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Exploring Architects' Awareness, Access, and Utilization of Artificial Intelligence in Architectural Design: A Study of Selected Chapters of the Nigerian Institute of Architects in South-East Nigeria

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Abstract

This study examines the awareness, access, and utilization of Artificial Intelligence (AI) tools among architects in Southeast Nigeria, focusing on the Abia, Imo, and Ebonyi chapters of the Nigerian Institute of Architects (NIA). The principal objective was to evaluate the current adoption levels of 10 AI tools across architectural design, interior design, and 3D modeling domains. Using a mixed-methods approach, quantitative survey data were collected from 127 architects, supplemented by qualitative interviews with 15 practitioners. Results, revealed moderate awareness (58.7%), but low utilization (22.3%) of AI tools, with significant barriers, including cost (72.4%), training deficits (68.5%), and unreliable internet (63.0%). Competency assessments showed proficiency gaps in advanced AI applications like Sidewalk Labs for urban planning (17.2%) and Hypar for BIM integration (19.6%). Conclusions indicate that while Nigerian architects recognize AI's potential particularly for visualization (Midjourney, Adobe Firefly) and feasibility analysis (TestFit) systemic infrastructural and educational limitations hinder adoption. The study recommends NIA-led initiatives for localized training programs, industry-academia partnerships on AI curricula, and advocacy for digital infrastructure improvements to bridge the AI adoption gap in Southeast Nigeria's architectural practice.

KEYWORDS: Architects, Awareness, Access, Utilization, Artificial Intelligence, Architectural design

1. INTRODUCTION

The practice of Architecture, its approaches, backgrounds, and know-how are today at the center of passionate debates challenged by outsiders, arriving with new practices, and questioned within, as practitioners doubt of its current state, Architecture is undergoing a truly profound advancement. (Chaillou, 2019.) Among the elements that will leave a long-term effect on our discipline, is technology. Technology certainly is one of the main courses at play. The development of drawing tools has gotten more and more advanced since the introduction of digital tools like CAD and CAAD in the early 1960s, (Carpo.M., 2019).

The global Architecture industry is experiencing a paradigm shift through AI integration, with 55% of design professionals adopting AI tools for visualization, generative design, and sustainability analysis (Muslihat, 2025).However, Nigerian architects face disproportionate challenges including undervaluation, inadequate remuneration, and limited institutional support (Maina, Adamu, & Sarafadeen, 2023) The Nigerian Institute of Architects (NIA),founded in 1960 with ~12,000 members, struggles to address these issues while promoting technological advancement (Adeniyi, 2025).In Southeast Nigeria, where architectural firms are predominantly small-scale, AI adoption remains embryonic despite its potential to optimize feasibility analyses, regulatory compliance, and sustainable design. (Ogunbodede & Atchrim, 2025).

1.0 Statement of Research Problem

The global Architecture industry is experiencing a paradigm shift through AI integration, with 55% of design professionals adopting AI tools for visualization, generative design, and sustainability analysis (Muslihat, 2025).However, Nigerian architects face disproportionate challenges including undervaluation, inadequate remuneration, and limited institutional support (Maina, Adamu, & Sarafadeen, 2023) The Nigerian Institute of Architects (NIA),founded in 1960 with ~12,000 members, struggles to address these issues while promoting technological advancement (Adeniyi, 2025). In Southeast Nigeria, where architectural firms are predominantly small-scale, AI adoption remains embryonic despite its potential to optimize feasibility analyses, regulatory compliance, and sustainable design. (Ogunbodede & Atchrim, 2025).

1.1 Review of Relevant Literature

1.1.1 Historical Overview

In the mid-20th century scholars in the United Kingdom conducted research for many years on the possibility of building machine intelligence and then founded the artificial intelligence field in 1956. Although the first use of the term artificial intelligence, was first coined by John McCarthy in 1956 when he held the first academic conference on the subject (Smith, McGuire, Huang, & Yang, 2006). This field of artificial intelligence was started by the members of the Ratio Club, a group of researchers including Alan Turing. The first extensive work in the field of artificial intelligence was done in the mid-20th century by the British logician and computer pioneer Alan Mathison Turing (Encyclopeadia Britannica, 2007). He is also regarded as the father of Modern computer science. Born in 1911, he showed great proficiency with mathematics and after progressing from college he put out a paper "On Computable Numbers, with an Application to the Entscheidungs problem" in which he projected what would later be known as a Turing Machine – a computer with the ability of computing any computable function. This publication itself was built on concepts proposed by Kurt Godel that there are statements about computing numbers that are true, but that can't be proven (Enslow, 1989). Alan Turing worked on the problem and was determined to help define a system for ascertaining which statements could be proven. In the process, he proposed the Turing Machine. The paper defines a "computing machine" with the capacity to read and write symbols to a tape using those symbols to execute an algorithm (Martins, 1984.) This paper and the Turing machine provided that base for the model of computation. While Alan Turing was engrossed primarily in mathematics and the theory of what would become computer science throughout and immediately after college, soon World War 2 came and he became interested in more hands-on matters. The use of cryptography by the Axis gave him a spur to focus on building a machine capable of breaking ciphers. Before this potential use presented itself, Alan Turing likely hadn't been too concerned that the Turing machine he'd proposed in his earlier work was not feasible to build. In 1939 he was requested to join the Government Code and Cipher school as a cryptanalyst (Singh, 1999)and it became clear that he needed to build a machine capable of breaking codes like Enigma which was used by the Germans. He designed in a few weeks and received funding for the construction of electromechanical machines called 'bombes' which would be used to break Enigma codes and read German messages by automating the processing of 12 electrically linked Enigma scramblers. It wasn't the Turing machine, but the idea of generating cipher text from plaintext via a distinct algorithm fit with the Turing machine notion. After the war, Turing returned to academia and became engrossed in the more philosophical problem of what it meant to be sentient, which led him down the path to the Turing test. The ground-breaking work of Alan Turing after WWII established the grounds for the concept of computer intelligence. It is also important to note that Bush's seminal work "As We May Think" (Bush, 1945)where he proposed a system that amplifies people's knowledge and understanding was written five years before Alan Turing a paper on the notion of machines being able to simulate human beings and the ability to do intelligent things, such as play Chess. (Turing, 1950). In his work, Alan Turing examined the question of whether or not machinery can show intelligent behavior. To resolve the problem, Turing proposed a first experiment involving three subjects: A, B, and C. Then, in his paper Computing Machinery and Intelligence, " which to this day is still considered the benchmark for identifying the intelligence of an artificial system (Haenlein & Kaplan, 2019).Alan Turing in reasoning about the question 'Can machines think?' proposed to reformulate the proposition as: Can machines do what we (as thinking entities) can do? Then, he proposed a test known as the "imitation game" also called the "Turing test". In this test, a man and a woman go into separate rooms, and guests try to tell them apart by writing a series of questions and reading the typewritten answers sent back. Both the man and the woman have the goal of convincing the players that they are the other. Turing modified the game by exchanging one of the two players (man or woman) with a machine. This enabled Turing to formulate the following question: "Will the interrogator decide wrongly as often when the game is played like this as he does when the game is played between a man and a woman?" This test, or "Imitation Game" as it was called in the paper, was put out as a modest test that could be used to substantiate that machines could think.

