

Harnessing the Use of Artificial Intelligence among Higher Education Institutions in Tanzania: Challenges and Prospects

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ABSTRACT

This study investigates the use of AI among higher education institutions (HEIs) in Tanzania by examining the challenges and prospects of using such technology among academics. The study was premised on the positivism paradigm and adopted a quantitative research approach. The online survey was used to collect data from 207 members of academic staff at Moshi Co-operative University (MoCU). The survey received a response rate from 63 (31%) of academics. The study used convenience sampling because the survey was shared through their emails to gather data for the study. The study findings established that academics have awareness of the use of AI in academia. However, its application is still slow because of challenges associated with its use, such as cheating and plagiarism, the absence of required infrastructure, the problem of internet connectivity, a lack of privacy, and a dearth of well-defined laws governing its utilisation. Some of the common AI tools preferred to be used by academics were identified, including Grammarly, Bing AI, ChatGPT, Quillbolt, and Bard AI. The availability of various applications to detect AI-generated contents, such as image analysis tools, text analysis tools, meta-analysis, content moderation platforms, pattern recognition algorithms, text analysis, and others, guarantees a better future of AI usage among HEIs in Tanzania. Harnessing the use of AI among HEIs in Tanzania will improve independent and collaborative learning, facilitate online tutorials, be used as language assistance, help in research, detect plagiarism, and provide access to information and knowledge among people with disabilities. The study recommends policies and guidelines to be formulated to harness the use of AI among academics in Tanzanian HEIs. The study also recommends HEIs offer training on the proper use of AI in academic settings and formulate policies and guidelines to guide the usage of such technology among HEIs in Tanzania.

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1. INTRODUCTION

The usage of artificial intelligence (AI) has brought benefits and drawbacks to the higher education sector across the globe. Chen, Chen and Lin, (2020) defined artificial intelligence (AI) as is a machine's ability to adapt to new settings, deal with developing scenarios, solve problems, answer questions, devise strategies, and execute a variety of other duties that need some amount of intelligence often found in humans. AI is not a single thing; it is an umbrella which consists of several things including machine learning, knowledge-based systems, computer vision, robotics, natural language processing and automated planning and scheduling (Cardona, Rodríguez, & Ishmael 2023). AI is applied almost in all fields, ranging from pattern discovery by using big data analysis, data clustering, and sequencing to highly accurate output prediction from data (Kim & Kim, 2022). AI began life as computers and computer-related

technologies, and then evolved into web-based and online intelligent education systems. Eventually, embedded computer systems and other technologies were used, along with web based Chatbots and humanoid robots, to carry out teaching tasks either independently or in conjunction with instructors (Chen, Chen & Lin, 2020).

In 1920, as part of the global Fourth Industrial Revolution (4IR), artificial intelligence (AI) technology was developed in the fields of electrical, mechanical, and computer science (Mwilongo, Mwageni, & Matto, 2022). AI was founded as a field of study in the 1950s, but for more than 50 years after, it was mostly ignored by science and had little use in real life. Education field is among the users of AI in their operations, different AI technologies are used in education. Zhang and Aslan (2021) identified AI technologies such as chatbot, expert systems, intelligent tutor, machine learning, personalized learning and visualization which are applied in education sector. AI in education holds immense potential for transforming learning environment, teaching environment and administrative practices Irfan and Murray (2023). With the advent, development, and widespread use of technology—more specifically, artificial intelligence—educators may now carry out their responsibilities more quickly and effectively (Chen, Chen & Lin, 2020).

