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The Rise of Large Language Models (LLMs) in Academic Research: Opportunities and Challenges

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Abstract

This study investigates the use of AI chatbots for academic writing among research students and academics in Sub-Saharan Africa. A survey of 115 participants revealed a growing adoption of chatbots, with over 77% already using them for various tasks. Brainstorming research ideas and literature review support were the most popular applications, highlighting their role in sparking creativity and knowledge management. While nearly half found chatbots highly impactful, a significant portion reported moderate or low effectiveness, suggesting a need for further development. Ethical considerations were prominent, with privacy being the top concern. Participants emphasised the need for clear guidelines on data security, and mitigating bias in AI-generated information. Findings also identified a lack of institutional support for AI chatbots. Over half reported limited support, and many were unsure about available resources in their institutions to support the use of chatbots. This highlights the need for universities to develop training programs and technical support structures to help researchers leverage this technology effectively. Overall, the study suggests a promising future for AI chatbots in Sub-Saharan African research. However, addressing ethical concerns and fostering institutional support is crucial for maximizing their benefits and ensuring responsible integration within academic workflows.

Keywords

Large Language Models (LLMs); Academic Research; Artificial Intelligence (AI); Ethical Considerations; Chatbots; Bias in AI; Responsible Technology Use

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1. Background

Artificial intelligence (AI) is a game-changer in today's world. It's a core element of the third industrial revolution, fundamentally transforming how consumers, businesses, organisations, and entire industries function. In essence, AI equips machines and computer systems with capabilities traditionally thought to be exclusive to humans. These include perception, reasoning, problem-solving, and the ability to learn and adapt (Khosravi et al., 2024; Neema & Sanni, 2020; Sanni & Neema, 2020; Sanni et al., 2018) Large language models (LLMs) are shaking up the world of education; these AI models, powered by deep learning, can churn out human-quality text based on what they're given. Trained on massive amounts of text data, LLMs can understand and respond in natural language, creating coherent and relevant answers (Donker, 2023; Jee, 2023; McCorduck & Cfe, 2004; Singhal et al., 2022; Teubner et al., 2023). The early AI models were like simple calculators,

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stuck answering a limited set of questions. But with advancements in Natural Language Processing (NLP), AI has become much smarter, handling complex interactions and tailoring responses. These new chatbots, fueled by generative AI, are still under development, but their potential for automating tasks is vast. This is especially true in education, where educators might not be fully aware of their capabilities just yet (Ilieva et al., 2023; Khosravi et al., 2024). For over 20 years, AI in education (AIED) research has been exploring how AI technologies like chatbots can empower learners and automate some teaching functions. These chatbots are constantly evolving, learning to recognize user intent and generate personalized responses based on context and machine learning (Askell et al., 2019; Chen et al., 2020; Ilieva et al., 2023; Murphy, 2019; Sanni et al., 2018; Singhal et al., 2022).

These AI models are game-changers for learning; they can answer any question and chat about any subject, making them valuable tools for both students and teachers. Students can use them for help with assignments, projects, and even theses. Teachers can leverage them to create program proposals, review existing programs, write course outlines and lesson notes, and even generate exam questions and marking guides. They present valuable opportunities for academics to alleviate workload pressures and achieve a better work-life balance. Utilizing AI software to handle routine questions allows instructors, who are often burdened with other responsibilities, to free up valuable instructional time (Kuleto et al., 2021; Richard et al., 2024). The benefits are wide-ranging; improved access to information; personalized learning; efficiency and timeliness; instant feedback; reduced workload for teachers; and improved research productivity (Hwang & Chang, 2023; Imran & Almusharraf, 2023; Tsabedze et al., 2022). It's important to be mindful while using these AI tools. While they offer a ton of benefits, there are challenges and ethical considerations in academia. Educators desire to leverage the advantages of LLMs, while also ensuring students are actively learning and developing critical thinking skills. For example, LLMs like ChatGPT, Gemini, Poe, and YouChat can create incredibly realistic text. This can make it tricky to tell the difference between something a machine wrote and something a human wrote. Besides, these AI tools can challenge traditional learning methods. Since LLMs can create such realistic text, it can be hard to tell if a student's work is truly original. This disrupts how tutors assess student work and whether they're thinking critically. Also, LLMs are trained on massive amounts of information, but that information might not always be accurate or unbiased. If students rely on LLM-generated content, they might unknowingly pick up these biases. While LLMs can be helpful, leaning on them too heavily can reduce opportunities for students to develop essential skills. These include research, critical analysis, collaboration, and getting feedback from peers. There are valid concerns about using LLMs in classrooms. these include intellectual property, plagiarism, and ethical use of technology. However, the positives outweigh the challenges, LLMs can open doors to vast knowledge allowing students to access a wider range of information than ever before, also LLMs can tailor the learning experience to each student's needs and interests (Aljanabi, 2023; Chaka, 2023; Eysenbach, 2023).

