



GENDERED INNOVATION IN NIGERIA: ASSESSING FEMALE PARTICIPATION IN THE EVOLUTION OF ARTIFICIAL INTELLIGENCE AND ICT ECOSYSTEMS

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Abstract

Artificial Intelligence (AI) and Information and Communication Technology (ICT) are central to global digital transformation and sustainable economic growth. However, female participation in the innovation and adoption of these technologies remains disproportionately low, particularly within the Global South. This paper examines the status of female engagement in Nigeria's AI and ICT sectors, identifying structural and systemic obstacles that impede gender parity. It adopted a qualitative methodology – including a systematic review of scholarly literature, policy frameworks, and industry reports – to evaluate the current landscape of the Nigerian digital economy. Findings indicate that women remain significantly underrepresented in ICT education, AI research, and high-growth technology entrepreneurship. This disparity is driven by entrenched socio-cultural norms, digital literacy gaps, and inequitable access to technological infrastructure. The paper contends that enhancing female participation is a critical catalyst for inclusive innovation. It concludes by advocating for the institutionalization of gender-responsive ICT policies, the expansion of targeted STEM initiatives for women, and the creation of robust support frameworks to bridge the digital gender divide and foster sustainable economic development in Nigeria.

Keywords: Artificial Intelligence (AI), ICT, Gender Innovation, Digital Gender Divide, Nigeria, STEM Equity, Socio-Cultural Barriers.

Introduction

The global socio-economic landscape is undergoing a shift driven by the proliferation of Artificial Intelligence (AI) and Information and Communication Technology (ICT). These technologies serve as the fundamental enablers of productivity, governance, and social reconfiguration [1]. Within the African context, Nigeria has emerged as a digital frontier, characterized by a growing fintech ecosystem and an increase in telecommunications infrastructure over the last two decades [2]. However, this technological trajectory is marked by a persistent gendered digital divide that affects the inclusivity and sustainability of the nation's digital economy.

Despite the rhetoric of technological democratization, women in Nigeria remain underrepresented within the core domains of AI research, high-level software engineering, and industrial technology leadership [3]. While gender disparity in STEM is a documented global phenomenon, its manifestations in emerging economies are compounded by an intersection of institutional gaps and socio-cultural constructs that influence female entry into high-tech spheres [4]. The exclusion of women from AI and ICT innovation represents an epistemological and economic challenge that warrants academic scrutiny.

Evidence suggests that gender-diverse research environments foster broader problem-solving capacities and reduce the risk of algorithmic bias, thereby improving the reliability of technological outcomes. Consequently, addressing the barriers to female participation is a prerequisite for Nigeria to transition from a consumer of global technology to a diversified innovator. This study provides an analysis of the Nigerian digital landscape to evaluate the current metrics and socio-technical status of female participation across the nation's AI and ICT sectors. Furthermore, the research examines the systemic socio-cultural, economic, and institutional mechanisms that obstruct female professional and academic trajectories in these fields. By identifying these structural hurdles, the paper aims to formulate evidence-based policy recommendations and strategic intervention models designed to institutionalize gender-inclusive innovation within the Nigerian digital economy.

Study Area and Methodology

Study Area

The focus of this inquiry is Nigeria, the largest digital market in Africa. The study area is characterized by asymmetrical development patterns; while urban centres such as Lagos and Abuja serve as hubs for the continent, rural areas continue to face infrastructural deficits. This geographic disparity often overlaps with gendered access, as socio-economic constraints in the Global South typically impact women more significantly, creating a multi-layered barrier to technological engagement.

Methodology

This research employs a qualitative meta-synthesis approach. By adopting an analytical desk-research design, the study synthesizes data from longitudinal policy reviews, including Nigerian National ICT policies and NITDA frameworks. It further incorporates a thematic literature synthesis of peer-reviewed scholarship on the relations between university, industry, and government concerning gender in West Africa. Institutional data from the International Telecommunication Union (ITU) and UNESCO regarding STEM enrolment and labour force statistics in Nigeria provide the empirical basis for the discussion. The data were processed using thematic analysis, categorized by structural, cultural, and individual levels of influence.

Results and Discussion

Status of Female Participation in AI and ICT

Despite representing nearly half of the national workforce, women remain significantly underrepresented in Nigeria's technology sector. Current metrics suggest that the gender imbalance is entrenched within both academic and professional spheres [1]. In tertiary education, female enrolment in engineering, computer science, and information technology is markedly lower than male enrolment, creating a foundational deficit in the talent pipeline [8]. This disparity extends into the professional workforce, where women constitute only a small percentage of practitioners in high-growth fields such as software development, data science, and artificial intelligence research [4]. Furthermore, this underrepresentation is visible in leadership roles within technology companies and innovation

ecosystems. A pervasive digital gender divide amplifies this imbalance; men generally possess greater access to digital hardware and high-speed internet, which limits the ability of women to acquire the technical competencies necessary for participation in the modern digital economy [7, 11].

