The Impact of Artificial Intelligence in University Education in Nigeria Towards a Built and Sustainable Environment

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Abstract- This study investigates the implications of integrating artificial intelligence (AI) into university education in Nigeria, particularly within the context of the built environment. By reviewing existing literature, employing qualitative and quantitative methodologies, and analyzing data from questionnaires, the study aims to assess the current state, challenges, and opportunities AI presents in enhancing educational outcomes. Findings suggest that while AI offers significant potential for transforming teaching and learning in Nigerian universities, there are barriers to its effective implementation, including infrastructure limitations and the need for comprehensive faculty training. The study underscores the importance of proactive measures to address these challenges and offers recommendations for policymakers, educators, and stakeholders to harness the full benefits of AI in university education for the advancement of the built environment sector in Nigeria.

Indexed Terms- Artificial Intelligence (AI), University Education, Nigeria, Built Environment, Sustainable development, Smart cities, Data analytics, Machine learning, Virtual reality, Augmented reality, Technology Integration, Educational Innovation

I.   INTRODUCTION

Artificial Intelligence (AI) refers to the simulation of human intelligence processes by machines, particularly computer systems. These processes include learning, reasoning, problem-solving, perception, understanding natural language, and decision-making. AI technologies enable machines to perform tasks that typically require human intelligence, such as recognizing patterns in data, making predictions, understanding and responding to natural language, and autonomously navigating through environments. AI encompasses various subfields, including machine learning, natural language processing, computer vision, robotics, and expert systems. Its applications range from virtual assistants and recommendation systems to autonomous vehicles and medical diagnosis tools on this note Artificial intelligence (AI) has emerged as a transformative force in various sectors worldwide, including education. In the context of Nigerian universities, where the demand for skilled professionals in the built environment is high, the integration of AI presents both challenges and opportunities. This literature review examines the impact of AI on university education in Nigeria, particularly in the context of building a sustainable built environment.

PROFESSIONAL AI RESEARCHER

DID YOU KNOW?

35% of businesses have adopted AI.

50% of consumers are now optimistic about AI.

77% of devices in use feature some form of AI.

AI will contribute $15.7 trillion to the global economy by 2030.

9 out of 10 organizations support AI for a competitive advantage.

43% of businesses are concerned about technology dependence.

33% of consumers think they are using AI platforms (actual usage is 77%).

85.1% of AI users use the technology for article writing and content creation.

81.6% of digital marketers think content writers' jobs are at risk because of AI.

AI technology has also had a significant impact on the transportation industry. Self-driving cars, powered by AI algorithms, are becoming a reality. These vehicles have the potential to reduce accidents, improve traffic flow, and enhance overall transportation efficiency. AI-powered logistics systems are optimizing supply chain management, reducing delivery times, and minimizing costs. The transportation industry is undergoing a transformative shift, thanks to the advancements in AI technology.

Furthermore, AI technology is playing a crucial role in the field of cybersecurity. AI algorithms can detect and respond to cyber threats in real-time, helping to protect sensitive data and prevent cyber-attacks. By analyzing patterns and anomalies in network traffic, AI-powered systems can identify potential vulnerabilities and proactively defend against emerging threats. As cyber threats continue to evolve, AI technology is becoming an indispensable tool in safeguarding our digital infrastructure.

AI Assistant Is Transforming Education Industry

AI-Assistant in Education

As this current generation has grown up with the advantage of having technology at their fingertips, the field of education has been dramatically transformed in this digitally driven world. The global adoption of technology in education is changing the way we teach and learn. Gone are the days when teachers used the traditional teaching method by using chalk, duster, and blackboard. Nowadays, smart classrooms, digital whiteboards, smartpens are providing new experiences.
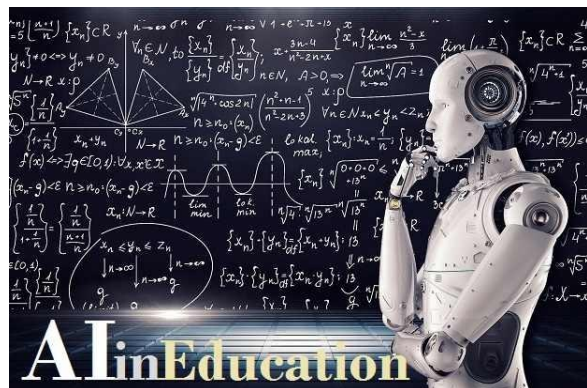
If we talk particularly about Artificial Intelligence, it is a technology that is shaping the future of education by transforming old methods of learning into a comprehensive new manner through the use of augmented reality and simulation technologies. Be it repetitive teaching tasks or students struggling with the learning experience; this revolutionizing innovation has solutions to modernize the way of learning and teaching both. The total AI industry covers a wide range of applications such as Natural language processing, Robotic process automation, and Machine learning that are not helpful only for teachers and students but also for HR, Admin and management people. Let's dive in deep into some of the advantageous transformations caused by AI- assistant in education sector-

