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INTEGRATION OF AI IN BUILDINGS FOR OPTIMUM FUNCTIONALITY AND EFFICIENCY IN NIGERIA: STUDYING THE PROSPECT AND INHIBITING FACTORS

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ABSTRACT

This study examined the integration of Artificial Intelligence (AI) in buildings for optimum functionality and efficiency in Nigeria, focusing on its prospects and inhibiting factors. Descriptive survey design was adopted for this study. The study was carried out in Nigeria and the targeted population for the study comprised of all the architects, civil engineers, quantity surveyors and builders in Nigeria. A stratified sampling technique was used in selecting 20 Architects, 20 civil engineers, 20 quantity surveyors and 20 builders, each from 3 geographical zones in Nigeria (South-South, South-East and North-West), represented by Akwa Ibom State, Abia State, Kaduna State. This gave a total sample size of 240 respondents. The instrument used for data collection was a structured questionnaire titled "Artificial Intelligence for Optimum Functionality and Efficiency in Buildings Questionnaire" (AIOFEBQ). Face and content validation of the instrument was carried out by an expert in test, measurement and evaluation in order to ensure that the instrument has the accuracy, appropriateness and completeness for the study under consideration. The reliability coefficient obtained was 0.89 and this was high enough to justify the use of the instrument. The researcher subjected the data generated for this study to appropriate statistical technique such as descriptive statistics to answer research questions. From the result of the data analysis, it was observed that for the roles of AI in providing optimum functionality and efficiency in buildings the highest percentage (16.67%) was recorded against "Improvement of Security and Safety Systems". Also, from the result of the data analysis on the Prospect of AI in Building Optimum Functionality and Efficiency it was observed that the highest percentage (37.92%) was recorded against "Predictive Maintenance". As regards the challenges of AI in providing optimum functionality and efficiency it was observed that the highest percentage (170.59%) was recorded against "Data Quality and Availability. Finally, as regards the mitigating strategies to the challenges of Adopting Artificial Intelligence in providing optimum functionality and efficiency, it was observed that the highest percentage (26.25%) was recorded against "Data Quality and Availability". The study concluded that despite these challenges, AI has strong potential to improve building efficiency in Nigeria if supporting infrastructure, training, and policies are strengthened. One of the recommendations made was that the government should develop clear policies and regulatory frameworks to support AI adoption in building design, construction, and management.

KEYWORDS: Artificial Intelligence, Buildings, Optimum Functionality, Efficiency, Nigeria, Inhibiting Factors

INTRODUCTION

The integration of Artificial Intelligence (AI) in buildings represents a transformative advancement in the architecture, engineering, and construction (AEC) sector, particularly in developing countries such as Nigeria. AI-driven systems—including machine learning algorithms, Internet of Things (IoT) devices, and automated building management systems are increasingly being deployed to enhance building functionality, optimize energy consumption, and improve operational efficiency.

In Nigeria, where infrastructural inefficiencies, high energy consumption, and maintenance challenges persist, the adoption of AI in buildings offers significant prospects. Studies have shown that smart building technologies can substantially improve energy efficiency and reduce operational costs, which is crucial in a country facing inconsistent power supply and rising energy demands (Odefadehan, Banjo, Oladejo, Oluwole, & Olaifa, 2025). Furthermore, AI enhances construction and building management processes through predictive maintenance, real-time monitoring, and automation of repetitive tasks, thereby increasing productivity and minimizing human error. The integration of AI also supports the development of sustainable urban environments by enabling intelligent energy management systems and optimizing the use of resources such as water and electricity. In cities like Lagos, AI-driven smart building infrastructure is increasingly recognized as a key component of smart city development, contributing to improved urban planning and environmental sustainability (Ibitoye, Abass, Onabote, Kolawole, & Daser-Adams, 2025).

Another critical inhibiting factor is the shortage of skilled professionals with expertise in AI and smart building technologies. The limited availability of trained personnel affects the design, implementation, and maintenance of AI systems in buildings. Moreover, regulatory and policy gaps, including the absence of clear frameworks governing AI adoption in construction and building management, create uncertainty and discourage investment (Okpala, 2024). Ethical concerns, data privacy issues, and resistance to technological change among stakeholders also contribute to the slow pace of adoption.

