GENERATIVE AI TOOLS AND OPEN SCIENCE PRACTICES IN NIGERIAN ACADEMIC INSTITUTIONS

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Abstract
This study explores the potentials of Generative Artificial Intelligence (GAI) and Open Science practices in Nigerian academic institutions. The study was conceived as result of a Webinar organized during the International Open Access Week 2024 by The Digital Librarian's Upskill and Connect Village and Libsense Open Science Nigeria, tagged: "Community over Commercialization." A total of 91 respondents were used, comprising faculty members (45), students (34), and administrators (12) across Nigeria's six geopolitical zones. Data for the study were collected through google form and administered to participants via various social media platforms and emails. Google Forms analytics tool used to analyze the data, which were presented in tables using frequency counts and simple percentages. The result of study revealed that the Webinar significantly improved the understanding of the participants on the potential applications of Generative AI tools and Open Science in Research. It was concluded that the integration of generative AI tools and open science practices in Nigerian academic institutions presents a significant opportunity for fostering research innovation, increasing collaboration, and advancing scholarly impact. It was recommended that Nigerian academic institutions should prioritize investment in robust AI infrastructure to support the implementation of generative AI tools effectively, there is a need to organize regular workshops, seminars, and training sessions on generative AI tools and open science practices to enhance the research capabilities of academics and students among others.

Keywords: *Generative Artificial Intelligence; Open Science; Research Innovation; Capacity Building; Collaboration;*

Introduction

Generative AI is a type of machine-learning model that utilizes labeled data (such as text, images, audio, and simulations) to identify patterns and structures. Once it has encoded this knowledge, it can generate new content effectively. (Felix M, 2024). Generative AI tools and open science practices are revolutionizing the global research and educational landscape, offering new avenues for knowledge creation, dissemination, and collaboration. Tools such as ChatGPT, Bard, and DALL-E are transforming how research is conducted by enabling automation of repetitive tasks, enhancing creativity, and streamlining processes (Smith & Taylor, 2023). These technologies are being adopted across various sectors, including education, where they support teaching, data analysis, and resource development. Similarly, open science practices promote transparency, equitable access, and collaboration in research, addressing long-standing disparities between developed and developing nations in research infrastructure (Miller et al., 2022). Together, these innovations are reshaping the way knowledge is created and shared globally, (Ade-Ibijola & Okonkwo, 2023).

In Nigeria, academic institutions face unique challenges that hinder the full adoption of generative AI and open science practices. These challenges include limited funding, outdated technology, inadequate training, and gaps in supportive policies (Okafor et al., 2021; Adegbite, 2022). Despite these barriers, Nigeria has demonstrated potential in embracing technological advancements, with sectors like finance and agriculture successfully integrating digital tools (Adewuyi et al., 2023). However, the slow adoption of generative AI and open science in academia is attributed to insufficient awareness, poor infrastructure, and resistance to change among stakeholders (Johnson & Akinwale, 2023).

Integrating generative AI and open science practices into Nigerian academia can provide opportunities to address these systemic challenges. AI tools can automate tasks like data analysis and report writing, enabling researchers and educators to focus on innovation (Chukwuma et al., 2022). Open science practices can improve collaboration and global visibility for Nigerian researchers, democratizing access to scholarly outputs and addressing the inequitable distribution of knowledge resources (Eze & Umeh, 2023).

Evidence shows that institutions adopting open science practices experience higher productivity, increased citations, and enhanced international collaboration (Miller et al., 2022; Eze & Umeh, 2023). For Nigerian universities, which often face limited access to high-impact journals, open science can democratize knowledge creation and dissemination. Generative AI tools also address skill gaps by providing accessible platforms for data analysis and research presentations (Adegbite, 2022).