AI IN EDUCATION: BEYOND THE HYPE AND FEARS

grading for practically all types of multiple-choice and fill-in-the-blank exams. Today, essay-grading software is also in its infancy that can check grammar mistakes and wrong sentence structure, allowing teachers to focus more on in-class activities.

2. There would be no language barrier

One of the most beneficial aspects of AI solutions is their ability to convert educational content into a variety of other languages. This will allow overseas students to take courses that are not offered in their home countries. This, in turn, creates an interactive community for students of diverse ages and grades. These factors enable students to learn considerably more quickly and achieve their academic goals more effectively.

3. Personalized and improved learning experience

Conversational AI is an excellent tool for teachers to use to improve their students' learning experiences. The capabilities of an intelligent chatbot system can assist students in grasping facts and knowledge in a faster, more efficient, and engaging manner. An educational chatbot can assist students in preparing for tests by revisiting key concepts, administering topic-

1. Automate tedious teaching tasks

As we know, Artificial Intelligence is very helpful to automate tedious tasks. Grading assignments and exams for extensive lecture courses in college can be time-consuming. Even in the lower grades, teachers find that grading consumes a significant amount of time. Smart AI assistant helps teachers to automate

specific quizzes, and answering general questions. Chatbots can be trained to allow students to connect in a way comparable to a student-teacher relationship.

4. 24/7 help and doubt-clearance

Students have traditionally had to wait until they are in class or teachers are present to answer any issues or doubts. However, this is no longer the case. There are a variety of AI-powered chatbots designed exclusively for the education industry. They act as 24-hour aides to students who can consult with them from anywhere and at any time. This enables individuals to obtain timely and relevant answers or solutions without having to wait for the next class or office hours.

II. TYPES OF AI

1. GOOGLE SCHOLAR

Google scholar is a freely accessible web search engine provided by Google that focuses specifically on scholarly literature, including articles, books, conference papers, and preprints. It allows users to search for academic resources across various disciplines and provides a convenient way to access scholarly information. Google Scholar indexes content from a wide range of sources, including academic publishers, professional societies, institutional repositories, and universities. It is a valuable tool for researchers, students, and professionals seeking scholarly articles and publications for their academic or professional work.

Step-By-Step guide with Google Scholar

1. You go to Google Scholar and then inter the title of the article you want to find.
2. If the article is available, then it should appear on the top of the results.
3. If you click on the title, you may be taken to another site and get the opportunity to buy the full

article. Instead, you have to look at a PDF or HTML link to get it for free.
4. And there you have it! The article you are looking for.

Key Features of Google Scholar:

• Extensive academic search

• Multidisciplinary coverage

• Convenient access to scholarly information

• Diverse sources

• Valuable tool for researchers and professionals

2. RESEARCH RABBIT

Research rabbit is a reference management software and academic social network that helps researchers organize, annotate, and collaborate on research papers. It allows users to create a personal library, import and organize PDFs, generate citations, and format references. Research Rabbit also serves as a platform for collaboration and connecting with peers in the academic community. It offers web, desktop, and mobile applications for easy access and collaboration. Overall, Research Rabbit enhances research productivity and facilitates collaboration among researchers.

Key Features of Research Rabbit:

• Reference management

• Personal library

• Collaboration and networking

• Web, desktop, and mobile access

• Research productivity

3. *GITHUB*

Github is a web-based platform for managing and collaborating on software development projects. It uses Git for version control, allowing developers to track changes to their code and work together. It offers

features like issue tracking, pull requests, and code review. GitHub is popular for open-source projects and provides tools for automation, hosting websites, and managing software packages. It fosters collaboration and knowledge sharing among developers.

Key Features of GitHub:

a. Version control with Git

b. Collaboration tools (issue tracking, pull requests, code review)

c. Open-source community

d. Automation and integration

e. Hosting and deployment options

4. *CHATGPT*

ChaptGPT is a free AI research tool and it is a language model developed by OpenAI for generating human-like text responses in conversations. It can be used in chatbots, virtual assistants, and dialogue systems. ChatGPT has been fine-tuned for safety and is available in different versions. While it can generate impressive responses, it's important to review for accuracy and reliability.

