APPLICATION OF ARTIFICIAL INTELLIGENCE IN DEVELOPING A CONTEMPORARY NIGERIA

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Abstract

Artificial Intelligence (AI) refers to the capability of a digital computer or a machine controlled by computers to execute tasks typically associated with human intelligence. This research explores the advantages, future impacts, and challenges of AI in Nigeria. It examines the concept and origins of AI and highlights its relevance to the Nigerian context. The study particularly discusses the challenges AI faces in Nigeria and presents applications showing its potential to boost the nation's economy. The paper also explores the future of AI in global and Nigerian technological landscapes. Using a survey research method, the Ministries of Education, Finance, Agriculture, Health, and Works in Awka, Anambra state, formed the study area. A sample size was selected from the population of 420. Findings revealed that AI can assist in enhancing ministry coordination, lowering costs, and improving fiscal planning in Nigeria. Based on the research outcomes, recommendations are made to encourage AI's development, such as supporting research innovation and developing policies around AI adoption in workplace management, monitoring, and recruitment.

Keywords: Artificial Intelligence, Educational Reform, Economic Development, Technology innovation, Digital Development

INTRODUCTION

Artificial Intelligence (AI) is reshaping modern society and work environments. With its increasing adoption in developed nations, AI is recognized as a key driver of the Fourth Industrial Revolution (4IR). By 2025, AI is projected to generate a global market exceeding $35 billion and could double the annual economic growth rates of several economies. It is also anticipated that AI will facilitate collaboration between humans and machines to address some of the world's toughest challenges (Accenture & Gordon Institute of Business Science, 2017).

However, Africa has been slow to adopt these transformative technologies, largely due to challenges such as inadequate infrastructure, knowledge gaps, and limited research capacity (Travaly & Muvunui, 2020). Despite this, significant efforts have been made to integrate AI into sectors like healthcare and finance across the continent, but implementation remains far behind other regions. Researchers argue that African nations, including Nigeria, stand to benefit immensely from fully leveraging AI's economic and technological potential (Travaly & Muvunui, 2020).

Moreso, AI and Machine Learning (ML) researchers has already made notable contributions in several areas, demonstrating positive impacts on society (Zhang & Lu, 2021). While AI continues to evolve, offering vast potential in areas such as Law, health, Security, and transportation, it also faces ethical, social, legal, and technological problems (Thiebes et al., 2021). Concerns such as AI bias, privacy issues, and misuse of AI technologies (e.g., deepfakes or unauthorized surveillance) have led to decreased trust in AI systems (Obermeyer et al., 2019; Adam et al., 2021; Hill et al., 2020).

In Nigeria, AI has the potential to contribute to sectors like education (Sanusi et al., 2022), security (Falode et al., 2021), energy (Sanusi et al., 2022), and healthcare (Muhammad et al., 2021; Anazodo et al., 2022). However, the adoption of AI faces obstacles such as a lack of awareness, insufficient knowledge, poor infrastructure, and trust issues (Imhanyehor et al., 2021). Addressing these challenges through improved data, algorithms, and computing capabilities is essential for

better AI performance and its application across industries, including healthcare, retail, automotive, and finance, as seen in other parts of the world (Zhang & Lu, 2021). Enhancing these conditions in Nigeria will foster more reliable AI systems and trust in their decision-making capabilities.

Concept of Artificial Intelligence

Artificial Intelligence (AI), also referred to as machine intelligence, is the demonstration of intelligence by machines, unlike the natural intelligence observed in humans and animals (McCorduck, 2004). This means machines can be designed to perform tasks typically associated with intelligent beings. AI is a branch of computer science that focuses on creating intelligent machines capable of working and reacting like humans with the help of digital electronics.

The term often describes the process of developing systems equipped with human-like cognitive abilities, however, reasoning, discovering meaning, generalizing, and learning from past experiences are part of the process. From the time of the digital computer's development in the 1940s, computers have proven their ability to handle complex tasks, including proving mathematical theorems and excelling in games like chess.

Benefits of Artificial Intelligence

In light of the COVID-19 pandemic, the rapid advancement of artificial intelligence technology has captured global attention and achieved considerable success. AI is playing an increasingly important role in both our lives and the global economy, with noticeable impacts on various sectors. Leading industrialized nations, such as the United States, the United Kingdom, and European countries, are racing to capitalize on AI's benefits (Ding, 2018).

AI presents promising opportunities for generating government revenue when effectively implemented. As noted by Russell (2019), several keyways AI directly contributes to revenue generation today include:

1. As AI technology continues to evolve, it will become a powerful tool for businesses. AI can address tax evasion by improving tracking of enterprises' tax liabilities, reducing the issue of double taxation.

2. Government revenue agencies that adopt AI early will be well-positioned to meet future needs. AI can help decision-makers focus on improving revenue collection through targeted awareness campaigns.

3. AI enhances efficiency, enabling people to explore new opportunities, create new revenue streams, and achieve cost savings. Throughout history, technological advancements like electricity and automobiles have significantly improved human life, and AI has the potential to surpass these achievements.