Using AI, students can have a personalized learning assistant that can act as a guide through the vast array of learning opportunities, an instructor, or a learning partner. It could also record the student's interests and progress in a block chain-protected learning record (Holmes, Bialik, & Fadel, 2019). Though education systems around the world are more resistant to technological changes in their traditional organisation, AI in education has nevertheless experienced several challenges in its growth. AI was envisioned to personalize learning through tutoring systems, revolutionizing the educational landscape (UNESCO, 2019). On the other hand, Fontanilla et al. (2023) affirms that AI technology has the potential to enhance student learning while expediting the teaching and learning process. Educators will be able to devote more of their attention to providing students with meaningful learning experiences because of the occasional reduction in pointless labour. Although AI has many advantages for higher education institutions in terms of helping in the teaching and learning process, there are also risks and ethical considerations related to its use, including privacy concerns, cheating in academia, and data protection. Additionally, there have been some worries among HEIs academics and other employees that AI will take their employment. The current study is therefore being undertaken to assess the use of AI in academia among HEI instructors in Tanzania and the challenges they encounter in using such a technology.

Main Research Objective: To assess of the use of AI in academia among HEIs in Tanzania. Specifically, the current study was guided by the following objectives: (1) To assess academics level of awareness on the use of AI in academia; (2) To determine the usefulness of AI in academia; AND (3) To examine challenges encountered by academics in the use of AI in academia.

Literature review

One of the useful models for determining whether users would accept and use new technology is the technology acceptance model (TAM 2), which was propounded by Davis in 1989. The TAM 2 model identifies two factors that impact the adoption and use of new technology: an individual's perceptions of the technology's ease of use and the technology's perceived usefulness for the user. The attitudes of users about the adoption and application of new technology are among the additional aspects linked to the TAM 2 model. The use of a system is extended into cultural and social merits in the Technology Acceptance Model 2 (TAM 2), which also includes extra social influence mechanisms and cognitive instrumental processes. Thus, the perceived usefulness is directly influenced by subjective norms, work relevance, output quality, experience, and voluntariness. The TAM 2 model's variables are regarded to be helpful in this study context for determining the use of AI in academia by looking at the advantages that

AI may offer to them in their academic endeavours and their associated challenges. The variables, such as culture and experience from TAM 2 model, can be used to ascertain how frequently academics will use AI in their academic activities based on their skills of using such technology. Thus, the study was guided by variables that were conceptualised from the TAM 2 model, including perceived usefulness, and perceived ease of use.

According to a study done in China by Niu et al. (2023), educators saw the usage of AI as a helpful tool because it comes with various advantages, including assessment tools and an abundance of excellent mini-structure films. Additionally, a study conducted by Chounta et al. (2021) in Estonia discovered that instructors knew very little about AI and how it may help them in the real world. Nonetheless, they saw it as a chance for learning. Billy and Anush (2023) performed a survey in the USA and discovered that most instructors felt that AI could never equal human inventiveness in the classroom. They also firmly stated that while such technology can support educators efficiently, it cannot completely replace human instructors. Another study conducted by Mandal and Mete (2023) in India showed that teachers had a favourable opinion of the usage of AI in the classroom since it aided them in their instructional techniques. According to a study by Barret and Pack (2023), educators thought that using AI for brainstorming and outlining was more beneficial in the early phases of the writing process than it was in the later stages. This means AI should be used to some extent that will not compromise the quality of education because academics and students are expected to develop independent critical thinking to ensure they have skills and techniques for solving various problems. A study by Hostetter et al. (2023), found that faculty members who had previously used ChatGPT or other AI tools agreed more strongly than those who had not that AI could be utilised to help struggling writers. In a study that was conducted in Malaysia on the application of artificial intelligence (AI) in education, Zulkarnain and Yunus (2023) discovered that teachers had a positive perception of AI integration because of the technology's dynamic features and efficacy, even though they encountered several difficulties in using it. This means academics have perceived the use of AI to be useful because of the advantages it offers them because it is embedded with a lot of features that can enable users to multitask, hence saving their time. According to the Shirin (2022) study, which was carried out in Bangladesh, teachers knew very little about artificial intelligence (AI) and how it helps with learning. They did, however, think of it as a potential educational opportunity.