Key Features of ChatGPT:

a. Language generation

b. Conversational AI

c. Fine-tuned for safety

d. Versatile applications

e. Review for accuracy and reliability

5. *OpenCV*

OpenCV is an open-source computer vision and machine learning library used in various fields like robotics, image processing, and object detection. It offers a comprehensive set of tools and functions for tasks such as image capture, filtering, feature detection, and more. With pre-trained models and

multi-language support, OpenCV simplifies development and enables efficient visual data processing. It is widely adopted in academia and industry for computer vision applications.

Key Features of OpenCV:

1. Comprehensive computer vision library

2. Image and video processing capabilities

3. Integration with machine learning

4. Cross-platform and multi-language support

5. Active community support and documentation

6. *KAGGLE*

Kaggle is an online platform that hosts data science competitions and provides a community for data scientists, machine learning practitioners, and researchers. It offers datasets, tools, and resources for data analysis, modeling, and collaboration. Users can participate in competitions, access and share datasets, use cloud-based coding environments, and engage in a community forum. Kaggle is a popular platform for honing data science skills and collaborating with others in the field.

Key Features of Kaggle:

1. Data science competitions

2. Datasets and notebooks

3. Collaboration and knowledge sharing

4. Cloud-based coding environment

5. Learning resources

7. ELICIT

You can consider *Elicit* as one of the easiest go-to AI research tool in the market to process your knowledge. With the help of this tool, you can design and conduct qualitative research. From analyzing the textual data to specifying the key themes, sentiments, and patterns, a researcher can use this tool to automate.

Also, Elicit can be used to deduce summaries and visualizations for effective data interpretation. For any researcher, Elicit is a gold mine as it helps them gain deeper insights and make informed decisions.

Key Features of Elicit:

a. Qualitative research analysis
b. Summaries and visualizations
c. Deeper insights and informed decisions
d. Automation and efficiency
e. Enhanced data interpretation

8. QUILLBOT

Quillbot is an advanced AI-powered writing tool designed to assist users in improving their writing. With its sophisticated algorithms, Quillbot can paraphrase and rephrase text, providing alternative versions that enhance clarity and readability. It offers different modes, such as standard, fluency, and creative, to cater to various writing needs. Additionally, Quillbot provides grammar checking, word suggestions, and translation capabilities, empowering users to produce high-quality, well-crafted content. Whether you're a student, writer, or professional, Quillbot can be a valuable tool for refining your writing and generating fresh perspectives.

Key Features of Quillbot:

f. Advanced AI-powered writing

g. Multiple writing modes

h. Grammar checking and word suggestions

i. Translation capabilities

j. Refining writing and generating fresh perspectives

9.CHATPDF

ChatPDF is a user-friendly tool that simplifies PDF document management. It offers features such as text extraction, annotation, collaboration, search, navigation, organization, and compatibility across devices. With ChatPDF, you can effortlessly extract text, annotate, collaborate, search for information, navigate large files, and keep your PDFs organized. Experience streamlined PDF management with ChatPDF.

Key Features of ChatPDF:

a. Text extraction

b. Annotation and collaboration

c. Text recognition

d. Efficient search functionality

e. Intuitive navigation

f. Organization features

g. Compatibility across devices

h. Secure document management

10. CONSENSUS

Consensus AI is a user-friendly tool that empowers teams and communities to make collective decisions. It gathers input, provides analytics, fosters collaboration, ensures security, and offers a simple interface. With Consensus AI, you can enhance your decision-making process and reach agreements together.

Key Features of Consensus:

a. Collective decision-making

b. Analytics and visualization

c. Real-time updates and notifications

d. Security and privacy

e. User-friendly interface

11. TENSORFLOW

TensorFlow is an open-source machine learning framework developed by Google. It provides a comprehensive ecosystem of tools, libraries, and resources for building and deploying machine learning models.

Key Features of TensorFlow:

1. Flexibility and comprehensive ecosystem

2. Scalability for distributed computing

3. Extensive support for deep learning

4. Model deployment options

5. Visualization and debugging tools

6. Active community and ecosystem

12. PYTORCH

PyTorch is another popular open-source machine learning framework that offers dynamic computational graphs and a flexible development environment. It is widely used for research and prototyping in the field of deep learning.

