 respondents) have been using building related computer software applications for about 6 years and above.

Respondents were asked to select the means through which they installed the various building related computer software applications on their computers. The results are as shown in Table 4. The result shows that "copying a computerapplication software from a friend or family member and installing" is the most probable way Builders installed computer software applications to their computers in Nigeria. Followed by "buying the software from the market". The least probable means of installing building related computer applications by builders

in Nigeria is free download from the internet or through professional and regulatory bodies like Council of Registered Builders of Nigeria (CORBON).

From Table 5, it can be seen that the highest ranked challenge to adopting computer software applications amongst Builders in Nigeria is "Nigerian Educational Institutions don't adequately train Builders in the use of computer software due to lack of equipment and qualified tutors in the use of computer software". This finding agreed with Okoro (2010) who stated that there are lapses in the curriculum for building construction programmes due to new innovations that are not captured; hence the need for content, facility and skill updating to meet the demands of these innovations.

To determine the computer software used the most by Builders in Nigeria, a list of common building related computer software applications reviewed from literature were presented to respondents to state if they use these software at all and how often. Respondents were asked to indicate their level of usage of these computer software application by ticking in the appropriate cells in the table corresponding to the 5 point Lickert scale of 1= Never   2 = Rarely   3 = Sometimes   4 = Often   5 = Always. Table 6 presents the results of responses. It shows that Microsoft Excel with Relative Importance Index (RII) 0.79 ranks the 1st amongst building related computer software applications used by builders in Nigeria. The 2nd most used software is AutoCAD with 0.76 RII and the 3rd is Microsoft Project with 0.68 RII. Coming from behind is Orion taking the 4th position with RII of 0.52 and 5th position is SketchUp with 0.5 Relative Importance Index. The least ranked building related computer software applications used by Builders in Nigeria are WinQS, CAFM, SAP 2000, Cat Pro and Fastrack, with Relative Importance Index (RII) of 0.26 respectively.

Table 7 shows the list of latest building related computer software builders within the study area are using. They are:

1. **QBuild:** This is an engineering software developed and released for use in 2002 by QBuildSoftaware Corporation. It began with a simple AutoCAD ERP link. QBuild solutions enable the direct connection of CAD data to ERP, reducing engineering costs, streamlining internal ECN processes, and equipping sales teams with engineering expertise. Enterprise Resource Planning (ERP) is the integrated management of main business processes, often in real time and mediated by software and technology. Engineering Change Notice (ECN) is a document authorizing and recording design changes throughout the prototyping and life-cycle phases of a product. ECN documentation contains the justification for changes made to a component or system once the initial design is complete.

2. **Technosoft Estimator:**Technosoft Estimator is an Excel based software developed by Technosoft Associates to handle estimating of building prices, producing builders estimates and bill of quantities with adjustable overhead and profit from preliminary to roof carcass (Technosoft, 2018).

3. **Health and Safety Xpert:** Health and Safety Xpert is a Health and safety software developed by HBXL Group. By simply imputing the details of your job, Health and Safety Xpert will select the relevant paperwork. It includes features such as corrective/preventive actions, forms management, incident, injury reporting, inspection management, and safety risk assessment. The software produces essential documents such as Risk and COSHH Assessments, Method Statements, Construction Phase Health & Safety Plans and lots more site management checklists and registers.

4. **Artlantis:** Atlantis is a stand-alone 3D software for creating photorealistic renderings and animations. It is compatible with all the 3D modelling software in the market; handling .dxf, .dwg, .obj, .fbx and .3ds file formats, thereby allowing it to seamlessly interacts with all leading BIM and CAD software applications.

VI. CONCLUSION

The study appraised the use of software in Nigeria building construction industry through assessing the level of awareness of building related computer software amongst Builders in Nigeria, determining which software is used the most by Builders in Nigeria, find out hindrances to the adoption of building related computer software by Builders in Nigeria, find out the latest building related computer software used by Builders in Nigeria. Questionnaires were used as instrument for data collection and survey research strategy was used, the data was analysed using percentage frequency and relative importance index.

This study reveals that majority of Builders (92%) within Jos and Abuja metropolises (the study area) are aware of the existence of computer software packages. However, their literacy level is very low as the bulk of these

Builders (57%) are slightly aware of the existence of these software (they are aware of the existence of about 1-4 software only); and also, the level of usage or application of these software is low compared to the level of awareness. Microsoft Excel is the most used building related computer software application used by Builders within the study area followed by AutoCAD, Microsoft Project, Orion, and SketchUp. The least used building related computer software applications used by Builders in Nigeria within the study area are WinQS, CAFM, SAP 2000, Cat Pro and Fastrack. Nigerian Educational Institution's inability to adequately train Builders in the use of computer software due to lack of equipment and qualified tutors in the use of computer software was identified as the main challenge hindering the adoption of computer software amongst Builders.

The limitation of the study is in the method adopted, future research can adopt structured oral in-depth interview and since Nigeria has 36 states plus FCT, other states might be included in future studies in order to contradict or support the findings of this research.

REFERENCES

[1]. Amusan, L. M., Oloniju, L. I., Akomolafe M., Makinde, A., Nkolika-Peter, P., Farayola, H, & Faith O. (2018). Adopting Information and Communication Technology in Construction Industry.International Journal of Mechanical Engineering and Technology (IJMET) 9(1), 739–746. Retrieved October 22nd, 2019 from http://www.iaeme.com/IJMET/issues.asp?JType=IJMET&VType=9&IType=1

[2]. Gambo, M. D. (2017). Impact of Information Communication Technology on Building Construction Project Delivery in Nigeria.International Journal of Sciences, Engineering & Environmental Technology (IJOSEET), 2(2), 10-1.

[3]. Kuroshi, P. (2015). Construction practices and Skills gap in the Construction Industry. A paper delivered at delivered at the 45th Builders' Conference/Annual General MeetingOluyole 2015. Retrieved October 27th, 2019 from http://niobnat.org.ng/assets/Downloads/NIOB%20Ibadan%20Conference%20Presentation%20by%20Dr%20Kuroshi.ppt

[4]. Ogunbiyi, M. A. (2014). The national building code and the construction industry professionals in Nigeria.International Journal of Social Sciences and Entrepreneurship, 1(12).

[5]. Okoro, C. E. (2010). Innovations in Building Technology and curriculum revision needs for Building Construction Programmes of Colleges of Education (Technical). A thesis submitted to the Department of Vocational Teacher Education (Industrial Technical Education) University of Nigeria, Nsukka.

[6]. Oladapo, A.A. (2006). The Impact of ICT on Professional Practice in the Nigerian Construction Industry.Electronic Journal of Information Systems in Developing Countries. Retrieved at https://www.researchgate.net/publication/228665914

[7]. Owolabi, O.S.B &Olufemi, O.D.K (2018).Effect of the Use of ICT in the Nigerian Construction Industry.The International Journal of Engineering and Science (IJES) 7(5), 71-76.

[8]. UNESCO (2002).Information and Communication Technology in Education.A curriculum for Schools and Programme of Teacher Development. Retrieved June 17th, 2019 from http://eduteka.icesi.edu.co/pdfdir/CurriculoUnesco.php