Alijohani (2020) study that was conducted in Saudi Arabia showed that instructors were in favour of using AI in the classroom. According to Joshi, Rambola and Churi's (2020) research, educators strongly advocated for the positive implementation of AI in the classroom and thought it was a beneficial tool. Widianingtyas, Mukti and Silalahi (2023) did a study in Indonesia and discovered that most teachers were familiar with AI technologies and understood how ChatGPT might be used in a classroom setting. To support the effectiveness and efficiency of instruction, they recommended actions to improve knowledge of and integration of AI in education. The literature consulted shows that the use of AI has been perceived to be useful in education in various ways. Although some of the academics encountered challenges in their use, they have accepted that such a technology is useful in education and can help them in academia. However, most of academics have not shown concern regarding their shortcomings in educational settings. The literature that was reviewed demonstrated that instructors in other parts of the world are aware of the use of AI in education, and they perceived the use of such technology to be positive in academia. However, the use of AI in academia is still in its infant stage in Tanzania HEIs because most academics are concerned about issues such as academic integrity and privacy.

Challenges of using AI in Higher Education

The use of AI in academia has some advantages as it was discussed in the previous section including providing better ways for teaching and learning. However, there are some drawbacks associated with the use of such technology in educational context that need to be considered to embrace its application. According to a study done in Estonia by Tundrea (2020), there are five potential problems with using AI: data bias, moral deskilling, moral agency, privacy concerns, and perceptions of quality. To fully utilise AI in the context of higher education, researcher advised taking all ethics into account. According to a different study by Slimi and Carballido (2023), one of AI's weaknesses is its biased algorithms, which could have a negative impact on students' admissions or grades if they are utilised in educational institutions.

Other challenges were noted in the study by Akinwalere and Ivanov (2022), including the comprehensiveness of the data produced by AI, the correctness of the information obtained from such technology, and the fact that the information produced by such technological instruments is not always reliable or is sometimes biased. According to a Chinese study by Yuk and Hu (2023), the use of AI was linked to the following challenges: privacy concerns, ethical dilemmas, career advancement, and societal values. Thus, this calls for developers, educators, and other stakeholders to come to an agreement on how best AI can be used in higher education institutions without compromising the quality of education. Al-Tkhayneh, Alghazo, and Tahat (2023) study recommended that higher education institutions must address legal and moral issues such data security and privacy when utilizing AI to ensure that the technology is used effectively in educational settings. Another study by Saaida (2023) confirmed that integrating and using such technology in the context of higher education requires addressing issues related to the ethical use of AI, such as justice, transparency, and accountability as well as preserving data privacy and security.

According to Fontanilla et al. (2023) study, educators have some reservations about using AI in the classroom due to students' overreliance on these technologies as substitutes for traditional teaching methods rather than as additional resources for learning. According to a study done in Romania by Pisica et al. (2023), students now have more opportunities to cheat in class because they can use this technology to inform themselves of the answers, particularly during tests and exams. Therefore, educators and students need to be trained on the best use of AI to ensure such a technology is used ethically in academia as a learning aid. Kelly, Sullivan and Strampel (2023) aver that, if instructors and students are not instructed on how to maintain academic integrity when utilizing AI in their academic work, the use of AI in academia may result in copyright infringement or academic misconduct like plagiarism. Celik et al. (2022) noted several difficulties instructors had when using AI, including the technology's lack of dependability, its technical capability, and its adaptability to various contexts. Three obstacles were noted by Onalapo and Onifade (2020) as being connected to the application of AI in African educational settings: regulatory, techno-economic, and security concerns, as well as related data issues. These authors maintained that for AI to be applied in African educational settings, the three issues must be resolved. A study by Slimi and Carballido (2023) noted that, privacy and dignity are among the challenges related to AI that higher education institutions need to think about. These issues should be protected by international law since AI has the potential to be utilised without limits and to infringe upon human freedom. The literature consulted shows various challenges that are associated with the use of AI in academia that higher education institutions should consider ensuring they gain maximum benefits out of such technology while minimising risks associated with its use.

