Digital Learning in the Age of Artificial Intelligence: Insights from Selected Higher Learning Institutions in Tanzania

Marystela Baynit[1]
Cosmas B.F. Mnyanyi[2]
Mohamed Salum Msoroka[3]

[1]marystellabaynit@gmail.com
[2]cosmas.mnyanyi66@gmail.com
[3]msorokakabomah@gmail.com

[1, 2,3]The Open University of Tanzania

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ABSTRACT

The rapid advancement of artificial intelligence (AI) technologies is reshaping education globally, with it is significant implications on teaching, learning and administrative processes in higher learning institutions. The higher learning institutions in Tanzania are increasingly adopting digital learning solutions powered by AI to address challenges such as limited teaching resources, less interactive delivery approaches, lengthy assessment approaches and the need for personalized education. This study explores the integration of AI in digital learning within the selected Tanzanian higher learning institutions (HLIs), highlighting its opportunities, challenges, and impact on educational outcomes. Although existing research has produced several contributions on both topics, the knowledge generated in the field appears fragmented and the findings are sometimes ambiguous. This study aims to consolidate the state of art of scholarly research published over the past 36 years at the intersection of the AI tools in Tanzania higher Learning Institutions. The Technology Acceptance Model (TAM) was employed to guide this study. The model explains how perceived usefulness and ease of use influence the adoption of technology. To this aim, we carried out a systematic literature review by retrieving a set of 117 papers which was later limited to time, English language and key words as inclusion criteria only 45 papers were utilized and complemented with key informant interviews.The reviewed documents were strategically selected from the Scopus and web of science scholarly journals. The data were extracted and synthesised into sub themes. The findings reveal that a proportion of HLIs instructors are adopting AI tools in their teaching and learning activities. The common AI-driven tools employed by instructors include; ChatGPT, Grammarly, intelligent tutoring systems, automated grading platforms, and data analytics. It has been further noted that the AI tools have significantly impact in teaching and learning by providing personalized feedback, improving learning resources accessibility and in turn improving students' academic performance. However, the study identifies several challenges, including inadequate infrastructure, high implementation costs and limited technical expertise. There is also concern over data privacy, ethical considerations, and the potential for reduced human interaction in education. This paper concludes that while AI integration in Tanzanian higher education is in its early stages, it offers immense opportunities for improving educational outcomes and institutional efficiency. Recommendations are provided to address challenges, emphasizing policy development, capacity building and increased investment in AI infrastructure to enhance effective educational outcomes.

Keywords: Artificial Intelligence (AI), Digital Learning, Higher Learning Institutions (HLIs)

I. INTRODUCTION

Higher learning institutions are in dynamism in this digital era where digital platforms were highly used to enhance the delivery of teaching and learning activities. The digital learning ranges from online classes, virtual classrooms and e-learning platforms including Moodle, goggle and zoom (Baynit et al., 2025). The improvement of Artificial intelligence (AI) where educational landscape were highly transformed worldwide including Tanzania. The integration of AI in higher learning institution has come up with meaningful educational transformation particularly in Tanzania. HLI's has witness the integration of AI-driven digital learning tools to enhance educational delivery and accessibility. It has been observed that AI's capacity to personalize learning experiences, automate administrative tasks, and support decision-making processes positions it as a pivotal tool in modern education (Ndibalema, 2022).

The studies highlight the transformative potential of AI in education particularly higher learning institution, there is limited empirical research on its implementation and impact in the context of Tanzanian HLIs. Existing literature focuses primarily on general digital learning trends but offers little insight into the unique challenges and opportunities associated with AI adoption in local institutions (Baynit et al., 2025; Mtebe & Raisamo, 2014).This knowledge gap

underscores the need for a focused investigation into how Tanzanian HLIs are integrating AI into their educational practices and the implications for teaching, learning, and administrative processes.

The adoption of AI in higher HLIs is seen as a strategic move to bridge educational gaps and improve the quality of learning outcomes (Mtebe & Raisamo, 2014). The incorporation of AI into these platforms facilitates adaptive learning systems, predictive analytics, and intelligent tutoring systems that cater to individual learner needs, thereby enhancing engagement and improving educational outcomes (Haderer & Ciolacu, 2022). For instance, AI-powered tools can analyse student performance data to provide real-time feedback and recommend personalized study resources, which is particularly beneficial in resource-constrained environments like Tanzania (Chung, 2004; Belenkov et al., 2025)

The rapid integration of AI tools into HLIs highly depends on the pace of technology adoption moderated by users' perceived easiness to use and its usefulness. The Technology Acceptance Model (TAM) by Davis, (1989) identifies two factors that impact the adoption and use of new technology that an individual's perceptions of the technology's ease of use and the technology's perceived usefulness for the user. Since, AI tools are being recently integrated into HLIs, mapping the scope usage/application, opportunities, challenges and impact in learning process requires significant attention by scholars. The attitudes of users about the adoption and application of new technology are among the additional aspects linked to the TAM model.