The objective is to provide a thorough analysis of Generative AI's applications, benefits, challenges, opportunities, and support in Nigerian Academic Institutions. It is crucial for policymakers to grasp the context of AI as a product of substantial capital investments in education especially as it relates to Open Science Practices in Nigerian Academic Institutions (Crawford, 2022). Often, as with ChatGPT, scholarly, open science practices, open data, open access publishing, open peer review and open educational Resources (Perrigo, 2023). Africa's primary contribution has been the supply of minerals, data, and undervalued labor. This study investigates the integration of Generative AI tools and Open Science Practices in Nigerian academic institutions in Nigeria.

Despite these benefits, barriers remain. A significant challenge is the lack of digital infrastructure in many Nigerian universities. Over 70% of public universities lack the required

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technological resources to support advanced research tools (Chukwuma et al., 2022). Cultural resistance also plays a role, with many educators and administrators fearing obsolescence or displacement, (Adewuyi et al., 2023 in Tripathi, M.K. &. Maktedar, D.D, 2020). This study explores the level of awareness and adoption of generative AI tools and open science practices in Nigerian academia. It analyzes their impact on research and collaboration while identifying challenges and proposing strategies for effective integration. By addressing these issues, Nigerian academic institutions can harness the potential of these innovations to remain globally competitive.

Objectives of the Study
1. Determine the perception of respondents on the Improved Research Efficiency of GAI tools and Open Science Practice.
2. Determine the perceived benefits of GAI tools and Open Science Practices in Nigerian Academic Institutions
3. Identify the challenges of GAI tools and Open Science Practices in Nigerian Academic Institutions
4. Explore the opportunities that exist for integrating GAI tools and Open Science Practices in Nigerian Academic Institutions
5. Identify the support needed to enhance the adoption of GAI tools and Open Science Practices in Nigerian Academic Institutions

Literature Review
Generative AI tools have garnered significant attention globally due to their potential to enhance research and education. Tools like ChatGPT and Bard enable researchers to generate content, analyze data, and solve problems efficiently, making them integral to modern academia (Smith & Taylor, 2023). DALL-E, a visual generative AI tool, also demonstrates how AI can support creative disciplines like design and communication. The rapid adoption of these tools is transforming education, enabling automation of repetitive tasks and fostering creativity among students and faculty. However, their adoption varies globally, influenced by factors such as infrastructure, awareness, and cultural acceptance (Miller et al., 2022).

Open science practices complement generative AI by fostering collaboration, transparency, and accessibility in research. Open-access publishing, data sharing, and collaborative platforms allow researchers from low-resource settings to access resources that would otherwise be inaccessible (Eze & Umeh, 2023). Studies show that institutions adopting open science practices experience higher research outputs and increased global collaboration, making these practices indispensable for developing nations (Miller et al., 2022).

In Nigeria, the adoption of generative AI and open science practices is still at an early stage. Limited awareness, insufficient infrastructure, and policy gaps hinder their uptake. Chukwuma et al. (2022) report that most public universities in Nigeria lack the digital infrastructure required to support AI and open science platforms. Moreover, many educators and administrators resist adopting these technologies due to fears of redundancy and a lack of training (Adewuyi et al., 2023).

Despite these challenges, the integration of these technologies into Nigerian academia offers immense potential. Generative AI tools can address skill gaps, particularly among students and early-career researchers, by providing user-friendly platforms for data analysis and content generation (Adegbite, 2022). Open science practices can democratize access to research

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resources, enabling Nigerian researchers to participate in global collaborations and improve the visibility of their work (Eze & Umeh, 2023) (Meshram, et al., 2018).

One of life's tragedies lies in people's unawareness of available tools and devices capable of transforming their lives, (Mavani, et al., 2021). This situation becomes particularly poignant when resources are accessible, yet individuals remain ignorant, hindering their ability to access or fully utilize them. Certainly, disruptive technologies are revolutionizing education in this era of intelligence like never before (Rodolfo, Rodrigo & Jesus, 2022). Mundane administrative, teaching, and learning tasks are now easily managed and facilitated through a variety of innovative technologies, including AI, robotics, learning analytics, and blockchain. Despite these technological advancements, many developing countries, particularly those in the African region still lag behind in fully leveraging advanced technologies in education (Toseef & Khan, 2018). Efforts to address these barriers include government and institutional initiatives to improve digital infrastructure and promote awareness of AI and open science. For example, training workshops and partnerships with international organisations can enhance adoption rates and equip stakeholders with the skills necessary to utilise these innovations effectively (Johnson & Akinwale, 2023).