2. METHODS

The study was premised on positivism paradigm where a survey was conducted to collect quantitative data from members of academic staff at Moshi co-operative university (MoCU). This

paradigm is closely related to natural science because scientists who adhere to it think that a problem can be objectively investigated by formulating and testing hypotheses, and that conclusions can be drawn from the data to explain the phenomenon (Saunders, Lewis, & Thornhill 2019). MoCU is one of the public universities in Tanzania which offers various academic programmes ranging from Certificates to PhD level with a total of 207 academics. Online questionnaire (survey monkey) was designed using both closed and open-ended questions to collect data for the study. A total of 63 academicians completed the surveyed questionnaire and submitted, which is equal to 31% of the population. Anseel et al. (2010) and Groves (2006) alluded that the online techniques of data collection should reach at least 30% of the response rate because of its nature of collecting data. Convenience sampling was used to select members of academic staff to participate in the study because the questionnaire was shared in their institutional emails and therefore whoever felt convenient to participate was allowed. The collected data were cleaned, coded, and analysed using SPSS version 27 using descriptive statistics, and results were presented in forms of tables, percentages and frequencies.

3. RESULTS AND DISCUSSION

Demographic information

The demographic information of the study respondents is presented in Table 1. The respondents' ranks ranged from tutorial assistants to associate professors. Most of the respondents 57.1% are assistant lecturers or assistant librarians. Regarding experience, 34.9% of the respondents have 5–10 years of teaching experiences. Discipline-wise, 30.2% are from the business discipline, 22.2% from the science discipline, 34.9%, from social science, 6.3% from the humanities discipline, and 6.3% from the law discipline. This shows that the findings were obtained from various members of the staff who were expected to provide information that this study sought to collect.

Table 1. Respondents demographic information

Demographic Information	Respondents (n= 63)	
	Frequency	Percentage
Ranks	Associate professor/ Associate library professor	2 3.2%
	Senior lecturer/Senior Librarian	6 9.5%
	Lecturer/ Librarian	9 14.3%
	Assistant lecturer/ Assistant librarian	36 57.1%
	Tutorial assistant/ Trainee librarian	10 15.9%
Years of teaching/	5- 10 years	22 34.9%
	11-20 years	19 30.2%
Research experience	Less than 5 years	21 33.3%
	More than 20 years	1 1.6%
	Business	19 30.2%
Discipline/Area of expertise	Law	4 6.3%
	Science (Engineering, Technology and mathematics)	14 22.2%
	Social sciences	26 41.3%

Awareness of Artificial Intelligence Tools

The respondents' awareness of the use of artificial intelligence tools in academic activities was assessed. The findings show that 57 (90.5%) said that they are familiar with the use of AI tools in academic activities, while 6 (9.5%) respondents said that they are not familiar with the use of AI tools in education. The findings show that academics are aware of the application of AI in education.

Usefulness of AI tools in academia

The respondents were asked to respond to what extent they perceive artificial intelligence tools to be useful in their academic activities. Most respondents perceive the usage of AI tools in their academic activities to be very useful 28 (44.4%); 25 (39.7%) indicated useful; 1 (1.6%) indicated not useful; and 9 (14.3%) indicated neutral. This result implies that above 80% of the respondents acknowledge the advantages of using AI tools in academia. Various advantages of using AI in academia were mentioned by the respondents, 5 (7.9%) mentioned that it improves individual learning, 14 (22.2%) help in analyzing data, 7 (11.1%) it assist in grading system, 28 (44.4%) it facilitates the online tutorials, 37 (58.7%) it help in generation of contents, 60 (95.2%) work as language assistants, 9 (14.3%) can perform predictive analytics, 31 (49.2%) help in research, 20 (31.7%) can detect plagiarism, 17 (27) Perform online laboratory functions, 50 (79.4%) Used as collaborative learning platforms, 4 (6.3%) help in recruitment process, 24 (38.1%) Improve access to people with special needs as shown in Table 2.