Without a vision of what AI could achieve, the field itself might never have formed or simply remained a branch of math or philosophy. The fact that the Turing test is still being discussed and researchers attempt to produce software capable of passing it are indications that Alan Turing and the proposed test provided a strong and useful vision to the field of AI. Its relevance to this day seems to indicate that it will be a goal for the field for many years to come and a necessary marker in tracking the progress of the AI field as a whole.

1.1.2. AI in Architecture- Background

The emergence of highly technological advancements such as Artificial Intelligence (AI), Machine Learning (ML), Internet of Things (IoT), and digital twins have made significant changes and improvements in the way we work and interact with each other and drawing digitally has been widely practiced by architects, Thus digital image files showing plan drawings have become the most popular format to communicate between architects and clients. These advancements have enabled the consumption and analysis of large volumes of data in a shorter time than any human ever would be able to do. (Carl, 2022)

According to Chaillou, (2019), the application of AI into the architectural realm didn't happen as a sudden disruption, but rather as a natural progression and accumulation of preceding concepts that used related technologies. One of the early examples of utilizing digital technology to serve the architectural design imagination was Frank Gehry's design for the Guggenheim Bilbao Museum. The building's distinctive curved surfaces and flowing lines are a signature feature of Gehry's architecture, and they posed a significant challenge for traditional architectural design methods. To overcome this challenge, Gehry turned to digital technology. He used a computer-aided design (CAD) program called CATIA, which was originally developed for the aerospace industry to design fighter jets. Using CATIA, Gehry was able to visualize and materialize the complex curved surfaces of his design, creating a 3D model that could be used to guide the construction of the building (Plate. 1). The steel frame for the Guggenheim Bilbao Museum is composed of hundreds of individual steel members, each of which was designed using CATIA, which allowed to precisely control the shape, size, and location of each member, ensuring that the frame well, before the construction process. This early adoption of digital technology allowed Gehry to achieve his ambitious design for the Guggenheim Bilbao Museum, pushing the boundaries of architectural design and creating a truly iconic building.

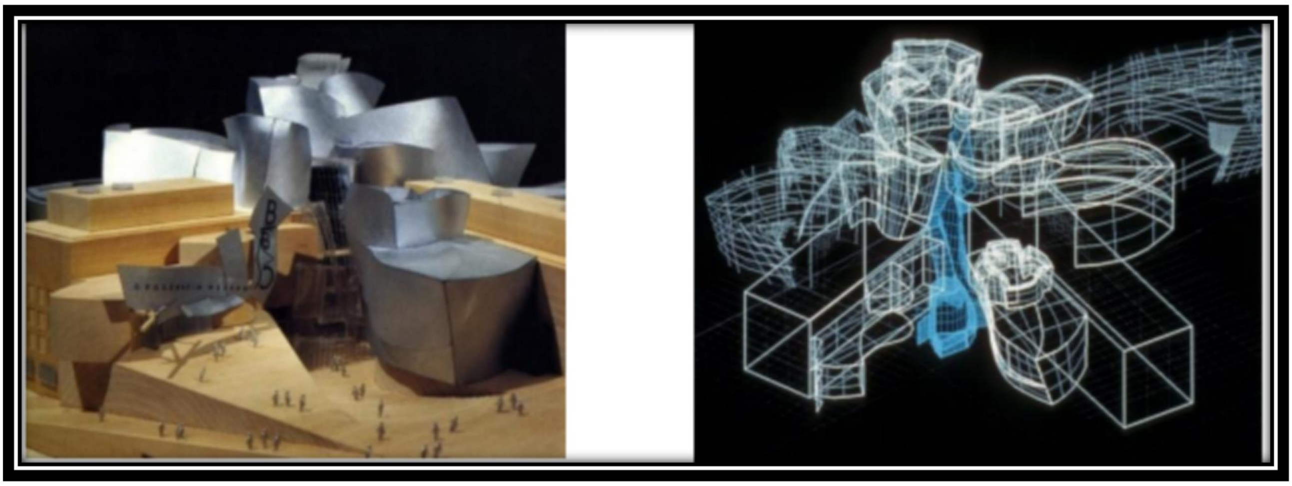

Plate 1: The free-form scale model of Guggenheim Bilbao Museum (Right) Vector representation of the museum's form in CATIA (Marcos, 2017)