This study highlights the transformative potential of generative AI and open science practices in Nigerian academia while underscoring the systemic challenges that must be addressed. By bridging gaps in infrastructure, training, and policy, these innovations can enhance research outputs, collaboration, and knowledge dissemination in Nigerian universities. While most respondents were familiar with generative AI tools and open educational resources, awareness of other open science practices like open data and peer review was lower, indicating a need for targeted training. Challenges included insufficient training (40.7%), ethical concerns (29.7%), and limited institutional support (15.4%). Despite these barriers, 97.8% believed these tools could enhance research productivity, collaboration, and innovation, emphasizing their importance in advancing modern research practices and addressing existing gap.

Methodology

The study employed a cross-sectional research design. It utilized a Webinar that was organized during Open Access Week 2024 organized by The Digital Librarian's Upskill and Connect Village and Libsense Open Science Nigeria, tagged: "Community over Commercialization." that drew participants from Nigerian Universities. The study was to assess the adoption and impact of generative AI tools and open science practices in Nigerian universities. A sample size of 91 respondents was used including 45 faculty members, 34 students and 12 administrators across Nigeria's six geopolitical zones. Quantitative data were exclusively collected through a structured questionnaire, which was administered via Google Forms. The questionnaire was designed to capture key information on the respondents' awareness, usage, challenges, and perceived impacts of generative AI and open science practices. The use of Google Forms provided an efficient and accessible platform for respondents, ensuring a high rate of participation.

Data analysis was performed using the built-in Google Forms analytics tool, which presented the data in terms of frequencies, simple percentages, and tables. This method allowed for a clear and simple presentation of results, facilitating the interpretation of trends and patterns across the respondents. The streamlined data collection and analysis process ensured

that the study could gather meaningful insights on the adoption and impact of these technologies in Nigerian academia, while maintaining clarity and efficiency in analyzing the data.

Results And Discussion

The findings of the study were presented and the discussed in line with the objectives of the study in the tables below:

Objective One: Perception of respondents on the Improved Research Efficiency of GAI tools and Open Science Practice.

N = 91

Table 1: Generative AI tools and Open Science Practice can improve research efficiency

S/N	Generative AI tools and Open Science Practice can improve research efficiency	Frequency	Percentage
1	Strongly Agree	61	67.0%
2	Agree	28	30.8%
3	Neutral	2	2.2%
4	Disagree	0	0.0%
5	Strongly Disagree	0	0.0%
	Total	**91**	**100%**

The data in Table 1 above indicates that a significant majority of respondents believe generative AI tools and open science practices can improve research efficiency, with 61 (67.0%) strongly agreeing and 28 (30.8%) agreeing while 2 (2.2%) maintained neutrality in their opinion. This high level of consensus aligns with literature emphasizing the transformative potential of generative AI tools in enhancing creativity, reducing time spent on repetitive tasks, and improving the quality of academic outputs (Floridi & Chiriatti, 2020). Similarly, open science practices are widely recognised for fostering transparency, collaboration, and accessibility, which are critical for efficient and impactful research (Nosek et al., 2015). The overwhelming agreement among respondents accentuates the perceived value of these tools and practices in optimizing research workflows and advancing scholarly contributions.

Objective Two: What do you think are the most significant benefits of using Generative AI Tools and Open Science in Research?