Furthermore, despite its potential, the integration of AI into educational systems remains uneven, particularly in developing countries like Tanzania, where the education sector faces significant challenges such as limited infrastructure, lack of technical expertise, and disparities in access to digital tools (Ndibalema, 2022; Ponera & Madila, 2024; Mnyanyi et al., 2010). Furthermore, the adoption process is fraught with obstacles, including inadequate ICT infrastructure, inconsistent internet connectivity, and limited capacity of educators to effectively use AI-driven tools (Mambile & Mwogosi, 2024). These barriers hinder the potential of AI to improve learning outcomes, particularly in resource-constrained environments. Additionally, ethical considerations, such as data privacy and the equitable use of AI technologies, remain inadequately addressed (Kondo & Diwani, 2023).

According to Kondo and Diwani (2023), AI tools have the ability to enhance teaching and encourage learning. However, it raises serious ethical issues related to upholding academic integrity, such as the possibility of plagiarism, the suppression of critical thought, and data privacy. In investigating the function of AI in Tanzanian HLIs, this study aims to close this gap. It seeks to determine the advantages AI offers, the obstacles to its uptake, and its general effect on educational quality. The study support evidence-based tactics for using AI to enhance educational results in Tanzania and other contexts by offering a thorough examination.

Addressing these challenges requires a comprehensive understanding of the current state of digital learning and the role of AI in Tanzanian higher education institutions and more AI driven opportunities in HLIs in Tanzania. Therefore, the main goal of this review paper intended to explore the integration of artificial intelligence (AI) in HLIs in Tanzania, focusing on its opportunities, challenges, and impact on teaching, learning and administrative processes. Specifically, study examined the extent to which artificial intelligence (AI) tools are integrated into teaching and learning, in selected higher learning institutions in Tanzania. Identify the opportunities and challenges associated with the adoption of AI technologies in Tanzanian HLIs. To analyze the impact of AI integration on educational outcomes and institutional efficiency in the context of Tanzanian HLIs.

1.1 Statement of the Problem

The rapid advancements in artificial intelligence (AI) have transformed the global education landscape, offering opportunities to improve teaching, learning, and administrative processes. In higher education, AI has proven effective in enhancing personalized learning, automating administrative tasks, and providing real time feedback (Belenkov et al., 2025). Despite its potential, the integration of AI into educational systems remains uneven, particularly in developing countries like Tanzania, where the education sector faces significant challenges such as limited infrastructure, lack of technical expertise, and disparities in access to digital tools (Ndibalema, 2022; Ponera & Stephen Madila, 2024)

Tanzania's higher learning institutions are progressively adopting AI technologies to address these challenges (Lashayo et al., 2023). However, the adoption process is fraught with obstacles, including inadequate ICT infrastructure, inconsistent internet connectivity, and limited capacity of educators to effectively use AI-driven tools (Mambile & Mwogosi, 2024). These barriers hinder the potential of AI to improve learning outcomes, particularly in resource-constrained environments. Additionally, ethical considerations, such as data privacy and the equitable use of AI technologies, remain inadequately addressed (Kondo & Diwani, 2023).

While global studies highlight the transformative potential of AI in higher learning institution, there is limited empirical research on its implementation and impact in the context of Tanzanian higher education (Wang'ang'a, 2024). Existing literature focuses primarily on general digital learning trends but offers little insight into the unique challenges and opportunities associated with AI adoption in local institutions (Mtebe & Gallagher, 2022). This knowledge gap underscores the need for a focused investigation into how Tanzanian higher learning institutions are integrating AI into their educational practices and the implications for teaching, learning, and administrative processes.

This study seeks to address this gap by examining the extent to which artificial intelligence (AI) is integrated into teaching, learning and administrative processes of AI in higher learning institutions in Tanzania. It aims to identify the opportunities AI presents, the challenges to its adoption and its overall impact on the quality of education. In providing a comprehensive analysis, this study contributed to evidence based strategies for leveraging AI to improve learning outcomes in Tanzania and similar contexts

1.2 Research Objectives

Specific Objectives of the Study

i. To examine the extent to which artificial intelligence (AI) is integrated into teaching, learning, and administrative processes in selected higher learning institutions in Tanzania.
ii. To identify the opportunities and challenges associated with the adoption of AI technologies in higher learning institutions in Tanzania
iii. To analyze Impacts of Integrating AI Applications in enhancing learning teaching and learning in higher learning institution in Tanzania.

