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CONCEPTUAL UNDERSTANDING OF BUILDING INFORMATION MODELING (BIM) FOR QUANTITY SURVEYORS: A LITERATURE REVIEW IN TERTIARY INSTITUTION

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ABSTRACT
There have been several developments in the construction industry over the last decade, the most significant of which has been information technology and its application. Building Information Modeling (BIM) is now widely regarded as a better solution to enormous building problems; it has significantly impacted the building and construction industries in the project design and implementation phases and is a good tool for the entire project lifecycle. This paper aims to explain the concept of BIM to QS professionals. This paper suggests a conceptual understanding of BIM based on recent findings: BIM awareness level from a student perspective, BIM adoption, and global implementation of BIM. Hopefully, the concepts emphasized in this paper will spark a positive debate about BIM, garnering some interest from practitioners and researchers. Students' responses show that many need more understanding of BIM. At the same time, the willingness of quantity surveying and other construction professional firms to adopt BIM still needs to be higher. Tertiary institutions should include BIM in their academic curricula because it may be crucial to future quantity surveyors' employability.

1. INTRODUCTION

Over time, we have observed a general misconception amongst stakeholders in the discourse surrounding the built environment and construction industry, increasing project certainty, cost-effectiveness, and timeliness requirements. At the same time, the irresistible pull of Digitalization persists, with many projects demonstrating that digital ways of working are becoming fully embedded, representing an opportunity to transform the delivery of significant programs truly. It is no longer straightforward to see digital disruption as the domain of BIM practitioners or as something that can only be model-based. It is here to stay in the construction industry. A new form of teamwork between the project team is made possible by data and technology (Jon, 2022).

According to Ibrahim & Ahmad (2020; Haron, 2013), the construction industry has grown more complex and challenging to manage due to low investment rates, rising costs, increased risk, waste, and greatly increased labor productivity. Therefore, BIM is a desirable solution with the management of information and all building issues as its primary goals.

This study provides background information on building information modeling (BIM), discusses how it relates to the profession of quantity surveying, and ultimately discusses how important it is to the building industry as a whole. BIM is one of the most promising recent

innovations in the built environment and construction industry. BIM technology enables accurate digital construction of a building model, cost estimation of buildings, project scheduling, and project monitoring.

Quantity surveyors need to be updated on the substantial advantages this BIM paradigm shift will bring. They must, therefore, be familiar with BIM-based project delivery. This will clear the way for current quantity surveyors to acquire the knowledge and abilities required to ride the next global wave of sustainable development and maintain their leadership positions in the industry. Quantity surveyors must be open to embracing and implementing any innovation in the construction industry if they hope to maintain their competitiveness on a global scale (Reuben et al., 2021).

2. LITERATURE REVIEW

In traditional construction projects, the client always comes up with the idea for the project. The BIM approach to project execution begins with the client, who prepares the project BIM brief before engaging the consultant. The brief preparation is usually done under the supervision or consultation of lead consultants or an executive project manager who is well-versed in the chosen BIM package. The presentation of information with Computer Aided Designs (CAD) software is strictly in two and three dimensions, e.g., plan, sections, elevations, and the presentations are independent of each other and the cost and schedule associated with them (Akinsiku, 2016).

Even though BIM is used in many large design and construction projects, it still needs to be widely used in the industry. Design and construction projects are now more efficient in cost reduction, quality improvement, schedule, and improved collaboration among project participants. Furthermore, project owners have begun to recognize additional benefits derived from BIM as a work method, such as reduced claims, more straightforward calculations and visualizations for promotional purposes, and ease of cross-disciplinary collaboration (Ibrahim & Ahmad, 2020).
Recent developments on a global scale have sped up the adoption of digitalization-driven processes and practices. Model-centric and data-driven workflows are becoming more prevalent in the construction industry. BIM and digital twins play a more significant role in the tasks construction project teams must complete. As a result, it is critical to track and measure the sector's advancements in applying digital technology (Jon, 2022).

2.1. Building Information Modelling (BIM) Concept

What is BIM?

BIM is a constantly evolving and vast subject to research. With so many theories to choose from, BIM can be easily confused and misunderstood. BIM is an ambiguous acronym that can be highlighted differently by different professions at different levels of study. As a result, it is critical to carefully examine the terminology to establish a clear understanding of the foundation of this research. BIM is "the digital representation of the building process to facilitate information exchange and interoperability in digital format."

'BIM is essentially value-creating collaboration through the entire lifecycle of an asset, underpinned by the creation, collation, and exchange of shared three-dimensional (3D) models and intelligent, structured data attached to them.' These definitions all appear to agree on BIM as a digital representation.