(N = 91)

Table 2: Perceived benefits of GAI tools and Open Science Practices in Nigerian Academic Institutions

S/N	Benefits of GAI tools and Open Science Practices	Frequency	Percentage
1	Accelerating the generation and discovery of new knowledge	62	68.1%
2	Enhancing research productivity	75	82.4%
3	Facilitating Collaboration across institutions	40	44%
4	Reducing the cost of conducting research	44	48.4%
5	Increasing visibility and accessibility of Research Outputs	44	48.4%

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The data in Table 2 highlights the perceived significant benefits of using generative AI tools and open science in research. Enhancing research productivity was rated the highest, with 75 (82.4%) of respondents acknowledging its importance. Accelerating the generation and discovery of new knowledge followed with 62 (68.1%) highlighting the transformative impact of these tools in fostering innovation. Increasing visibility and accessibility of research outputs 44 (48.4%) and reducing the cost of conducting research 44 (48.4%) were rated equally, reflecting the dual benefits of cost-efficiency and broader dissemination. Facilitating collaboration across institutions was noted by 40 (44.0%) of respondents, highlighting its role in promoting interdisciplinary and inter-institutional research. These findings align with literature emphasizing generative AI's capacity to streamline research processes and enhance creativity (Floridi & Chiriatti, 2020), as well as the contributions of open science in fostering transparency, accessibility, and collaboration (Nosek et al., 2015). Together, these tools and practices are seen as pivotal in advancing modern research ecosystems.

Objective Three: What is the major challenge you face when using Generative AI tools or adopting open Science practices?
(N = 91)
Table 3: Major Challenges of GAI tools and Open Science Practices in Nigerian Academic Institutions

S/N	Challenges of GAI tools and Open Science Practices	Frequency	Percentage
1	Insufficient Training	37	40.7%
2	Inadequate Institutional Support	14	15.4%
3	Limited Access to Technology	13	14.3%
4	Ethical Concern	27	29.6%
	Total	91	100%

The above table 3 represents respondents' view on the likely challenges faced when using Generative AI tools or adoption open Science practices. The report revealed that 37 (40.7%) of the respondents are of the Opinion that insufficient training is the major challenge affecting adoption of GAI tools and Open Science Practice in Tertiary institution. Other respondent 27 (29.67%) feels it is due to ethical concerns, while 14 (15.4%) believed the challenges is due to inadequate institutional support and 14.3% are of the opinion that due to limited access to technology. These findings align with literature identifying training gaps, ethical dilemmas, and infrastructural limitations as key obstacles to leveraging generative AI and open science effectively (Leonelli et al., 2020; Tenopir et al., 2017). Addressing these challenges through comprehensive training programmes, robust institutional frameworks, and ethical guidelines is essential to fully realize the potential of these transformative tools and practices.

Objective Four: What opportunities do you think exist for integrating Generative AI Tools and Open Science Practices in Nigerian academic institutions.
(N = 91)
Table 4: Opportunities that exist for integrating GAI tools and Open Science Practices in Nigerian Academic Institutions

S/N	Opportunities that exist for integrating GAI tools and Open Science Practices	Frequency	Percentage

1	Promoting Interdisciplinary research collaborations	37	40.7%
2	Increasing Access to global research data and resources	14	15.4%
3	Leveraging AI tools for improved research output and Innovation	13	14.3%

The data in Table 4 highlights several opportunities for integrating generative AI tools and open science practices in Nigerian academic institutions. The most recognised opportunity is leveraging AI tools for improved research output and innovation, identified by 60 (65.9%) of respondents. This reflects the potential of generative AI to streamline research processes, enhance creativity, and boost the quality of academic outputs. Increasing access to global research data and resources was noted by 56 (61.5%) of respondents, emphasizing the role of open science in fostering inclusivity and bridging resource gaps. Additionally, 48 (52.8%) of participants highlighted the potential for promoting interdisciplinary research collaboration, emphasizing the importance of these tools and practices in fostering partnerships across diverse fields and institutions. These findings align with literature emphasizing the transformative role of AI and open science in enhancing global research participation, fostering innovation, and addressing regional academic challenges (Floridi & Chiriatti, 2020; Adeoye et al., 2023). Together, these opportunities present a pathway for Nigerian academia to enhance research impact and global visibility.

