



AI-Driven Architectural Planning in the Global South Context: Nigeria in Focus

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Abstract

The growing democratization of Artificial Intelligence production and consumption worldwide is reshaping the contemporary architectural sector. Whereas existing literature focuses more on application models fitted for developed nations, research on AI-driven architectural planning is still scanty in the Global South Zone, particularly in Nigeria. This study therefore explores the extent of structural adoption of AI tools in architectural planning within select economies of the Global South. Importantly, it canvasses for a regional, participatory approach through the twin theoretical lens of Technological Determinism and Diffusion of Technology to position AI not as a replacement but as an enhanced digital agency for sustainable, context-based architectural planning. This study argues that AI architectural planning tools offer accessible opportunities for site analysis, design, cost evaluation, and holistic participatory planning, despite challenges of informal settlements, climate change, and weak data infrastructure. Anchoring on a qualitative research method, preliminary findings reveal unstructured, unregulated structural integration with skill gaps and acute lack of regional datasets. Fundamentally, the research recommends the incorporation of AI architectural policy and implementation; investment in open, context-driven data and approach; and promotion of capacity building and public-private partnerships.

Keywords: AI, Global South, Architecture, Technological Determinism, DOI

General Overview

Unprecedented demographic shifts now characterize the 21st-century urbanization in the Global South. Higher rate of migration from rural to urban, dilapidated infrastructure, epileptic power supply, and degrading environment are parts of the experience developing economies are

facing. Already, 55 per cent of the population or the world live in urban regions, with close to 90 per cent of the global urban population growth expected to occur in Africa and Asia by 2050, that is: "Together, India, China and Nigeria will account for 35% of the projected growth of the world's urban population between 2018 and 2050. By 2050, it is projected that India

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will have added 416 million urban dwellers, China 255 million and Nigeria 189 million" (The UN, 2018).

This rapid migration is immensely impacted the housing system and other sectors of the economy. It is estimated by National Integrated Master Plan (NIMP) that Nigeria needs roughly \$3trn over a 30-year period to address her infrastructural deficits (Madu, 2024). This is further compounded by over-reliance on traditional architectural planning strategies and technologies—manual drafting and design, paper-based approvals, and rigid planning stemmed from the colonial regimes which are today not accounting for climate flexibility and regional material economies (Cobbinah et al., 2022). Despite all this, Artificial Intelligence is a new normal, emerging robustly as a disruption within architecture. By learning from a large set of data and identifying structure, styles and context to create text based on what it learned, AI tools have the capacity to optimize consumption of architectural material, predict structural behaviours under load activity, and stimulate microclimatic performance such as ventilation, daylight and heat gain.

The prospects of AI-driven architectural planning tools for Global South, particularly Nigeria, are huge, as the automated software can address speed, affordability and climate resilience. Yet transforming them for Global South has posed a significant dilemma. This is due to the fact that AI technologies produced for highly digitalized economies cannot

sufficiently be imported and explored into the contexts where settlements are informal, electricity is erratic and inadequate, technical manpower is scarce.

Statement of the Problem

The Global South, Nigeria in particular, faces a critical avalanche of unplanned expansion, housing system deficits, and climate change vulnerability. This could get worse unless Artificial Intelligence (AI) is integrated actively into architectural planning to keep pace with the emerging needs of the century's architectural planning practice. The reason for this is that traditional architectural planning strategies and technological tools are insufficient or not keeping pace with current AI advancement and democratization, creating a frequent clash between quality of urban plans and the flexible realities of growth, resource scarcity and informality in the Global South.

This is complicated by weak infrastructure, power supply, and internet as well as obvious shortage of properly AI-trained architects and physical planners. Further compounding the above challenges is the scantiness or total absence of existing literature on AI-driven architectural planning for Global South Zone, Nigeria inclusive. Available studies have revealed a constant gap in planning capacity in the essence that tools employed are unmatched with regional context because they are produced with high-tech economies in mind. Furthermore, empirical reviews do not focus on algorithmic bias, false positives, and ethical standards on data



privacy for site analysis and mapping, although "the Nigeria Data Protection Act (2023) with guidelines from the National Information Agency through Draft Code of Practice (2022) spells out a legal framework, principles, rights, and obligations aimed at safeguarding personal data and information" (Chukwuka et al., 2026).

