Exploration of Building Information Modelling in the Nigerian Construction Industry

Benjamen Sunkanmi Adeyemi[1], Helen Ifedolapo Babalola[1], Clinton Ohis Aigbavboa[1], and Wellington Didibhuku Thwala[2]

[1]CIDB Centre of Excellence, Faculty of Engineering and the Built Environment, University of Johannesburg, Johannesburg, South Africa
[2]Department of Civil of Engineering, College of Engineering, Science and Technology, University of South Africa, South Africa

ABSTRACT

This study aims to examine various challenges of Building Information Modelling (BIM) in the Nigerian construction industry (NCI). In this study, a quantitative method was used. A sum of 80 questionnaires were sent out, and 57 questionnaires were received back from the construction professionals in Nigeria. The findings revealed major challenges facing BIM in the NCI such as individual opinions concerning BIM, absence of non-integration of model design, inadequate protocol relating to BIM, inadequate protocol relating to BIM, and lack of competent staff. There is need for construction stakeholders to avoid anything causing hindrances to the use of BIM in the NCI. The study objectives were accomplished from the literature as well as questionnaires usage. It is recommended that construction stakeholders need to be careful with the kind of opinion they offer pertaining to the application of BIM in Nigeria.

Keywords: Building information modelling (BIM), Construction industry, BIM challenges, Nigeria

INTRODUCTION

BIM is a collection of interrelating strategies, processes and technologies producing an "approach to manage the crucial building design as well as project data in digital setup all through the building's life-cycle" (Penttila, 2006). BIM is a three elemental digital exhibition of a structure with its basic mechanisms and features. BIM consists of smart building elements that encompass data qualities and parametric guidelines for every object. BIM is the system as well as practice of virtual design and construction (VDC) from its entire advancement. It is a phase to share understanding, information, and converse between project partakers. Precisely, data contains in traditional sketches results to idleness that generates misunderstanding in interpretation. In divergence BIM conveyed as non-redundant leading model to rationalize project life cycle procedures (Masood et al, 2014). The notion of BIM is to construct a building in a virtual atmosphere before it is real physical construction so that difficulties alongside with their prospective impacts anticipated to be met

during real construction phase can be functioned out and analyzed in advance (Azhar, 2011). The possible application of BIM by the construction industry stakeholders can lead to better benefits in terms of reducing cost, escalating productivity, decrease errors and enhance the superiority of our work products eventually in enhancement of the built environment. This study aimed to assess various issues of BIM in the NCI.

CHALLENGES OF BUILDING INFORMATION MODELLING

Eastman et al. (2011) and Aryaci et al. (2011) revealed numerous possible issues of BIM application such as resistance to change, adjustment of current plan to lean-adjusted plans, educating the employees as well as absence of competent staff. Based on the assertion of Jamal (2018), incompetent users might unconsciously change the content of data thus threatens to a project. The disjointed nature of construction task likewise adds towards BIM avoidance among the construction partakers. Kulven and Nyberg (2014) disclosed that majority of BIM obstruction were high costs of learning and culture confrontation to change. However, several other obstacles are the unsuitability of software, expenses essential to implement this technology, and absence of existence of focussed training and standard. A study conducted by Howard and Björk (2008) established numerous hindrances to apply BIM in Denmark, Hong Kong, and some other countries. The hindrances were: necessity of training; necessity of disseminating information; absence of standards; as well as deficiency in legal issues to apply BIM. Likewise, Keegan (2010) highlighted various issues to the application of BIM namely: inadequate awareness pertaining BIM by the client; insufficient understanding pertaining the software; and cost of applying and updating the BIM. However, pertaing to the problem of applying the BIM, Zakaria et al. (2013) emphasised that amongst the key challenges facing within the CI is the lack of knowledgeable BIM employees in the construction sectors. The difficulty is applying the BIM in addition to huge monetary investment are the main reason while several construction firms oppose the use of BIM. Also, this is aligned with the study by Thurairajah and Groucher (2013), it was revealed that shortage of experience and understanding of BIM is among the major issues of construction BIM. According to Enhassi and AbuHama (2017), the motive for lack understanding BIM is the absence of regulations on how to utilise and associate BIM in the production stage of construction tasks. Based on the assertion of Fadason et al. (2018), the key issues to BIM are inadequate consciousness among participants, absence of standard to control practise, inadequate information technology (IT) infrastructure, inadequate instruction and learning, deficiency in government direction. However, looking at construction tasks in emerging nations that still utilise old-style technology they discovered that projects in those nations are undergoing issues within their construction sectors. Moreover, Becerik-Gerber et al. (2011) stated two foremost set of issues to application BIM: skill and approach issues, and managerial issues. According to Lahdou and Zetterman (2011), the obstacles for implementing BIM in the construction task procedure in Sweden were:

individual opinions pertaining BIM; problems in application of BIM software; and absence understanding. A study conducted by Hassan and Rasheed (2019) revealed the major issues confronting the BIM implementation such as culture confrontation in company avoid implementation of BIM, absence of non-incorporation model strategy and absence of information required to assess quantity, cost of modernising software as well as hardware, absence of qualified staff, preliminary cost to implement BIM technology and inadequate of protocol and standards that related to BIM. According to Jamal et al. (2019), in the people's context, the main factors faced within construction sector is the deficiency of knowledgeable BIM workforce within the CI. However, the difficulty of utilising BIM additionally to extreme financial investment are the major purposes industry's opposition among the project partners.

METHODOLOGY

This study assessed various challenges of BIM in the NCI with a quantitative research approach. Based on the assertion of Polit and Hunglar (1994), quantitative research is an authorized research and unprejudiced way of getting information from a sample of people through self-reporting. This study made use of descriptive analysis. Both primary and secondary source of data collection were utilised in this study. The primary data was gotten through the use of questionnaires and secondary data of collection was gathered from current literature review. The study was conducted in Lagos state and Abuja the Federal capital Territory of Nigeria. Various professionals that work in government and private construction firms were targeted in this study. These construction professionals are quantity surveyors, architects, project managers, construction managers and builders. The sample method that was used in this study was random sampling. Since random sampling usually offer entire participants an equal chance to be selected for the research with the same standard. Regarding he questionnaire that was used in this study, a sum of 80 questionnaires were sent out and 57 were gotten back from the respondents. Then, Statistical Package Social Science (SPSS 21) was utilised for the analysis.

FINDINGS AND DISCUSSIONS

Respondents Background Information

From Table 1 under the respondent's profession, Construction manager possess the maximum percentage with 25.9%, followed by quantity surveyor 19.0%, builders = 15.5%, project manager = 10.3%, civil engineer = 6.9%, architect = 1.1%. While under the age group, 26-30yrs has 32.8%, 41-45yrs =20.7%, 36-40yrs =13.8%, 46 yrs above has 10.3%, 31-35years =8.6%. In years of experience, 1-5yrs has 31.0%, 11-15yrs = 22.4%, 6-10yrs =17.2%, 16-20yrs = 17.2%, 20yrs above has 10.3%. Lastly, in respondents' educational qualification. Master's degree = 43.1%, bachelor's degree =36.2%, HND =13.8%, OND = 3.4% while doctorate =1.7%.

Table 1. Respondents background information.

Demographic	Percentage
Respondents Profession	
Architect	1.1
Builder	15.5
Civil Engineer	6.9
Construction Manager	25.9
Project Manager	10.3
Quantity Surveyor	19.0
Age group	
21–25 years	10.3
26–30 years	32.8
31–35 years	8.6
36–40 years	13.8
41–45 years	20.7
46-years above	12.1
Years of experience	
1–5 years	31.0
6–10 years	17.2
11–15 years	22.4
16–20 years	17.2
20years above	10.3
Educational qualification	
OND	3.4
HND	13.8
Bachelor's Degree	36.2
Master's degree	43.1
Doctorate	1.7

Descriptive analysis of Challenges of Building Information Modelling in the NCI

From Table 2, the results show the respondent ranking from the maximum to the lowermost. According to respondent "Individual opinions concerning BIM" was ranked the first with (M = 3.98, SD = 0.790); "absence of non-integration of model design" was ranked second with (M = 3.95, SD= 0.854); "inadequate protocol relating to BIM" was ranked third with M = 3.91, SD = 0.912); " lack of competent staffs" was ranked third with (M = 3.91, SD = 1.106); "problems in applying BIM" was ranked fourth with (M = 3.88, SD = 0.994); "cost of applying and updating the BIM" was ranked fifth" with (M= 3.88 and SD = 0.927); "culture confrontation to change" was ranked sixth with (M = 3.79, SD = 0.861); " resistance to change" was ranked seventh with (M = 3.77 and SD = 0.964); "high cost of education" was ranked eighth with (M = 3.75, SD = 1.023); "deficiency in legal issues to apply BIM" was nineth with (M= 3.74, SD = 1.009); "inadequate knowledge pertaining BIM by owner was ranked tenth with (M = 3.72, SD = 1.048); "absence of standards in utilizing BIM was ranked eleventh

Table 2. Challenges of building information modelling in the NCI.

