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LIMITED ADOPTION OF ADVANCED BIM TOOLS IN ARCHITECTURAL
EDUCATION: EVIDENCE FROM SOUTHWESTERN NIGERIA

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ABSTRACT

This study examined the availability and utilization of Building Information Modelling (BIM) tools among architectural educators in three public universities in southwestern Nigeria. Using a purposive sampling technique, a structured questionnaire was distributed to 80 architectural educators, out of which 41 valid responses were received, yielding a response rate of 51%. The survey collected data on the BIM tools accessible to educators, the specific categories of BIM tools they used, and the frequency of such use in teaching and research activities. Findings revealed substantial variability in BIM tool usage across the institutions. 3D Modelling and Rendering & Visualization were used most frequently, while advanced tools linked to multi-disciplinary collaboration, such as MEP Systems Design, Clash Detection, Construction Simulation (4D), and Cost Estimation (5D), were rarely utilized. This pattern indicates that although foundational BIM capabilities are present, higher-level, interoperability-driven tools remain under integrated in architectural education within the selected universities. The study concludes that BIM utilization is uneven and generally limited to basic functions, underscoring the need for more comprehensive integration of advanced BIM tools in architectural curricula in southwestern Nigeria.

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1.0 Introduction

Building Information Modelling (BIM) has evolved since the 1970s into one of the most transformative digital innovations in the global Architecture, Engineering, and Construction (AEC) industry. It integrates intelligent 3D modelling with data-driven processes to enhance coordination, productivity, and sustainability across the building lifecycle. Today, BIM is not only a technological advancement but a pedagogical necessity, reshaping how architectural design, visualization, and collaboration are taught and practiced worldwide. However, while BIM adoption in advanced economies has become mainstream, the situation in developing regions, particularly in Sub-Saharan Africa, remains uneven. In Nigeria, BIM awareness among architects is relatively high (Ibem et al., 2018; Ezeji et al., 2023), yet utilization levels remain low (Olugboyega et al., 2023; Hamma-Adama et al., 2018). This discrepancy is especially evident in the limited application of advanced and interoperability tools, such as Dynamo, Solibri, Enscape, and BIM 360. These are tools that support automation, model coordination, and cloud-based collaboration (Uwakonye et al., 2017). The consequence is a persistent skills gap that constrains the competitiveness of Nigerian architects and hampers the construction industry's transition to digital workflows aligned with global best practices.

A major factor behind this challenge lies in architectural education. Studies like Hamma-Adama et al., (2018), Oyewole and Dada, (2019), as well as Babatunde et al., (2021), have consistently identified inadequate training and limited curricular integration of BIM as key barriers to adoption in professional practice. Hamma-Adama and Kouider (2018) reported that over 70% of architecture students in Nigerian universities graduate with only basic CAD skills, while less than 15% gain exposure to collaborative or advanced BIM applications. This shortfall in training suggests a systemic problem originating from architectural schools—institutions that serve as the primary training ground for the nation's future design professionals. If educators lack both access to

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and proficiency with BIM tools, graduates are likely to perpetuate the same deficiencies, deepening the technological lag between Nigeria and more digitally advanced contexts.

Although a few studies have investigated BIM integration in architectural education Uwakonye *et al.*, (2017) and Maina, (2018), most have focused on student perceptions or general institutional readiness. Research addressing the perspectives of educators who are directly responsible for curriculum design, resource allocation, and teaching implementation remains limited, particularly within developing regions. As Correa *et al.* (2025) observed in their multi-regional study of educators, the dynamics influencing BIM teaching in the Global South differ substantially from those in developed contexts, necessitating localized empirical evidence to inform policy and curriculum development.

Therefore, this study aims to evaluate the extent and nature of BIM tools utilization among architectural educators in selected universities in Southwestern Nigeria. The specific objectives are to identify the BIM tools available and accessible to architectural educators in the study area, as well as to assess the frequency and extent of use of both basic and advanced/interoperable BIM tools. By addressing these objectives, the study provides empirical insights into the current state of BIM-based teaching in Nigerian architectural education and offers evidence-based recommendations for enhancing digital competency and curriculum integration within the region.