II. LITERATURE REVIEW

2.1 Theoretical Review

The integration of digital learning and artificial intelligence (AI) in learning is grounded in several theoretical frameworks that explain how technology enhances teaching and learning processes. The theory provide insights into the design, adoption, and implementation of AI-driven digital learning systems in higher education. This study is guided by Technological Acceptance model (TAM),the model has been highlighted below;

2.1.1 Technology Acceptance Model (TAM)

The study is guided by two theoretical models based on the study objectives. The first model employed is Technology Acceptance Model (TAM) as developed by Davis, (1989). This model guides the specific objective one which intends to describe the ICT infrastructure usability. The basic TAM model included and tested two specific beliefs: Perceived Usefulness (PU) and Perceived Ease of Use (PEU). Perceived Usefulness is defined as the potential user's subjective likelihood that the use of a certain system for example single platform E-payment System that improve his/her action and Perceived Ease of Use refers to the degree to which the potential user expects the target system to be effortless (Davis, 1989). The belief of the person towards a system may be influenced by other factors referred to as external variables in TAM. The TAM model is important in adoption acceptance of Ai in higher learning institutions. The easy use of the digital platforms are more beneficial to instructors and students (Mtebe & Raisamo, 2014). The improvement of digital use and the advancement of AI integration in Tanzania is challenged by low digital literacy and lack of proper training focused to instructors and students in this area.

2.2 Empirical Review

Artificial Intelligence (AI) is increasingly influencing higher learning institution in Tanzania, impacting teaching, learning and administrative processes. Studies from the past five years provide insights into AI's integration, associated opportunities and challenges, and its impacts on educational outcomes and institutional efficiency. The empirical studies on the integration of digital learning and artificial intelligence (AI) in learning provide valuable insights into the practical challenges, benefits and outcomes of these technologies across different contexts

2.2.1 The Integration of Artificial Intelligence (AI) in Teaching, Learning, and Administrative Processes

The integration of AI in learning has shown significant potential to enhance learning outcomes. The study by Zawacki-Richter et al. (2019) conducted a systematic review of AI applications in higher learning and found that personalized learning, automated assessment, and virtual tutors are the most prevalent implementations. These technologies improve learner engagement and academic performance by tailoring content to individual needs (Wang'ang'a, 2024). However, challenges such as data privacy concerns and the high cost of AI solutions persist. For instance, the high initial investment required for AI systems limits their scalability in developing regions.

AI tools are seen as opportunities to create personalized learning environments, where students can receive tailored educational content. They also enable adaptive assessments to gauge student progress more effectively (Abdulmunem, 2023; Ponera & Madila, 2024).AI can help in creating inclusive learning environments, particularly for students with disabilities. It provides resources for independent and collaborative learning, which are particularly valuable in resource-constrained environments (Mathew & Mgina, 2024)

In addition to enhancing teaching and learning, AI is improving administrative functions within universities. Jasim et al. (2024) found that AI applications in scheduling, resource allocation, and student enrollment systems have

Streamlined administrative processes, making universities more efficient and responsive to student needs. By automating routine administrative tasks, universities can focus more on academic support and research innovation.

According to Bucea-Manea-Toniş et al. (2022) institutions that have invested in digital infrastructure and educator training are more likely to succeed in integrating AI technologies. In Tanzania, Mtebe & Raisamo, (2014) emphasized the need for targeted capacity-building programs to equip instructors with the skills required for AI adoption, highlighting a significant gap in technical expertise as a barrier. The digital trainings that are offered to instructors enhanced teaching and learning in this digital and AI integration era.

A study by Holmes et al. (2019) suggests that AI technologies can significantly improve learning outcomes when effectively implemented. Holmes et al. (2019) reported that students using AI-enabled personalized learning platforms demonstrated a 20-30% improvement in academic performance compared to those in traditional learning environments. This underscores the potential of AI to enhance learning quality in resource constrained settings like Tanzania, provided systemic challenges are addressed.

Additionally, Garcia et al. (2024) found that AI virtual assistants could foster a sense of continuous interaction with the learning platform, motivating students to stay engaged with their coursework, even outside of traditional classroom hours. Their study highlighted the effectiveness of chatbots in answering frequently asked questions and providing assistance for course content. AI's role in fostering collaborative learning has been explored in several studies. Research by Parveen et al. (2024)) showed that AI systems, particularly those used in virtual classrooms, enabled real-time collaboration among students by providing tailored suggestions for group interactions based on students' learning profiles. By enhancing communication and cooperation, AI tools support active learning and peer-to-peer engagement.

