Managing Human-Centred Values with 5ir Technologies: The Role of Educational Leaders in Senior Secondary Schools, Nigeria

By

Dr. Vivian Tochukwu Ibe
Department of Educational Management,
Faculty of Education, University of Port Harcourt
vivian.ibe@uniport.edu.ng

&

Oliobi, Getrude I. Ph.D
Department of Educational Management,
Faculty of Education, University of Port Harcourt
getrude@gmail.com

Abstract

This theoretical study investigates the strategic role of educational leaders in managing the integration of 5IR technologies within Nigeria's senior secondary schools, with an attention on sustaining humanistic principles in tech-driven learning environments. The Fifth Industrial Revolution (5IR) is a transformative age marked by the convergence of modern technologies, artificial intelligence (AI), robotics, and the Internet of Things (IoT) with key human-centred values such as empathy, ethics, creativity, and cooperation. Using Transformational Leadership Theory, Humanistic Learning Theory, Ethical Leadership Theory, and the Techno-Ethical Paradigm of 5IR, this study provides a theoretical analysis of the implications, opportunities, and ethical challenges. These arise from the incorporation of human agency and intelligent machines in education. The study examines international trends, Nigeria's educational system, and the current leadership gap in fostering inclusive, emotionally intelligent, and morally upright teaching approaches. Some primary proposals include developing a national digital ethics policy, providing professional development to ethical tech leaders, and reforming the curriculum to integrate digital literacy with core human values. The study concludes that visionary and ethically trained educational leadership is very important in directing Nigerian education through a value-aligned integration of 5IR technologies.

Keywords: Leadership, Fifth Industrial Revolution, Human-centred Values, ethical technology, digital ethics.

Introduction

The path of industrial revolutions reviews the constant interaction between technological advancement and socio-economic transformation. Historically, the First Industrial Revolution in the late 18th to early 19th century, presented the mechanization of production through steam and water power, increased productivity, and laid the foundation for urban industrial economies. The Second Industrial Revolution in the late 19th to early 20th century, initiated mass production, electricity, and the internal combustion engine, further transforming industries and labour systems (Schwab, 2016).

The Third Industrial Revolution, or the Digital Revolution, became known in the mid-20th century and was depicted by the rise of electronics, computers, and information technology. Its emergence revolutionized data processing, communication, and, in the end, the global economy. Lately, the Fourth Industrial Revolution (4IR), hyped by Klaus Schwab, has launched cyber-physical systems, the Internet of Things (IoT), Artificial Intelligence (AI), and biotechnology. It gave special value to automation, connectivity, and data exchange, often resulting in concerns about human redundancy and ethical dilemmas (Schwab, 2017; OECD, 2023).

The Fifth Industrial Revolution (5IR) emanated as a model that seeks to re-humanize technology in reaction to the perceived dehumanization of work in the 4IR. 5IR is the collaboration between humans and intelligent machines to advance innovation, creativity, empathy, and well-being. It pictures a future where technology, rather than replacing human values, accelerates them (Marwala, 2023; Mishra et al., 2022). Empathetic AI, collaborative robotics (cobots), and human-augmentation systems, which make up 5IR technology, are being made to cooperate with human-centred values, including ethics, emotional intelligence, and social inclusion. For instance, AI is progressively being advanced for efficiency and to acknowledge human emotions and respond with empathy essential in fields like education, healthcare, and social services (Henriksen et al., 2022). Educational leadership is notably important in this context because leaders are expected to direct the ethical adoption of these technologies in ways that uphold human dignity, encourage inclusive innovation, and empower learners rather than marginalize them. Empathy-based leadership is a cornerstone of this revolution and distinguishes it from the previous industrial model (Benešová & Tupa, 2021). The Fifth Industrial Revolution marks a transformational shift

toward technological humanism, wherein machines and digital systems work alongside human creativity, ethics, and emotion to build a more inclusive and sustainable society.

Consequences of COVID-19 made the education sector in Nigeria slowly embrace emerging technologies such as AI, virtual learning environments, and mobile platforms. The National Policy on ICT in Education supports technology integration, but limitations in the system, like a shortage of infrastructure, low digital literacy among teachers, and irregular funding, prevent progress (Adu et al., 2021; Yakubu & Dasuki, 2023). Public and rural schools delay in operation because of insufficient resources and support, while urban and private schools have begun to use digital tools during the pandemic (Onyema et al., 2021; Iwuanyanwu & Ugwu, 2022). Some urban institutions are proceeding with AI-based learning systems, supported by NGOs or private sector initiatives. However, lack of digital access, training, and leadership support has made the adoption very difficult in public secondary schools (Okoye & Ogbomo, 2022). Ethical considerations like data privacy, algorithmic bias, and potential erosion of human values worsened technology integration (Olanrewaju et al., 2023). There is an emerging urgency for an effective framework that places precedence on human-centred educational goals alongside digital transformation as Nigeria steers both 4IR and 5IR.