2. Materials and Method

This study was conducted in selected universities offering accredited architecture programs within the Southwestern region of Nigeria. The region is home to several public and private universities that collectively play a leading role in shaping architectural education and professional practice in the country. There are six federal universities located in the region as shown in Fig. 1. These are the University of Lagos (UNILAG), Obafemi Awolowo University (OAU) in Ile-Ife, University of Ibadan (UI), Federal University of Technology, Akure (FUTA), Federal University of Agriculture, Abeokuta (FUNAAB), and Federal University Oye-Ekiti (FUOYE)—only five currently run programs in architecture. From these, three universities—University of Lagos (UNILAG), Obafemi Awolowo University (OAU), and Federal University of Technology, Akure (FUTA)—were purposively selected for this study. The selection was based on criteria relevant to the study objectives, particularly their differences and similarities in curriculum orientation, institutional resources, and levels of digital technology adoption in architectural training.

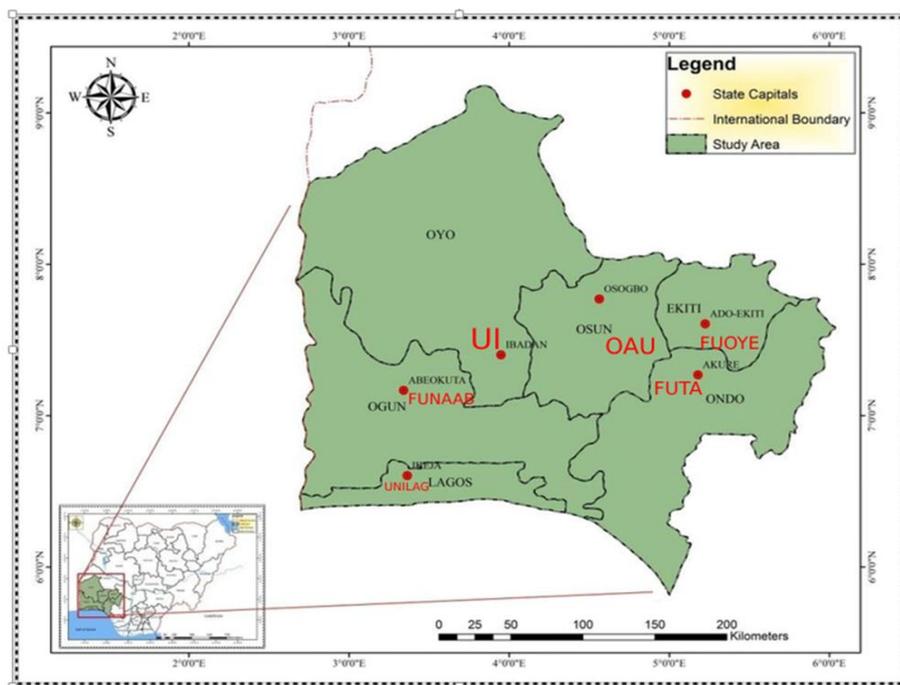


Figure 1: Map of Southwestern Nigeria with the location of Federal Universities (Cooperative Information Network. COPINE)

UNILAG represents a metropolitan university with strong industry linkages and early exposure to digital design integration in its curriculum. OAU, one of the oldest architecture schools in Nigeria, combines a traditional design pedagogy with gradually expanding digital training facilities. FUTA, as a technology-driven

institution, emphasizes applied sciences and technical innovation in its architecture program. Together, these universities provide a balanced representation of the range of pedagogical and technological conditions under which architectural education operates in Southwestern Nigeria. The selection of these institutions therefore offers a comparative framework for assessing variations in BIM tools accessibility and utilization among architectural educators within the same regional context but across diverse institutional environments.

Southwestern Nigeria lies within the tropical rainforest zone and experiences a warm–humid climate characterized by distinct wet (April–October) and dry (November–March) seasons, with average temperatures ranging between 24 °C and 33 °C. The region hosts major urban centres such as Lagos, Ibadan, Akure, and Ile-Ife, which serve as educational and economic hubs. Its dense urban population, rapid construction growth, and emerging real estate market make it a strategic location for studying the integration of digital technologies in the built environment. These socio-economic and climatic conditions have also intensified the need for environmentally responsive design education and digital proficiency, which are factors directly relevant to the implementation and teaching of BIM within the region’s architecture schools.