	Mean	Std. Deviation	Rank
Individual opinions concerning BIM	3.98	0.790	1
Absence of non-integration of model design	3.95	0.854	2
Inadequate protocol relating to BIM	3.91	0.912	3
Lack of competent staffs	3.91	1.106	3
Problems in applying BIM	3.89	0.994	4
Cost of applying and updating the BIM	3.88	0.927	5
Culture confrontation to change	3.79	0.861	6
Resistance to change	3.77	0.964	7
High cost of education	3.75	1.023	8
Deficiency in legal issues to apply BIM	3.74	1.009	9
Inadequate knowledge pertaining BIM by owner	3.72	1.048	10
Absence of standards in utilizing BIM	3.67	1.058	11
Unsuitability of software	3.56	1.102	12
Necessity of disseminating information	3.42	1.051	13

Table 3. Crobach's alpha for challenges of building information modelling.

Cronbach's alpha	Number of items
0.809	14

with (M = 3.67, SD = 1.058); "unsuitability of software's was ranked twelfth with (M = 3.56, SD= 1.05).

From Table 2, the findings revealed that individual opinions concerning BIM, absence of no-integration of model design, inadequate protocol relating to BIM, lack of competent staffs, problems in applying BIM, cost of applying BIM and culture confrontation to change were the highest rated challenges facing BIM in the NCI. Lahdou and Zetterman (2011) agreed that individual opinion concerning BIM is among the major issues confronting BIM in the construction. Because every professional in the construction has their different opinions which are diverse in nature. Likewise, absence of non-integration of model design agrees with Hassan and Rasheed (2019). While Eastman et al. (2011) and Aryacil et al. (2011) concurs that lack of competent staffs is among the major challenges of BIM. According to Jamal et al. (2018), incompetent users might unconsciously change the content of data thus endangers to a project. The disjointed nature of construction task likewise adds towards BIM resistance among the construction partakers. However, in a situation whereby there are incompetent employees in the construction, this will surely affect the implementation of BIM in the organsiation. In term of problems in applying BIM, Zakaria et al. (2013) opined that among the key issues facing within the construction industry is the absence of knowledgeable BIM employees in the construction sectors. The difficulty is applying the BIM in addition to huge monetary investment are the major cause while some construction firms oppose the use of BIM.

From Table 3, the whole fourteen variables of challenges pertaining the BIM application in the NCI have a Cronbach's alpha of 0.809. This signifies that the Cronbach's alpha derived in this study is acceptable. Because Pallant (2010) states that value above 0.8 is preferably as Cronbach's Alpha.

IMPLICATIONS OF RESULTS

The theoretical assessment is coherent with the empirical discoveries for this study. The responses that were gotten from the construction professionals tally with the literature on various issues of BIM in Nigeria. Based on the findings, it was revealed that "Individual opinions concerning BIM" is the utmost issue affecting BIM in Nigeria. However, there is need for the professionals to be careful with the kind of opinions they give concerning BIM implementation. The avoidance of different individual perception concerning BIM will enhance the good influence of implementation of BIM in Nigeria.

CONCLUSIONS AND RECOMMENDATIONS

The result gotten in this study shows the top six eight issues of building information modelling in the NCI such as individual opinions concerning BIM, absence of non-integration of model design, inadequate protocol relating to BIM, lack of competent staffs, problems in applying BIM, cost of applying and updating the BIM, culture confrontation to change, and resistance to change. The individual opinions concerning the BIM, is usually problematic in the construction industry, since every construction participant has diverse perception toward the utilisation of BIM. Moreover, the absence of non-integration of model design is part of main issue in the implementation in the BIM in the construction industry. Though, the study objectives were accomplished form the literature as well as questionnaire usage. It is recommended in this study that construction professionals need to be careful with the kind of opinions they give pertaining building information modelling implementation.

ACKNOWLEDGEMENT

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