2.2. The Standard BIM Depiction

A BIM model begins with a parametrically enhanced 3D that has information—both geometric and non-geometric—embedded into each of its various components. However, a 3D BIM model becomes richer and more robust with other information dimensions as more information is added to the parametric objects. Researchers categorize BIM as 3D, 4D, 5D, 6D, 7D, and nD.

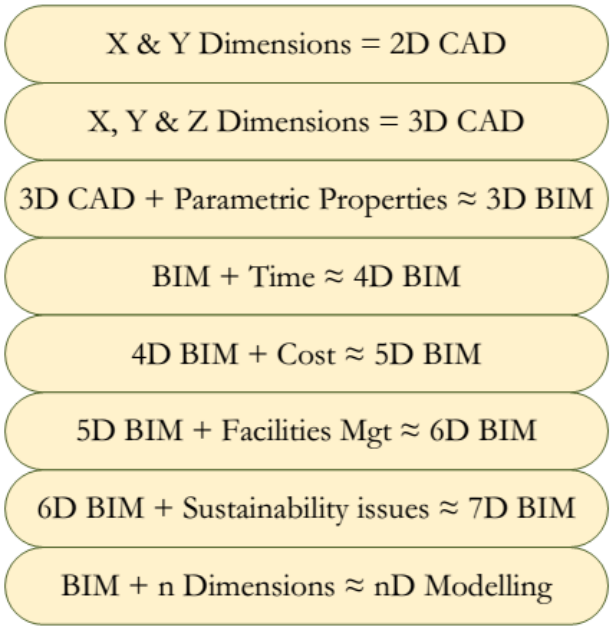

Figure: This illustration shows the Standard BIM Depiction according to levels of development/implementation

2.3 Need of a Quantity Surveyor/Construction professional to get familiar with BIM

It is difficult to avoid the conclusion that in the future, a growing portion of design and construction will be completed using computers, replacing manual labor like machines and steam power did during the Industrial Revolution. Recognizing the value of the quantity surveying profession globally is necessary. Without a doubt, the presence and activity of quantity surveyors (QS) in the industry benefit the construction industry. In light of the profession's ongoing evolution, the services provided by quantity surveyors have greatly expanded. The Quantity Surveyor (QS) is essential to executing any construction project in terms of cost management, financial advice, Bill of Quantities preparation, tender analysis, cash flow forecast, whole-life costing, contract administration, and other areas.

Simply put, the construction of complex buildings began to become a reality, and with that complexity came an additional issue in terms of sharing design information across the multidisciplinary team, including the client. BIM emerged as a potential solution to this problem, enabling the inclusion of all necessary information within a single universal model that could be given and understood by all project participants. Quantity surveyors simply cannot afford not to use BIM in light of its capabilities. In other words, QS professionals need to be fully informed about the opportunities BIM could present for their current and future roles.

3. METHODS

In order to fully comprehend this research, three surveys were discussed. Firstly, the results from administering Questionnaires to QS students regarding BIM knowledge to explore BIM awareness in Nigerian Tertiary Institutions, then a survey on the level of BIM adoption in the UK construction industry and the global implementation of BIM and observed barriers.

3.1 Student BIM Perception level

A total of 185 questionnaires were distributed to 400Level and 500level Quantity Surveying Students of Ahmadu Bello University (ABU) Zaria, Abubakar Tafawa Balewa University (ATBU) Bauchi, and Federal University of Technology (FUT) Minna with 92 to ABU, 50 to ATBU & 43 to FUT.

3.2 Responses from Questionnaires

Table 1: Results of chosen respondents from ABU, ATBU, FUT

	A.B.U			A.T.B.U			F.U.T		
BIM CONCEPT AGREEMENT BY STUDENT	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	Rank
4D(time) and 5D(cost) information can't be stored using BIM model	2.55	1.18	9	2.76	1.19	9	2.70	0.96	9
BIM involves digital representation of objects	3.73	0.58	1	2.88	1.15	8	3.05	0.90	7
BIM is a digital database which contains integrated files	3.63	0.67	2	3.44	0.91	2	3.74	0.66	1
BIM is a revolutionary development to QS profession	3.48	0.83	3	3.44	0.88	1	3.40	0.95	2
BIM is a software consisting of single building model	2.47	1.08	10	2.36	1.01	10	2.60	0.82	10
BIM is collaborative project oriented method	3.35	0.64	5	3.20	0.86	4	3.28	0.63	3
BIM is the perfect solution to all difficulties in the construction industry	3.18	0.99	7	3.16	0.98	5	3.12	0.98	6
Projections of entire life cycle of a building is one of many features of the BIM concept	3.13	0.76	8	2.94	0.89	7	2.88	0.93	8
The nD (any other design information) is one of the features that make BIM exceptionally unique	3.39	0.81	4	3.06	1.00	6	3.16	0.84	4
With BIM it is extremely easy to ensure removal of mistakes and all risks in construction project	3.18	0.97	6	3.22	1.00	3	3.14	1.04	5
AMS	3.21	RANK	1	3.05	RANK	3	3.11	RANK	2