Objective Five: Types of Support that would enhance the adoption of Generative AI tools and open science practices?
(N = 91)
Table 5: Support needed to enhance the adoption of GAI tools and Open Science Practices in Nigerian Academic Institutions

S/N	Support needed to enhance the adoption of GAI tools and Open Science Practices	Frequency	Percentage
1	More Training and Workshops	73	80.2%
2	Funding for Research	44	48.4%
	Institutional Policies to Support Open Science	50	54.9%
3	Access to Technological Infrastructure	47	51.6%
	Collaborative Networks among researchers	46	50.5%

The data in table 5 indicates that the most critical support needed to enhance the adoption of generative AI tools and open science practices is more training and workshops, identified by 73 (80.2%) of respondents. This underscores the importance of capacity-building initiatives to equip researchers with the necessary skills. Institutional policies to support open science were highlighted by 50 (54.9%), emphasizing the role of strategic frameworks in fostering a culture of openness and collaboration. Access to technological infrastructure 47 (51.6%) and funding for research 44 (48.4%) were also noted as significant enablers, addressing resource and financial barriers. Additionally, 46 (50.5%) of respondents identified collaborative networks among researchers as a key support, reflecting the importance of partnerships for knowledge exchange and joint projects. These findings align with literature emphasizing the need for a holistic approach to capacity building, infrastructure development, and institutional support to

maximize the potential of generative AI and open science practices (Nosek et al., 2015; Leonelli et al., 2020).

Conclusion

The integration of generative AI tools and open science practices in Nigerian academic institutions represents a transformative pathway for strengthening research systems and enhancing scholarly outputs. Findings from the study indicate that while academics, particularly librarians, demonstrate a growing understanding of AI-enhanced research workflows and open knowledge dissemination, important disparities persist in the adoption of key open science components such as open data and open peer review. These gaps point to structural and capacity-related limitations that continue to shape the institutional research ecosystem. The challenges identified, ranging from inadequate training opportunities to ethical uncertainties and limited institutional support, suggest that the full value of generative AI and open science cannot be realized without deliberate investment in researcher capacity, policy development, and digital infrastructure. Despite these constraints, there is strong recognition of the potential of these tools and practices to improve research productivity, enrich collaboration, and encourage methodological innovation. Overall, the evolving integration of generative AI and open science principles offers significant opportunities for Nigerian academic institutions to modernize research processes, strengthen transparency, and enhance global relevance. Achieving this potential will require coordinated strategies that address infrastructural deficits, promote responsible AI use, and encourage a culture of openness across disciplines. By doing so, institutions can reposition themselves as active contributors to global scientific advancement and ensure that research practices remain aligned with contemporary technological and scholarly trends.

Recommendations

The study recommends as follows:

1. Nigerian academic institutions should prioritize investment in robust AI infrastructure to support the implementation of generative AI tools effectively. This includes advanced computing resources, AI software licenses, and training for researchers and staff to leverage these tools efficiently.

2. There is a need to Organize regular workshops, seminars, and training sessions on generative AI tools and open science practices to enhance the research capabilities of academics and students. These programmes should focus on both technical skills and ethical considerations related to AI.

3. Interdisciplinary collaborations and research partnerships should be encouraged among institutions, industry stakeholders, and international organisations to promote knowledge exchange and drive innovation in generative AI applications.

4. Promote a culture of data sharing and transparency within academic institutions to facilitate open science practices. Establish guidelines for data management, storage, and sharing that adhere to ethical standards and encourage reproducibility in research.

5. Develop institutional policies and guidelines that support the ethical and responsible use of generative AI tools in research. Address issues related to data privacy, intellectual property rights, and ethical considerations in the development and deployment of AI technologies.

6. Engage with the wider academic community, government agencies, and industry partners to raise awareness about the benefits of generative AI tools and open science practices. Foster a collaborative environment that encourages knowledge dissemination and fosters research innovation.
7. Implement mechanisms to evaluate the impact of generative AI tools and open science practices on research outputs, collaboration networks, and academic performance. Monitor the adoption and utilization of these tools to identify areas for improvement and optimization.