Global AI Adoption Trends: AI tools like Midjourney and Adobe Firefly have revolutionized architectural visualization by converting text prompts into photorealistic images, while platforms like ARCHITEChTURES enable real-time generative design optimized for energy efficiency and space utilization (Muslihat, 2025, Ghodsian, 2025). Urban planning AI such as Sidewalk Labs uses machine learning to analyze traffic patterns and environmental data, facilitating sustainable city development. Crucially, AI's value extends beyond automation; it enhances creativity by handling repetitive tasks, allowing architects to focus on complex problem-solving.

1.1.3 Artificial Intelligence and Conceptual Designs in Architecture

An instance of using AI factually in architectural design could be found in the study conducted by As, Pal, & Basu, (2018) where they presented a deep neural network (DNN) approach using graphs to generate conceptual designs in architecture. They showed that their system can evaluate and score designs, decompose them into essential building blocks, and recombine them into novel compositions (Fig.1). The authors also demonstrated how to use generative adversarial networks (GANs) to generate new designs not seen in the training set. The study showed how DNNs can be used to discover interesting building blocks in design data, merge them in a mathematically principled manner to yield new compositions, and generate interesting design variations using GANs. The preliminary results were promising, but the authors noted limitations and constraints in the scope of the designs, the limited number of design samples, and the lack of evaluation of the generated designs.

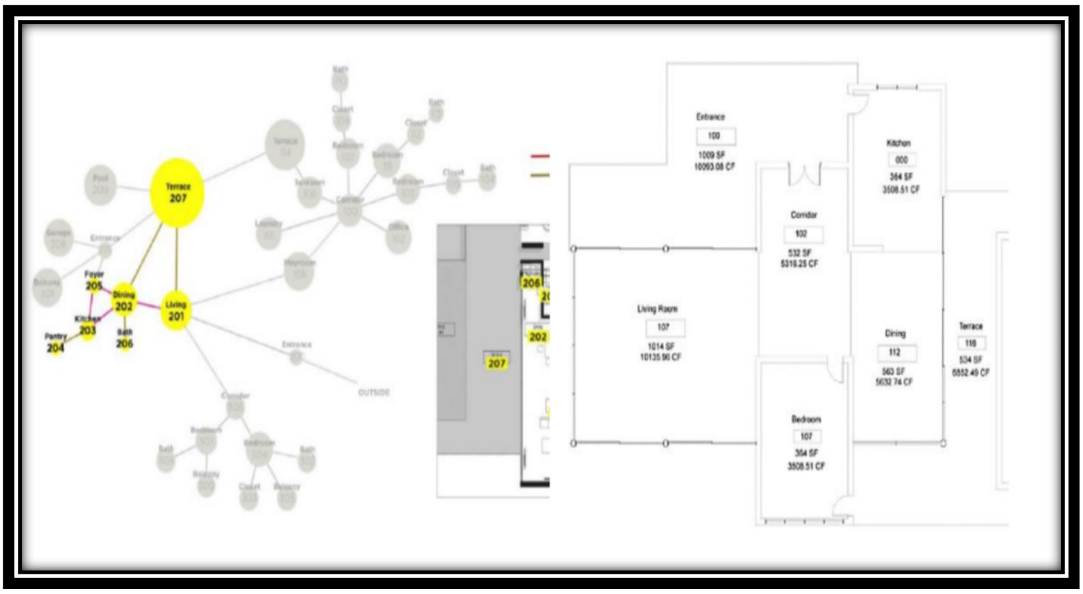

Fig 1: (Left) DNN concluding zoning relationships from the dataset provided (Right) a floor plan generated by AI using the concluded zoning rules (As, Pal, & Basu, 2018)

1.1.4 Artificial intelligence: Virtual reality used in architecture

Virtual media is a bridge to fill a physical space. In the last decade, a tool called Virtual Reality became widely known in the gaming industry. Virtual reality is defined as follows: "A computer simulation of a real or imaginary system that enables a user to perform operations on the simulated system and shows the effects in real-time." (The American Heritage Dictionary, 2020) Examples of this technology are the virtual reality glass HTC Vive and the Oculus Rift. Google has made a cheaper alternative called Google Cardboard where, unlike the Vive and the Rift which rely on an external processing unit, the phone becomes the processing unit that projects the virtual world surrounding the user. The aim is then to merge the simulation with the in a real space. A virtual-physical space, also called Augmented Reality. This optimum tool set has the potential for the user to interact with virtual objects surrounding him. An example of this technology is the Microsoft Hololense, which is already capable of rendering objects in real-time.

1.1.5 Artificial Intelligence: Smart Buildings and Cities

AI plays a crucial role in the development of smart buildings and cities, where sensors and systems can dynamically respond to changing environmental conditions. Building management systems powered by AI can optimize energy usage, control lighting, and HVAC systems, and enhance overall efficiency. A good example of a smart building is The HSB Living Lab is a residential building that is occupied by students and guest teachers, located at the Joannesberg Science Park in Gothenburg, Sweden is a collaboration project between Chalmers University of Technology and HSB, a Swedish housing association who aim is to research more sustainable living methods and create sustainable housing for the future. The building is made out of pre-fabricated housing units that are composed together to inhabit 33 people who reside in the building continuously. To research construction technologies of future use, the building features interior facades that can be swapped out and upgraded. To achieve the goal of researching sustainable living methods, the project uses smart technologies and therefore also relates to the term Smart Architecture. These technologies track the students' behavior and indoor qualities such as the emissions of each user, and the concentration of carbon dioxide in each space unit but also detect the social behavior of the inhabitants.