AI can automate routine administrative tasks like admissions, resource allocation, and student support, thus reducing staff workload and increasing operational efficiency (Begum, 2024). AI can optimize the use of available resources, from staffing to course scheduling, helping institutions run more efficiently even with limited resources (Zhao et al., 2024). Also, AI-powered chatbots and virtual assistants have emerged as tools to enhance student engagement and provide 24/7 support. A study by Labadze et al. (2023) examined the use of AI chatbots in higher learning institutions and found that students appreciated the ability to interact with chatbots for administrative inquiries, course-related questions, and technical support. This freed up instructors' time, allowing them to focus on more complex student needs. AI-powered chatbots also helped reduce barriers to accessing information and increased overall student satisfaction with their academic experience

2.2.2 Opportunities and Challenges in the Adoption of Artificial Intelligence (AI) Technologies in Higher Learning

A significant challenges to the adoption of AI is the lack of reliable infrastructure. Many institutions face issues with internet connectivity, limited access to modern AI technologies, and outdated systems (Kiwonde, 2024). Concerns around data privacy, plagiarism, and academic integrity are highlighted (Wang'ang'a, 2024). There is resistance from some academic staff who worry that AI could lead to job losses or change teaching dynamics in ways they cannot control. (Mambile & Mwogosi, 2024). Faculty and staff are often not sufficiently trained in AI applications, limiting the ability to fully exploit its potential (Mulyani et al., 2025). There's also a need for clear guidelines and policies on the ethical use of AI in education (Ponera & Stephen Madila, 2024).

In Africa, the use of AI in higher learning institutions is at an early stage, with a focus on addressing systemic challenges like access and quality. A study by Hutson et al. (2022) highlighted that AI-driven solutions, such as chatbots and virtual classrooms, have been piloted in countries like South Africa and Kenya. These implementations have improved access to educational resources, particularly in remote areas. However, infrastructural constraints, such as unreliable electricity and limited internet connectivity, hinder broader adoption.

Similarly, research by Stuart, (2024) identified AI initiatives led mainly by academic staff, with limited institutional support. Potential applications for AI included student assessments, research, laboratory experiments, teaching, decision-making and support for students with disabilities, and examination invigilation. However, challenges such as resource scarcity, inadequate infrastructure, and technical issues were also noted (Mosha & Ngulube, 2024).

A research by Mtebe & Gallagher, (2022) identified key challenges to digital learning adoption in higher education, including inadequate infrastructure, limited digital literacy, and insufficient funding. Their study revealed that only 38% of higher learning institutions have access to reliable internet connectivity, and less than 20% of instructors are proficient in using advanced digital tools. Despite these challenges, initiatives such as the Digital Tanzania Project have made strides in improving digital infrastructure, though their impact on AI adoption remains limited.

Despite the potential benefits, several challenges persist in the integration of AI in higher education. Holmes et al. (2019) highlighted ethical concerns surrounding the use of AI in education, particularly regarding data privacy, algorithmic bias, and the depersonalization of teaching. Institutions must ensure that AI applications comply with data protection regulations and are used responsibly to avoid reinforcing inequities in education.

Moreover, Khlaif et al. (2024) observed that faculty members often face resistance to adopting AI due to concerns about job displacement and the adequacy of training for effectively integrating AI into the curriculum. Faculty development programs that emphasize AI's role as a tool to enhance, not replace, traditional teaching practices are crucial to fostering successful AI adoption in higher education. AI has the potential to enhance student performance tracking and feedback. Tools that offer personalized learning experiences can help students grasp complex subjects more effectively (Mambile & Mwogosi, 2024; Sadykova & Kayumova, 2024).

2.2.3 Impacts of Integrating Artificial Intelligence (AI) Applications in Enhancing Teaching and Learning in Higher Learning Institutions

AI facilitates better inclusion by supporting students with disabilities, making education more accessible to a broader group (Mulyani et al., 2025). A research by Ikubor et al. (2024), Villarreal, (2023) and, Widianingtyas et al. (2023) assessed AI awareness and utilization among students and staffs. Findings revealed that 77% of respondents were aware of AI, with 65% actively using AI tools, primarily for content development applications like ChatGPT. The study highlighted both positive impacts, such as time savings and improved information access, and negative effects, including over-dependency and reduced critical thinking.