Researchers such as (Baguma et al., 2024) have cautioned against the application of LLM across the board in Africa as this could worsen existing social and economic inequalities, which include limited technological advancement, historical injustice, marginalization, and underrepresentation of African languages, values, and norms in LLM training datasets. The authors employed a documentary analysis methodology, examining existing literature on the potential harms of large language models (LLMs) specifically in the African context. It evaluates both documented harms and those identified in Western contexts, as well as novel harms based on African norms, values, and contextual factors. The study relies heavily on documentary analysis and theoretical evaluation, with limited empirical data to support its claims. This limits the ability to assess the real-world impact of LLMs in Africa. The current study tries to fill this gap through empirical research using surveys to highlight both the challenges and opportunities from the viewpoint of research students and lecturers. By addressing these gaps, this research can contribute to a more comprehensive understanding of the impact of LLMs in Sub-Saharan Africa and support the development of more inclusive and equitable AI technologies. The research of same citation (Pantserev, 2022) employs an exploratory approach to examine existing practices and risks associated with the malicious use of artificial intelligence (MUAI) in Sub-Saharan

African countries. The study focuses on a highly relevant and critical issue—cybersecurity and the malicious use of AI—within the specific context of Sub-Saharan Africa, offering region-specific insights. The study addresses a broad range of issues, including information security, psychological security, and cybersecurity, providing a holistic view of the challenges faced by Sub-Saharan African countries. However, the study does not appear to include primary data collection or empirical analysis, relying instead on existing literature and secondary sources, which may limit the depth and reliability of its findings. This study offers a valuable exploration of the challenges associated with the malicious use of artificial intelligence in Sub-Saharan Africa, particularly in the context of cybersecurity. However, the lack of empirical data, and the absence of detailed solutions highlight areas where future research can provide more in-depth and actionable insights. By addressing these gaps, future studies can contribute to the development of more effective strategies for combating MUAI and enhancing cybersecurity across the region.

The study of (Donlon & Tiernan, 2023) employs an experimental case study methodology, where the authors document their process and experiences in using AI (specifically ChatGPT-3.5) to generate academic material relevant to their professional context. The experimental approach provides firsthand, practical insights into the capabilities and limitations of AI in academic writing, offering valuable real-world perspectives. By focusing on a specific professional context, the study ensures that the findings are directly applicable to similar academic and professional settings. However, the study lacks a comparative analysis between AI-generated content and traditionally produced academic content. Also, the discussion on generative AI could be more balanced by getting the perspectives of both students and academics in less developed countries. Besides, future studies should conduct comparative analyses to evaluate the quality, credibility, and effectiveness of AI-generated academic material against human-generated content. Overall, the study of (Donlon & Tiernan, 2023) provides valuable insights into the use of AI, specifically ChatGPT-3.5, in academic writing through an experimental case study approach. However, its limited scope, lack of comparative analysis, and focus on a single professional context suggest areas where future research can expand and deepen the understanding of AI's role in academia. By addressing these gaps, future studies can provide more comprehensive insights into AI's broader implications and potential in educational technology. (Imran & Almusharraf, 2023) employs a systematic literature review (SLR) methodology to examine the role of ChatGPT as a writing assistant in academia. The study uses a PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flowchart to systematically select the 30 most relevant articles from an initial pool of 550, ensuring a thorough and unbiased selection process. By reviewing a wide range of articles, the study captures diverse perspectives and insights on the use of ChatGPT as a writing assistant. The study highlights the need to revisit academic policies and training but does not provide detailed recommendations or explore the broader pedagogical implications of integrating AI tools like ChatGPT into academic writing courses. The research community would benefit from further studies that examine the impact of ChatGPT on academic integrity. This study provides a systematic review of the role of ChatGPT as a writing assistant in academia, offering valuable insights into the opportunities and challenges associated with its adoption. However, the limited time frame, and lack of empirical validation highlight areas where future research can build upon and expand the understanding of AI's impact on academic writing.

(Spivakovsky et al., 2023) employ a case study methodology focused on Kherson State University, where it examines the process of developing institutional policies for the application of artificial intelligence (AI) in education, training, and research. By focusing on a specific institution, the study provides detailed, context-specific insights into the process of formulating AI policies, which can be highly relevant for similar institutions seeking to develop their policies. The study addresses various stakeholders within the educational ecosystem, including students, lecturers, and researchers, ensuring that the institutional policies are inclusive and cover different aspects of academic life. It offers actionable recommendations and guidelines for AI use, which can be directly implemented by other higher education institutions seeking to navigate the complexities of AI integration. However, the study is centred on a single institution, which limits the ability to compare AI policy development

across different educational contexts. The focus on a single institution, lack of empirical validation, and limited exploration of ethical challenges highlight areas where future research can expand and deepen the understanding of AI governance in education. A recent study by (Chukwuere, 2024) employs a narrative literature review (NLR) methodology to synthesize existing research on the integration of generative AI chatbots in higher education institutions (HEIs). He submitted that NLR allows for a broad and integrative analysis of diverse sources, drawing from a wide range of academic databases and scholarly publications. NLR can provide a rich, narrative-driven understanding of the evolving trends and discussions around generative AI chatbots in education. However, the study lacks empirical validation of the theoretical insights andit is believed that subsequent studies should incorporate empirical methods, such as case studies, experiments, or surveys, to validate the impact and effectiveness of generative AI chatbots in HEIs. The study provides valuable insights into the potential and challenges of integrating generative AI chatbots in HEIs using a narrative literature review methodology. However, its reliance on existing literature without empirical validation, the absence of longitudinal perspectives, limited focus on user experience, and the need for detailed ethical guidelines highlight areas where future research like this current one can build upon and expand the understanding of AI's role in education.