This study employed a quantitative descriptive survey design. Both primary and secondary data were used to examine the availability and utilization level of BIM tools among architectural educators in selected universities within Southwestern Nigeria. The primary data were collected through a structured questionnaire administered to available architectural educators in the three selected universities. These are University of Lagos (UNILAG), Obafemi Awolowo University (OAU), and Federal University of Technology, Akure (FUTA). The secondary data were obtained from departmental handbooks and records of the architecture departments of these institutions, providing information on faculty size, areas of specialization, and program structure. The study population comprised 80 architectural educators across the three universities. The distribution included 24 educators from UNILAG, 21 from OAU, and 35 from FUTA. The number of valid responses received amounted to 41, representing an overall response rate of 51.25%. The institutional response rates were 50% for UNILAG (12 respondents), 71% for OAU (15 respondents), and 40% for FUTA (14 respondents).

The questionnaire contained closed-ended questions, designed to measure the availability, frequency, and extent of BIM tool utilization. To ensure content validity, the instrument was reviewed by three senior academics with expertise in architectural education and digital design technology. A pilot test involving six architectural educators (two from each selected university) was conducted to assess clarity, relevance, and consistency of the items. Feedback from the pilot was used to refine the questionnaire before full administration. The reliability of the instrument was established using Cronbach’s Alpha, which yielded a coefficient of 0.82, indicating high internal consistency and reliability of the questionnaire items. Questionnaires were distributed both physically and electronically, depending on the participants’ availability and preference. All responses were coded and analysed using Statistical Package for the Social Sciences (SPSS) version 26. Data analysis involved the use of descriptive and inferential statistical techniques, including frequency counts, percentages, means, standard deviations, and Chi square. These were used to summarize the level of BIM tools accessibility and utilization among respondents. Results were presented in tables to clearly illustrate patterns of BIM tools availability and utilization across the three universities.

3. Results and Discussion

3.1 BIM tools used by respondents

This section examined the types of BIM Tools utilized by the respondents; the different combinations of BIM tools used as well as the extent of use. Understanding the specific BIM Tools employed by educators is essential for capturing the state of BIM Tools utilization among architectural educators, and could provide needed clues toward policy formulation to support comprehensive BIM education, and eventual full BIM adoption in practice.

3.1.1 Individual BIM tools used by respondents

A detailed list of individual BIM tools was given to respondents, who were then asked which ones were used at their institutions. The variety of uses of BIM in architectural education and practice is reflected in the list of BIM tools, which span from simple design and visualization to sophisticated analysis, project management, and sustainability evaluations. The BIM tools that were offered and how frequently the respondents chose them are displayed in Table I.

The distribution of BIM tool usage shows that 3D Modeling (33) and Rendering & Visualization (20) are by far the most frequently used tools among respondents. While this confirms their foundational role in architectural education, it also reflects deeper structural tendencies within the Nigerian academic context. Architecture programmes continue to prioritize representational and design-focused tools because they align with traditional studio pedagogy, require less interdisciplinary coordination, and are supported by readily available software and faculty expertise. This may explain why these tools dominate both teaching and research activities across institutions

Table 1: BIM tools usage by respondents

BIM Tool	Frequency
3D Modeling	33
Rendering & Visualization	20
Energy Analysis	14
Lighting Analysis	12
Scheduling & Time Management	12
Facility Management	12
MEP Systems Design	10
Quantity Takeoff & Cost Estimation	10
Construction Simulation	9
Structural Analysis	8
Construction Monitoring & Progress Tracking	8
Collaborative Tools	6
Sustainability & LEED Certification	6

Moderate usage of Energy Analysis (14), Lighting Analysis (12), and Scheduling & Time Management (12) suggests emerging interest in performance-based and management-oriented BIM tasks. However, the variation in adoption possibly reflects differences in curriculum emphasis, availability of specialized software, and the degree to which sustainability or project-management competencies are incorporated into existing course structures. The presence of these tools, though not yet widespread, indicates that some institutions are gradually responding to global trends in sustainable design and integrated project delivery. In contrast, lower frequencies for specialist tools such as MEP Systems Design (10), Construction Simulation (9), and Structural Analysis (8) point to more systemic barriers. These tools typically require higher computational capacity, cross-disciplinary teaching frameworks, and faculty trained in engineering-aligned BIM functionalities. According to their departmental handbooks and records, these are resources that the architecture departments in this study context lack. The underutilization of Construction Monitoring and Sustainability/LEED tools further highlights a gap in training for whole-life project delivery and collaboration, which are central to mature BIM workflows.