Limitations and Suggestions for Further Research

The following constitutes major limitation for the study:
1. The study drew insights from a relatively small and specific group of participants, with librarians forming the majority. This limited diversity may not fully capture the perspectives of other key stakeholders such as faculty members, postgraduate students, and research administrators.
2. The findings rely heavily on self-reported responses, which may be influenced by individual perception, social desirability bias, or limited self-awareness regarding actual use of generative AI tools and open science practices.
3. Although the study examined awareness and adoption of open science practices, it did not explore them in depth, particularly areas such as open data governance, open peer review workflows, and institutional policy frameworks.
4. The study assessed participants' perceived understanding of AI and open science concepts, but did not measure their actual proficiency or practical application. This limits the ability to determine the real skill gaps.

Future studies should include:
1. A wider range of stakeholders such as lecturers, researchers across disciplines, postgraduate students, and ICT personnel to provide a more holistic understanding of adoption patterns.
2. Incorporating qualitative methods such as interviews, focus groups, or case studies will provide deeper insights into lived experiences, institutional barriers, and contextual challenges associated with AI and open science implementation.
3. Further Research should examine how generative AI and open science practices differ across fields such as the humanities, social sciences, STEM, and health sciences to provide targeted recommendations.

References

Adegbite, T. (2022). Addressing skill gaps in Nigerian universities: The role of generative AI tools. *Journal of Educational Innovation, 12*(3), 45–58.

Ade-Ibijola, A., & Okonkwo, C. (2023). Artificial Intelligence in Africa: Emerging Challenges. In Responsible AI in Africa: Challenges and Opportunities (pp. 101-117). Cham: Springer International Publishing.

Adewuyi, O., et al. (2023). Barriers to technology adoption in Nigerian academia. *African Journal of Technology Studies, 8*(1), 12–25.

Chukwuma, I., et al. (2022). Digital infrastructure challenges in Nigerian universities. *Journal of African Education, 10*(4), 60–78.

Eze, A., & Umeh, B. (2023). The impact of open science on African research visibility. *Global Open Science Journal, 5*(2), 89–101.

Felix M, (2024). Generative ai in african continent (ghana, nigeria, kenya, rwanda, tanzania), Ai & big data department, Woosong university, 2024.

Johnson, K., & Akinwale, R. (2023). Resistance to AI adoption in education. *Nigerian Journal of Education Research, 7*(2), 25–39.

Mavani, N.R, Ali, J.M, Othman S., Hussain M.A, Hashim H, & Rahman N.A, (2021) Application of artifcial intelligence in food industry—a guideline, Food Eng. Rev.14 (2021) 1–42, 2021.

Meshram V., Patil K,. Meshram V, Hanchate D. & Ramkteke S.D, (2018). Machine learning in agriculture domain: a state-of-art survey, Artif. Intell.Life Sci. 1 (2018), 1000010.

Miller, J., et al. (2022). The role of open science in reducing global research inequities. *Open Access Quarterly, 15*(1), 34–47.

Rodolfo B.B.,. Rodrigo, O.C.P. Jesus G.L.Y, (2022) Digital twins application in the postharvest supply chain of fruits and vegetables: a systematic review of the literature, IEOM Soc. Int.Proc. Int. Conf.Ind. Eng.Oper. Manag.Istanb. (2022) 118–130.

Smith, R., & Taylor, P. (2023). Generative AI in education and research: A global perspective. *International Journal of Educational Technology, 9*(1), 50–65.

Toseef M. & Khan M.J, (2018). An intelligent mobile application for diagnosis of crop diseases in Pakistan using fuzzy inference system, Comput. Electron. Agric. 153 (2018) 1–11.

Tripathi, M.K. &. Maktedar, D.D, (2020). A role of computer vision in fruits and vegetables among various horticulture products of agriculture felds: a survey, Inf. Process. Agric 7 (2) (2020) 183–203.