AI-powered personalized learning systems have become a key focus in higher learning institutions. These systems use data-driven insights to tailor content to individual students' needs, learning styles, and paces. Research by Shete et al. (2024) found that AI-based adaptive learning systems significantly improved student engagement and academic performance by offering personalized feedback and adjusting the level of difficulty based on student performance. These systems provide an individualized approach that traditional teaching methods may struggle to offer at scale.

Similarly, Al-Raimi et al. (2024) and Kisanjara and Maguya (2024) explored AI applications in natural language processing (NLP) and how these tools can analyze students' responses to provide real-time feedback. Their findings demonstrated that NLP-based AI applications led to improvements in student writing skills and comprehension, as they offered specific recommendations for improvement. Learning analytics powered by AI play a vital role in monitoring and enhancing student performance. According to Kuleto et al. (2021) learning analytics systems use AI algorithms to predict students' academic success and identify those at risk of underperforming. These systems use vast amounts of student data including attendance, grades, online behavior to generate insights that educators can use to intervene and support students in real-time.

Ouyang et al. (2023) demonstrated that AI-driven learning analytics improved the ability to identify patterns in students' engagement with learning materials, which helped educators modify content delivery and identify struggling students early in the course. AI tools instructors can create more adaptive and responsive learning environments, which contribute to improved retention rates.

The use of AI for automated assessment and feedback has shown promise in enhancing both teaching and learning. Hooda et al. (2022) reported that AI applications such as automated grading systems can provide instant feedback, reducing the grading burden on instructors and allowing for more frequent assessments. Automated grading systems using machine learning models have been effective in grading multiple-choice tests and even short-answer questions, offering real-time feedback to students.

However, Owoc et al. (2021) caution that while automated grading systems offer efficiency, their impact on student learning is contingent upon the quality of the algorithms used and the ability to provide meaningful feedback. They recommend using AI assessments as complementary tools rather than replacing human educators' input entirely. Furthermore, Charllo (2021) discussed AI's capacity to provide collaborative tools for remote learning environments, which have become essential in the wake of the COVID-19 pandemic. AI tools that facilitate group project management, communication, and real-time collaboration on shared documents helped students work effectively in teams, even in virtual spaces

III. METHODOLOGY

This study adopted a systematic literature review (SLR) to address its objectives. Data collection involved several steps including setting the review planning, (ii) conducting the review, and (iii) extracting the data and report writing as emphasised by Schmeisser (2013). The reviewed publications were selected based on time and reputable sources. The review selected 117 publications however 45 articles were utilized from with inclusion from 1989 to 2025 year from various scholarly publication platforms data bases including Scopus and web of Sciences. The search string was structured so that the results contained papers with at least one term from each set in the title, abstract, and keywords. In order to select relevant papers, we developed the inclusion and exclusion criteria reported. These are divided into quality and fit-for-purpose criteria (Zahoor et al., 2022). Quality criteria are aimed at excluding documents that cannot guarantee a certain level of scientific rigor. In particular, following the approach used in several previous studies

Pittaway et al. (2004); Spender et al. (2017); Zahoor et al. (2022), we only considered papers published in peer-reviewed academic journals. Fit-for-purpose criteria are aimed at verifying whether the article content actually matches the purposes of our review. Basically, these criteria allowed us to verify that the title, abstract, or keywords of the selected papers did not include our search words by chance.

To reflect more contextual findings the key informant tools was developed to supplement data extracted from reviews. The tool targeted HLIs instructors, managers and students. The key informants were selected from two higher learning institutions in Tanzania; that is Institute of Accountancy Arusha (IAA) and the Open University of Tanzania (OUT). Four academic staff and four students were purposively selected from each institution based on the experience of AI application in their academic undertakings. Finally the data were presented thematically as per emerging themes

IV. FINDINGS & DISCUSSION

4.1 Response Rate

The analysis of the findings highlighted several key important themes as far as AI integration in HLIs is concerned. These themes include the scope of AI application on teaching and learning in HLIs, the mapping of common AI tools that are mostly applied in HLIs, the opportunities and challenges of the AI technology application into teaching and learning. Review began with the global practice and finally to Tanzania context

4.1.1 The Scope of AI Application on Teaching and Learning in HLIs

For the comparative purpose we begin the analysis from developing countries then narrowed to the Tanzania context. The significance of AI application in teaching and learning; and adoption acceptance in HLIs in developing countries is well acknowledged by various studies According to a study done by Sadykova & Kayumova, (2024) 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. Another study conducted by Chung (2004) 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 Billy & Anush (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 students are expected to develop independent critical thinking to ensure they have skills and techniques for solving various problems.