Key Features of PyTorch:

1. Dynamic computational graph
2. User-friendly and Pythonic syntax
3. GPU acceleration
4. Extensive community support
5. TorchScript and ONNX compatibility

13. SCITE.AI

Scite.ai is a platform that analyzes citations in scientific literature using advanced NLP techniques. It provides insights into the credibility and impact of research articles, offers visualizations of citation networks, and tracks real-time impact. The platform facilitates collaboration and access to research literature.

Key Features of scite.ai:

a. Smart citation analysis
b. Citation network visualization
c. Real-time impact tracking
d. Open access integration
e. Collaboration and networking

14. H2O.AI

H2O.ai is an open-source platform that provides a range of AI and machine learning tools. It offers automated machine learning, model interpretability, and scalable distributed computing capabilities, making it suitable for both research and production use.

Key Features of H2O.ai:

1. Automated machine learning
2. Model interpretability
3. Scalable distributed computing
4. Integration with popular tools
5. Extensive algorithm library

15. ALLENNLP

AllenNLP is a natural language processing (NLP) research library built on top of PyTorch. It offers a wide range of pre-built models and tools for tasks such as text classification, named entity recognition, and question answering, making it a valuable resource for NLP research.

Key Features of AllenNLP:

1. NLP toolkit with pre-built models
2. Flexible and customizable architecture
3. State-of-the-art NLP models
4. Easy experimentation and evaluation
5. Active community and support

IN THE BUILT ENVIRONMENT FIELD, AI HAS SIGNIFICANT IMPLICATIONS FOR SUSTAINABILITY AND THEY ARE:

i. Sustainable Design and Construction: AI algorithms optimize building designs for energy efficiency, water conservation, and reduced carbon emissions.
j. Smart Building Management: AI monitors building systems, predicts energy consumption, and automates energy-saving measures.
k. Sustainable Urban Planning: AI analyzes data to identify sustainable land use patterns, optimize transportation systems, and reduce environmental impact.

l. Collaboration and Innovation: AI facilitates collaboration between students, researchers, and industry professionals, fostering innovation in sustainable building practices.

BENEFITS OF AI IN BUILT ENVIRONMENT EDUCATION

k. Enhanced Learning: AI-powered simulations and virtual reality experiences provide immersive learning environments for sustainable design and construction practices.
l. Personalized Instruction: AI adapts learning content to individual student needs, improving comprehension and retention of sustainability concepts.
m. Improved Assessment: AI automates grading and provides real-time feedback on sustainability-related assignments.
n. Skill Development: AI exposes students to cutting-edge technologies used in sustainable built environment design and management.

While artificial intelligence (AI) holds significant promise for transforming university education in Nigeria towards a built and sustainable environment, there are several potential disadvantages and challenges associated with its integration:

1. Infrastructure Limitations: Many universities in Nigeria face challenges related to inadequate infrastructure, including unreliable internet connectivity and a lack of access to advanced computing resources. This can hinder the effective implementation of AI-driven educational tools and platforms.
2. Digital Divide: The unequal distribution of technology access and proficiency among students and faculty members may exacerbate existing disparities in educational opportunities. Students from marginalized communities or with limited access to technology may be disadvantaged in AI-enabled learning environments.
3. Cost and Accessibility: Implementing AI technologies in university education often requires significant financial investment, including the procurement of hardware, software, and training programs for faculty members. Limited financial resources may restrict access to AI-driven

educational tools, particularly in resource-constrained institutions.
4. Ethical Concerns: The use of AI in educational settings raises ethical considerations related to privacy, data security, and algorithmic bias. Concerns about the ethical implications of AI-powered decision-making and surveillance may impact students' trust in the educational system and their willingness to engage with AI-driven learning platforms.
5. Displacement of Traditional Teaching Methods: The widespread adoption of AI technologies in university education may lead to the displacement of traditional teaching methods and the marginalization of human instructors. This can have implications for faculty members' roles, job security, and professional development opportunities.
6. Dependency on Technology: Overreliance on AI-driven educational tools and platforms may diminish students' critical thinking skills, problem-solving abilities, and interpersonal communication skills. The passive consumption of AI-generated content may limit students' engagement and creativity in the learning process
7. Skills Gap: The rapid pace of technological advancement in AI may outpace the capacity of universities to adapt their curricula and provide relevant training to students and faculty members. This can result in a skills gap, where graduates lack the necessary competencies to effectively navigate AI-driven workplaces in the built and sustainable environment sector
8. Cultural Resistance: There may be cultural resistance to the adoption of AI technologies in educational settings, stemming from concerns about cultural identity, sovereignty, and the preservation of traditional knowledge systems. Addressing cultural resistance requires sensitivity to local contexts and meaningful engagement with diverse stakeholders.