Table 1 shows the respondents' responses in the three selected universities regarding to their understanding of the BIM concept. There is a varying level of awareness among the three institutions. For example, the Students from ABU appear to understand BIM as a digital representation better, followed by FUT respondents and then ATBU.

Secondly, an analysis was carried out by the Chartered Institute of Building (CIOB) in the UK, where the respondents were majorly practicing Qs and construction firms; thus, their responses:

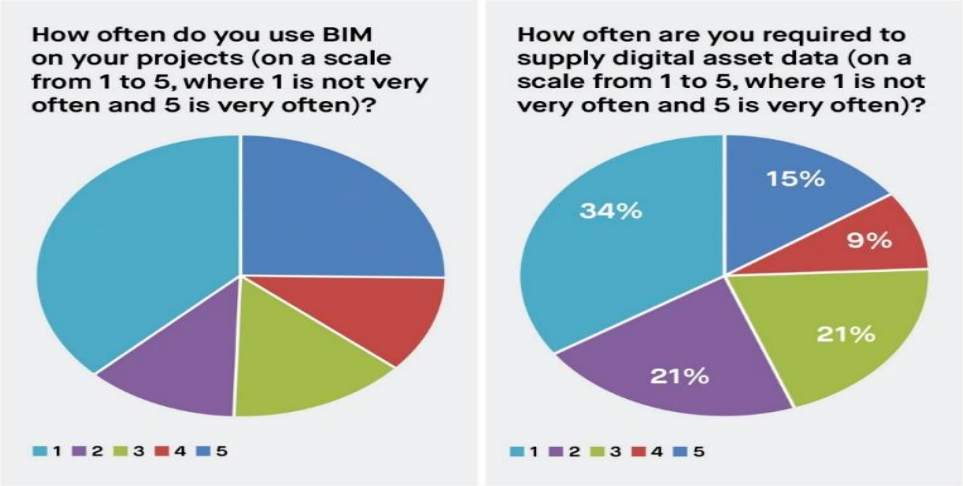

Figure 2: Survey Responses from construction professionals on BIM adoption in the UK

3.3 BIM adoption in the UK

The professionals who responded to the survey came from all over the UK construction industry: 34% general contractors, 14% public clients, 11% project managers/QS, 10% architects, 10% consulting engineers, 9% private clients, 9% specialist contractors, 3% house builder. Figure 2 shows the level of BIM adoption among construction professionals in the UK. Close to 40% of the respondents were not keen to use BIM, but 25% were likely to use it for their project.

3.4 Digitization in Construction Global Survey

Similarly, the Royal Institute of Chartered Surveyors (RICS) conducted a global survey on Digitalization in the Construction industry. Participants were asked to offer their opinions on the following four aspects of Digitalization in the building industry:

The RICS survey response was 44% from the UK, 9% from America, 10% from Europe, the Middle East and Africa 13%, and 24% from Asia Pacific.