In this context, balancing technological advancement with empathy, ethics, creativity, and collaboration is crucial. While digital tools offer efficiency, they cannot replicate the emotional intelligence and ethical reasoning of human educators (Henriksen et al., 2022). Inclusive teaching requires an ethical structure that stops supervision risks and marginalization (Mishra, Mehta & Henriksen, 2022). Also, creativity and collaboration must be cultivated to stop overly technocratic education systems that subdue social-emotional growth (Dede et al., 2021; OECD, 2023). The Fifth Industrial Revolution, led by ethical leadership, handles these issues by integrating human and machine intelligence (Marwala, 2023; Schwab & Malleret, 2021). In Nigeria's regional and social inequalities situation, educational leaders must encourage inclusive, empathetic, and culturally grounded digital adoption (UNESCO, 2022; Olanrewaju et al., 2023).

The Fifth Industrial Revolution (5IR) in education is changing our education; therefore, there is a need for educational leadership to manage and sustain human-centred values. Traditional models sometimes do not have the vision, training, and frameworks to lead in this digital era. Leaders must

develop transformational leadership strategies that incorporate digital innovation with nurturing interpersonal relationships, emotional intelligence, and community-based values.

Conceptual Framework

Fifth Industrial Revolution (5IR) Technologies

The Fifth Industrial Revolution (5IR) depicts a transition from the automation-centric structure of the Fourth Industrial Revolution (4IR) to one that focuses on human-machine collaboration, trying to combine technological innovation with human values and emotional intelligence. 5IR recommends a more human-centric teaching where technology is created to serve and to collaborate with humans in emotionally responsive ways, while 4IR emphasizes efficiency and digital disruption through technologies like AI, IoT, and robotics (Marwala, 2023; Schwab & Malleret, 2021). Artificial intelligence (AI) with affective computing capabilities, collaborative robotics (cobots), the Internet of Things (IoT), and emotional intelligence in machines, which are major technologies, enable systems to recognize and respond to human emotions (Henriksen et al., 2022). These tools are gaining growing attention in education to create adaptive learning systems, facilitate smart classrooms, and support inclusive digital teaching.

Human-centred values are the ethical, emotional, and interpersonal conduct that ensure technology promotes human dignity and well-being. The values include empathy, ethics, emotional intelligence, creativity, inclusion, and collaboration. Such values in educational contexts guarantee that students actively engage with digital content and are emotionally active, morally stable, and socially connected (Mishra, Mehta & Henriksen, 2022; OECD, 2023). As emerging technologies become more established in learning environments, there is a need for structured systems and curricula that encourage kind communication, critical thinking, and collective problem solving (capacities that machines cannot originate and which remain very important for human progress in a digital age).

Educational leadership in the context of 5IR must transcend routine administration to embody visionary**,** transformational, and ethical leadership. Visionary leaders express a clear, future-oriented educational mission that collaborates technological growth with human values. Transformational leaders motivate and authorize teachers and learners to innovate, adapt, and collaborate in passing complicated digital changes (Bush, 2021, & Fullan, 2022). Ethical leadership guarantees that decisions around the adoption and use of technologies in schools

preserve principles of fairness, inclusion, and respect for human dignity (Olanrewaju et al., 2023). In Nigeria's regional and social context, inequalities are obvious; such leadership is essential to make sure that the placement of 5IR technologies is equitable, culturally sensitive, and pedagogically sound.

Klaus Schwab's The Great Narrative for a Better Future (2021) and Tshilidzi Marwala's 5IR: When Humans Meet Intelligent Machines (2023) present very important ideas for blending human-centred values with 5IR technologies in education. Schwab (2021) encourages ethical, sustainable, and inclusive digital transformation, stressing that institutions like schools should cultivate empathy, creativity, and global citizenship through stakeholder-driven approaches. His work demands that educational leaders treat as very significant over ordinary technological edge. Marwala (2023) concentrated on the unification of human consciousness and intelligent machines, stressing that 5IR should improve instead of replacing human abilities. He prescribes integrating emotional intelligence and sociocultural awareness in both machine design and education. This concept aptly applies in Nigeria, where digital inclusion needs to address existing disparities. Marwala's demand for human-machine collaboration requires leaders to devise strategies toward ethically driven, transformative education. Generally, these works supply a powerful ethical and strategic foundation for managing 5IR technologies in schools while preserving important human values like empathy, inclusion, and collaboration (Schwab, 2021; Marwala, 2023).