Statement of the problem

Despite the recognized potential of artificial intelligence (AI) to transform curriculum design and development, its integration into secondary school education in Akwa Ibom State remains largely underdeveloped and inconsistent as the current curriculum practices still depend heavily on traditional, rigid structures that do not adequately respond to students' diverse learning needs or the demands of a rapidly evolving digital society. Although AI has the capacity to support personalized learning, continuous assessment, and data-driven decision-making, many schools in the state face significant barriers such as inadequate ICT infrastructure, limited technical expertise among educators, and insufficient policy support for implementation. In addition, concerns relating to data quality, ethical issues, and resistance to change further hinder the effective adoption of AI in curriculum processes. As a result, the existing curriculum may not fully equip students with essential 21st-century skills needed for academic success and global competitiveness. Therefore, the problem lies in the gap between the potential benefits of AI in curriculum development and its actual application in secondary schools in Akwa Ibom State, creating a need for systematic investigation into how these challenges can be addressed for effective integration.

Objectives of the study

1. To find out the roles of AI in providing optimum functionality and efficiency in buildings in Nigeria.
2. To examine the prospect of AI in building optimum functionality and efficiency in Nigeria.
3. To assess the challenges of AI in Providing Optimum Functionality and Efficiency in Nigeria.
4. To find out the mitigating strategies to the challenges of adopting artificial intelligence in providing optimum functionality and efficiency in Nigeria.

Research Questions

1. What are the roles of AI in providing optimum functionality and efficiency in buildings in Nigeria?
2. What are the prospects of AI in building optimum functionality and efficiency in Nigeria?
3. What are the challenges of AI in providing optimum functionality and efficiency in Nigeria?
4. What are the mitigating strategies to the challenges of adopting artificial intelligence in providing optimum functionality and efficiency in Nigeria?

LITERATURE REVIEW

Concept of Artificial Intelligence (AI)

Artificial Intelligence (AI) simply means the ability of a computer or machine to think, learn, and make decisions like a human being. It allows machines to solve problems, understand information, and improve their performance over time without being fully controlled by humans. It is also known as the science of creating intelligent machines. Also, Stuart Russell and Peter Norvig (2021) explain that AI involves systems that can act intelligently to achieve specific goals.

Artificial intelligence (AI) has become one of the most important technological advancements in the modern world. It refers to the development of computer systems that can perform tasks that typically require human intelligence, such as learning, reasoning, decision-making, and problem-solving. As technology continues to evolve, AI is increasingly being integrated into various sectors including education, healthcare, agriculture, and business, thereby transforming the way people live and work.

According to John McCarthy (2007), AI is concerned with building intelligent machines capable of performing tasks that would normally require human intelligence. In addition, Stuart Russell and Peter Norvig (2021) describe AI as systems that can perceive their environment and take actions that maximize their chances of success. This shows that AI is not only about machines thinking but also about machines acting intelligently. According to Kingsley & James (2025) AI enables machines to perform tasks that require human intelligence, such as speech recognition, decision-making, and data analysis.

Concept of Building Construction

Building construction refers to the process, techniques, and activities involved in the creation of structures such as residential, commercial, and industrial buildings. It encompasses planning, design, material selection, site preparation, and the actual erection of structures in a systematic and organized manner. The concept of building construction integrates both technical and managerial aspects to ensure that buildings are safe, functional, durable, and aesthetically pleasing. According to Kineber, Oke & Elshaboury, (2024), modern building construction is no longer limited to physical assembly but also includes strategic planning, sustainability considerations, and efficient project delivery systems that enhance overall performance.

As explained by Obamoh, Etuk & Equere (2025) Building construction is the process of putting together materials and parts to make structures that meet human requirements, like homes, offices, learning centers, medical facilities, and entertainment venues. In contemporary construction practice, the concept has evolved to incorporate sustainability, innovation, and efficiency. As noted by Gu, Guo, Peng, & Wang (2023), building construction now emphasizes environmentally friendly practices such as energy efficiency, waste reduction, and the use of sustainable materials to minimize negative environmental impacts. This shift reflects global concerns about climate change and resource conservation, making green construction a fundamental aspect of modern building processes. Furthermore, digital technologies such as Building Information Modeling (BIM) and smart construction systems are increasingly being integrated into construction activities to improve accuracy, reduce errors, and enhance collaboration among stakeholders.

Concept of Optimum Functionality in Buildings

Optimum functionality in buildings refers to the efficient and effective performance of a structure in meeting the intended needs of its occupants while minimizing resource use, operational costs, and environmental impact. It involves the integration of architectural design, structural systems, building services, and environmental considerations to ensure that a building operates at its highest level of performance. A functionally optimal building provides comfort, safety, accessibility, and flexibility while also supporting energy efficiency and sustainability goals (Oke, Aigbavboa & Thwala, 2021).