4. In the economic realm, AI can support job evolution by complementing human efforts rather than replacing them. The collaboration between humans and machines will boost productivity. Additionally, AI can reduce human error and provide data analysis that leads to cost savings.

Future Impact of Artificial Intelligence on Nigeria

In Healthcare

Nigeria's health sector faces numerous challenges, including a shortage of skilled professionals and inadequate infrastructure for development (Okoroafor et al., 2021). Many rural areas remain understaffed due to poor social amenities such as electricity, telecommunications, and working conditions (Okoroafor et al., 2021). Factors such as low-risk awareness among healthcare workers, cost barriers, and community beliefs further hinder access to services like sexual and reproductive healthcare (WHO, 2019). However, AI has proven useful in areas such as medical imaging, where neural networks can classify medical images from raw data with increasing accuracy (Folke et al., 2021). In Nigeria, AI can bridge the gap by improving medical predictions and diagnostics, especially in underserved regions.

In Energy

Nigeria's oil and gas industry has suffered significant revenue losses due to issues like oil spills, with over 700 spills recorded annually, causing environmental and economic damage (Ejiba et al., 2016). Machine learning algorithms can analyze data patterns and identify irregularities in

performance, aiding energy companies in making data-driven decisions to optimize operations (Nisi et al., 2015). This technology could enhance efficiency in the energy sector and reduce losses.

In Agriculture

Agriculture is vital for reducing poverty in Nigeria. Studies show that increased youth participation in farming can significantly raise per capita farm income and reduce poverty rates (Omodero, 2021). However, many farmers lack the skills to manage pests, and farming costs have risen, affecting productivity (Osabohein, 2021). Global food production should be increased by an estimated 60-70% to feed the increasing population of 9 billion people by 2050 (Rockstrom et al., 2017). Using ML in four sectors (reproduction, production, processing, and distribution) in Agriculture could be very beneficial. Machine learning has the potential to revolutionize agriculture by predicting crop yields, detecting diseases, forecasting weather, and optimizing production planning and distribution (Ben & Hanana, 2021). These applications could help Nigeria increase agricultural output to meet global food demands.

Challenges in the Application of Artificial Intelligence in Nigeria

Several obstacles hinder Nigeria's full adoption of artificial intelligence:

1. Investment: AI technology requires significant financial resources, which the Nigerian government may struggle to provide. The costs of installation, maintenance, and the need for high computing power make it unaffordable for many businesses.

2. Software Malfunctions: AI relies on machine algorithms, which means decision-making power is delegated to automated systems. This can make it difficult to trace errors and leaves human operators with limited control over the system.

3. Lack of Political Will: A lack of consistent political commitment to transitioning from traditional methods to digital processes can stall AI adoption. Shifting government priorities and inconsistent policies often hinder long-term technological progress (Dike, 2019).

4. Limitations: Like all technologies, AI has its limitations. It cannot perform every task, but it can open new job opportunities across various industries.

5. Data Security: AI systems rely on vast amounts of sensitive and classified data, which raises concerns about data breaches and identity theft. Managing these security risks is essential as AI systems become more widespread.

6. Algorithm Bias: AI decisions are only as reliable as the data used to train them. If training data contains biases related to race, gender, or other factors, the AI system may yield unfair or unethical outcomes.

7. Lack of Technological Advancement: Nigeria's AI development could be hampered by inadequate infrastructure and a lack of skilled personnel.

Theoretical Framework

This research is grounded in the theory of technological determinism, which was originally conceptualized by Thorstein Veblen and further developed by Karl Marx and Marshall McLuhan. Technological determinism posits that technology is a driving force behind societal transformations, influencing social structures and cultural values (McLuhan, 1964). This theoretical framework is particularly useful for analyzing how AI could reshape education in Nigeria. Technological determinism emphasizes the role of technology in catalyzing educational reform, suggesting that the integration of AI into the Nigerian education system could enhance learning processes, administrative efficiency, and educational equity (Smith & Marx, 1994). This study applies this framework to explore the potential for AI to influence and transform the educational landscape in Nigeria.

Methodology

The study utilized the library research technique to gather data for the work. Most of the information sources were drawn from previous literature. Thus, secondary sources were used to gather data. The data were gathered from journals, periodicals, textbooks, and online materials. In addition, critical observations by the researchers were also utilized to analyze events relating to the phenomenon.

Conclusion

Artificial intelligence has revolutionized numerous industries and has the potential to significantly benefit Nigeria's economy and society. AI's ability to mimic human reasoning has been a focus of research for years, and it has made remarkable strides in various fields. To maximize AI's advantages, Nigeria must prioritize its development and integration. AI can perform tasks typically requiring human input by processing large datasets and recognizing patterns. This technology holds immense promise for enhancing several sectors in Nigeria, from healthcare to education and beyond.

Recommendations

1. Innovative research and policy frameworks should be established for the integration of AI into workplace management and recruitment processes, particularly in industries like media.

2. Standards must be developed to ensure transparency in AI development, tracking the use and origin of datasets throughout their lifecycle.

3. Nigeria should adopt unbiased and ethical strategies to address AI-related challenges and improve trust in AI systems.

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