Likewise, (Vibbi, 2024) has cited the issue of poor data quality in Sub-Saharan Africa and its potential impact on the development of ethical artificial intelligence (AI) systems. The authors argued that the lack of online representation for African languages limits the availability of natural language data for training inclusive language models. The study uses documentary analysis to examine existing literature on large language models (LLMs) and their potential harms in Africa. It reviews harms documented in both African and Western contexts, as well as novel harms that may arise from applying LLMs in the unique socio-cultural and linguistic environment of Africa. It provides an extensive review of existing research, encompassing harms that are already recognized in Africa, those acknowledged in Western contexts but not yet applied to Africa, and potential new harms unique to the African context. This broad scope ensures a thorough examination of the issues. However, the study primarily relies on secondary sources and theoretical analysis, with limited empirical data or case studies to validate the identified harms. It primarily focuses on potential harms, with less attention given to the potential benefits of LLMs in Africa. Therefore, this current study tries to fill this gap using empirical data to analyse both the harm and benefits of LLMs in the Sub-Saharan African context. Similar sentiments were shared by (Hamdan et al., 2021) who cited governance issues and lack of institutional capacity as hindrances to maximizing the potential of AI in Africa, and (Ayana et al., 2024) who observed limited progress in sub-Saharan Africa on AI governance institutions, national strategies on AI, sovereignty prioritization, data protection regulations, and adherence to local data usage requirements. (Ayana et al., 2024) employed qualitative evaluation and comparative analysis to assess Sub-Saharan African (SSA) countries' progress in decolonizing AI governance. The study emphasizes the decolonization of AI governance, a critical and often overlooked aspect of global AI governance. This focus helps in addressing biases and inequalities in AI development and deployment. By using specific indicators such as AI governance institutions, national strategies, and data protection regulations, the study provides a structured framework for evaluating each country's progress, making the analysis more systematic and transparent. This study offers a critical evaluation of the progress made by Sub-Saharan African countries in decolonizing AI governance, highlighting the importance of equity, ethical AI, and regional partnerships. However, the qualitative focus, potential for subjective bias, and limited geographical and longitudinal scope suggest several areas where future research could deepen and broaden the understanding of AI governance decolonization.

(Baguma et al., 2024) further argued that most African languages are underrepresented on the internet: they are primarily oral with little available in written and digitized form, with conflicting orthographic standards. All these constitute some of the challenges of relying on LLMs for academic and research data in the Sub-Saharan African context. Ethical considerations surrounding AI development, such as fairness, transparency, and bias, become more pronounced in the context of inadequate data quality in the African context (Vibbi, 2024). Therefore, there is a need to recognizing

persistent colonial repercussions, in Sub-Saharan Africa leading to biases in AI solutions and disparities in AI access based on gender, race, geography, income and societal factors (Ayana et al., 2024). Although AI chatbots have the potential to enhance and streamline academic processes, their integration into writing raises ethical concerns, particularly in Sub-Saharan Africa. Issues include underrepresented African languages, limited training datasets from the region, poor data quality, absence of a national AI strategy, lack of institutional support, and insufficient data protection regulations. Given the limited research on this topic within Sub-Saharan Africa, this paper aims to contribute to the existing literature by examining these challenges and ethical implications from the perspective of research students and academics in the region.

2. Materials and Method

This study employed a quantitative research approach, specifically a cross-sectional design, to explore the challenges and ethical considerations of AI in academic writing for research students and academics in Sub-Saharan Africa. Data collection utilized an online survey questionnaire administered through Google Forms. The survey was active from December 2023 to January 2024. The target population comprised research students and academics from three countries in Sub-Saharan Africa: Nigeria, Eswatini, and Uganda. To ensure unbiased representation and equal opportunity to participate, a random sampling technique was employed. Ethical considerations were strictly adhered to during questionnaire administration. The study included 115 participants. The survey instrument consists of four sections. Section 1: Background Information - This section gathers basic details about the participants involved in the research. Section 2: Generative AI Usage in Research - This section assesses participants' familiarity and experience using generative AI for academic research purposes. Section 3: Perceptions of Generative AI - This section explores participants' views on the effectiveness, desirability, and ethical considerations surrounding the use of generative AI in academic research. Section 4: Support for Generative AI - This section gauges the level of support for incorporating generative AI tools within academic institutions. To ensure that the instrument effectively measures its intended variables, both content and construct validity were rigorously established through expert evaluation by senior researchers in information science. These experts provided critical feedback on the instrument’s relevance and accuracy in capturing the intended constructs. Furthermore, the instrument’s reliability was evaluated through a pilot study involving ten participants. The data collected from this pilot group were analyzed using Cronbach's alpha, a statistical measure of internal consistency. The resulting Cronbach's alpha coefficient indicated a satisfactory level of reliability, confirming that the instrument consistently measures the intended constructs. This validation process ensures that the instrument can be confidently utilized in the final data collection phase.