In order to guarantee that spaces are properly planned for their intended uses, the idea places a strong emphasis on the alignment between building design and user requirements. This comprises effective circulation within the building, sufficient lighting and ventilation, thermal comfort, and appropriate spatial layout. Additionally, optimum functionality involves the seamless integration of building systems such as heating, ventilation, air conditioning (HVAC), electrical, and plumbing systems to enhance performance and reduce energy consumption (Zhang, Liu, H & Li, 2020).

Smart technologies and environmental design ideas are also incorporated into contemporary approaches to optimal functionality. Building performance can be monitored and controlled in real-time through the use of sensors, energy management tools, and building automation systems, increasing productivity and user comfort. Furthermore, the adoption of green building materials and passive design strategies enhances environmental performance while maintaining functionality (Cabeza, Chàfer & Mata 2021).

Concept of Optimum Efficiency in Building

When a building's systems, operations, and design achieve the best performance with the least amount of energy, resource, and cost waste while preserving tenant comfort and functioning, this is referred to as optimal efficiency in buildings. This concept emphasizes balancing energy consumption, thermal comfort, indoor air quality, water use, and operational effectiveness to ensure sustainable and cost-efficient building performance (Zhou, Yan, & Hong, 2021).

Integrating resource management techniques, smart technology, and building design methods is necessary to achieve maximum efficiency. According to Adeyemi & Amhana (2024) a key component of resource management is the process of allocating and using resources like staff, materials, and equipment in the most effective manner possible. For instance, energy-efficient HVAC systems, high-performance insulation, adequate ventilation, and the integration of renewable energy sources all help to lower energy use while preserving occupant comfort. Similarly, water-efficient plumbing systems, daylight optimization, and automation through building management systems (BMS) ensure resources are used effectively without unnecessary loss (Wei, Wang, & Zhu, 2020).

Roles of AI in Providing Optimum Functionality and Efficiency in Buildings

- **Energy Management and Optimization**

AI aids in tracking and managing building energy use. It evaluates use trends using machine learning algorithms and automatically modifies HVAC (heating, ventilation, and air conditioning) systems to cut down on energy waste. It can also predict energy demand based on weather conditions and occupancy, ensuring efficient energy use and cost reduction (Wei et al., 2020).

- **Enhancement of Indoor Environmental Quality**

By controlling temperature, humidity, lighting, and air quality, artificial intelligence enhances indoor comfort. AI systems use the real-time data collected by smart sensors to modify the environment to suit the needs of occupants. This ensures a healthier and more comfortable indoor environment, thereby improving productivity and well-being (Kim et al., 2021).

- **Predictive Maintenance of Building Systems**

By identifying problems in building systems before they arise, AI makes predictive maintenance possible. To find possible problems, it examines data from devices including electrical installations, HVAC systems, and elevators. This reduces maintenance costs, prevents unexpected breakdowns, and prolongs the lifespan of building components (Zhou et al., 2021).

- **Space Utilization and Management**

AI analyzes occupancy trends to maximize the usage of space within buildings. It assists in locating unused spaces and makes recommendations for more effective space allocation techniques. This is particularly useful in offices, schools, and commercial buildings where efficient use of space enhances overall functionality (Wei et al., 2020).

- **Improvement of Security and Safety Systems**

By using intelligent monitoring and surveillance systems, AI improves building security. It can identify faces, spot anomalous activity, and sound an alarm in the event of a security breach. In emergency situations, AI can assist in evacuation planning and real-time decision-making, improving overall safety (Kim, Park & Lee, 2021).

- **Automation and Smart Building Integration**

AI automates building operations by integrating with Internet of Things (IoT) devices. This covers appliance management, climate control, and lighting control. Automation ensures that building systems respond efficiently to changes in occupancy and environmental conditions, thereby improving functionality and reducing manual intervention (Zhou et al., 2021).

- **Support for Sustainable Building Practices**

By lowering energy use and carbon emissions, AI promotes sustainability. It enhances the efficacy of renewable energy systems inside buildings and encourages their utilization. AI-driven systems help achieve green building standards and promote environmentally responsible construction (Wei et al., 2020).

