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TRANSFORMING ADULT EDUCATION IN THE 21ST CENTURY THROUGH ARTIFICIAL INTELLIGENCE IN NIGERIA: INNOVATION, IMPACTS, AND ETHICAL CONSIDERATIONS

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Abstract

The 21st century has witnessed a significant transformation in socio-economic, politics, religion, commerce and particularly adult education which is driven by technological innovations, advancements and modernization. Artificial Intelligence (AI) has emerged as a major innovation in adult education, offering personalized learning experiences, feedback mechanism, adaptive assessments, accessibility and enhanced learner-centered engagement and participation. This article explores the potential of AI in transforming adult education in Nigeria, the challenges and its impact on learning outcomes, and ethical considerations that arise. Finding revealed that AI is an inevitable modernization and transformation in all human endeavors particularly in adult education by providing tailored learning pathway, improving accessibility, proximity, and fostering lifelong learning at the comfort of the learners. The paper reveals that transformation of adult education in Nigeria through AI driven education would reduce educational inequality and digital illiteracy, increase access to teaching and learning, instill managerial skills, solve personal problems, enhance lifelong activities, and reduce illiteracy both in the urban and rural areas. On the basis of this, the paper recommended the need for careful consideration of ethical issues, such as data privacy, bias, and transparency among others.

Keywords: Transformation, Adult Education, Artificial Intelligence, Innovation, Impact, Ethical Considerations.

Introduction

Education is a foundational pillar which contributes towards construction and maintenance of social order in any society. Education is a process through which individuals particularly adults develop their abilities, attitudes and other forms of behaviours which are of positive value to the society where they live (Okafor & Teibowei, 2024). Owede (2022) believes that education in Nigeria is a tool 'par excellence' for effecting national development. It is obvious that for any society to achieve national development the adult population which is the engine room for economic prosperity must have basic education, digital literacy inclusive in order for them to participate in the developmental paradigm.

Education is a fundamental driver of social, technological, and economic development of any nation and the integration of Artificial Intelligence (AI) helps to reshape the educational landscape in the 21st century. Education is an important key to transforming people's culture, social, and religious belief which promotes societal change. It is an instrument for bringing about changes in knowledge, values, behaviours, and life styles required to achieve sustainability and stability within and among societies (Rajaj & Chiv, 2009). Adult Education is a human engineered resource development which is an organized learning activity within an organization in order to improve performance or personal growth for the purpose of improving in the job, the individual, or the society where the person lives (Bello, 2022).

Education therefore serves as a bridge that links an individual and his community, reduces unemployment, maintains peace and harmony and enhances community development and well-being. Seya (2014) opines that investment in the development of human capital through education (adult education) is crucial for developing a labour force and managerial know-how capable of competing with the today's global economy. Invariably, transforming adult education through AI will contribute not only to human capital development of individuals but instill in them managerial skills to participate in the decision making process, evaluation, assessment, and development of their societies; it will also reduce illiteracy and enhance lifelong learning among the citizens. Ouane (2009) believes that adult education is now more than ever emerging as an empowering tool of Artificial Intelligence (AI) transformation capable of liberating and harnessing the creative

forces of adult citizens. It enhances community development and improves wealth of nations through technological innovations. It is an education that enriches citizens' knowledge, improves their understanding of changes in the environment and helps them to adapt to the positive changes brought about by AI.

The 21st century Information and Communication Technology (AI inclusive) transformation of adult education is attached to the changing technological world, which inevitable impact global modernization and development of a sustainable skills and knowledge built innovation. It brought a new innovation in the transformation of world order. Despite the historical, scientific and technological revolutions AI has enhanced the pedestal of change, innovation, dynamism, creativity and proffered priority for ethical engagement and participation, (Oji & Okemini, 2022). The changes in information and communication technology have also improved the process of teaching and learning at the formal, semi-formal and non-formal levels of education. Education in its entirety instills managerial skills to beneficiaries which enable them to organize, consult, manage, evaluate, implement and solve their personal needs and prioritize societal welfare and needs for community well-being and development.