3. Result

3.1. Participants' Educational Levels

The survey results provide valuable insights into the educational levels of participants utilizing chatbots for academic purposes (Table 1). The study involved a diverse group of participants, with a significant representation of PhD holders (31.9%). This suggests a focus on researchers with extensive experience who might be looking for advanced research tools. Master's Degree holders (28.3%) and Undergraduates (21.2%) also form a considerable portion, indicating a growing trend of interest in AI chatbots across various research levels.

Table 1: Participants' Educational Levels

Level of Education	Percentage (%)
Undergraduate	21.20%
Graduate	8.90%
Post-graduate	9.70%
Master's degree	28.30%
PhD	31.90%

3.2. How Research Participants Utilize Chatbots

A strong majority (77%) of participants reported already using AI chatbots for academic purposes (Table 2). This highlights a significant level of interest and early adoption of this technology within the research community. The remaining 23% who haven't adopted AI chatbots could be due to factors like lack of awareness, concerns about effectiveness, or specific research needs not yet addressed by chatbots.

Table 2: How Research Participants Utilize Chatbots

	Percentage (%)
Participants who have used Chatbot for research	77%
Participants who have never used Chatbot for research	23%

Figure 1 sheds light on how researchers are utilizing AI chatbots within the academic research process.

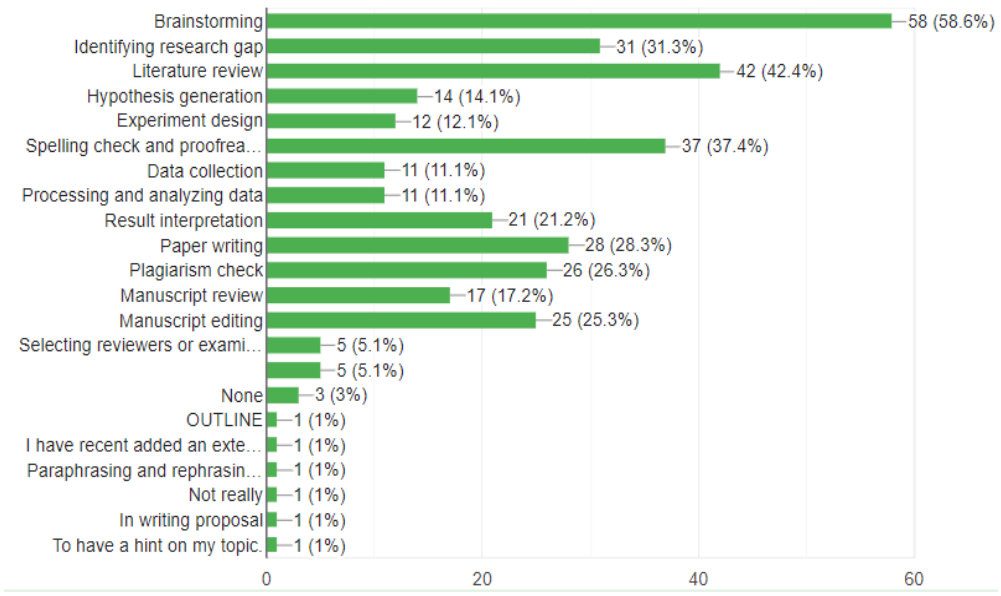

Figure 1. How Researchers Utilize AI Chatbots in Academic Work

Brainstorming takes the Lead (58.6%): The most popular application of chatbots is for brainstorming research ideas (over half of respondents). This suggests chatbots are seen as valuable tools for sparking creativity and generating new research directions. Literature Review Support (42.4%): A significant portion of participants leverage chatbots for literature review tasks, indicating

their potential to assist with information retrieval and summarizing research findings. Identifying Research Gaps (31.3%): Over a third of participants find chatbots helpful in identifying research gaps, highlighting their potential to analyze existing literature and pinpoint areas for further investigation. Writing & Editing Support (28.3% & 25.3%): While less prevalent than brainstorming and literature review, chatbots are also used for writing assistance (28.3%) and manuscript editing (25.3%). This suggests a growing role for chatbots in the later stages of the research process. Plagiarism Checking (26.3%): A notable portion of participants utilize chatbots for plagiarism checks, demonstrating an interest in ensuring academic integrity and originality. The survey results in Table 3 reveal a moderate level of awareness regarding AI chatbots among the participants. A significant majority (59.3% familiar + 15.9% expert) of participants indicated some level of familiarity with AI chatbots. This suggests a growing presence and understanding of this technology. A noteworthy portion of participants (almost 16%) consider themselves expert users, highlighting the potential for in-depth knowledge and experience with AI chatbots within this group. While the majority is familiar, a minority (11.5%) remains unfamiliar with AI chatbots. This highlights the need for continued efforts to raise awareness and educate users about the capabilities of this technology.