Table 2 deepens this picture by showing how these patterns vary across institutions. OAU consistently record the highest use of core tools such as 3D Modeling (45.5%) and Rendering (50%), suggesting stronger departmental investment in visualization-driven BIM skills. UNILAG's and FUTA's smaller contributions across most tools may reflect differences in resource allocation, faculty specialization, or institutional priorities. A Chi-Square test of independence was conducted to determine whether BIM tool usage was significantly associated with institutional affiliation. The Chi-Square test yielded: $\chi^2 = 1.75$, $df = 22$, $p \approx 1.00$. This extremely high p-value indicates that there is no statistically significant difference in BIM tool usage across the three universities.

This shows that the observed variations in counts are not statistically meaningful. Instead, the three institutions exhibit a statistically uniform pattern of BIM tool adoption. This finding suggests that the universities are influenced by common systemic factors rather than institution-specific drivers. For example, architectural programmes in Nigeria are regulated by similar accreditation requirements from the National University Commission (NUC) and the Architects Registration Council (ARCON). This may result in comparable curricular structures. Additionally, faculty exposure, availability of licensed BIM software, and infrastructural limitations such as computer laboratories and internet connectivity are challenges shared across most public universities. These systemic constraints may restrict the integration of more advanced BIM functionalities (e.g., collaborative tools, construction simulation, MEP systems design), thereby contributing to the consistent underutilization observed across all three institutions.

Table 2: BIM tools usage analysis across institutions

BIM Tool	Frequency			
	OAU	UNILAG	FUTA	TOTAL
3D Modelling	15 (45.5%)	10 (30.3%)	8 (24.2%)	33
Rendering & Visualization	10 (50%)	5 (25%)	5 (25%)	20
Energy Analysis	6 (42.9%)	4 (28.6%)	4 (28.6%)	14
Lighting Analysis	5 (41.7%)	4 (33.3%)	3 (25%)	12
Scheduling & Time Management	5 (41.7%)	4 (33.3%)	3 (25%)	12
Facility Management	4 (40%)	3 (30%)	3 (30%)	10
Quantity Takeoff & Cost Estimation	4 (40%)	3 (30%)	3 (30%)	10
Construction Simulation	4 (44.4%)	3 (33.3%)	2 (22.2%)	9
Structural Analysis	3 (37.5%)	3 (37.5%)	2 (25%)	8
Construction Monitoring & Progress Tracking	3 (37.5%)	3 (37.5%)	2 (25%)	8
Collaborative Tools	3 (50%)	2 (33.3%)	1 (16.7)	6
Sustainability & LEED Certification	3 (50%)	2 (33.3%)	1 (16.7%)	6

In summary, these findings suggest that while universities in southwestern Nigeria have begun integrating BIM, especially in design-oriented tasks, they remain limited in adopting collaborative, interdisciplinary, and lifecycle-focused tools. This uneven pattern is likely shaped by curriculum rigidity, limited software licensing budgets, insufficient faculty training, and modest industry pressure for higher-level BIM competencies. These underlying factors help explain why foundational tools dominate usage, advanced tools remain marginal, and institutional differences persist without clear statistical confirmation.

3.1.2 Combinations of BIM tools used by respondents

The study further examined the range and patterns of BIM tools combination usage among architectural educators in the three selected universities in southwestern Nigeria. Table 3 categorizes the tools into functional groups to improve clarity and to reflect how educators typically use BIM tools in practice and instruction. The tools span foundational modelling, performance analysis, scheduling and cost management, design coordination, interdisciplinary engineering, construction monitoring, facility management, and collaborative platforms.