Skillful innovation and impact engagement, ethical considerations, and adult education can only be made possible if AI is made human centered programme and this can be achieved through AI driven adult education. It is on this premise that Omona in Okafor and Izo (2025) insist that information in the 21st century is regarded as one of the most fundamental rights requirement for personal and social development, and for citizens' engagement in effective governance. Effective AI services will enhance socio-economic development by creating a knowledge-based society and empowering people especially marginalized people (rural citizens) and those living in poverty to exercise their rights, be economically active, learn new skills, enrich cultural identity and take part in decision making process (Okafor & Izo, 2025). International Federation for Libraries Association (IFLA, 2013b) states that community development which is part of Adult Education is an approach for improvement that is geared towards the upliftment of community members to a better living by solving the community needs. Nwankwo (2011) believes that adult education is tailored towards enhancing participants' better living both materially, socially and economically. It is a process in which people are taught how to improve themselves through knowledge and skill

acquisition. It enables them towards finding solutions to their problems. In this circumstance therefore, AI driven adult education will transform adult learning and activities to be conceptualized as a change process causing improvement to life activities, needs and programmes, and social relations that are aimed at meeting the needs and aspiration of people with similar historical and cultural heritage (Bello, 2022). It is on the basis of the above discourse that this paper investigates how AI has transformed Adult Education and learning through innovations, technological impact, ethical considerations, and learner participation in the 21st century Nigeria.

Concept of Adult Education

Adult education has been defined by several authors and scholars and each definition is based on the philosophical perspective of the authors or the scholars. Zuofa (2023) opines that adult education and learning entails systematic, ongoing learning activities that adults engage in to acquire new skills and information which will enable them adapt to global changes. This change which comes through AI educational transformation will help built a human sustainable development through adult education and programmes. Education according to Gbesoevi (2019) is a process of training and developing knowledge, skill, mind and character of people. It is a process where the latent abilities of individuals are developed so that they can be useful to themselves and the community at large. However, adult education encompasses all aspect of the formal, informal and non- formal learning process through which people who are considered adults by their community enhance and expand their capacity to live better and work in their own interests as well as their societies, organizations, and communities' interest, (UNESCO,2016). This definition captures adult education as a core component of lifelong learning and education which AI is tailored toward transforming because it involves all forms of education and learning armed at ensuring that all adults participate in their community development. This will impact positively and inculcate in adults of 21st century the innovative programmes that will enhance basic social amenities and initiatives that will provide services for a community, ultimately fostering advancement and development (Dimkpa, 2023).

Knowles, Elwood et al (2015) adduce that the dynamics of adult education lays in the potentials of social transformation to individual beneficiaries in character, skills, literacy, political participation and ethical considerations which enhance community development activities. Asiyai (2015) states that obtaining quality education is the foundation to improving citizens' lives and sustainable development as it is only quality education that can sharpen the minds of the individuals, imbibe technological innovations and help transform the society economically, socially and politically. In addition, Hussain (2013) maintains that adult education programmes confirm increased levels of self-esteem and high levels of knowledge and skills which encourage positive and active engagement of people in their own development and well-being. Adult education programmes should be transformed into learning, participation and engagement to meet the 21st century technological development of the country. It is a human driving force geared toward solving the numerous cultural, political, educational, and socio-economic problems hindering human development. This is why Onyenemezu (2012) asserts that education is a means to provide a balanced individual capable of surviving in his environment and contributing meaningfully towards the survival of that society he belongs. Therefore, adult education becomes a tool that equip individual to improve himself and make him socially, politically and technologically relevant.

It is in this regard that Ekuri, Betiang *et al*, (2022) state that adult education programmes (AI as a component) is the fertilizer needed for development and democracy to take root and grow. It is the invisible ingredient in any successful strategy such as AI for eradicating poverty, illiteracy, superstition, and achieving gender equality. AI is a mechanized instrument that exposes and empowers beneficiaries to be on their own, contribute towards their children education and mostly imbibe in technological development (Ekuri *et. al*., 2022). AI proffers solutions to all human socio-economic, political, religious, and community underdevelopment. Adult education is an education that is programmed to conscientize, sensitize and re-direct adults of a community towards solving their immediate problems and thereafter become useful globally.