Significance of the Study

This research is providing a detailed exploration of the extent of AI-driven technology adoption in Nigerian and Global South architectural planning practice, thereby offering architects, practitioners, policymakers, and tech firms a context-sensitive perspective fused by Technological Determinism and Diffusion of Innovations for migration from traditional models to participatory, AI-induced architectural systems. It also offers empirical insights into infrastructural and resources challenges for AI architectural planning integration, thereby stimulating interest in investments through PPP models and ethical use in line with the revised *National Physical Development Plan* (NPDP), *National Urban Development Policy*, *National Housing Policy* of 2012, and *Data Protection Act* of 2023.

Aims of the Study

This study targets the following: Assess the current status of AI readiness and inclusion in architectural planning practice in select countries of Global South, with a specific reference to Nigeria; identify the infrastructural, skills and policies that stand

as obstacles to AI-driven architectural planning within Global South setting; evaluate the effects of AI algorithmic bias, data breach and hallucination for Nigerian architectural planning context; and recommend workable strategies to support AI-enabled architectural planning in Nigeria.

Methodology

A non-quantitative research method is adopted for this study with thematic analysis of relevant journal articles, Nigerian policy documents, and publications from the agencies like the UN and NITDA.

Conceptual and Theoretical Underpinnings

This research intersects around Artificial Intelligence, architectural planning and the Global South. AI is a smart software invented to perform tasks humans would ordinarily do. The earliest theoretical work on AI was by British mathematician Alan Turing in the 1940s and the first AI programmes developed in the early 1950s (Copeland, 2026). This view supports that "the generic term AI is not new or contemporary" (Tošić, 2025).

Hence, AI is the ability of an electronic machine to perform complex operations normally that are linked with human intelligence—a term applied to the development of proficient systems that can



reason, discover meaning, generalize, or learn from past experience yet do not have the full capacity to match human flexibility (Copeland, 2026).

The foregoing is further corroborated by the fact that AI as robots is programmed to think, learn, and solve problems like humans would do (Akwo et al. (2026). Akwo et al. further offered extensive interpretations referring the automated machines as "systems that display intelligent behaviour by analyzing their environment and taking action with some degree of autonomy to achieve specific goals (Boucher, 2020)", thus AI covers various subfields of "machine learning, natural language processing, robotics, and computer vision, all of which are designed to perform tasks that typically require human cognition (Anayochukwu, 2025)". AI operates through an algorithm that handles reasoning, learning, problem-solving, language understanding (Anyi Chukwu, 2025). For a fact, AI is an automated bot that generates contents which are normally crafted by humans (Abioye et al., 2021, Akinteye et al., 2025; Oginni, 2026).

The bot generates responses by mimicking humans after a prompt by a human user. Contents generated are already available on the storehouse of knowledge or databases elsewhere where the machine surf from, dubbed it and produce it for use. This is possible through the same algorithm—a set of rules or steps known as patterns. Simply put, AI learns from huge datasets, identifies structure, styles and context, and creates

text based on what it learned. If the data requested is not available, the bot using a pattern that can mislead to forge the information. Contents from AI can be inauthentic, misleading, deceitful, and mechanical. And the information is often formulaic—easily detected by discerning experts. AI does not have human intuition, creativity, and emotional intelligence (Samsonovich, 2020; Tanimomo et al., 2024) hence "The enormous volumes of data needed for AI operations give rise to issues with data management, storage, and privacy" (Siddiq, et al., 2016). The automated not is capable of reshaping "architectural design by providing new tools and capabilities that improve accuracy, productivity, and creativity," (Salau et al., 2024). In architectural planning, AI covers a wide range of "machine learning and rule-based systems that automate design iterations, optimize building information models, and generate visual content", including the use of "Maket.ai, Architectures, Midjourney, Ark Design AI, Space maker (Autodesk Forma), Leonardo.Ai, Kaedim, and Hypar" (Akanume, 2024). Artificial Intelligence-driven architectural planning is no longer viewed as linearity but a "dynamic and feedback-oriented process through the continuous repetition, exchange of data, and optimization of performance" (Bhatti, 2026).

