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# Examining the Perception of Construction Stakeholders on the use of BIM for improving Construction Management Practices in Anambra state

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## I. INTRODUCTION

The term "construction" is no longer limited only to the physical activities involving men, materials and machinery but covers the entire stage of activities from conception to realization of a construction project. While "management" is a social process by which a co-operative group (superiors) directs the action of others (subordinates) for the accomplishment of a common goal.The National Building Information Modeling Standards (NBIMS) committee of USA defines BIM as follows: "BIM is a digital representation of physical and functional characteristics of a facility. Many developed economies of the world have recorded impressive outcomes by implementing BIM in their construction practices, and this necessitates the need for an investigation into the level of its awareness by construction stakeholders in the Nigerian Construction Industry. The construction industry in Anambra state faces numerous challenges in terms of project delivery and management practices such as inadequate project planning and design, poor execution and management, limited adoption of technology, shortage of skilled workforce, deficient risk management strategies, and inefficiencies in procurement and contract administration are among the key limitations. By understanding the current perceptions of stakeholders, including architects, engineers, builders, and quantity surveyors, it will be possible to highlight the barriers and challenges that hinder the widespread implementation of BIM. The aim of this paper was to examine the perception of construction stakeholders on the use of BIM for improving construction management practices in Anambra state with a view to recommend measures for improved and massive integration of BIM in the study area. The following are the objectives of the study which are:assess the level on awareness of BIM by construction stakeholders in Anambra State of Nigeria and to recommend measures for improved and massive integration of BIM in the study area. At the end of this study, the expected contributions are for researchers, state government and clients as through the perception of the construction stakeholders on improving construction management practices through BIM, stakeholders (construction managers, Builders, Engineers, e.t.c) in the construction industry would be aided in improving management capabilities and enable the construction sector to efficiently deliver projects and attain developmental objectives.

## II. LITERATURE REVIEW

The major shift in ICT for the Architecture Engineering and Construction (AEC) sector results to the spreading of Building Information Modeling (BIM). BIM is a system and its main objective is the managing of the information and because of that it is also a project management matter.

### 2.1 Stakeholders Perception on the use of BIM

The review explores the perspectives of stakeholders such as architects, engineers, contractors, clients, regulatory bodies, and BIM specialists. By analyzing a selection of scholarly articles, this review highlights the unique viewpoints, challenges, and opportunities that each

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stakeholder group brings to the adoption and implementation of BIM in the construction industry. Building Information Modeling (BIM) is increasingly being recognized as a transformative technology within the construction industry. Understanding the perceptions of different construction stakeholders towards BIM is crucial for its successful integration into project workflows. This literature review investigates the diverse perspectives of various construction stakeholders, acknowledging their role in the implementation and utilization of BIM.

1. **Architects' Perception:**Architects, as key stakeholders in the construction process, have been found to hold positive perceptions regarding BIM. Studies indicate that architects view BIM as a powerful tool for design coordination, clash detection, and improved communication with project teams (Succar, 2009). They also recognize the potential for BIM to enhance visualization and reduce errors during the design phase.
2. **Engineers' Perception:**Engineers, another crucial stakeholder group, also perceive BIM to have several benefits. They consider BIM as a valuable tool for improving interdisciplinary coordination, enabling clash detection, and enhancing overall project efficiency (Li, Chan, Skitmore, and Huang, 2014). Engineers appreciate BIM's ability to facilitate collaboration, streamline design analysis, and aid in the optimization of structural systems.
3. **Contractors' Perception:**Contractors play a critical role in the construction process, and their perception of BIM is vital for successful implementation. Contractors perceive BIM as a valuable tool for constructability analysis, material quantity estimation, and project scheduling (Azhar, Ziraldo, Barclay, Rudnick, Squires, Vodovotz and Zamora, 2013). BIM is seen as a means to improve cost estimation accuracy, reduce construction delays, and enhance the overall quality of project delivery (Kassem, Benomran and Teizer, 2017).
4. **Clients' Perception:**Clients are increasingly recognizing the value of BIM in construction projects. They perceive BIM as a tool for better project understanding, improved decision-making, and enhanced collaboration with project teams (Eastman, Teicholz, Sacks, and Liston, 2014). Clients appreciate the visual representation facilitated by BIM, empowering them to make informed decisions during the planning and design phases.
5. **Regulatory Bodies' Perception:**Regulatory bodies play a significant role in shaping the adoption and implementation of BIM. Their perception of BIM often focuses on its potential to improve project outcomes and compliance with building codes and standards. Regulatory bodies recognize BIM's ability to streamline the building approval process, enhance regulatory compliance, and improve overall project quality (Khoshnoud, Alvarez Igarzábal, and Wittmann, 2019).
6. **BIM Specialists' Perception:**BIM specialists, including modelers, coordinators, and managers, offer a unique perspective on BIM. They perceive BIM as an essential tool for streamlining workflows, facilitating information exchange, and driving project efficiency (Zhou, Li, and Li, 2019). BIM specialists appreciate BIM's potential for enhancing project coordination, reducing errors, and improving collaboration among stakeholders (Nawari and Chichugova, 2016).