Concept of Artificial Intelligence

Artificial Intelligence (AI) is a branch of computer science dedicated to creating systems that emulate human behavior to enhance performance in various scientific and technological fields (Russell & Norvig, 2021). Artificial Intelligence has emerged as a transformative force across various sectors, offering innovative solutions to complex problems in the area of adult education programmes. AI holds the potential to revolutionize traditional teaching and learning methods in adult education and streamline learning at the comfort of adult learners.

In furtherance, Aka and Onoyima (2022) adduce that the use of emerging ICT tools such like AI platforms and devices have become an integral part of education in which case educators, policy makers, facilitators, stakeholders and students had to rely on the use of various technological devices, platforms and tools such as videoconferencing tools and e-learning platforms to aid continue education online. Spector (2012) states that the emerging AI provide opportunities for educators and facilitators to improve their skills and job performances as it introduces flexibility to teaching and learning process, and takes teaching and learning beyond the physical classrooms and face-to-face methodology.

Therefore AI could be seen as the application of electronic media, computers, telecommunication gadgets, digital media, and mobile devices, personal digital assistants (PDAs) for the acquisition, processing, storage, retrieving, and dissemination of information to citizens in other to be abreast of global innovations. Abraham and Bariyaa (2020) are of the opinion that AI as a branch of ICT is a terminology for information and communication system which refers to technology used for collecting, storing, editing, teaching, retrieving and passing on of information in various forms to improve education and enhance adult learning and education at the comfort of their homes or offices.

Information and Communication Technology in education refers to the technology that involves using electronic devices to transmit data, graphics, symbols, sounds, videos, messages, and pictures to achieve specific and broad educational goals and objectives. This is why transforming adult education through AI is of optimal importance as it will promote the need for appropriate technological platform to adequately communicate, educate, interact or interfere with the adult

learners and transmit their progress or challenges to the facilitators or change agents at the comfort of their homes and offices. This will enhance adult education, increase accessibility, reduces cost and improve their participations (Okafor & Izo 2025).

AI transformed adult education promotes transmission of basic skills and concepts that form the foundation of higher order thinking skills and creativity which is enhanced by AI through drill and practice (Okafor & Izo, 2025). It is in this premise that Haddad and Draxier (2002) state that AI contributed to effective learning through expanding access, promoting efficiency and improving the quality of learning and management system for societal well-being and citizens' development.

Transforming Adult Education through Artificial Intelligence in Nigeria

Cambridge Advanced Learners Dictionary (2013) defines transformation as a complete change in the appearance or character of something or someone, especially so that the thing or person is improved. Okafor and Izo (2025) state that Transformation is a process of changing something completely in order to improve on it and meet the society needs or demands. Therefore, the global changes which came as a result of AI revolution took the whole world by surprise. The changes came not only as educational challenges (formal and non-formal) but affected world economy, political, social, tourism and hospitality, and, also health. AI becomes a new way of social interaction, innovation, impactful teaching/learning and ethical considerations.

In other to meet the changes brought about by AI, Asiyai (2015) believes that obtaining quality education (adult education) is the foundation to improving people's lives and sustainable development, societal well-being and participation as it is only quality education that can sharpen the minds of individuals and help transform the society economically, socially, technologically and politically. However, Adult Education in the 21st century faces a lot of challenges which includes among others; changes in workforce, evolving and meeting learners demand and limited resources and accessibility (Okafor & Okafor, 2024). AI transformed adult education and learning will reduce the challenges through personalized learning which will be tailored to individual learning needs. AI driven adult education and programmes provide feedbacks through personalized assessment which will help participants know their progress and identify areas of improvement. AI through chatbots and virtual assistants could enhance learner engagement,

guidance and support through the learning process. These innovational variables are as a result of AI transformation of adult education geared towards meeting 21st century global needs.

AI induce innovational changes could impact significantly to adult education and its programmes. The impact could lead to improve learning outcome, increased accessibility by learners, improve learners' satisfaction and eliminate the old method of face-to-face teaching and learning. Transformed adult education through AI could reach a wider audience, not only those in the urban areas but also those in the rural areas and even the underserved areas (Okafor & Okafor, 2024). The flexibility method of adult education could be an asset to impact positively on the citizens and same time help to accommodate learning at diverse schedules of needs. AI transformed adult education and learning offers numerous benefits to adult participants. However, it raises some important ethical considerations in the area of data privacy, security and bias which AI does not take into consideration. AI thrives on bias, security of the individuals is not protected and decisions are imposed on the learners.