In a study that was conducted in Malaysia on the application of 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 instructors have perceived the use of AI to be useful because of the advantages it offers them as is embedded with a lot of features that can enable users to multitask, hence saving their time A research by Aljohani (2021) study that was conducted in Saudi Arabia showed that instructors were in favour of using AI in the classroom. According to Joshi et al. (2021) educators strongly advocated for the positive implementation of AI in the classroom and thought it was a beneficial tool.

The majority of teachers in Indonesia were aware of AI technology and how ChatGPT may be used in the classroom, according to a study by Widianingtyas et al. (2023). To enhance the effectiveness and efficiency of instruction, they proposed actions to deepen knowledge and integrate AI into the classroom. The literature evaluation indicates that the use of AI in education has been considered as advantageous in a variety of ways. Scholars acknowledge AI's potential in academics and education, but are concerned about learning environments, academic integrity and privacy hinder its application in Higher Education Institutions (HEIs) (Widianingtyas et al., 2023).

The integration of AI in Tanzania HLIs have been evidenced by various scholars. The study done by Lashayo et al. (2023) indicated that the incorporation of AI content into computing (ICT related) programmes is low (i.e., less than 16.6% of all total taught modules) at undergraduate and graduate levels, while 60% of ICT-based instructors have only 25% of required knowledge and skills to deliver AI-based modules and also revealed that no HEIs in Tanzania have designed an explicitly AI-based programme. The value of this study lies in informing different stakeholders and the entire public of the extent of incorporation of AIs in the design and delivery of computing programmes in HEIs, specifically in Tanzania

The study by Mambile & Mwogosi, (2024) discovered that enhanced assessment, time-saving, personalized learning, improved accessibility and detecting cheating are the perceived benefits of AI as a tool for enhancing learning in higher education in Tanzania. AI is being piloted to automate the grading of multiple-choice tests and assignments, reducing workload for academic staff (Barrett & Pack, 2023). AI algorithms assist in optimizing resource distribution, such as classroom scheduling and allocation of teaching staff, though scalability remains a challenge (Mambile & Mwogosi, 2024).

Further, it was revealed that students are more accepting of using AI tools in the classroom because they think they are more effective and engaging. On the other hand, faculty were more cautious and skeptical about employing AI

tools in the classroom because they worried about how it would affect their teaching methods and job security. A study by Shengelia (2024) revealed the growing use of AI-powered educational technologies in Tanzanian university settings, offering innovative solutions to traditional challenges and optimizing learning outcomes addressed the challenges and ethical considerations of AI integration, underscoring the need for targeted training to empower both students and instructors.

Artificial Intelligence (AI) has started transforming the teaching landscape in higher learning institutions (HLIs) in Tanzania. AI-powered systems, such as those piloted at the University of Dar es Salaam, support personalized instruction by adapting to the learning pace and style of individual students (Ponera & Madila, 2024). Tools are being used to analyse the effectiveness of teaching materials, guiding instructors in improving course content intelligent tutoring systems and other AI technologies adjust to each student's unique learning preferences and speed, improving student engagement and results (Mtebe & Raisamo, 2014). AI-driven platforms are used by universities such as the Open University of Tanzania and the University of Dar es Salaam to facilitate online courses and remote learning.

Apart from teaching AI also is being used to streamline administrative tasks, although its adoption remains in its infancy.AI tools are applied to manage and analyse large datasets, such as admission trends, attendance, and graduation rates (Faustino & Kaur, 2022). AI integration into teaching, learning, and administrative processes in Tanzanian HLIs shows promising developments but remains limited in scope. While initiatives at institutions like the University of Dar es Salaam and the Open University of Tanzania demonstrate the potential for AI-driven transformation, challenges such as infrastructure, skills gaps, and financial constraints must be addressed (Ndibalema, 2022). Comprehensive strategies, including policy development, training, and investment in technology, are essential to scale AI adoption in Tanzanian higher education.

However, the extent of adoption is uneven across institutions, with many struggling due to limited resources and training opportunities. Systems like Moodle, integrated with AI plugins, enable adaptive learning experiences, though their use is still at an early stage (Begum, 2024). Institutions like the Open University of Tanzania leverage AI for virtual simulations and remote learning environments, providing access to students in rural areas (Shengelia, 2024). Learning analytics are being used to monitor student progress and predict academic performance, but only a few institutions have adopted this technology extensively (Akinwalere & Ivanov, 2022).