Plate 2: The HSB Living Lab (Schmidt, 2020)

1.1.6 AI-image generation for design consideration: Case studies

One of the principal prospective uses for AI image generation is the knack to easily imagine radical, futuristic, and highly abstract forms. This allows for the generation of images that feature rare and abstract designs, often with a highly aesthetic configuration and impression. These results are done by creating a text prompt in the form of instruction that mixes various concepts, and architectural styles, and emphasizes terms such as "sci-fi" and "futuristic" elements within the prompt. For instance, Tim Fu, a designer at Zaha Hadid Architects, has demonstrated a variety of design explorations that mix organic forms and naturally inspired patterns in aesthetic architectural representations that reflect futuristic concepts and materials (Tim, 2022). These designs showcase the potential of AI image generation to create highly imaginative and abstract forms that can be used in the exploration of new architectural concepts and styles (Plate 3).

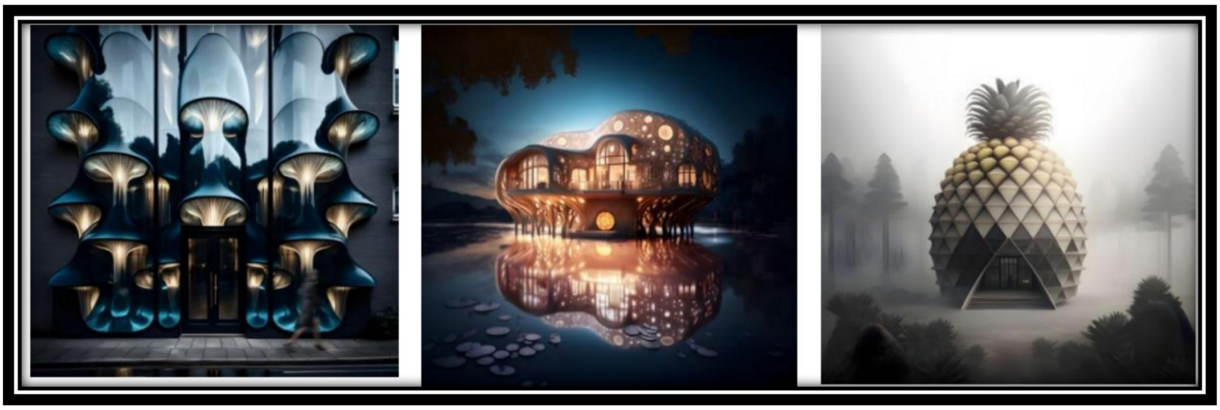

Plate 3: A variety of designs generated by Midjourney showing nature-oriented and futuristic concepts (Source: Tim, 2022)

1.1.7 Artificial intelligence and biomimicry architecture

AI image generation can be used to generate designs that mimic the forms, functions, and behaviors of natural systems, due to its ability to abstract elements and mix styles consistently. For example, a building designed using biomimicry principles might use materials and structures inspired by the shells of mollusks (snails) or the leaves of plants, allowing it to blend seamlessly into its environments and function more efficiently. In this context, (Elsayary, 2022) used Midjourney to generate a variant of imaginative forms that directly depict structures inspired by natural phenomena, such as ant colonies (Plate 4) and forests (plate 5). The author argued that the generated designs not only reflect nature but also the identity of the place, by using natural local materials in the forms as well. Midjourney was able to generate highly detailed, fluid forms with relatively convincing structural and aesthetic orders.

Plate 4: Design generated by midjourney inspired by ant colonies in terms of structure, forms, and materials (source: El Sayary, 2022)

Plate 5: Tree-like design inspired by African foliage nature (Source: El Sayary, 2022)

1.1.8 Artificial intelligence used in Architectural sketches

AI image generation also showed a potential use for enhancing architectural sketches and thoughts in several ways, where an AI image generation system could be taught to complete incomplete sketches or to create new variations of a design built on a set of input sketches. This could be useful for quickly generating a range of design options for architects to choose from, or for helping architects explore different design concepts more easily without the need to further envision each idea (e.g., using 3D modeling and rendering tools). A good example of this could be seen in the exploitation of img2img- an implementation of Stable Diffusion- by Abdelshakour, (2022) to generate façade design visualizations based on students' simple sketches. The generated images were reported as closely aligned with the original sketches in terms of camera angles, building masses, and heights (Plate 6). The author also notes that while the generation time for these images is relatively fast, they do require a high level of GPU computing to be generated quickly.