Prospect of AI in Building Optimum Functionality and Efficiency

The following are prospects of AI in achieving optimum functionality and efficiency in buildings:

- **Predictive Maintenance**

Predictive maintenance is another major application of AI that directly impacts building functionality and efficiency. Traditional maintenance strategies either rely on reactive approaches, repairing equipment only after failure, or preventive schedules that may not reflect actual usage conditions. AI, however, enables predictive maintenance by analyzing sensor data from building systems such as HVAC units, elevators, plumbing, and electrical equipment. Habeeb, Adesemowo & Babatunde Noted that with the help of AI, the companies can create some aspect of complex language translation and pattern recognition by disparate independent algorithms in an effort to implement some business globally. Machine learning algorithms detect anomalies and patterns that indicate potential system failures, allowing maintenance personnel to intervene before serious breakdowns occur. This ensures continuous functionality by minimizing unplanned system downtime and reduces costs by optimizing maintenance schedules. Carvalho et al. (2020) emphasize that AI-driven predictive maintenance extends the life of building equipment, reduces labor and material costs, and improves operational efficiency by ensuring that resources are used effectively.

- **AI-Driven Automation in Construction**

AI-powered automation and robotics are transforming the construction industry by improving precision, safety, and speed. Autonomous machinery, drones, and AI-based monitoring systems can perform tasks such as bricklaying, material transport, structural inspection, and site surveillance with minimal human intervention. Efficiency is increased through faster project completion, lower labor costs, and reduced material waste. Bock and Linner (2021) note that AI-driven construction automation also addresses labor shortages and enhances site safety by monitoring potential hazards and ensuring compliance with safety standards.

- **Personalized Indoor Environmental Control**

Finally, AI enables personalized environmental control within buildings, enhancing comfort and productivity while optimizing energy use. AI systems can learn occupants' preferences for temperature, lighting, and air quality and adjust conditions automatically. This improves

functionality by creating adaptive, user-centered environments that promote well-being and efficiency by avoiding unnecessary energy usage. For instance, AI can regulate heating or cooling only in occupied rooms and adjust lighting levels according to individual needs. Kim and Park (2022) demonstrate that AI-driven personalized thermal and environmental control improves occupant satisfaction while reducing overall energy consumption, making it an essential tool for sustainable and high-performing buildings.

The Challenges of AI in Providing Optimum Functionality and Efficiency

Below is a discussion of these difficulties:

- **Data Quality and Availability**

Data is essential to the efficient operation of AI systems. AI systems generate untrustworthy outcomes when data is erroneous, biased, or incomplete. Organizations frequently don't have enough high-quality data, which lowers system performance. Poor data management also limits the ability of AI to generalize across different environments (Sakubu, 2025; Akgun & Hosseini, 2025).

- **Algorithmic Bias and Fairness**

Biases from training data may be inherited by AI systems, producing unfair or biased results. This is a serious issue in fields including banking, healthcare, and hiring. Bias reduces trust in AI systems and affects their efficiency in decision-making processes (Zawacki-Richter, 2025; Sakubu, 2025).

- **Lack of Transparency and Explainability**

Many AI models operate as "black boxes," making it difficult to understand how decisions are made. This lack of transparency reduces accountability and trust, especially in critical applications. Users may find it difficult to rely on systems they cannot interpret (Sakubu, 2025).

- **High Cost and Resource Requirements**

AI systems require significant computational power, specialized hardware, and technical expertise. These high costs limit access, especially for small and medium-sized enterprises. As a result, efficiency is reduced due to limited adoption and scalability (Mohib, 2025).

- **Security and Privacy Concerns**

AI systems process large amounts of sensitive data, making them vulnerable to cyberattacks and data breaches. Privacy concerns also arise when personal data is misused. These risks reduce user confidence and hinder the effective use of AI technologies (Sakubu, 2025).

- **Ethical and Regulatory Challenges**

The rapid growth of AI has created ethical and legal concerns, including accountability, fairness, and control over automated decisions. The lack of clear regulations makes it difficult to ensure responsible AI usage. This limits trust and slows down adoption (Chen, 2021).

Mitigating Strategies to the Challenges of Adopting Artificial Intelligence in Providing Optimum Functionality and Efficiency

The following sections outline key challenges and corresponding solutions:

- **Data Quality and Availability**

To mitigate this challenge, organizations should establish strong data governance frameworks that include data collection standards, validation, cleaning, and regular updates. Ensuring the use of diverse and representative datasets helps improve model generalization and reduces bias. Additionally, techniques such as data augmentation and synthetic data generation can be used to compensate for limited data availability. Collaborative data-sharing initiatives, while maintaining privacy compliance, can also enhance access to quality datasets (Sakubu, 2025; Akgun & Hosseini, 2025).