Table 3: BIM Tools Considered in the Study, Categorized by Function

BIM Function Category	Specific Tools Included in the Study
Foundational Modelling & Visualization	3D Modelling; Rendering & Visualization
Design Coordination & Compliance	Clash Detection; Code Compliance & Model Checking; Issue Tracking & Management
Performance Analysis	Energy Analysis; Lighting Analysis; Sustainability & LEED Certification
Quantification & Scheduling	Quantity Take-off & Cost Estimation; Scheduling & Time Management
Construction & Monitoring	Construction Simulation; Construction Monitoring & Progress Tracking
Interdisciplinary Engineering Tools	Structural Analysis; MEP Systems Design
Lifecycle & Facility Management	Facility Management; Scan-to-BIM
Collaborative Workflow Tools	Collaborative Platforms / Common Data Environments (CDE)

Across institutions, foundational modelling tools, particularly 3D modelling software, were the most widely used. Tools supporting visualization, such as rendering software, also featured prominently. In contrast, advanced or specialized tools, such as construction simulation, sustainability analysis, or code-compliance checking, were used by significantly fewer respondents.

Table 4 presents the frequency of BIM tools combinations used by the respondents. The combinations are grouped according to the functional categories of BIM tools. The most common pattern is Basic Modelling Only, with 16% of the respondents relying exclusively on 3D modelling tools. This indicates that, for a sizable proportion of educators, BIM usage remains at an introductory or foundational level. Another notable cluster includes respondents who use Environmental Performance Tools, specifically Energy Analysis and Lighting Analysis (11%). A similar proportion (11%) combine Modelling and Visualization, typically using rendering tools alongside basic modelling platforms. These combinations suggest a partial integration of BIM functionalities beyond modelling but still reflect selective engagement rather than a full workflow adoption. A small but meaningful group (11%) reported using Comprehensive Multi-Function Sets, incorporating tools for modelling,

analysis, quantification, scheduling, monitoring, and visualization. These respondents demonstrate a more robust engagement with BIM workflows, indicating that some educators possess pockets of advanced practice.

More integrated combinations, such as those combining 3D Modelling, Energy Analysis, Lighting Analysis, Structural Analysis, and MEP Systems Design, occur less frequently (8%). These represent a deeper alignment with industry-level BIM processes, though they are still limited in number. Other combinations involving scheduling, facility management, sustainability analysis, construction simulation, and visualization occur with lower frequencies (3–8%). This distribution suggests isolated use of advanced tools rather than widespread institutional integration.

Table 4: BIM Tool combinations usage among respondents

BIM Tool Combination (Grouped by Use)	Description of Tools Used	Percentage of respondents (%)
Basic Modelling Only	3D Modelling only	16
Environmental Performance Pair Modelling + Visualization	Energy Analysis + Lighting Analysis 3D Modelling + Rendering & Visualization	11
Comprehensive Multi-Function Set	Combination of several tools including: 3D Modelling, Energy & Lighting Analysis, Quantity Take-off, Scheduling, Facility Management, Construction Simulation, Monitoring, and Visualization	11
Integrated Design & Engineering Set	3D Modelling + Energy Analysis + Lighting Analysis + Structural Analysis + MEP Systems Design	8
Modelling + Scheduling + Visualization + Facility Management	3D Modelling + Scheduling + Facility Management + Rendering	8
Modelling + Sustainability + Visualization	3D Modelling + Sustainability/LEED Certification + Rendering	8
Extended Full-Workflow Set	Large combination including modelling, analysis, coordination, scheduling, cost, engineering, collaboration, simulation, and visualization functionalities	8
Modelling + Quantification + Structural Analysis	3D Modelling + Quantity Take-off + Cost Estimation + Structural Analysis	5
Modelling + Facility Management + Lighting Analysis	3D Modelling + Facility Management + Lighting Analysis	5
Modelling + Visualization + Construction Simulation	3D Modelling + Rendering + Construction Simulation	5
Other Less Frequent Combinations	Various combinations occurring once each	3

Overall, the results reveal a skew toward basic BIM functionalities, with fewer educators utilizing advanced, interdisciplinary, or lifecycle-oriented tools. While some respondents employ extensive toolsets reflecting comprehensive BIM workflows, these users constitute a minority. The findings indicate that BIM adoption in these universities remains uneven, with significant gaps in the use of performance analysis tools, collaboration platforms, construction simulation tools, and compliance-checking applications. These patterns highlight opportunities for targeted capacity-building within architectural education, particularly in enhancing educators' proficiency with advanced BIM tools that support integrated design, sustainability assessment, interdisciplinary coordination, and digital construction processes.