Almost all the work of architecture has to do with design and planning and the commonly used AI tools are "Artificial Neural Network (ANN), Support Vector Machine (SVM) and ANFIS, Multivariate



Adaptive Regression Spline (MARS) and RF, SVM and Fuzzy Logic and LR and Particle Swarm Optimization (PSO) thus supporting in data collection and processing, creation of design options, Building Information Modelling (BIM), energy and structural performance analysis, and architectural delineation" (Momade et al., 2020; Darko et al., 2020; Mailafiya et al., 2024)

The term "Global South" describes developing and emerging nations situated in Africa, Asia (with the exemption of Japan, South Korea, and Israel) Latin America and the Caribbean, and Oceania (New Zealand and Australia, excluded). These developing economies share similar colonial and socioeconomic histories, hence becoming "more vulnerable with rising numbers of small and medium-sized enterprises, growing informal sectors, rising poverty, inequality and unemployment" (UNCTAD, 2018). Global South is a grouping reference to "countries sharing post-colonial history and development goals" (Tesema, 2024). Carl Oglesby in 1969 first used the term 'Global South' loosely to mean "...developing countries, least-developed countries, underdeveloped countries, low-income economies, or the out-of-favor third world countries" (World Population Review, 2026).

This research leverages Technological Determinism and the Diffusion of Innovation (DOI) as two theoretical foundations to examine the extent of adoption of AI-driven architectural

planning in the Global South. Coined by American sociologist Thorstein Veblen (1857–1929), Technological Determinism is a reductionist theory. Technology is the driving force upon societal change and progression (Chukwuka, 2026). This theory is specifically traced to Marshal McLuhan in 1964, though Innis in 1950 first used 'technological determinism' before McLuhan elaborated on it to build it as a theory (Ngwu et al., 2024).

It is important to further state that Technological determinism comprises variant concepts that are united to mean ideas and social development that are dependent upon technology, hence technology that has: "autonomy of development (both in the sense of having an immanent evolutionary potential and its own logic of development, and in the sense of independence from socio-cultural control and self-sufficiency, up to understanding it as a *causa sui*); the development of technology is treated as progress; and the development of technology is emergent " (Mezentsev 2019). Conversely, the theory of Diffusion of Innovation (DOI), first developed in 1962, explains how, why and at what pace new ideas and technologies are distributed through culture and organization. Everett Rogers' theory, though modified in subsequent editions, identifies five core characteristics influencing the integration of innovations unlike the three key phases highlighted for the adoption of technology integration according to the TOE (Chukwuka, 2026).



While Technological Determinism (TD) explains that AI when explored to its full potential fundamentally transforms architectural planning processes, manpower and urbanization with ease, efficiency and precision beyond traditional models, the DOI spotlights transformative power that will occur when AI is fully included, adapted and diffused within the Global South or Nigeria's architectural planning. In essence, the intersection between the twin foundational theories rests on the capacity of AI and the relative speed and sociocultural conditions through which that AI's capacity can reshape the regional architectural planning practice.

Empirical Gaps

Few scholars have researched on the role of Artificial Intelligence in the developing economies. Akinteye (2025) in his studies focused on urban design and architecture for urban dwellers in Nigeria and recommends that more research should be conducted in the area of AI in urban planning, whereas Akdag et al.'s (2026) review examined the integration of AI tools in the architecture and physical planning field. While the former considers Nigeria's use of AI, the latter take a general consideration, particularly centering architecture as an academic field of study. Bhatti's research study (2026) focuses on AI technologies with its ethical, cultural and environmental considerations, suggesting that the future of AI should be reflective and critical. Yet this study however does not examine the use of AI in architectural planning. It further does not

take into account the content of Global South. While Tesema (2024) in his work examined with comparative lens between Global South and Global North, observing that the US and China recorded highest in the use of AI as at 2023 with varying degree of adoption across developing economies, the study does not account for use of AI in architectural planning as well. Although Tosic's research examines the Interplay between the principles and outcomes of "AI-driven architectural design and sustainability" (Tošić, 2025), there is absence of the Global South context. Notwithstanding, all the foregoing research studies, as much as they examine the role of AI, do not base their analysis on the DOI and the TD, hence the uniqueness of this study.