- **Algorithmic Bias and Fairness**

Addressing bias requires the adoption of fairness-aware machine learning techniques and continuous monitoring throughout the AI lifecycle. Developers should conduct regular bias audits and use tools designed to detect discrimination in model outputs. Incorporating diverse datasets and interdisciplinary perspectives during development also helps reduce bias. Furthermore, implementing ethical AI frameworks ensures that fairness is prioritized in system design and deployment (Zawacki-Richter et al., 2025; Sakubu, 2025).

- **Lack of Transparency and Explainability**

The implementation of Explainable Artificial Intelligence (XAI) is essential to improve transparency. Techniques such as feature importance analysis, visualization tools, and interpretable models allow users to understand system outputs. Providing clear documentation and model explanations enhances accountability and trust. In high-stakes environments, organizations should prioritize the use of simpler and more interpretable models where possible (Sakubu, 2025).

- **Security and Privacy Concerns**

To enhance security, organizations should implement robust cybersecurity measures, including encryption, secure data storage, and strict access controls. Privacy-preserving techniques such as federated learning, differential privacy, and data anonymization should be adopted to protect user information. Compliance with data protection regulations and regular security audits are also critical in maintaining system integrity and user trust (Sakubu, 2025).

- **Ethical and Regulatory Challenges**

Governments and organizations must establish comprehensive AI governance frameworks that define ethical principles such as fairness, accountability, and transparency. Developing and enforcing regulatory policies ensures responsible AI usage. Collaboration among policymakers, researchers, and industry stakeholders is essential to create standardized guidelines and promote global best practices. Continuous review and adaptation of these policies are necessary to keep up with technological advancements (Chen et al., 2021).

METHODOLOGY

Descriptive survey design was adopted for this study. The study was carried out in Nigeria and the targeted population for the study comprised of all the architects, civil engineers, quantity surveyors and builders in Nigeria. A stratified sampling technique was used in selecting 20

Architects, 20 civil engineers, 20 quantity surveyors and 20 builders, each from 3 geographical zones in Nigeria (South-South, South-East and North-West), represented by Akwa Ibom State, Abia State, Kaduna State. This gave a total sample size of 240 respondents. The instrument used for data collection was a structured questionnaire titled "Artificial Intelligence for Optimum Functionality and Efficiency in Buildings Questionnaire" (AIOFEBQ). Face and content validation of the instrument was carried out by an expert in test, measurement and evaluation in order to ensure that the instrument has the accuracy, appropriateness and completeness for the study under consideration. The reliability coefficient obtained was 0.89 and this was high enough to justify the use of the instrument. The researcher subjected the data generated for this study to appropriate statistical technique such as descriptive statistics to answer research questions.

RESULTS AND DISCUSSIONS

Research Questions 1:

The research question sought to examine the roles of AI in providing optimum functionality and efficiency in buildings in Nigeria. To answer the research question, percentage analysis was performed on the data, (see table 1).

Table 1:
Percentage analysis of the roles of AI in providing optimum functionality and efficiency in buildings in Nigeria.

Roles	Frequency	Percentage
Energy Management and Optimization	34	14.17
Enhancement of Indoor Environmental Quality	27	11.25*
Predictive Maintenance of Building Systems	38	15.83
Space Utilization and Management	29	12.08
Improvement of Security and Safety Systems	40	16.67**
Automation and Smart Building Integration	39	16.25
Support for Sustainable Building Practices	33	13.75
TOTAL	**240**	**100%**

****** **The highest percentage frequency**
***** **The least percentage frequency**
SOURCE: Field survey

The above Table 1 presents the percentage analysis of the roles of AI in providing optimum functionality and efficiency in buildings. From the result of the data analysis, it was observed that the highest percentage (16.67%) was recorded against "Improvement of Security and Safety Systems", while the least percentage (11.25%) was recorded against "Enhancement of Indoor Environmental Quality". This finding agrees with the opinion of Kim et al, (2021) who mentioned that AI aids in tracking and managing building energy use, and by controlling temperature, humidity, lighting, and air quality, artificial intelligence enhances indoor comfort.

Research Questions 2:

The research question sought to determine the prospect of AI in building optimum functionality and efficiency in Nigeria. To answer the research question percentage analysis was performed on the data, (see table 2).

Table 2:
Percentage analysis of the prospect of AI in building optimum functionality and efficiency in Nigeria.