1.1.9 Artificial Intelligence Algorithms used in Architecture

Generative Adversarial Networks (GANs)

GAN is an acronym for generative adversarial networks. GAN is a class of deep neural nets that is a generative model (Uzun, Birgül Çolakoglu, & İncoeglu, 2020). GAN algorithms are used as a generative system. Generative Adversarial Networks (GANs) is an offspring of the evolution that Artificial Intelligence (AI), Machine Learning (ML), and Neural Networks (ANNs) have been processing through in the last century (Schmidt, 2020) Architectural plans are a subclass of architectural drawings. Architects draw plans centered on spatial organization decisions, such as the location of the building, the size of the space, the relation between the spaces, etc. Plan production is a repetitive drawing process where spatial organization decisions are made. The repetitive process in the designing and drawing of architectural plans can be produced autonomously using the GAN model, a deep learning algorithm. An example of studies carried out using a GAN network is the study by Huang & Zheng, (2018) were able to design plans using GAN networks. GAN networks are strong enough to generate visual data. The GAN system that Huang and Zheng used was a specialized GAN network called Pix2pixHD. This network can derive visual information from labels. For example, if the label is the kitchen label, drawings of the kitchen plan are generated on that label. In the dataset used by Huang and Zheng, features (furnishing, walls, and bearing systems) are produced autonomously on plan drawings using the GAN network. Chaillou, (2019) work is another study on plan generation with GAN networks. In this study, GAN networks generate plans in three steps. In the first step, the total shape of the plan is generated. In the second step, GAN produces interior partitioning and spatial arrangement. The third step ends with furnishing and plan production. This study reveals the power of GAN networks in autonomous plan generation. In Chaillou's work, the resulting plans are very clear, right down to the details of the plan, the openings in the walls, and the spatial organization.

Fig 2: Training sequence key (source: Chaillou, 2019)

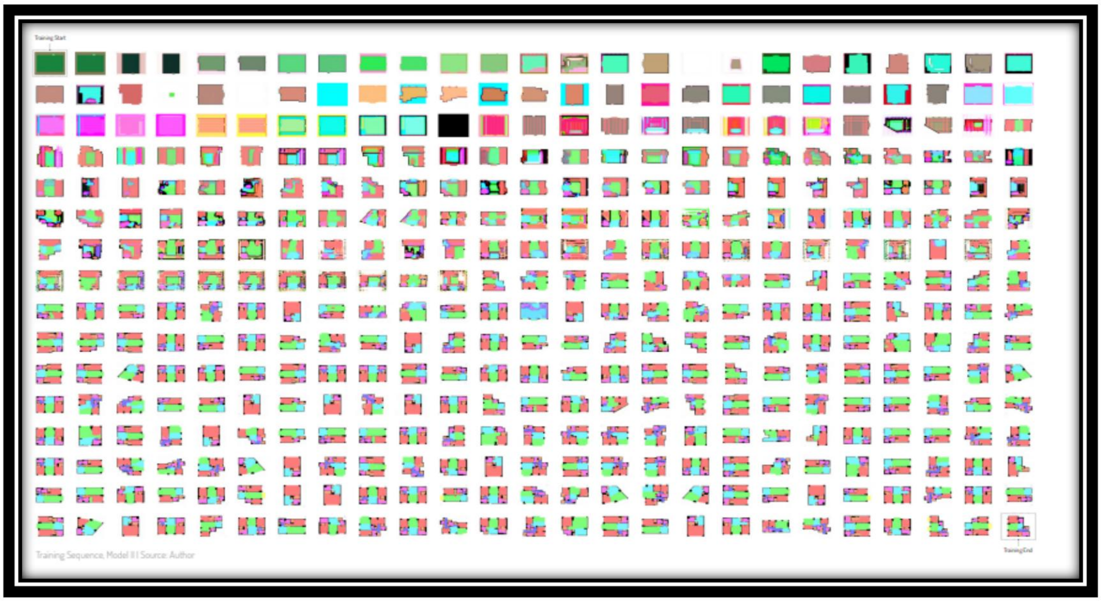

Fig 3: Training sequence model (source: Chaillou, 2019).

2. MATERIALS AND METHODS

2.1 Methodology

A cross-sectional survey targeted 210 Architects from Abia (n=76), Imo (n=89), and Ebonyi (n=45) NIA chapters, using stratified random sampling by firm size (small: <5 staff; medium: 5–20; large: >20). Inclusion required ≥2 years of practice. Final respondents: 127 (60.5% response rate). A sequential mixed-methods design was employed, Quantitative Survey, Measured awareness/access of 10 AI tools and competencies via likert-scale questions, while Qualitative Interviews, Explored experiential barriers and institutional roles. Triangulation captures both statistical patterns (quantitative) and contextual insights (qualitative), essential for studying emergent technologies in under-researched regions.

2.2 Research Instruments

The instrument used for this research is a structured questionnaire titled "AI adoption in Architectural Practice. The questionnaire is a close-ended type, which contains a set of pre-determined options for the items presented. The questionnaire contains four sections. Section A requires the demographic information of the respondents. Section B asked questions on Architects' awareness of artificial intelligence tools, while Section C, asked questions on Architects' Access and utilization of artificial intelligence tools in architectural design, section D asked questions on architects competence. Section B was structured using a Nominal Scale of very familiar, familiar with core features, vague idea of functions, heard the name only, and never heard. Section C Scale was structured using Likert scale responses modes of Always, often, sometimes, rarely and never, while section D Scale was structured using Likert scale responses modes, yes, No, and learning.

2.3 Validation of the Research Instrument

The instrument was validated by three experts, Lecturers of the school of Environmental design and Technology and Lecturers of the department of computer Science and computer engineering that specialize in AI. Fallout from the suggestion made by the experts was noted and the modifications were made to the questionnaires accordingly. All the articles in the questionnaire were judged to be important to what is being measured thereby guaranteeing adequate content and face validity of the instrument.