Transforming adult education for effective delivery through AI involves all inclusive promotion of quality e-learning, review of adult education curriculum to meet the demands of the new order. It is a capital investment in adult education and all those stakeholders like the facilitators, policy makers, teachers, supervisors, planners, and change agents must be transformed to understand changes so as to effectively transform adult education to meet the technological demand of AI (Okafor & Izo, 2025). This will help improve human relation, information, teaching and learning, engagement, and bring about social transformation in the country.

Challenges of Transforming Adult Education in Nigeria through Artificial Intelligent

Challenges referred to the obstacles and difficulties associated with adapting AI models to the Nigerian context in adult education. The transformation and digitalization of Artificial Intelligence (AI) in adult education is a significant tool to revolutionize teaching and learning. However, in Nigeria, the transformation and digitalization of AI in adult education faces numerous challenges, ranging from infrastructural deficits to socio-economic and policy-related constraints. Below are

some of the challenges that hinder effective transformation and digitalization of AI in adult education.

Nigeria as a developing country is faced with high level of infrastructural underdevelopment. This infrastructural deficit is a major challenge in implementing AI in adult education in Nigeria particularly in the rural areas of the country. Many educational institutions (adult education) lack basic amenities such as reliable electricity and internet connectivity which are essential for integrating AI technologies. It is in this instance that Ajadi, Salawu *et al*, (2008) insist that the digital divide in Nigeria significantly affects the adoption of technology in education, especially in underserved communities. However, this challenge could be overcome if government at all levels could invest on reliable electricity, improve internet connectivity and enhance other AI enabled devices to support digitalization.

The high level of digital illiteracy among Nigerian adults and facilitators is a great factor hindering transformation of AI in adult education and programmes. Many adults lack the skills to interact with AI-driven educational platforms while many facilitators do not have the technical knowledge to integrate AI tools into their teaching practices. As Okebukola (2009) points out, the lack of capacity-building initiatives for teachers in technology adoption hinders educational innovation. This challenge could be overcome if government provides digital training for adults' learners and facilitators.

The cost of developing, implementing, and maintaining AI system at the initial stage which requires hardware, software, and technical expertise poses a significant barrier for many educational institutions such as adult education and learners in Nigeria, especially given the country's economic challenges. UNESCO (2019) highlights that cost is a critical factor hindering the digitalization and adoption of emerging technologies (AI) in developing countries. The government should strive to offer incentives and fund educational institutions and individuals that adopt AI in adult education.

The economic disparities in Nigeria mean that many adult learners may not afford AI-enabled devices or internet services. This challenge might inadvertently exclude marginalized groups, contrary to its goal of inclusivity (World Bank, 2022). Adult education as a lifelong education

thrives on inclusiveness and the government should implement policies to address economic disparities to enhance equitable access to AI platforms.

Conclusion

The world has become a global community due to the invention and introduction of technology in all facets of human activities including education (formal and non-formal). Artificial Intelligence therefore has the potential to transform adult education in the 21st century, through personalized learning experiences, assessment, proximity and enhanced learner engagement participation. However, careful consideration of ethical issues is essential to ensure that AI is fair, transparent and protect the personality of all adult learners. By harnessing the potential of AI, we should create a more inclusive, effective and sustainable adult education programmes and activities. It is inevitable therefore that the 21st century adult education and learning must be adaptive, communication and technology driven in order to meet AI system needs of the 21st century society.

Recommendations

The following recommendations are made based on the outcome of this paper.

1. It is imperative to establish measures that will protect adult learners' privacy, bias and transparency. This is necessary because AI does not consider the personality of the users.
2. AI transformed adult education will help to eliminate digital illiteracy, increase participation and enhance accessibility. This implies that the facilitators, stakeholders among others must understand the benefits of AI and conscientize the adult learners about the benefits and the limitations in order to promote holistic adult learning activities.
3. AI platforms should be designed to maintain fairness, transparency and learner-centered. This will help to create all inclusive adult education programmes.
4. The curriculum of Adult and Non-formal Education should be redesigned to accommodate digital literacy programmes and technological innovations. The government should offer incentives and fund organizations and individuals that embodied AI in adult education.

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