Table 3: Research Participant Experiences with Chatbots

	Percentages (%)
Not familiar with Chatbots	11.50%
Basic awareness of Chatbots	18.60%
Can perform basic tasks with Chatbots	27.40%
Proficient User of Chatbots	26.50%
Expert User of Chatbots	15.90%

Table 4: Effectiveness of Chatbot as a Tool for Research

	Percentages (%)
Not Effective	6.20%
Somewhat Effective	8.20%
Moderately Effective	38.10%
Highly Effective	36.10%
Very effective	11.30%

The survey results presented in Table 4 indicate a positive sentiment towards chatbots as a tool for academic research. Almost half (47.4%) of the participants consider chatbots to be highly impactful for their research endeavors. This suggests chatbots are fulfilling a significant need and providing valuable assistance. A significant portion of participants (38.1%) find chatbots to be moderately helpful, indicating potential for further development to enhance their effectiveness. A minority of participants (14.4%) found chatbots to be less effective, suggesting there might be limitations or areas for improvement to address user needs. Overall, results suggest that chatbots are gaining traction as a valuable resource for researchers. A survey of participants revealed significant potential benefits of AI chatbots in research, with the top responses being reduced workload (59.4%), improved efficiency (58.4%), enhanced creativity (41.6%), and increased accuracy (36.6%). These findings are further illustrated in Figure 2.

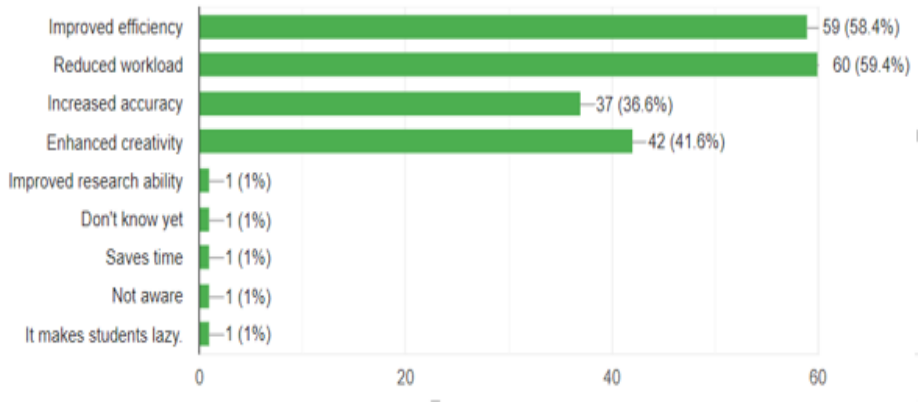

Figure 2: Benefits of using AI chatbots for Academic Research

A significant portion (38.4%) of participants reported a substantial increase in their research productivity after using AI chatbots. This suggests that AI chatbots can be a valuable tool for streamlining workflows and boosting research output. However, the majority (51.5%) noted only a moderate improvement. This may indicate that current AI chatbot functionalities haven't fully matured to optimize research workflows for all users. Finally, 10% of participants felt there was no significant impact. This highlights the need for further development to ensure AI chatbots offer widespread utility in research.

Table 5: Impact of AI chatbots on Research Productivity

	Percentages (%)
Increased moderately	51.50%
Increased significantly	38.40%
No significant impact	10%

3.3. Challenges Encountered by Research Participants When Using AI Chatbots

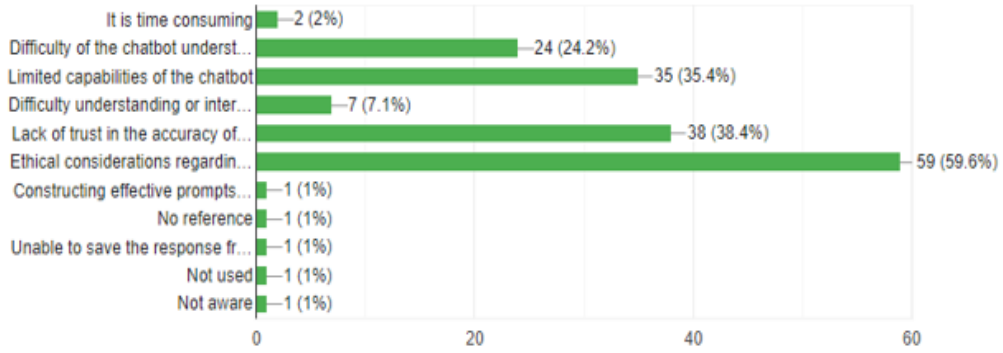

Figure 3: Challenges Encountered by Research Participants When Using AI Chatbots

Ethical concerns and information reliability are top challenges for AI chatbots in research. This is illustrated in Figure 3. A survey of research participants using AI chatbots revealed significant concerns: Ethical considerations (59.6%): Authorship and plagiarism were top worries, highlighting

the need for clear guidelines on AI's role in research contribution. Information accuracy (38.4%): A lack of trust in chatbot responses suggests the need for improved transparency and data verification methods. Limited functionalities (35.4%): Participants reported chatbots not meeting their full research needs, indicating a requirement for expanded capabilities. While some faced difficulties with chatbot prompts (24.2%) and responses (7%), these were less prevalent concerns.

3.4. Ethical Issues with AI Chatbots

Privacy tops ethical concerns surrounding AI chatbots in research. A survey of research participants using AI chatbots revealed a hierarchy of ethical concerns: Privacy (42%): This dominant concern highlights the importance of transparent data practices and robust user privacy protections when using AI chatbots for research. Security (34%): Researchers worry about unauthorized access to sensitive data processed by AI chatbots. Implementing strong security measures is crucial. Bias (32%): Concerns about biased information or outcomes generated by AI chatbots necessitate careful development and training datasets to minimize bias. Fairness (28%): Researchers want to ensure AI chatbots don't disadvantage certain research areas or methodologies. Fairness in access and functionality needs consideration. This is illustrated in Figure 4.