Table 2. Usefulness of AI tools in academia

Usefulness of AI	Respondents (n= 63)	
	Frequency	Percentage
Improve individual learning	5	7.9%
Help in analyzing data	14	22.2%
Assist in Grading system	7	11.1%
Facilitates online tutorials	28	44.4%
Generation of contents	37	58.7%
Work as Language assistants	60	95.2%
Can perform predictive analytics	9	14.3%
Help in research	31	49.2%
Can detect plagiarism	20	31.7%
Perform online laboratory functions	17	27%
Collaborative learning platforms	50	79.4%
Help in recruitment process	4	6.3%
Improves access to people with special needs	24	38.1%

Academic staff easiness or difficultness of using AI tools in academic activities

Respondents were probed to explain how easy or difficult they find using AI in educational settings. The findings revealed that out of 63, 33 (52.4%) of respondents found it easy to use AI tools, 11 (17.5%) mentioned being neutral on how difficult it is to use AI tools, 1 (1.6%) mentioned that it is very difficult to use AI tools, and 15 (23.8%) indicated that it is very easy to use AI tools in academic activities. Figure 1 summarises the respondents' responses.

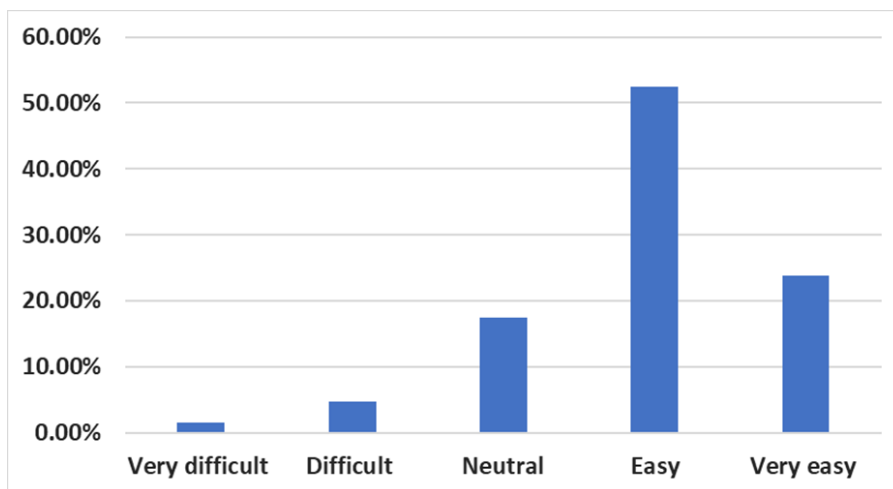


Figure 1. Academic staff easiness or difficulty of using AI tools in academic activities.

Types of AI tools used by academics

Those 49 respondents who said Yes, they are actively using AI tools in their academic tasks, were asked to describe the types of AI tools they are using and the specific tasks they are applying. Figure 2 shows the summary of the results of the respondents. About 3 (6.12%) of the respondents mentioned that they are using Bing AI in their academic tasks, like examining the areas to improve in paper manuscripts, summarising literature, and preparing teaching materials. Another 7 (14.3%) uses the Quillbot grammar AI tool for language editing, paraphrasing, and summarising documents, and 5 (10.20%) uses the Grammarly AI tool for language manipulation like editing, paraphrasing, and grammar checking. About 1 (2.04%) of respondents use image generators to develop different AI image contents for teaching. 8 (16.33%) of the respondents mentioned that they are using Bard AI for getting insight into issues, searching for teaching materials, as well as language editing and manipulation, and the rest 25 (51.02%) of the respondents use ChatGPT for searching for reading materials and teaching notes, getting insight into some emerging issues, and for language manipulation like summarising documents, paraphrasing, and grammar checking. Figure 2 summarises the types of AI tools used.