3.1.3 Discussion on pattern of BIM tools used by respondents

The pattern of BIM tool usage observed among architectural educators reveals a strong reliance on foundational tools, particularly 3D modelling, while more advanced or collaborative BIM applications remain marginal. Although this aligns with global trends in early-stage BIM adoption reported by Morton (2012) and Károlyfi *et al.* (2021), the persistence of this pattern within architectural schools in southwestern Nigeria reflects underlying structural and institutional constraints rather than mere pedagogical preference.

Several factors likely explain the limited engagement with advanced BIM tools. First, curriculum rigidity remains a major barrier. An examination of the departmental handbooks in the selected Universities showed that their architectural programmes still follow design curricula that prioritise representational and form-making competencies, to which 3D modelling and visualization naturally correspond. Integrating interdisciplinary tools, such as MEP design, construction simulation, or code-compliance platforms, often requires curriculum restructuring, cross-department collaboration, and technical teaching capacity that the institutions may not yet possess. Second, resource limitations also contribute to the underuse of high-level BIM tools. Advanced tools typically require higher-spec hardware, institutional licenses, and specialised training. In contexts where funding for digital laboratories is constrained, educators may default to tools that are more accessible, lighter to run, or already familiar to students. This corresponds with Chen et al. (2020), who note that many universities worldwide prioritise visualization and basic modelling when infrastructure does not support full BIM workflows.

These factors may contribute to an educational environment where BIM adoption is progressing, but in a narrow and fragmented manner. While the frequent use of modelling and visualization tools indicates an encouraging baseline, the limited integration of collaborative platforms, energy analysis, project coordination, and construction simulation tools suggests that students may graduate with competencies insufficient for supporting more complex or integrated BIM workflows. This has broader implications for the AEC sector’s digital transformation, as the skill gaps observed at the educational level are likely to translate into continued slow adoption at the professional level. A more holistic adoption of BIM tools within architectural education will therefore require targeted investments in digital infrastructure, capacity-building for educators, and curricular reforms that embed BIM not only as a representational tool, but as an integrated workflow covering design, analysis, coordination, and lifecycle management. Without such interventions, the gap between Nigeria’s BIM educational outcomes and global best practices may continue to widen.

3.2 Frequency of BIM tools used by respondents

A follow up question, presenting the respondents with a single-choice matrix question is ‘How frequently do you use BIM Tools in teaching and research?’. The BIM Tools were listed, and respondents are required to select one option (e.g., "Never", "Rarely", "Sometimes", "Often", or "Very Often") that best describes their frequency of use for each BIM Tool.

Table 5 shows the statistical summary of the usage of BIM Tools by respondents for academic activities, providing key insights into the frequency of usage for each BIM Tool. The mean values indicate the average frequency of use across respondents, while the median provides a measure of central tendency, representing the midpoint of responses. The mode highlights the most frequently selected category of usage (e.g., "Never" or "Sometimes"), and the standard deviation reflects the variability in responses.

Table 5: Frequency of BIM Tools Usage among respondents

BIM Tool	Mean	Median	Mode	Standard Deviation
3D Modeling Frequency	2.19	2	1	1.39
Clash Detection Frequency	0.13	0	0	0.34
Energy Analysis Frequency	1.95	2	2	1.33
Quantity Takeoff Frequency	0.86	0	0	1.42
Scheduling Frequency	0.86	0	0	1.46
Structural Analysis Frequency	1.68	2	0	1.68
MEP Systems Design Frequency	1.5	1	0	1.62
Construction Simulation Frequency	1.8	1	0	1.73
Facility Management Frequency	1.52	1	0	1.73
Collaborative Tools Frequency	0.11	0	0	0.32
Rendering Frequency	2.46	2.5	2	1.35
Code Compliance Frequency	0.56	0	0	0.7
Scan-to-BIM Frequency	1	0	0	1.68
Sustainability Frequency	1.67	2	0	1.59
Lighting Analysis Frequency	1.71	2	0	1.49
Issue Tracking Frequency	1	0	0	1.68
Construction Monitoring Frequency	1.48	1	0	1.66

Analysis of respondents’ frequency of BIM tool usage reveals a clear hierarchy of adoption, with foundational tools, particularly 3D Modeling and Rendering, showing the highest mean values (2.19 and 2.46 respectively), while collaborative and coordination-oriented tools such as Clash Detection (mean = 0.13) and Collaborative

Platforms (mean = 0.11) remain largely unused. The prevalence of 3D Modeling aligns with earlier observations by Morton (2012) and Károlyfi *et al.* (2021), who noted its centrality in architectural pedagogy due to its role in design communication, visualization, and spatial reasoning. Rendering displays similarly high usage, reflecting the longstanding emphasis on visual presentation within architecture programs.