Systemic Barriers to Gender Inclusion

The research identifies several intersecting mechanisms that obstruct female professional and academic trajectories in Nigeria:

Socio-Cultural Constraints: In many Nigerian communities, technology-related professions are traditionally perceived as male-oriented domains. These cultural expectations and stereotypical gender attitudes often deter young women from pursuing science and technology, influencing their educational choices and career aspirations from a formative age [9].

Educational Inequality and STEM Access: Limited access to quality STEM education remains a primary obstacle. Educational inequality ensures that a narrow range of women's experiences are represented in ICT innovation, effectively sidelining potential contributors before they enter the workforce.

The Digital Infrastructure Gap: The digital gender divide involves more than just skill; it is rooted in inequitable access to computers, smartphones, and reliable internet connectivity. This gap restricts women's participation in online technical education and digital entrepreneurship [7].

Workplace Marginalization: Within the technology industry, women frequently encounter systemic issues such as gender discrimination, wage disparities, and restricted opportunities for promotion. These hurdles impede long-term career development and contribute to high attrition rates among female tech professionals [4].

Capital and Network Asymmetry: Female entrepreneurs often lack the financial resources and innovation networks essential for scaling technology startups. Data indicates that women-led technology ventures in Nigeria are consistently underfunded compared to those led by their male counterparts [13].

Emerging Opportunities for Gender Diversity

Notwithstanding these challenges, the study identifies significant opportunities to stimulate female involvement in Nigeria's AI and ICT sectors. National ICT strategies are increasingly prioritizing gender-inclusive programming as a core component of digital development [5]. Collaborative initiatives between international organizations and private technology providers have introduced scholarships, mentoring programs, and technical training specifically for women in machine learning and software engineering [6].

Furthermore, the expansion of Nigeria's startup ecosystem offers a platform for women to develop dynamic digital tools and participate more fully in the digital economy [2]. The proliferation of Open Educational Resources (OERs) and online learning platforms has also democratized access to advanced technical skills, allowing women to bypass traditional institutional barriers to gain expertise in data analytics and software development [15]. These developments suggest that while systemic hurdles are significant, targeted institutional support and the leveraging of digital learning tools can foster a more inclusive innovation landscape.

Conclusion and Recommendations

Conclusion

This study contends that the persistent underrepresentation of women in Nigeria's AI and ICT sectors is not a circumstantial anomaly but a structural byproduct of historical socio-cultural biases and institutional inertia. While Nigeria is making significant strides toward developing a vibrant digital economy, gender inequalities continue to constrain the collective potential of its technological innovation. The evidence suggests that without deliberate and coordinated intervention, the ongoing digital transformation may inadvertently mirror and amplify existing gender disparities.

Unlocking the full capacity of Nigeria's human capital requires a departure from passive inclusion toward an active, multifaceted approach involving government, academia, and the private sector. By institutionalizing gender-diverse and accessible ICT frameworks, Nigeria can fortify its technological advancement and ensure that the benefits of the digital era are equitably distributed. Ultimately, increasing female participation in AI and ICT innovation is a

prerequisite for achieving the technological sovereignty and sustained economic growth necessary for national development [3].

Policy Recommendations

To foster a more inclusive digital landscape in Nigeria, the following evidence-based strategies are recommended:

Institutional Incentives and Targets: Universities and technology firms should be encouraged to meet specific gender parity targets in research and development roles. The implementation of targeted grants and research funding for gender-diverse teams can incentivize institutions to prioritize female representation in high-tech disciplines.

Reform of STEM Pedagogy: Educational curricula must be reviewed to ensure they are gender-neutral and free from stereotypical biases. Furthermore, mentorship programs should be institutionalized across secondary and tertiary levels to provide female students with visible role models and clear career pathways in AI and data science.

Infrastructure and Digital Equity: To eliminate the gender-based digital divide, the Nigerian government must prioritize the expansion of digital infrastructure and affordable internet penetration. Enhancing accessibility will broaden the scope for women and girls to engage with digital technologies and participate in the online knowledge economy [7].

Gender-Responsive Workplace Frameworks: Technology companies should develop and enforce robust gender equity policies. These include pay transparency, anti-discrimination protocols, and support systems that facilitate long-term career development for women in the technology workforce.

Collaborative Innovation Ecosystems: Strategic partnerships between governmental agencies, universities, and private tech entities are essential. These collaborations should focus on creating specialized innovation hubs and scholarship programs that facilitate wider participation of women in AI research and technological entrepreneurship [5, 6].

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