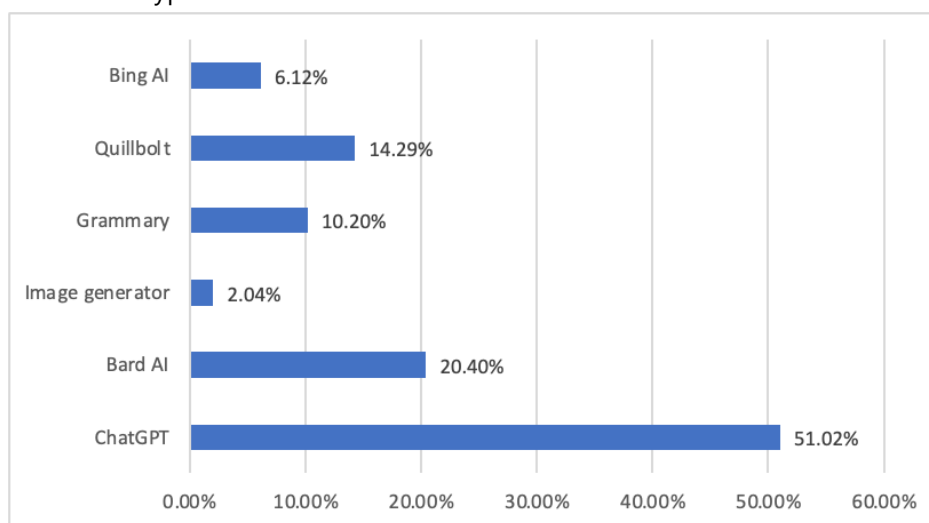


Figure 2. AI tools used for academic activities

Challenges encountered by academics in using AI

Respondents were asked to mention challenges they encounter in their use of AI in education. Out of 14, 6 (42.86%) of respondents mentioned that they don't have access to AI tools or the experience to use them. Another 3 (21.43%) mentioned that the use of AI tools in academic tasks delimits the thinking ability of academic staff, which is why they don't use AI tools, while 5 (35.71%) mentioned that AI tools in academic task tasks encourage plagiarism among academic staff, hence they decided not to use them to avoid plagiarism. Figure 3 summarises the respondents' responses.

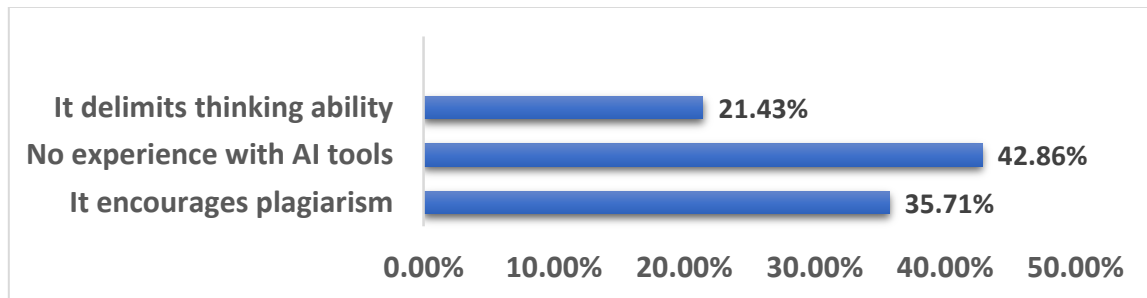


Figure 3. Challenges encountered by academics in using artificial intelligence tools

Discussion

The first objective of the study was to assess the awareness of educators about the existence and use of AI in educational settings. The findings revealed that most of the academics were aware of the existence and usage of AI in education. The reason for the great awareness among educators is that most of them are using such technology for various academic purposes. The use of AI has raised questions among education stakeholders, though in Africa HEIs the use of such technology is in infants' stages. Some of the questions that most education stakeholders have raised are about the issue of integrity in academic writing. Although there are still debates on the use of AI in education settings, some educators have continued to use such a technology in academic settings. Thus, their awareness is associated with their usage of such technology for various academic activities. Various studies, such as those conducted by Carona et al. (2023); Chen et al. (2020); and Celik et al. (2022) established that educators were aware of the existence and use of AI in education because of their frequent usage of such technology. Although the use of AI in Tanzania HEIs has not been formally accepted because of the issues associated with its use in academia, but most of the academics are using such technology for doing various academic related tasks such as report writing, language editing and others. The findings further established that some academics, especially those who mentioned that they were unaware of the existence and usage of AI tools in academia, have been using AI tools such as those for grammatical editing without knowing such tools are AI products.