2.4 Procedure for Data Collection

The researchers obtained a letter of introduction from the Head of the Department of Architectural Technology, Akanu Ibiam Federal Polytechnic, for interviews conducted in person and transcribe verbertim. The survey was carried out between May 12th, 2025 to June 20th 2025.The researchers read and clarified the aim of the study to the participants. The respondents had adequate time to react to the questionnaire. After this, the researcher personally collected the answered questionnaire and reviewed the qualified and sufficiently completed questionnaire. Inadequate information or a doubtful answer like showing observable patterns was removed for those particular items only. Decent consideration was maintained throughout data collection. The researcher ensured that respondents were not compelled to fill out the questionnaire and respondents were allowed to participate voluntarily. Also, the utmost confidentiality and secrecy of the respondents were maintained during the administration, collation, and report of research findings. Through the assistance of a statistical analyst, the researchers tabulated the data collected from the participants using Quantitative: SPSS v28 for descriptive statistics and chi-square tests.

Qualitative, Thematic analysis using NVivo 14,which was employed to analyze the data and test the hypotheses related to the level of access and awareness of AI in architectural design among Architects of different firm size. Ethical considerations were maintained throughout the data collection period. The researchers ensured that respondents participated voluntarily and were not coerced into filling out the questionnaire. Additionally, utmost confidentiality and anonymity of the respondents were preserved during the administration, collation, and reporting of the research findings.

2.5 Data Analysis Techniques

The data collected and examined in this section embodies the variables of focus for the study and background information of Architects who were actively involved in the study. The demographic information in which data were collected and analyzed is presented in Table 1 revealing the demographic information of the participants in this research. As indicated, the gender difference rate of over 60% was observed, indicating that there was a remarkable difference in the proportion of participants in the study: female respondents (16.6%) were less than male respondents (83.4%). Correspondingly, more Architects from smaller firms 57.5 formed a larger proportion of the sample size, while 33.4% and 9.4% were from medium and larger firms respectively.

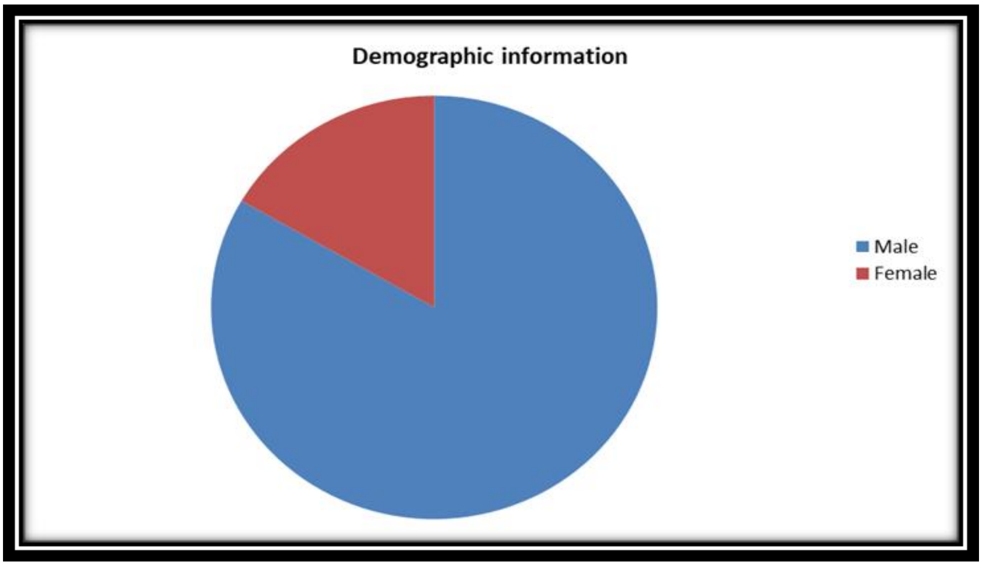

Fig 4: Pie chart shows the percentage of respondents' for Male and Female Architects

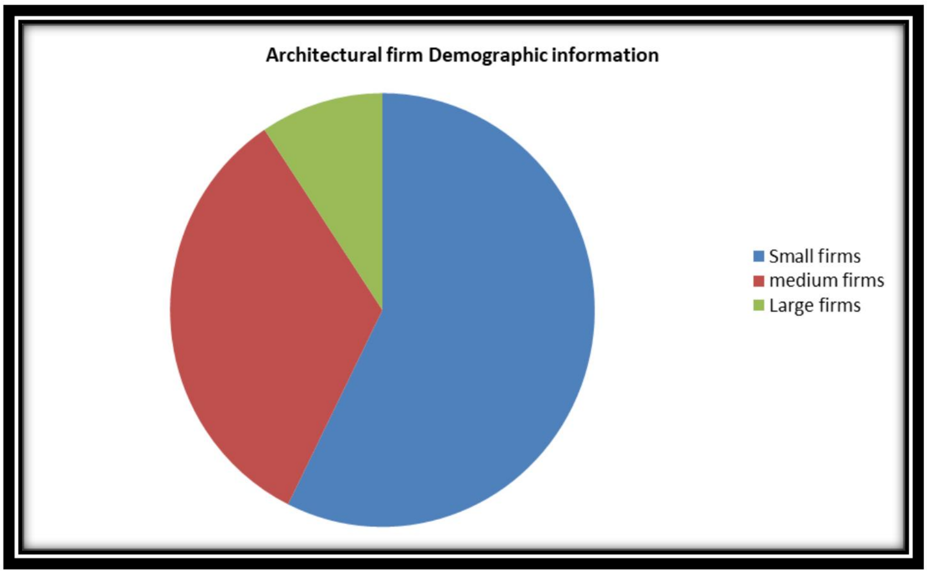

Fig 5: Pie chart shows the percentage of respondents for small firms, medium firms and large firm