Theoretical Framework

This study employed a multidimensional theoretical foundation that combined leadership, learning, ethics, and technological innovation. The following theories show how educational leaders can harmonize the transformative potential of Fifth Industrial Revolution (5IR) technologies by preserving and encouraging human-centred values in senior secondary schools in Nigeria.

Transformational Leadership Theory (Burns, 1978; Bass, 1985)

Educational leaders, according to transformational leadership theory, are change agents who inspire, motivate, and encourage followers in achieving greater success and personal growth. Burns (1978) introduced the concept of leadership based on moral purpose and value-driven action, while Bass (1985) expanded it into four main components: idealized influence,

inspirational motivation, intellectual stimulation, and individualized consideration. Transformational leaders in 5IR schools administer technological change at the same time maintaining empathy, inclusion, and ethical responsibility, encouraging a vision-oriented environment that promotes innovation without sacrificing the emotional and moral foundation of education.

Humanistic Learning Theory (Rogers, 1969)

Carl Rogers' humanistic learning theory emphasizes the development of the whole person, focusing on self-actualization, emotional well-being, and learner autonomy. The theory supports a learner-centred approach in which empathy, respect, and trust are foundational to educational relationships. As 5IR introduces intelligent systems and AI-driven learning environments, the risk of depersonalized education increases. Humanistic learning theory comes up with an important position to ensure that technologies do not weaken but support human connection and emotional commitment in the classroom. Leaders using this theory prioritize environments where students feel valued and emotionally safe while working with colleagues and digital systems.

Ethical Leadership Theory (Brown & Treviño, 2006)

Ethical leadership theory explains how leaders overcome moral complexities in authority, influence, and technology. For Brown and Treviño (2006), ethical leadership is demonstrating and supporting acceptable behaviour through personal actions and interpersonal connections. In tech-driven school contexts, where data privacy, algorithmic bias, and access inequality are increasing challenges, educational leaders must demonstrate ethical proactive thinking and uphold ethical standards. This theory supports the premise that leaders must establish a moral example, build an atmosphere of trust, justice and accountability, fairness, and trust in the deployment of 5IR tools in education.

Techno-Ethical Paradigm of 5IR (Marwala, 2023)

Techno-ethical paradigm of the Fifth Industrial Revolution, according to Marwala's (2023), seeks the collaboration of empathy, emotional intelligence, and human-centric ethics into machine learning and AI systems. This paradigm calls into question the value-neutral viewpoints of technology, insisting that digital tools must be planned and carried out in frameworks that uphold human dignity and social cohesion. For educational leaders, this means accepting technologies that

are efficient and ethically match the goals of holistic education. The paradigm calls for inclusive digital strategies that consider cultural sensitivity, emotional impact, and the broader social consequences of automation in learning spaces.

Transformational Leadership Theory, Humanistic Learning Theory, Ethical Leadership Theory, and Techno-Ethical Paradigm of 5IR suggest visionary, emotionally intelligent, ethically educated, and technologically savvy leadership plans for Nigerian secondary schools, promoting empathy, inclusion, creativity, and ethical responsibility.

Global Trends in 5IR in Education

The Fifth Industrial Revolution (5IR) is improving educational systems internationally by incorporating human values with intelligent technologies. 5IR stresses human-centred innovation, where artificial intelligence (AI), virtual and augmented reality (VR/AR), and big data analytics are used to build up student performance and to encourage empathy, creativity, inclusion, and well-being.

AI Tutors and Adaptive Learning: Artificial intelligence is being widely adopted in the form of intelligent tutoring systems that provide personalized learning experiences. These AI-driven platforms analyse students' performance data in real time to adjust content delivery based on individual strengths, weaknesses, and learning styles (OECD, 2023). AI tutors are being progressively developed to be emotionally responsive, utilizing affective computing to acknowledge students' emotions and adapt instruction, in line with the 5IR goal of emotionally intelligent technologies (Mishra, Mehta & Henriksen, 2022).