Application of AI-Driven Architectural Planning in Global South: The Nigerian Context

India and Brazil are widely cited as pioneers "in building digital public infrastructure" (Sahasranamam, 2026). Nigeria is slower in foundational digital systems and only beginning to experiment with AI in architectural planning practice. Comparing China, Brazil, South Africa and Nigeria as models of the Global South, analysis reveals four unique pathways to AI inclusion in architecture planning practice. Whereas China demonstrates a state-focused, rapid-scale data-rich model, Brazil represents municipal innovation strained by inequality. In Africa, South Africa displays improved technical capacity together with constant infrastructure and inequality,



while Nigeria illustrates the barrier of integrating AI in the context of data scarcity, instability of power supply, institutional fragmentation, and policy instability.

For a fact, China indeed places herself as the Global South leader in terms of the application of AI in urban governance and architectural planning practice, enabled by massive communist investments and initiatives such as "New Infrastructure" (Du et al. 2023) and "Smart Cities", hence "a new generation of Chinese firms is challenging traditional architectural practices, signaling a significant shift in the global architectural landscape. Among them, XKool, a groundbreaking AI architectural firm, is making waves" (Jing Daily Culture, 2023). XKool is an AI-driven architectural platform empowering the architectural planning sector with data-driven opportunities "for design, construction, and management" (Jing Daily Culture, 2023). AlphaGo influenced the software. Before its development, the existing Computer Aided Design (CAD) and Building Information Modeling (BIM), dating to the 1970s and 1990s respectively, were ready for disruption, leading to XKool (Jing Daily Culture, 2023)

Cities in China such as Shenzhen and Hangzhou now use AI to monitor real-time construction sites, automated building plan approvals and predict traffic and energy demands. Firms also employ GenAI to optimize high-density housing and infrastructural projects. Brazil is yet another Global South country that offers an

AI-driven architectural planning but with more municipal autonomy. Major wealthy urban areas like São Paulo and Rio de Janeiro have developed open data platforms and Geo-informatic systems which back up flood risk mapping, transit optimization and monitoring informal settlements. On data, China and Brazil have hugely invested in geospatial datasets, notwithstanding.

Nigeria offers a challenging case of AI-driven architectural planning, as architectural planning remains largely manual, dependent on paper approvals and zoning codes, not reflective of current realities (Cobbninah et al., 2022). The country is at the experimental stage of AI in architectural planning, as she has limited exposure to AI in architecture and physical planning. In Nigeria, the following are common AI tools for architecture: Autodesk Forma used for site analysis and urban planning, Test Fit used for real estate feasibility, and Maket used for residential floor planning generation, Flinch 3D for evaluating spatial floor plan arrangements against daylight and sustainability metrics. Most Nigerian architects and physical planners use Krea AI to change rough sketches into a more presentable format. Visoid is another AI-powered architectural visualization software designed to turn basic 3D models, sketches, or viewport screenshots into photorealistic renderings, connecting easily with major design programmes such as Revit, SketchUp, ArchiCAD and Rhino.



Conclusion

This research shows that the inclusion of AI in architectural planning practice within Global South, particularly in Nigeria, is still at the experimental stage with the exception of China. The findings also highlight that architectural planning and processes in Nigeria remain largely manual, despite the popularity of AI. Despite use of some AI tools in architecture, they are adopted in an ad-hoc manner without institutional and policy guidance. This study further finds that AI technologies developed by Global North for highly digitalized economies cannot adequately be deployed in Global South, where settlements are informal, power supply erratic, broadband weak, and technical manpower scarce. Nigeria is an AI consumer, not a producer. Also, current research and application of AI in architecture do not sufficiently consider algorithmic bias, false positives and ethical concerns. Although there exists Nigeria Data Protection Act and NITDA Draft Code of Practice, their implementation in architectural planning practice is weak, if not absent. Findings, again, reveal that previous studies do not focus on Technological Determinism and Diffusion of Innovation adopted by this research. This study, therefore, concludes that AI has the potential to reshape architectural planning, manpower and urbanization with ease efficiency and precision beyond what traditional models can offer. Fundamentally, the research recommends full incorporation of AI architectural policy and implementation; investment in open, context-driven data and approach; and

promotion of capacity building and public-private partnerships.

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