Prospect	Frequency	Percentage
Predictive Maintenance	91	37.92**
AI-Driven Automation in Construction	84	35.00
Personalized Indoor Environmental Control	65	27.08*
TOTAL	**240**	**100%**

****** **The highest percentage frequency**
***** **The least percentage frequency**
SOURCE: Field survey

The above Table 2 presents the percentage analysis of the prospect of AI in building optimum functionality and efficiency. From the result of the data analysis, it was observed that the highest percentage (37.92%) was recorded against "Predictive Maintenance", while the least percentage (27.08%) was recorded against "Personalized Indoor Environmental Control". This finding agrees with Kim and Park (2022) who stated that AI-driven personalized thermal and environmental control improves occupant satisfaction while reducing overall energy consumption, making it an essential tool for sustainable and high-performing buildings.

Research Questions 3:

The research question sought to identify the challenges of AI in providing optimum functionality and efficiency in Nigeria. To answer the research question percentage analysis was performed on the data, (see table 3).

Table 3:
Percentage analysis of the challenges of AI in providing optimum functionality and efficiency in Nigeria.

Challenges	Frequency	Percentage
Data Quality and Availability	58	170.59**
Algorithmic Bias and Fairness	45	132.35
Lack of Transparency and Explainability	31	91.18
High Cost and Resource Requirements	27	79.41*
Security and Privacy Concerns	45	132.35
Ethical and Regulatory Challenges	34	100
TOTAL	**240**	**100%**

****** **The highest percentage frequency**
***** **The least percentage frequency**
SOURCE: Field survey

The above Table 3 presents the percentage analysis of the challenges of AI in providing optimum functionality and efficiency. From the result of the data analysis, it was observed that the highest percentage (170.59%) was recorded against "Data Quality and Availability", while the least percentage (79.41%) was recorded against "High Cost and Resource Requirements". This finding agrees with the opinion of Sakubu (2025) who noted that AI systems process large amounts of sensitive data, making them vulnerable to cyberattacks and data breaches.

Research Questions 4:

The research question sought to identify mitigating strategies to the challenges of adopting artificial intelligence in providing optimum functionality and efficiency in Nigeria. To answer the research question percentage analysis was performed on the data, (see table 4).

Table 4:
Percentage analysis of the mitigating strategies to the challenges of adopting artificial intelligence in providing optimum functionality and efficiency in Nigeria.

Mitigating Strategies	Frequency	Percentage
Data Quality and Availability	63	26.25**
Algorithmic Bias and Fairness	54	22.50
Lack of Transparency and Explainability	32	13.33*
Security and Privacy Concerns	54	22.50
Ethical and Regulatory Challenges	37	15.42
TOTAL	**240**	**100%**

****** **The highest percentage frequency**
***** **The least percentage frequency**
SOURCE: Field survey

The above Table 4 presents the percentage analysis of the mitigating strategies to the challenges of adopting artificial intelligence in providing optimum functionality and efficiency. From the result of the data analysis, it was observed that the highest percentage (26.25%) was recorded against "Data Quality and Availability", while the least percentage (13.33%) was recorded against "Lack of Transparency and Explainability". This finding agrees with the opinion of Akgun & Hosseini (2025) who mentioned that organizations should establish strong data governance frameworks that include data collection standards, validation, cleaning, and regular updates. Ensuring the use of diverse and representative datasets helps improve model

generalization and reduces bias. Additionally, techniques such as data augmentation and synthetic data generation can be used to compensate for limited data availability.

CONCLUSION

In conclusion, the integration of Artificial Intelligence in buildings presents significant opportunities for improving functionality, energy efficiency, and overall building performance in Nigeria. It offers promising prospects such as smart energy management, predictive maintenance, and enhanced security systems. However, the adoption of AI is constrained by high implementation costs, inadequate infrastructure, and limited technical expertise. Regulatory gaps and low awareness among stakeholders further hinder its widespread application. Addressing these challenges through policy development, investment in infrastructure, and capacity building is essential. Ultimately, effective AI integration can drive sustainable development and transform Nigeria's built environment.

RECOMMENDATIONS

1. The government should develop clear policies and regulatory frameworks to support AI adoption in building design, construction, and management.
2. Improve digital infrastructure such as stable electricity supply, high-speed internet, and smart grids to support AI-powered systems.
3. Train professionals in AI, IoT, and smart building technologies through universities, technical institutions, and professional programs.

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