Virtual and Augmented Reality (VR/AR) Classrooms: VR and AR are revolutionizing how students experience learning by creating immersive, hands-on experiences. These technologies are used worldwide to revive science experiments, historical environments, or artistic creations and foster student engagement. VR/AR is adjusted to support empathy by allowing students to virtually experience different cultural or disability viewpoints (Henriksen et al., 2022).

Data Analytics and Learning Insights: Improved data analytics plays a key role in modifying decision-making and student support systems. Schools can oversee student commitment, forecast achievements, and step in early by analysing huge datasets. Currently, global movements' back ethical data use to guarantee that student privacy, consent, and inclusivity are key to the

educational data master plan (OECD, 2023). This shows the wider 5IR change to values-based technical innovation, which attempts to coordinate innovation, equity, and social responsibility.

The Shift to Values-Based Innovation: The outstanding form of 5IR in education is a progressing global focus on values-based innovation, technological development led by empathy, ethics, and inclusivity. Mishra et al. (2022) maintain that true educational change must exceed technical skills to include the nurturing of socioemotional prowess, moral reasoning, and civic responsibility. This approach encourages the development of technologies that are not only effective but also culturally sensitive and human-centred, responding to the unique needs of diverse learners and communities.

5IR in Nigerian Senior Secondary Schools

Current Technological Infrastructure and Readiness

Nigeria has made headway toward digital transformation in education, evident with the introduction of ICT policies, computer-based learning platforms, and an increasing interest in digital literacy, though not uniformly implemented across regions and schools. Most public senior secondary schools in Nigeria have access to electricity, internet connectivity, and digital tools like interactive boards, educational software, and AI-based learning platforms are restricted (Ajayi et al., 2022). These inadequacies interfere with the country's readiness to fully embrace 5IR educational innovations like AI tutors, virtual reality (VR) environments, and data-driven personalized learning.

These critical challenges that obstruct the effective adoption of 5IR in Nigeria's secondary schools include the Digital Divide. There is a significant difference between urban and rural schools in terms of access to digital infrastructure. This widens the existing gap in the quality of education and restricts the ability of schools in rural areas to participate in the global shift toward human-machine collaboration (Onyema et al., 2020). Another challenge is Low Teacher Digital Literacy**.** The preparedness of teachers is a great concern. Most of the teachers do not have training in the use of new educational technologies. According to Ololube (2021), teachers in Nigeria do not have the confidence and ability to incorporate new technologies into classroom teaching effectively because of inadequate digital competencies. Thirdly is the Lack of Ethical Tech Policies. Presently, Nigeria lacks all-inclusive policies to guide the ethical use of emerging educational technologies in secondary schools. Adebayo & Olamide, (2023) assert that student data privacy, AI

transparency, and algorithmic fairness are not well-addressed in existing education policies, raising concerns about the responsible and human-centred deployment of 5IR tools.

Managing Human-Centred Values in Tech-Driven Schools

The Fifth Industrial Revolution (5IR) is transforming education, requiring a focus on sustaining human-centred values like empathy, ethics, inclusion, creativity, and resilience. Countries like Japan and South Korea are incorporating AI and robotics to encourage inclusive pedagogies (Mishra et al., 2022), while Europe emphasizes digital ethics and responsible AI use (OECD, 2023). In Africa, schools are focusing on contextually relevant applications of 5IR technologies while preserving community values and social equity Adu et al., 2021). These efforts emphasize the role of resilience in managing socio-economic disparities and digital divides. A holistic approach is needed to ensure the successful management of human-centred values in tech-driven schools.

Roles of Educational Leaders in the 5IR Era

The role of senior secondary schools' leaders is fast-changing as education introduces the Fifth Industrial Revolution (5IR). Apart from being administrators, leaders must be visionaries, moral mentors, change agents, and policy advocates who promote a values-based strategy to technology adoption.

As Visionaries: Anticipating Tech Trends and Leading Value-Integrated Adoption

Educational visionaries need a deeper understanding of new technologies such as immersive learning environments (VR/AR), adaptive learning systems, and AI tutors. This means carefully considering how these tools can be combined with empathy, creativity, and student well-being. Visionary leadership places technologies as tools for human empowerment as well as efficiency (Mishra et al., 2022). Leaders are meant to guarantee that inclusive and progressive educational values provide a platform for digital change.

As Ethical Guides: Maintaining Dignity, Fairness, and Empathy

As schools implement AI-powered platforms and data analytics, privacy, justice, and emotional depth in learning stand the threat of being endangered. Educational leaders act as ethical stewards, scrutinizing technological implementations for potential biases while upholding students' dignity. Brown and Treviño (2006) emphasize the importance of ethical leadership in creating trust, moral

discussion, and accountability, especially when implementing intelligent systems that can impact student outcomes. Leaders should ensure that AI applications encourage empathy over depersonalization.