**2.2 Measures for improved and massive integration of BIM in Construction management practices.**

To promote the improved and massive integration of BIM in Anambra State's construction industry, several measures have been suggested by researchers. Tay and Zuo (2017) propose measures such as

1. **Developing BIM Guidelines and Standards:** BIM guidelines and standards play a crucial role in promoting the integration and implementation of BIM in construction projects. They provide a framework for data exchange, interoperability, and collaboration among project stakeholders. Several studies emphasize the importance of developing standardized BIM guidelines and protocols to ensure consistent practices across the industry (Eastman, 2008; Hamzah, Ahmad and Baharum, 2016). These guidelines establish clear procedures and methodologies that contribute to improved project coordination, reduced conflicts, and enhanced information sharing.
2. **Providing BIM Training Programs:**Effective BIM training programs are essential for increasing the adoption and proficiency of BIM among industry professionals. Research has shown that lack of knowledge and skills is a significant barrier to BIM implementation (Azharet al., 2012; Tam and Na, 2017). Tay

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and Zuo (2017) highlight the importance of offering comprehensive BIM training programs that cater to the needs of different stakeholders, including architects, engineers, contractors, and facility managers. These programs should cover both technical and managerial aspects of BIM to ensure users can maximize the benefits of BIM technologies.

3. **Establishing Public-Private Partnerships:**Public-private partnerships play a pivotal role in fostering BIM adoption and integration. Collaborative efforts between government agencies, industry organizations, and private companies can drive the development of BIM frameworks, support research initiatives, and provide funding for BIM-related projects. Tay and Zuo (2017) argue that establishing such partnerships can improve the accessibility of BIM technologies, facilitate knowledge exchange, and promote industry-wide collaboration.
4. **Incorporating BIM Requirements in Procurement Processes:**Embedding BIM requirements in procurement processes is vital to encourage the adoption of BIM throughout the project lifecycle. Procurement policies and procedures that stipulate the use of BIM in project delivery incentivize stakeholders to invest in BIM technologies and skills. Research has shown that when BIM requirements are included in project contracts, there is a higher likelihood of BIM adoption and integration (Chan, Zhao and Zuo, 2019; Zuo and Zhao, 2019). Tay and Zuo (2017) emphasize the need for clear and enforceable BIM mandates at both the organizational and governmental levels.
5. **Conducting Awareness Campaigns:**Raising awareness about BIM and its potential benefits among construction stakeholders is a critical measure to encourage its adoption. Tay and Zuo (2017) highlight the importance of conducting targeted awareness campaigns to educate professionals, organizations, and policymakers about the value and application of BIM. These campaigns should emphasize the long-term advantages of BIM, such as improved collaboration, decreased project costs, enhanced productivity, and increased sustainability. By addressing the misconceptions and promoting the benefits of BIM, awareness campaigns can effectively generate interest and drive the integration of BIM in the construction industry.

Promoting improved and massive integration of BIM requires a comprehensive approach that encompasses the development of guidelines and standards, provision of training programs, establishment of public-private partnerships, incorporation of BIM requirements in procurement processes, and conducting awareness campaigns.

## III. METHODOLOGY

In this study, the descriptive survey design was adopted. The design typically employed the use of questionnaire to get response opinion, preference and perception of the study. Anambra State, as seen is a State in the south-eastern part of Nigeria. It is located on latitude 5032 and 6045N and longitude 6043 and 7022E. The population of the study consist of 238 registered professional builders, Architects, Engineers and Quantity Surveyors, in the construction industry of Anambra State who manage construction projects in all categories of construction. Purposive sampling technique was used in this research. The total population of the study was reduced with Taro Yamani sample method to determine the appropriate sample size in this study, therefore the population for the study is 149. A structured questionnaire was used as a data gathering instrument. In the analysis of data obtained on the research, inferential and descriptive analysis was used. Questionnaires were measured with the use of likert scale. The study made use of descriptive statistical tools such as table of frequency, mean, standard deviation and percentages which will be ranked with weighted average mean score.