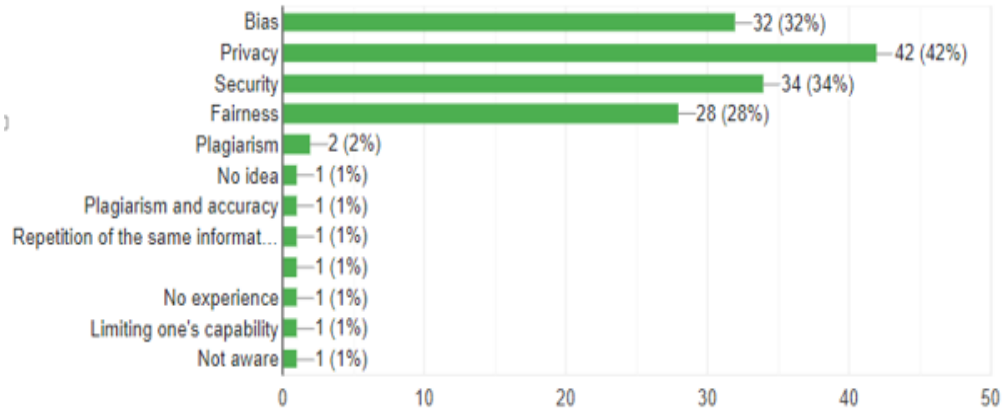

Figure 4: Ethical Issues with AI Chatbots

3.5. The State of Support for AI Chatbot Adoption in Academic Research

A survey of participants using AI chatbots for research identified key areas for improvement (Figure 5).

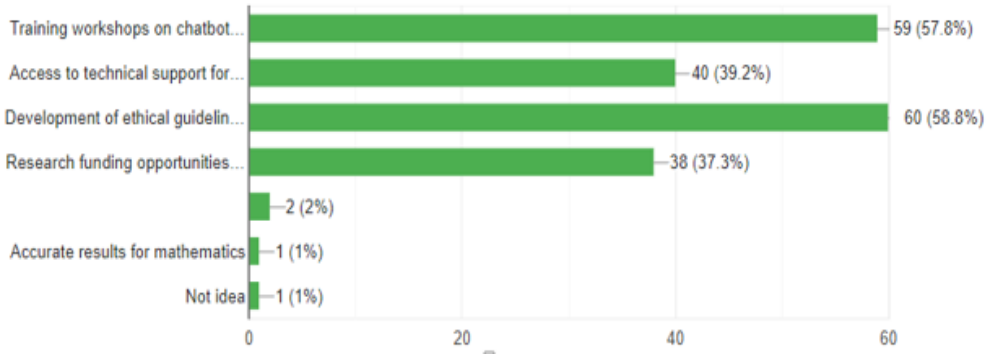

Figure 5: State of Support for AI Chatbot Adoption in Academic Research

Ethical guidelines (58.8%): This overwhelming response highlights the need for clear ethical frameworks governing AI chatbot use in research. Researchers need guidance on issues like authorship, privacy, and bias. Training workshops (57.8%): Participants seek training to understand both the capabilities and limitations of AI chatbots. Equipping researchers with this knowledge can maximize the effectiveness of chatbots in their workflows. Technical support (39.2%): Access to technical support is crucial for the seamless integration of AI chatbots into research practices. This could involve assistance with set-up, troubleshooting, and customization. Research funding (37.3%): Funding opportunities dedicated to exploring chatbot applications in research would encourage further development and adoption

Table 6: Academic Institution Support for Research Using AI Chatbots

My academic institution provides adequate support for research using AI chatbots	**Percentages (%)**
Adequate Support	7.10%
Inadequate Support	55.80%
Unsure	7.10%

The survey reveals a lack of institutional support for AI chatbots in research. A key finding from the survey (Table 6) highlights a gap in institutional support for AI chatbot use in research: Limited Support (55.8%): A majority of participants reported inadequate support from their institutions. This suggests a need for academic institutions to develop resources and initiatives to help researchers leverage AI chatbots effectively. Unsure (37.2%): A significant portion of participants were unsure about the availability of support. This points to a lack of clear communication or established programs within these institutions. Adequate Support (7.1%): Only a small percentage reported receiving sufficient support. This emphasizes the current underdevelopment of institutional support structures.

3.6. Enhancing Institutional Support for AI Chatbot Use in Research

An analysis of participant responses regarding enhanced support for AI chatbot use in research revealed several prominent themes, as highlighted below:

Theme 1: Effective Use of AI in Education
Subtheme 1.1: Training and awareness for ethical use of Chatbots
Educators and learners need proper training to understand the ethical implications of using AI chatbots. This includes issues like plagiarism, bias, and data privacy.
Subtheme 1.2: Improved efficiency for learners and instructors
Chatbots can streamline workflows for both learners and instructors by automating tasks and providing personalized assistance.

Theme 2: Technological Infrastructure for AI
Subtheme 2.1: Latest technologies, gadgets, and infrastructure
Access to up-to-date technology is crucial for seamless chatbot integration.
Subtheme 2.2: Fast internet access
Reliable and high-speed internet is essential for smooth chatbot operation.
Subtheme 2.3: Financial support for AI tools
Costs associated with AI tools can be a barrier to adoption.
Subtheme 2.4: AI technology experts
Having in-house expertise in AI technology can be highly beneficial.