As Change Agents: Driving Training, Re-skilling, and Human-Capacity Development

In the 5IR setting, leadership includes enhancing teachers and staff through ongoing in-service training. A lot of teaching professionals do not possess the 21st-century skills required to truly blend human-centric technologies. According to Okoye & Ogbomo (2022), change-oriented leaders set up staff training focused on technical skills and emotional intelligence, digital ethics, and teaching innovation. They promote a culture of lifelong learning and adaptability, important for surviving in a fast-changing technological environment.

As Policy Advocates: Institutional Reforms for Human-Centred Education

Policy advocacy is of utmost importance where leaders campaign for institutional restructuring that protects and promotes human-centred values in digital education. This means pushing for ethical AI use regulations, digital equity policies, and a student mental health methodological approach. Marwala (2023) points out the essence of a techno-ethical example in educational governance where empathy and social justice are primary to technology policies. Leaders must unite with stakeholders to work out policies that promote inclusive, values-driven innovation in schools.

Challenges and Ethical Considerations in 5IR Educational Technologies

1. Balancing Automation with Employment Concerns for Teachers

   A primary ethical problem in tech-driven education is the likelihood of displacing teachers by intelligent tutoring systems and automated evaluation tools. These technologies may automate the traditional teaching role, especially in deprived schools, though they improve learning efficiency. According to Mishra et al. (2022), automation must be handled with a "collaborative augmentation mindset", where technology does not replace but assists human professionals. Strategic leadership is required to make sure that technology boosts the dignity and capacity of teachers through reskilling and role redefinition.

2. Data Privacy, Surveillance, and Student Autonomy

   5IR technologies depend more on student data for personalization and performance analytics. However, the deficiency of large data governance structures in many Nigerian schools raises doubts over data privacy, consent, and surveillance. Olaniran and Amadi (2021) pointed out the danger of transforming students into "data subjects," without being in total charge of how their personal and behavioural data are collected, stored, or used. Using digital tools, ethical leadership must support transparent data policies, informed consent, and mechanisms that preserve student autonomy.

3. Risks of Algorithmic Bias and Exclusion

   AI systems, including those used in adaptive learning or grading, can reflect and perpetuate existing social biases. In various educational settings like Nigeria, this can lead to discrimination based on gender, socio-economic status, or regional disparities. Algorithmic bias is a problem in AI implementation in education, as it jeopardizes fairness and inclusivity UNESCO (2023). Underprivileged students face the risk of further exclusion from educational opportunities without localized data training and inclusive algorithm design.

The educational sector is at a crunch time as Nigeria deals with the difficulties of the Fifth Industrial Revolution (5IR). The unification of technologies like AI, robotics, and data analytics can change teaching and learning by protecting human values like empathy and inclusion. Therefore, value-driven educational leadership is needed to ensure equitable, empathetic, and empowering innovations.

Suggestions

As Nigerian senior secondary schools deal with the realities of the Fifth Industrial Revolution (5IR), a strategic and ethically sound response is key to optimizing its use while preserving human-centred values. Some suggestions to be considered for sustainable and inclusive educational transformation.

1. The Federal Ministry of Education should draft a National Digital Ethics Policy for Education that offers clear rules on data privacy, algorithmic transparency, equitable access, and ethical AI use to ensure responsible use of 5IR technologies.

2. Ministries of Education should create and fund continuous training of educational leaders in Ethical Tech Leadership to overcome the ethical, emotional, and strategic problems of leading in tech-integrated environments.
3. Colleges of education and Universities should incorporate Human Values (emotional intelligence, creativity, and collaboration) and digital literacy across subjects

References

Adebayo, A. M., & Olamide, B. T. (2023). Ethical considerations in the use of artificial intelligence in Nigerian education. *International Journal of Educational Policy and Leadership, 18*(1), 77–93.

Adu, E. O., Akinbobola, A. O., & Oke, O. (2021). Ethical considerations and educational technology integration in European classrooms: Insights for Africa. *International Journal of Educational Development, 86*, 102470. https://doi.org/10.1016/j.ijedudev.2021.102470

Adu, E. O., Idowu, A. I., & Ogunyemi, B. (2021). Digital technology, education and sustainable development in Africa: Opportunities and challenges. *International Journal of Education and Development Using ICT, 17*(1), 134–148.