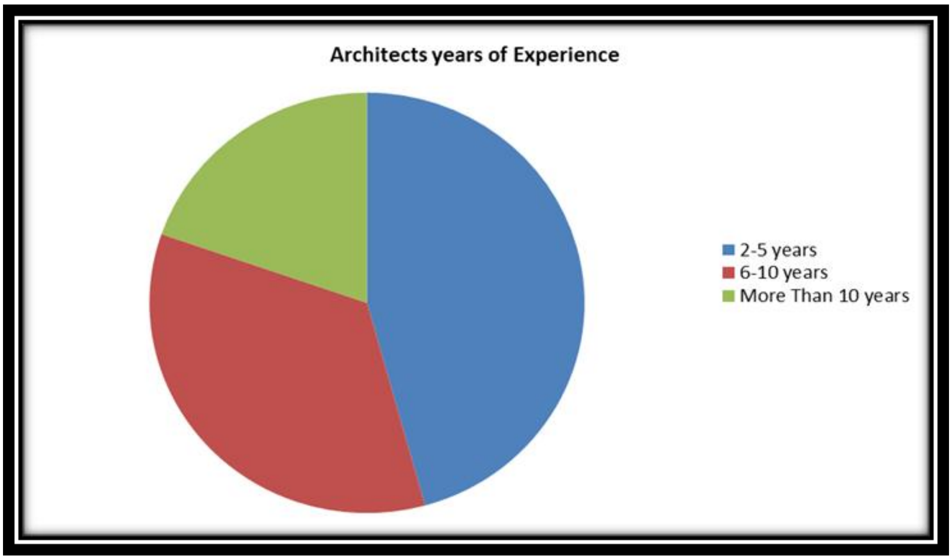

Fig 6: Percentage distribution of Firm size

3. RESULS AND DISCUSSION

3.1 Results

3.1.1 Research Questions

Research Question One:
Are Architects in the industry aware of the use of artificial intelligence in Architectural Design?

To examine the Architects awareness of Artificial intelligence for architectural design, a data modification was done and only 127 (60.5%) response rate of the sample size successfully responded to the questionnaire satisfactorily. Then, a percentage point scale of 50.0% was adopted. Data collected were analyzed using frequency counts and percentages. As indicated in Table 2, higher parts of the responses were skewed towards the “aware” response, implying that the majority of Architects in Practice are aware of Artificial intelligence used in Architectural design. However, Midjourney (78.7%), Adobe firefly (72.4) seem to be known among practicing Architects. Perhaps, in general, the cumulative total percentage point scale of which is greater than the benchmark of 50.0% indicated that the majority of architects aware of Artificial intelligence for Architectural design.

Research Question Two:
Do Architects in practice have access to Artificial intelligence for Architectural design?

In examining student’s access to Artificial intelligence for Architectural design, a percentage point scale of 50.0% was adopted. Data collected were analyzed using frequency counts and percentages. As indicated in Table 2, only 32.3%,41.7%, 12.6% had access to midjourney, Adobe Firefly and Testfit, leaving a greater percentage of 67.7%, 58.3%,87.4% respective, tilted towards the “not accessible” response, implying that the majority of the Architects in practice in different NIA chapters examined do not have access to Artificial intelligence for Architectural design. Perhaps, in general, the cumulative total percentage point scale, which is greater than the benchmark of 50.0%, indicated that the majority of the Architects do not have access to Artificial intelligence for Architectural design.

Research Question Three:
What is the level Architect’s competency in the use of artificial intelligence for Architectural Design?

In evaluating the competency of Architects in the use of Artificial intelligence for Architectural design, a percentage point scale of 30% was adopted. Data collected were analyzed using frequency counts and percentages. As indicated in Table 3, higher parts of the responses were tilted towards the “skilled” response. However, few of the participants still indicated that they were moderately competent (learning) in using Artificial intelligence for Architectural Design. These include: using Midjourney to convert text to image; using Maket AI to generate multiply editable floor plans for design options; using Adobe firefly for visual text effect, using sidewalk lab for urban planning, and using hypar to import data from Revit. Cumulatively, the summary total percentage point scale of 40.3% which is greater than the benchmark of 30% indicated that the majority of the Architects are skilled and competent in the use of artificial intelligence for Architectural Design.

3.1.2 Hypothesis Testing

H_1: Architects in Southeast Nigeria’s NIA chapters exhibit high awareness but low utilization of AI tools due to infrastructural constraints, training deficiencies, and economic barriers.

3.1.3 Demographics

Table 1: Respondent Characteristics (n=127)

S/N	Variable	Category	n (%)
1.	Gender	Male	106 (83.4 %)
		Female	21 (16.6 %)
2.	Firm Size	Small: Less than 10	73 (57.5%)
		Medium: 5-20	42 (33.1%)
		Large: Greater than 20	12 (9.4%)
3.	Experience	2-5	58 (45.7%)
		6-10	44 (34.6%)
		More than 10	25 (19.7%)

3.1.4 Awareness and Access

Table 2: AI Tool Awareness and Access (%)

S/N	Tool Category	Awareness	Access
	Architectural Design		
1.	Midjourney	78. 7%	32.3%
2.	Adobe Firefly	72.4%	41.7%
3.	Test Fit	39.4%	12.6%
4.	Side walk Labs	28.3%	8.7%
	Interior Design		
1.	Planner 5D	63.0%	37.8%
2.	Hutch	41.7%	19.7%
	3D Modeling		
1	Kaedim	37.8%	14.2%
2.	Luma AI	33.1	18.1%

Highest awareness: Midjourney (78.7%), Adobe Firefly (72.4%), Planner 5D (63.0%).
Lowest access: Sidewalk Labs (8.7%), TestFit (12.6%), Hypar (13.4%).
Small firms reported 42% lower access than large firms ($p<0.01$).