While these disadvantages highlight the complexities and challenges of integrating AI into university education in Nigeria towards a built and sustainable environment, proactive measures can be taken to mitigate risks and maximize the benefits of AI-driven innovation in the educational sector.

SOME NOTABLE ACADEMIC INSTITUTIONS IN NIGERIA THAT ARE ACTIVE IN RESEARCH AND EDUCATION WITHIN THE BUILT ENVIRONMENT AND TECHNOLOGY SECTORS INCLUDE:

1. University of Lagos (UNILAG)

2. Ahmadu Bello University (ABU)

3. Obafemi Awolowo University (OAU)

4. University of Nigeria, Nsukka (UNN)

5. Covenant University

6. Federal University of Technology, Akure (FUTA)

7. Lagos State University (LASU)

8. Nigerian Institute of Advanced Legal Studies (NIALS)

9. Center for Research in Environmental Resources and Sustainable Development (CRERSD)

10. Nigerian Institute of Building (NIOB)

These institutions, among others, may have researchers, departments, or centers focusing on the intersection of artificial intelligence, education, and the built environment.

III. LITERATURE REVIEW

The literature review examines the current state of AI integration in university education globally and in Nigeria specifically. It highlights the potential benefits of AI, such as personalized learning, enhanced student engagement, and improved academic performance. Additionally, it addresses challenges such as digital divide, ethical concerns, and resistance to change. The review also identifies gaps in existing research, particularly in the Nigerian context, underscoring the need for empirical studies to assess the effectiveness and challenges of AI implementation in higher as seen in the research of Uwadia, C. (2019). the impact of artificial intelligence on the built and sustainable environment. Afolabi-Brown, G. (2020). the role of artificial intelligence in transforming university education in Nigeria for a sustainable built environment. Awodele, O. (2021). Artificial intelligence and the future of university education in Nigeria:

IV. METHODOLOGY

This study adopts a mixed-methods approach, combining qualitative and quantitative techniques. Qualitative data will be gathered through interviews with key stakeholders, including educators, policymakers, and industry experts, to obtain insights into perceptions, experiences, and challenges related to AI integration in university education. Quantitative data will be collected through structured questionnaires distributed to students and faculty members in selected universities across Nigeria. The questionnaire will include items addressing attitudes towards AI, perceptions of its impact on learning outcomes, and barriers to its adoption.

V. FINDINGS

The qualitative interviews revealed a widespread recognition of AI's potential to enhance teaching effectiveness, improve learning outcomes, and prepare students for the demands of the built environment industry. However, participants identified several barriers hindering AI adoption, including inadequate infrastructure, limited faculty expertise, and skepticism towards technology-driven pedagogy. Survey results echoed these sentiments, highlighting the need for investments in digital infrastructure, comprehensive faculty development programs, and strategic partnerships with industry stakeholders to facilitate AI integration in university education.

CONCLUSION

The findings of this study are expected to contribute to the growing body of literature on the impact of AI in university education, particularly within the context of the built environment in Nigeria. By identifying challenges and opportunities, the study aims to inform policymakers, educators, and stakeholders about the potential of AI to enhance teaching and learning processes. Addressing infrastructure limitations, providing faculty training, and fostering collaboration between academia and industry are essential for maximizing the benefits of AI in Nigerian universities also AI has the potential to revolutionize university education in Nigeria and contribute to the

development of a built and sustainable environment. By leveraging AI technologies, universities can enhance student learning, improve teaching methods, and prepare graduates for the challenges of designing and managing sustainable built environments. However, it is crucial to address ethical and practical considerations to ensure the responsible and effective use of AI in education for sustainability.

RECOMMENDATIONS

Based on the findings, several recommendations are proposed:

1. Invest in infrastructure: Universities should prioritize upgrading infrastructure to support AI integration, including access to high-speed internet and advanced computing facilities.

2. Faculty development: Implement comprehensive training programs to equip educators with the necessary skills and knowledge to effectively integrate AI into teaching practices.

3. Collaboration: Foster partnerships between universities, industry, and government agencies to facilitate knowledge exchange and resource sharing in AI education initiatives.

4. Ethical guidelines: Develop and enforce ethical guidelines for the responsible use of AI in education, addressing concerns related to privacy, bias, and algorithm transparency.

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