However, the dominance of these basic tools also exposes structural limitations in BIM integration within this study context. While Energy Analysis (mean = 1.95; mode = "Sometimes") and Sustainability Analysis (mean = 1.67) show moderate uptake, their high standard deviations suggest uneven institutional capacity. This supports Maharika *et al.* (2020), who argued that 3D Modeling proficiency often precedes adoption of advanced BIM tools, but also indicates disparities in training, access, and curricular emphasis.

More critically, tools central to full lifecycle BIM adoption like MEP Systems Design, Construction Simulation, Facility Management, Quantity Takeoff, Scheduling, and Scan-to-BIM, all record low mean scores (0.86–1.80) and dominant "Never" modes. These patterns reflect deeper systemic issues. First, software cost and licensing constraints likely reduce access to specialized BIM platforms, especially in public universities. Second, curriculum rigidity in many Nigerian architecture programmes limits opportunities to embed advanced, interdisciplinary BIM workflows. Third, limited industry demand for integrated BIM processes reduces institutional pressure to train students in collaborative tools—an issue Chen *et al.* (2020) highlighted when noting that many universities prioritize visualization over full lifecycle BIM applications. Additionally, shortages of trained faculty, as reported by Babatunde and Ekundayo (2019), impede integration of tools such as cost estimation and scheduling, which require cross-disciplinary expertise.

The near-zero usage of collaborative tools which are central to interoperability and multi-disciplinary coordination reveals a significant gap in BIM maturity. This suggests that while educators can introduce students to representational and analytical tools, they struggle to engage with BIM's core collaborative ethos. The low standard deviations for tools like Clash Detection (0.34) further suggest uniform non-usage rather than individual preference differences, pointing to systemic barriers rather than isolated cases. As Carvalho *et al.* (2021) noted, advanced BIM tools are more commonly adopted in institutions with strong industry partnerships. This is a relationship that remain underdeveloped in this study context.

Overall, the results indicate that BIM adoption in architectural education within the study context remains in an early developmental stage dominated by visualization-focused tools. This has broader implications for the AEC sector. The limited exposure of architecture students to integrative and collaborative BIM tools may prolong the desired transition toward full BIM implementation. Without strategic curriculum reforms, increased investment in software and training, and stronger industry–academia alignment, the gap between basic BIM literacy and full lifecycle BIM competence is likely to persist.

4. Conclusion

This study identified the BIM tools available to architectural educators in some selected universities and assess the extent and frequency of their use. The findings show wide range of BIM tools is accessible across the institutions; however, their usage varies considerably. Overall, 3D Modelling tools were used most frequently, followed by Rendering & Visualization and Energy Analysis applications. In contrast, more advanced tools, particularly those central to interdisciplinary collaboration such as Construction Simulation and MEP Systems Design, were used far less often. This distribution indicates that while foundational BIM competencies are being developed, higher-level BIM capabilities have not yet been integrated into teaching practice to the same degree. To address these gaps, several steps are recommended. Universities should adopt institution-wide BIM integration frameworks that ensure consistent exposure to both foundational and advanced BIM tools. Curriculum committees can embed structured modules on collaborative BIM processes, including MEP coordination and construction simulation. Educators would benefit from targeted professional development programs supported by industry partners or accreditation bodies. At the policy level, governmental and regulatory agencies could establish minimum BIM competency standards for architectural education to promote national alignment. In summary, while BIM tools are available and in use to varying degrees, their uneven adoption—especially of advanced, collaboration-oriented tools—indicates a need for coordinated curricular, institutional, and policy interventions to strengthen BIM competence within architectural education especially in southwestern Nigeria.

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