The study's second objective was to assess the usefulness of AI in educational settings. The findings revealed that the majority of academics affirmed that the use of AI in educational contexts offers several benefits. They indicated that the use of AI has facilitated the learning process, and therefore instructors can use their time for other academic activities. The study further established that AI tools can enhance personalized learning, it can be used in analyzing large datasets such as comments received from students and other HEIs customers, facilitates the online tutorials, and are useful for contents generation. The study findings also established that AI tools are useful in performing productive analytics such as trend of students' enrollment and dropouts. It has been also noted that AI are useful in helping researchers in diverse of ways and such tools can be used for plagiarism detection. When properly used AI can work as a collaborative working platforms, can improve access to information and knowledge among people with special needs and finally can be deployed in the recruitment process to filter applicants with the required qualifications. The findings are in line with the study by Kim and Kim (2022), which

established that academics had developed positive attitudes towards the use of AI in education because of the advantages it offered them.

The study found that several AI tools are used by academics in their academic activities, such as ChatGPT for language editing, searching educational materials, and compiling teaching notes; Bard AI for language editing and paraphrasing; Grammarly; and Quill Bolt. The findings established that, the use of AI in education was regarded as easy among the educators, which is why the majority of them perceived the use of such a technology to be useful, which has in turn influenced them to frequently use AI in academia. A study that was conducted by Alotaibi (2023; Malik et al., 2023; & Nazari et al., 2021) established that Grammarly, QuillBolt, and ChatGPT were the most used AI tools in academia. Such AI tools have enabled educators with difficulties in writing, especially in improving their language during writing their academic papers, official letters, and paraphrasing, which has also enabled them to save time for other academic endeavours.

The study also identifies several challenges encountered in adopting and using AI tools in education activities such as lack of experience in using AI tools, plagiarism; and limit thinking ability. The study conducted by Yu (2024), Michel-Villareal, and Vilalta-Perdomo (2023) also discovered the challenges associated with plagiarism in academia using AI tools. The findings of the study revealed that educators encountered several challenges in using AI tools because this is a new emerging technology, especially in low-income countries like Tanzania. Challenges associated with the use of AI in education included issues of privacy, promoting laziness among academics, plagiarism in academia, inadequate training on the use of such emerging technology, and a lack of clear policies to harness the use of AI in academic settings. A study by Mwilongo, Mwageni and Matto (2022) noted various problems encountered by sub-Saharan HEIs such as low internet connectivity and shortage of power. They recommended HEIs in sub-saharan Africa to come up with frameworks for infrastructure development and training for education stakeholders.

4. CONCLUSION

The purpose of the study was to investigate the use of AI tools among HEIs in Tanzania. The study findings reveal that most of academics had awareness of the use of AI in academia and some were using such technology such as Grammarly, and Quillbolt for editing languages without noticing such application are AI tools. The study also indicates that AI tools are very useful in academic activities because it has enhanced learning and teaching process in higher learning institutions. Academics use AI tools for academic activities such as content generation, language editing and paraphrasing, and the preparation of teaching notes and learning materials. The study found that most of the respondents are using AI tools like ChatGPT, Bard AI, Quillbolt, Grammarly, and Bing AI. The study also identified some challenges that affected the usage and adoption of AI tools in education including plagiarism of academic work, it limits the thinking ability of the educators, and there is a lack of experience among academics on the use of AI. Although there are some challenges associated with the use of AI in academics, the availability of tools to detect AI generated contents such as image analysis tools, reverse image search, meta-analysis, machine learning models, blockchain verifications, content moderation platforms and others guarantee the future of AI usage among HEIs in Tanzania. The study recommends therefore that education stakeholders should provide education to create awareness about the ethical use of AI tools among academics, and finally higher learning institutions should formulate regulations on the use of AI tools in academia.

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