Similar weaknesses in terms of application has been observed in other countries, For instance , a study conducted by Chounta et al. (2022) 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. According to a study by Zhao et al. (2024) carried out in Bangladesh, teachers knew very little about AI and how it helps with learning. They did, however, think of it as a potential educational opportunity. A significant proportion of faculty and administrative staff lack the necessary skills to implement and use AI tools effectively (Mtebe & Raisamo, 2014). Many HLIs face budgetary limitations, preventing them from acquiring and maintaining advanced AI systems (Kondo & Diwani, 2023).

Concerns around data privacy and the lack of clear policies on AI use in education further complicate adoption (Mambile & Mwogosi, 2024). Issues such as data privacy, algorithmic bias, and the potential misuse of AI technologies raise ethical questions that need to be addressed through proper policies and regulations (Bajaj et al., 2023; Semlambo et al., 2022).Resistance from faculty and staff, stemming from fear of job displacement and skepticism about AI, slows down its adoption (Sarakikya & Kitula, 2024).The absence of comprehensive national or institutional policies guiding AI adoption in higher education leads to inconsistent implementation and limited scalability (Ndibalema, 2022).

According to Hutson et al. (2022), AI technology is positively perceived that it has potentials to enhance teaching and learning where instructors have begun integrating it into teaching and learning in HLIs especially in developing countries and particularly in Tanzania. However, the overall application is still at infancy stage with majority of institutions are just early adoption phase and integration. Though at infancy stage of adoption yet it is significance and efficiency in teaching, resource accessibility and facilitating assessment has been observed.

The instructors in HLIs especially in developing countries and Tanzania in particular are utilizing AI tools their teaching and learning activities. However, the number of users is still low among the population of Instructors. The review have indicated acceptance of the technology to be used in their training process. The technology application functionality scope are limited to key functions of teaching, assessment of students grades, research data search and analysis and synthesis and with few application of tools in communication and administrative activities such as planning and timetable scheduling

4.1.2 AI Opportunities in Enhancing Higher Learning Training Processes

Furthermore it has been noted that 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 (Haderer & Ciolacu, 2022). The potential of AI integration in African higher education, highlighting its challenges such as resource constraints, lack of skilled AI professionals, inadequate data protection infrastructure, and regulatory oversight (Joshi et al., 2021). They identify five areas for AI integration,

including infrastructure readiness, capacity building, collaboration, ethics, and educator-learner perspectives. The initiative aims to provide insights for policymakers and researchers in Africa.

AI technology has the potential to enhance learning as evidenced by various studies (Shengelia, 2024). For instance, 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 HLIs in Tanzania. Harnessing the use of AI among HLIs 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 (Ponera & Madila, 2024)

AI-driven tools provide personalized and adaptive learning experiences, catering to individual student needs and improving engagement. For instance, intelligent tutoring systems have been piloted in some Tanzanian universities to support self-paced learning (Mtebe & Raisamo, 2014). AI-enabled virtual learning environments and e-learning platforms allow students in remote and underserved areas to access high-quality educational resources, reducing geographic barriers (William et al., 2024). Providing technical training and professional development for educators and administrators to enhance AI literacy (Pedró, 2019).Collaborating with technology companies to share resources and expertise for affordable and sustainable AI solutions (Mathew & Mgina, 2024). Developing clear guidelines and regulations to address ethical, privacy, and operational challenges in AI adoption (Mnyanyi et al., 2010)

AI-driven assessments provide students with instant feedback, promoting continuous learning and immediate correction of misconceptions. This has been shown to improve pass rates in digitally supported courses (Mathew & Mgina, 2024). AI analytics help instructors identify struggling students early and intervene with targeted support. Studies show that institutions using AI analytics have experienced a 20% reduction in dropout rates (Sarakikya & Kitula, 2024). AI systems automate repetitive administrative tasks such as scheduling, grading, and admissions. For example, an AI-based grading tool implemented at Ardhi University reduced grading times by 40%, allowing faculty to focus on research and teaching (Kondo & Diwani, 2023). AI algorithms analyse student data to optimize resource distribution, including faculty assignments and classroom scheduling. This has led to a 30% improvement in resource utilization at institutions like Sokoine University of Agriculture (Mambile & Mwogosi, 2024).

Institutions using AI for decision-making have seen improvements in strategic planning. AI systems provide actionable insights from large datasets, enabling data-driven policy formulation and program design (Kumbo et al., 2023).While initial AI adoption is costly, long-term savings have been reported due to reduced administrative overhead and improved operational efficiency. A study highlighted that Tanzanian universities adopting AI saved an average of 20% on administrative costs over three years (Mtebe & Raisamo, 2014). While AI improves accessibility for some, disparities in infrastructure and internet access limit its benefits for students in rural areas (Kondo & Diwani, 2023). Resistance from staff unfamiliar with AI technologies can hinder the full realization of its benefits, slowing institutional transformation (Sarakikya & Kitula, 2024). Data privacy and bias in AI algorithms can affect trust and the equitable distribution of benefits, impacting overall outcomes (Mambile & Mwogosi, 2024).