## IV. RESULTS AND DISCUSSIONS

### 4.1 Statistical Analysis of Data Generated

Upon carrying out basic analysis of the data gathered, the descriptive statistics was used to analyze the questions addressing the research questions raised earlier in the study. The consequent results reported in the tables below indicates the frequency, the mean and the standard deviation of each variable. In this research the results was presented and analyzed under each question being assessed.

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**Table 4.5: What is the level of awareness on the use of BIM by Construction stakeholders in Anambra**

| Profession | Frequency | Percent |
|---|---|---|
| **Very High** | 6 | 7.50 |
| **High** | 33 | 41.25 |
| **Neutral** | 28 | 35.00 |
| **Low** | 13 | 16.25 |
| **Very Low** | 0 | 0.00 |
| **Total** | **80** | **100** |

Source: Researcher's Field work, 2024

Table 4.5 shows the level of awareness on BIM by construction stakeholders in Anambra state. It can be seen from the table that "very high" represents 7.50% of the response, "high" represents 41.25%, "neutral" represents 35%, "low" represents 16.25% and "very low" represents 0% of the response. This indicates that a greater percentage of the stakeholders in Anambra state are very much aware on the use of BIM.

**Table 4.9: Measures needed for improved and massive integration of BIM in the study area.**

| S/N | Variables | SA | A | U | D | SD | ∑F | Mean | Ranking |
|---|---|---|---|---|---|---|---|---|---|
| **1** | Developing guidelines and standards | 28 | 40 | 9 | 3 | 0 | 80 | 4.16 | 3rd |
| **2** | Providing BIM training programs | 33 | 32 | 14 | 1 | 0 | 80 | 4.21 | 2nd |
| **3** | Establishing public-private partnership | 23 | 37 | 17 | 3 | 0 | 80 | 4.00 | 5th |
| **4** | Incorporating BIM requirements in procurement process | 31 | 33 | 11 | 5 | 0 | 80 | 4.13 | 4th |
| **5** | Conducting awareness campaign | 36 | 33 | 8 | 3 | 0 | 80 | 4.28 | 1st |
| | **Average** | | | | | | | **4.16** | |

Source: Researcher's Field work, 2024

From table 4.9, conducting awareness campaign (4.28), providing BIM training programs (4.21) and developing guidelines and standards (4.16) are the most suggested measures needed for improving the massive integration of BIM in Anambra state while incorporating BIM requirements in procurement processes (4.13) and establishing public private partnership (4.00) are the least most suggested measures needed for improving the massive integration of BIM in Anambra state

**Summary**

1. The stakeholders in the study area are aware of BIM in construction management practices and this is important towards integrating BIM in construction management practices in the construction industry of the study area. (Table 4.5).This is buttressed by Ezeokoli et al, (2016) who outlined that the level of BIM awareness in Anambra state is 93%. This implies that that awareness level of BIM in the study area is relatively high.
2. Developing BIM Guidelines and standards, providing BIM training programs, providing public-private partnerships to enhance BIM adoption, incorporating BIM requirements in procurement processes and conducting awareness campaigns to educate construction stakeholders about the benefits and application of BIM are important for the massive integration of BIM in construction

management practice. (Table 4.9). This is in line with Tay and Zuo (2017) study which suggested measures such as developing BIM Guidelines and standards, providing BIM training programs, providing public-private partnerships to enhance BIM adoption, incorporating BIM requirements in procurement processes and conducting awareness campaigns to educate construction stakeholders about the benefits and application of BIM which is important for the massive integration of BIM in construction management practice.

**Recommendations**

Based on the research conducted, the following recommendations are proposed:

1. **Awareness and Training:** relevant governmental and construction agencies should create awareness among construction stakeholders about the benefits and potential of BIM in improving construction management practices. Provide training programs and workshops to enhance their understanding and skills in using BIM effectively
2. **Policy and Regulation:** Develop and implement policies and regulations at the government level that promote the use of BIM in construction projects. This can include providing incentives or mandates for BIM implementation, or incorporating BIM requirements in tendering and procurement processes.

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