3.1.5 Competency in AI Applications

Table 3: Competency in AI Applications

S/N	Task	Proficiency
1.	I can use Midjourney to convert text to images	68.5%
2.	I can use Maket AI to generate multiple design options	51.2%
3.	I can use Adobe Firefly for visual/text effects	47.2%
4.	I can use Sidewalk Labs for urban planning	17.2%
5.	I can use Hypar to import data from Revit	19.6%
6.	I can se Cove Tool with SketchUp/Revit plugins	38.6%

Advanced BIM integration (Hypar, Cove Tool) and urban planning AI (Sidewalk Labs) showed <20% proficiency.

3.2 Discussions

3.2.1 Awareness-Access-Utilization Disconnect

While 58.7% awareness parallels global trends (Muslihat, 2025).The 22.3% utilization rate reflects systemic constraints. Cost barriers (72.4%) exceed those in Brazil (48%) or India (53%) (Ghodsian, 2025), indicating Nigeria's acute economic challenges. The preference for visualization tools (Midjourney, Firefly) over analytical AI (Test Fit, Cove Tool) suggests pragmatic prioritization; visualization delivers immediate client value with lower computational demands.

3.2.2 Gender and Firm-Size Disparities

Female architects' access (16.6%) lagged behind males', mirroring PrimeTech's findings on resource allocation biases. Small firms faced compounded barriers: limited budgets, outdated hardware, and no IT support. This perpetuates a two-tier profession where only large firms can leverage AI for complex projects like smart cities.

3.2.3 Competency Gaps and Educational Implications

Low proficiency in BIM-integrated AI (Hypar: 19.6%; Cove Tool: 38.6%) signals curricular obsolescence. Nigerian architecture programs most times emphasize on manual drafting over computational design, leaving graduates unprepared for industry shifts.

3.2.4 The NIA's Role

Respondents called for a strategic reallocation of resources toward initiatives that more directly support architectural practice in the age of AI:

3.2.4.1 Localized Training Initiatives

A key concern raised was the lack of accessible, context-sensitive AI education for practicing architects, especially those outside urban centers. Respondents proposed that the NIA could serve as a critical intermediary by partnering with local universities, tech hubs, and AI developers to co-create training modules that are:

- Low-bandwidth and offline-capable, allowing access in areas with unstable internet connectivity.
- Professionally contextualized, using examples, case studies, and datasets relevant to West African urbanism, construction methods, and regulatory frameworks.
- Modular and scalable, enabling a "learn-as-you-go" approach for busy professionals and students with varied schedules.
- Delivered through mixed media, including translated voice-overs, info graphics, Whatsapp-based support groups, and radio segments, to accommodate diverse learning styles and digital literacy levels.
- Such an approach would not only democratize access to AI literacy but also encourage innovation grounded in local realities, reducing reliance on imported frameworks that may not align with regional design priorities or infrastructural constraints.

3.2.4.2 Transformative Opportunities for NIA

Leveraging its institutional reach (12,000 members) NIA could spearhead AI adoption through:

A. Short-Term Interventions (0–12 Months)
Localized AI Training Hubs:
Partner with universities and Polytechnics to deploy offline-capable AI labs featuring tools like Maket AI and Digital Blue Foam for low-bandwidth areas.
Model: Adopt NIH's Butler-Williams Scholars Program, with tiered pricing (large firms: ₦50,000/session; small firms: ₦5,000).

Software Subsidization:
Negotiate group licenses with AI developers (e.g., 40% discounts on Adobe Firefly for NIA members) and lobby for tax waivers on architectural AI imports.

B. Medium-Term Strategies (1–3 Years)
Curriculum Modernization:
Integrate AI competency into ARCON's licensing exams, using Nigeria's Architectural Education Act as leverage.

Published bimonthly by the Nigerian Institute of Electrical and Electronics Engineers (NIEEE) Awka Chapter, Nigeria..

C. Systemic Advocacy

National AI Policy Frameworks:
Draft policy whitepapers demanding government investment in:
Rural broadband (target: 50 Mbps by 2030) and Renewable energy microgrids for architectural studios.

3.2.4.3 Theoretical Framing: Institutional Reorientation

Aligning with the Technology-Organization-Environment (TOE) model, NIA must reconfigure:

- Technology: Promote AI-compatible workflows e.g., (SketchUp + Cove Tool integration over Revit-centric pipelines).
- Organization: Restructure committees to include "AI Innovation Officers" and tie chapter funding to training outcomes.
- Environment: Lobby for inclusion in Nigeria's National Digital Economy Strategy to access tech development grants.

3.2.4.4 Sustainability Implications

Underused sustainability AI (TestFit, Cove Tool) impedes Nigeria's climate goals. AI-optimized energy efficiency could reduce building emissions by 35%, critical for fast-urbanizing Southeast Nigeria

3.3 Recommendatins

1. For NIA: Launch AI certification programs with tiered pricing; negotiate group software licenses.
2. For Academia: Integrate AI modules focusing on tools with offline capabilities (e.g., Maket AI, Digital Blue Foam).
3. For Government: Upgrade broadband infrastructure; subsidize renewables for studios
4. AI's potential in Southeast Nigeria's architecture is palpable but untapped.Strategic, equity-focused interventions can transform it from a privilege into a pivotal tool for sustainable design advancement.

4. CONCLUSIONS

Awareness does not translate to utilization due to cost, training, and infrastructure gaps. Gender and firm-size disparities create inequitable AI access. Competency is highest in visualization but deficient in analytical and BIM applications. Environmental factors (internet, policies) dominate adoption barriers in developing economies, without intervention, AI may exacerbate existing inequalities in Nigerian architecture.

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