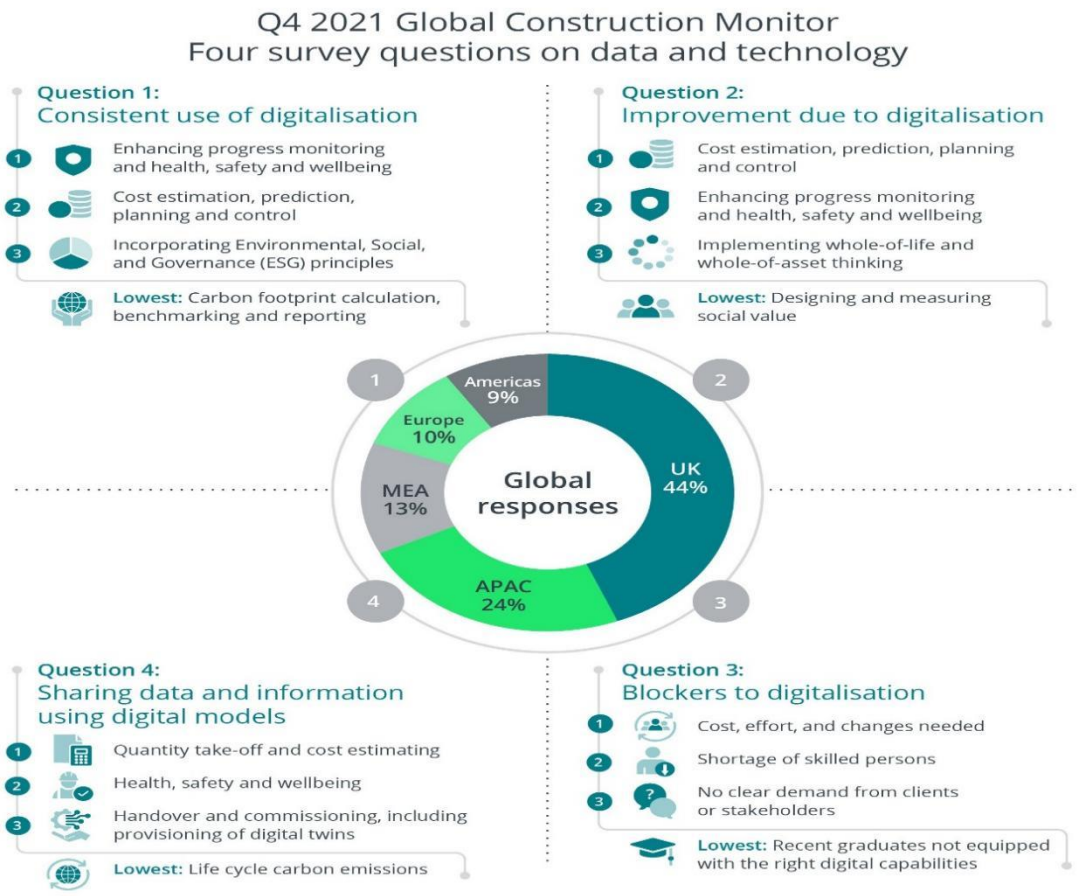

Figure 3: Survey responses on BIM implementation and Digitalization in Construction industry

The adoption rate: The following six functions were listed, and contributors were asked to indicate how many of their projects (on a scale of all projects to no projects) their organization consistently uses processes and practices driven by Digitalization (defined as BIM or digital twins): Implementing whole-life and whole-asset thinking will improve progress monitoring. The subsequent advancements brought about by Digitalization: For the same six functions, contributors were asked to rate their level of agreement with the statement "processes and practices driven by digitalization (defined as BIM or digital twins) help or are likely to help my organization improve" from "strongly agree" to "strongly disagree." Barriers to adoption: Participants were asked to rank the following barriers (from high to low) based on how much they believe they obstruct the Digitalization of design and construction processes and practices:

• The ability to modify the parameters of the digital twin or building information model; the cost, effort, and changes required.

The following factors make it challenging to realize benefits: lack of data standards, disciplinary silos, inconsistent approaches used by supply chain partners, difficulty realizing benefits, shortage of skilled workers, and recent graduates lacking the necessary digital capabilities.

4. CONCLUSION

Generally, from the student's perspective, it can be deduced that many have little understanding of the concept of BIM, with all the respondents agreeing with all the BIM benefits identified, the respondents also possess little knowledge regarding the BIM integration into the QS profession, and also the BIM drivers and information delivery are not known to students. BIM is becoming more popular worldwide, but its complete adoption in many Countries may take some time. This study highlighted the high awareness level of Building Information Modelling (BIM). However, based on the information gathered during this study and the comprehensive analysis of this information, the willingness of quantity surveying and other construction professional firms to adopt BIM still needs to improve. The responses to the digitalization questions in the survey show that digital technology is most commonly used for traditional functions such as 'cost estimation, prediction, planning, and control' and 'improving progress monitoring and health, safety, and well-being.' Emerging service areas such as ESG, whole-life and whole-asset approaches, social value, and carbon measurement should be utilized more.

5. RECOMMENDATIONS

- Tertiary institutions should include BIM in their academic curricula because it is a crucial component of future quantity surveyors' employability.
- Professional bodies should organize workshops, seminars, and training to raise awareness about BIM among quantity surveying practitioners, other construction professionals, and the general public and prepare developing countries for the challenges that BIM adoption may bring.
- The government should provide institutions with all necessary training facilities and make laws that encourage BIM usage among its construction stakeholders.
- The government should incentivize BIM usage by providing discounts to licensed BIM-based software.

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