Theme 3: Responsible AI Development and Use
Subtheme 3.1: Funding for AI research, including plagiarism detection

Investment in research is crucial for improving AI capabilities, including plagiarism detection tools.
Subtheme 3.2: Proper acknowledgement of sources in AI-generated results
Clear guidelines are needed for acknowledging sources used by AI chatbots to avoid plagiarism.
Subtheme 3.3: Policies for using AI in academics and research
Clear and comprehensive policies provide a framework for responsible AI use in academic settings.

3.7. How AI Chatbots Might Impact Research

Researchers were asked how AI chatbots might impact research, and the following insights emerged from sentiment analysis:

Table 7: How AI Chatbots Might Impact Research

Sentiment	Text
Positive	Improved learning and quality of research papers, Improved efficiency, productivity, and research output, Making research easier, Significantly improving research by enabling more research, Serving as a researcher assistant by reducing workload, Pushing the frontier of knowledge boundary, Automating data collection and providing secondary information, Helping researchers access and analyze data, finding patterns, Generating new hypotheses and testing them efficiently
Negative	Increased misinformation and plagiarism, Creating an era of recycled data and needing new standards, Limiting intellectual creations by depending on AI for ideas, Robbing researchers of critical thinking skills, Replacing human creativity and making researchers lazy, Creating overdependence on chatbots and reluctance in researchers
Dual Nature	While they offer benefits, chatbots also pose challenges that need careful consideration.

3.8. Top Concerns Regarding AI Chatbots in Research

Key concern emerged from the survey on researcher perspectives of AI chatbots: the potential negative impact on research quality and originality. Participants expressed several anxieties, including reduced creativity and intellectual laziness: researchers becoming overly reliant on AI for ideas and content. Plagiarism and inaccurate information: AI-generated content being used unethically or containing errors. Loss of critical thinking: researchers rely on AI without properly evaluating information. Bias and misinformation: AI perpetuating biases present in its training data. Erosion of originality and authorship: Difficulty distinguishing between human and AI-written work. Overall, respondents express anxieties about AI chatbots hindering the integrity and creativity within academic research. Researchers see potential in AI Chatbots despite concerns as revealed in Table 8.

Table 8: Recommending the use of AI chatbot for research to others

	Percentages (%)
To be recommended	66%
Not to be recommended	5.85%
Maybe	22.30%
Not sure	5.85%

The survey revealed an interesting paradox in researcher attitudes towards AI chatbots. A significant majority expressed worries about the widespread use of AI in academia. These concerns likely center around potential issues like plagiarism or the impact on research quality. Despite

concerns, recommendation is high (66%): Intriguingly, a majority of participants (66%) were still willing to recommend AI chatbots to others. This suggests they see potential benefits despite the identified drawbacks. Researchers acknowledge the potential risks associated with AI chatbots in academia, but they also recognize the potential value these tools can offer.

4. Summary and Conclusion

Artificial intelligence (AI) is rapidly transforming various sectors, and education is no exception. Large language models (LLMs), a type of AI adept at generating human-like text, are revolutionizing teaching, learning, and research. This paper explores the potential of LLMs in academic research, focusing on both the exciting opportunities and the critical challenges they present. Findings from this research suggest that AI chatbots are gaining traction as a valuable tool for researchers across experience levels and disciplines. This aligns perfectly with recent research by (Hwang & Chang, 2023; Imran & Almusharraf, 2023; Khosravi et al., 2024; Saleh, 2019). Their studies all found that utilizing ethically designed AI chatbots in research settings can demonstrably enhance the learning experience for students, as human-to-chatbot interaction allows real-time engagement, improves students' communication skills, and improves students' efficiency of learning. Moreover, the high adoption rate among PhD holders indicates the potential for advanced functionalities catering to complex research needs. Further investigation into the specific applications and perceived benefits of AI chatbots within different academic fields could provide even richer insights. Furthermore, the study found that AI chatbots are becoming increasingly recognized, with a significant portion of the researchers surveyed possessing at least a basic understanding. However, there's still room for improvement in reaching the currently unfamiliar segment. Besides, results showcase AI chatbots emerging as versatile tools across various research stages. Their primary role seems to lie in the initial phases - brainstorming, literature review, and identifying gaps. However, their application in writing and editing tasks suggests the potential for a more comprehensive role in the research workflow. AI chatbots hold significant potential to enhance research productivity, optimizing functionalities and user experience can lead to wider adoption and greater impact. More research is needed to understand how AI chatbots can best integrate into diverse research workflows. The results suggest that when it comes to AI chatbots used in research, privacy is the biggest ethical concern for participants, highlighting the importance of researchers being transparent about how data is collected and used. The findings from this research highlight several critical issues that warrant a deeper examination.