Ajayi, A. O., Alabi, T. O., & Ogunlade, O. O. (2022). ICT infrastructure and digital readiness in Nigerian secondary schools: Implications for e-learning and innovation. *Journal of Education and Practice, 13*(8), 45–54.

Benešová, A., & Tupa, J. (2021). The five industrial revolutions: From Industry 1.0 to Industry 5.0. *Management & Production Engineering Review, 12*(4), 72–80.

Brown, M. E., & Treviño, L. K. (2006). Ethical leadership: A review and future directions. *The Leadership Quarterly, 17*(6), 595–616.

Bush, T. (2021). *Theories of educational leadership and management* (5th ed.). SAGE Publications.

Dede, C., Richards, J., & Saxberg, B. (2021). *The human side of changing education: How to lead change with clarity, conviction, and courage*. Harvard Education Press.

Fullan, M. (2022). *The right drivers in action for schools, districts, and systems*. Corwin Press.

Henriksen, D., Mehta, R., & Mishra, P. (2022). Human-centered creativity in the age of AI. *TechTrends, 66*(1), 5–14. https://doi.org/10.1007/s11528-021-00660-7

Iwuanyanwu, E. C., & Ugwu, C. N. (2022). Exploring e-learning adoption in Nigerian secondary schools: A post-COVID-19 analysis. *African Journal of Educational Research, 26*(1), 45–60.

Marwala, T. (2023). *5IR: When humans meet intelligent machines*. Pan Macmillan.

Mishra, P., Henriksen, D., & Mehta, R. (2022). Rethinking the role of empathy and creativity in the age of AI. *Educational Technology Research and Development, 70*(3), 1121–1140. https://doi.org/10.1007/s11423-021-10044-5

Mishra, P., Mehta, R., & Henriksen, D. (2022). Empathy and ethical AI in education: A global perspective. *TechTrends, 66*(3), 274–285. https://doi.org/10.1007/s11528-022-00730-6

OECD (2023). *Education in the age of AI and digitalization*. OECD Publishing.

OECD (2023). *Teaching for the future: Global perspectives on education for sustainable development*. OECD Publishing.

Olaniran, S. O., & Amadi, C. A. (2021). Digital privacy and surveillance in Nigerian secondary schools: Implications for learner autonomy. *Nigerian Journal of Educational Technology, 6*(1), 33–47.

Olanrewaju, A. A., Sulaiman, T. S., & Lawal, F. (2023). Ethical concerns in the use of emerging technologies in Nigerian classrooms: Towards a human-centred approach. *Nigerian Journal of Educational Philosophy, 27*(2), 103–117.

Okoye, K. R. E., & Ogbomo, E. F. (2022). Inclusive pedagogy and student well-being in the age of digital learning in Sub-Saharan Africa. *African Journal of Education, Science and Technology, 8*(2), 40–55.

Okoye, K. R. E., & Ogbomo, M. (2022). Adoption of artificial intelligence in secondary education: Teachers' perceptions in South-East Nigeria. *Nigerian Journal of Educational Technology, 15*(2), 55–70.

Ololube, N. P. (2021). Teachers' preparedness and the use of technology in Nigerian secondary schools: Challenges and prospects. *African Journal of Educational Technology, 9*(2), 29–38.

Onyema, E. M., Eucheria, N. C., & Obafemi, F. A. (2020). E-learning and digital divide in Nigeria: Bridging the gap. *International Journal of Educational Research, 8*(2), 1–15.

Onyema, E. M., Eucheria, N. C., & Obafemi, F. A. (2021). Impact of COVID-19 pandemic on the education sector in Nigeria: Implications for policy and practice. *International Journal of Education and Development Using ICT, 17*(4), 61–75.

Schwab, K. (2016). *The fourth industrial revolution*. World Economic Forum.

Schwab, K. (2017). *Shaping the future of the fourth industrial revolution*. World Economic Forum.

Schwab, K., & Malleret, T. (2021). *The great narrative: For a better future*. World Economic Forum.

UNESCO (2022). *Reimagining our futures together: A new social contract for education*. UNESCO.

UNESCO (2023). *AI and education: Guidance for policy-makers*. United Nations Educational, Scientific and Cultural Organization.

Yakubu, M. N., & Dasuki, S. I. (2023). A framework for implementing ICT in Nigerian secondary schools: Lessons from rural communities. *Education and Information Technologies, 28*, 2411–2433. https://doi.org/10.1007/s10639-023-11345-w