While LLMs offer significant benefits, including enhanced productivity and accessibility, their application in academia is fraught with complexities that could undermine the integrity, quality, and inclusiveness of scholarly work. Therefore, strong user privacy protections are essential when working with AI chatbots. Studies that shared similar sentiments are (Chen et al., 2020; Guleria et al., 2023; Hwang & Chang, 2023; Kooli, 2023; Singhal et al., 2022). Besides, security and unauthorized access to sensitive data is a major worry, there is a need for robust security measures to safeguard end-user data. Concerns also exist about AI chatbots potentially presenting biased information or influencing research outcomes, therefore, careful development and using unbiased training datasets are crucial for AI chatbot development. Similarly, academic researchers want to ensure AI chatbots do not favour specific research areas or methodologies, in essence, fairness needs to be considered in terms of access and functionality for all research fields. Academic Integrity and Plagiarism, Bias and Misrepresentation in AI-generated content, Over-reliance on AI and the Erosion of Critical Thinking Ethical Considerations remain some of the obvious challenges. The findings from this study have several key implications for researchers using AI chatbots: Prioritize Transparency and User Control: Researchers must be clear about data collection and usage practices. Users should have control over their data and be able to opt out if desired. Implement Strong Security Measures: Robust security protocols are essential to prevent unauthorized access to sensitive data processed by AI chatbots. Minimize Bias in Development: Careful attention needs to be paid to creating unbiased training datasets and algorithms to avoid

biased outputs from the AI chatbots. Ensure Fair Access and Functionality: Researchers should strive to develop AI chatbots that are accessible and offer equal functionality for all research areas and methodologies. By addressing these concerns, researchers can build trust and ensure the ethical use of AI chatbots in research. In other words, it is essential to develop training programs and workshops on ethical chatbot use, and likewise integrate discussions on ethics into existing educational technology courses.

Research participants also emphasized the need to explore ways to leverage chatbots for repetitive tasks like scheduling, answering FAQs, or providing personalized feedback. Concerning academic institutions' role in supporting AI chatbot use in research, findings suggest that institutions should assess their current infrastructure and invest in upgrades if necessary, explore partnerships with technology providers for access to advanced tools to ensure adequate and stable internet connectivity across campus and explore options for expanding bandwidth or providing alternative access points. Furthermore, academic institutions need to seek funding opportunities or grants specifically for educational technology initiatives, explore open-source or affordable AI chatbot options, consider hiring or training staff with expertise in AI and chatbot technologies, and encourage collaboration between IT departments, educators, and researchers to develop and implement AI-powered solutions. These also include advocating for increased funding for AI research in education, with a focus on areas like plagiarism detection and ethical development, exploring collaborations with research institutions, develop and implementing clear policies on source attribution when using AI-generated content in academic settings. Educate both learners and instructors on proper citation practices for AI-assisted research, and establish institutional policies that address ethical considerations, data privacy, and academic integrity concerns related to AI chatbots. Moreover, there is a call to involve stakeholders like educators, researchers, and students in policy development. By addressing issues outlined in this study educational institutions can foster a more responsible and effective environment for utilizing AI chatbots to enhance the learning experience for both students and instructors. In essence. while LLMs present both opportunities and challenges for academic research, their potential benefits are undeniable. By acknowledging the inherent risks and establishing clear guidelines for responsible use, researchers can leverage LLMs to enhance the quality, efficiency, and overall impact of their work. Future research should explore strategies for mitigating risks and maximizing the potential of LLMs in the academic ecosystem.

In conclusion, this study has revealed a complex landscape where the potential benefits of AI and LLMs are accompanied by significant risks in the academics particularly for academics in less developed regions such as Sub-Saharan Africa. The challenges related to academic integrity, bias, over-reliance on AI, the digital divide, ethical considerations, and the risk of standardization all highlight the need for a cautious and thoughtful approach to integrating AI in academia. This study offers valuable insights into the use of AI chatbots in academic writing within Sub-Saharan Africa, contributing to the existing body of knowledge by highlighting both the opportunities and challenges associated with this technology. It provides a detailed understanding of how AI chatbots are being adopted and utilized by researchers in Sub-Saharan Africa, adding to the growing body of knowledge on AI in education. The focus on Sub-Saharan Africa adds valuable regional context to the global discussion on AI in academia, revealing specific challenges and opportunities pertinent to less developed regions. Policymakers and academic institutions should develop clear guidelines on data security and the ethical use of AI chatbots. This should include protocols for protecting user privacy and strategies for mitigating bias in AI-generated content. Universities and research institutions should establish dedicated training programs and technical support structures to help researchers effectively integrate AI chatbots into their workflows. This includes offering workshops, resources, and hands-on assistance to maximize the benefits of this technology. Similarly, collaboration with AI developers and researchers can help tailor these tools to better meet the specific needs of academic researchers. Academic institutions should encourage the adoption of ethical AI practices across academic institutions, including regular audits of AI tools to ensure compliance with privacy standards and bias

mitigation. This can help build trust in AI technologies and ensure their responsible use. Academic institutions should raise awareness about the potential benefits and limitations of AI chatbots among researchers and academic staff. They should also provide training on best practices and effective use of these tools, which can help users make informed decisions and improve their research outcomes. Future research should focus on developing strategies to mitigate these risks, ensuring that AI is used in a way that enhances, rather than undermines, the quality and inclusivity of academic research. Moreover, ongoing dialogue between technologists, educators, and policymakers is essential to navigate the ethical and practical challenges posed by AI in academia, ensuring that these tools are used responsibly and equitably.

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