Training faculty and administrative staff in AI technologies is essential to fully utilize their potential (Lashayo et al., 2023). Investments in reliable internet and advanced hardware will ensure equitable access to AI-powered education (Mathew & Mgina, 2024). Establishing ethical guidelines and regulatory frameworks will address privacy concerns and promote fair AI integration (Kumbo et al., 2023). The study by Zhao et al. (2024) showed that AI assesses students' skills and requirements using machine learning, and then utilizes the findings of that analysis to develop and disseminate personalized or tailored information that improves learning via increased retention and uptake. AI improves learning for students by providing them with possibilities for experiential or hands-on learning, particularly when paired with other technologies like virtual reality, 3-D, gaming, and simulation

AI tools automate repetitive tasks such as student registration, grading, and resource allocation, enabling institutions to operate more efficiently (Sarakikya & Kitula, 2024).AI-powered analytics help track and predict student performance, enabling institutions to offer timely interventions and improve academic outcomes (Billy & Anush, 2023). AI-powered learning analytics assist organizations in spotting trends in student performance, facilitating customized interventions (Semlambo et al., 2022). Learning analytics are being used to monitor student progress and predict academic performance, but only a few institutions have adopted this technology extensively (Stuart, 2024). AI tools are applied to manage and analyse large datasets, such as admission trends, attendance, and graduation rates (Kondo & Diwani, 2023).

AI is being used to automate the grading of multiple-choice tests and assignments, reducing workload for academic staff (William et al., 2024). AI algorithms assist in optimizing resource distribution, such as classroom scheduling and allocation of teaching staff, though scalability remains a challenge (Kondo & Diwani, 2023). Limited access to reliable internet and computing facilities slows adoption. Students can receive real-time feedback from AI tools, which allows for quick corrections and enhancements in learning (Lashayo et al., 2023). The reviewed findings mostly match with the findings from the interviewed instructors' whereby similar observation has emerged during

interview for instance the instructors have acknowledge the potentials of AI in improving teaching and learning. For instance, interviewee number 6 [RAI6] had the following to say:

> *"AI programs have revolutionized teaching and learning by enhancing efficiency and personalization. Adaptive learning platforms allow me to tailor instruction to individual student needs, ensuring everyone progresses at their own pace. AI-driven tools like ChatGPT and coding assistants enable students to solve problems independently, fostering creativity and innovation* [RAI6]*."*

According to interviewee RAI6, AI programs have revolutionized education by providing efficient, personalized learning. Adaptive platforms tailor instruction to individual needs Griffiths & Forcier,(2016), and tools like ChatGPT and coding assistants support independent problem solving and foster creativity (Holmes et al., 2019). This evolution transforms educators into facilitators and enhances student engagement and outcomes (Zawacki-Richter et al., 2019). Nevertheless, ethical challenges such as data privacy, algorithmic bias, and inequitable access remain (Sarakikya & Kitula, 2024). Future research must balance AI's transformative benefits with these concerns, ensuring a fair, effective integration into modern teaching and learning. Comprehensive inquiry and practical application are absolutely essential. AI interviewee 11 [RAI11] had a view that AI simplifies work that used to take a lot of time:

> *"AI has almost simplify our work because the work that was previously done in a day can now be done in few hours with AI tools for instance editing of students work, retrieval of reading resources and many more similar applications. But my worry is the AI Technology will replace our employment in the near future"* [RAI11]

According Interviewee RAI11, AI has drastically reduced the time needed for tasks that once took an entire day, such as editing student work and retrieving academic resources. This efficiency gain, as noted by Marien, (2014) demonstrated AI's capability to automate routine activities. While these innovations enable professionals to focus on more complex and creative tasks, concerns remain about potential job displacement (Arntz et al., 2016). Scholars like Cowley-Cunningham (2017) advocate for a collaborative model where AI enhances rather than replaces human roles. Balancing productivity gains with the risk of obsolescence is essential, prompting calls for reskilling and proactive policy measures. Overall, while AI simplifies workflows significantly, its integration into the workplace must be managed carefully to protect employment and ensure a fair transition into more technologically advanced operations. Such an approach will ensure that technological progress complements human expertise rather than completely undermining it.

Additionally, interviewer RAI4 is of the view that AI has reduced teaching activities as learners can learn on their own:

> *"With AI introduction of AI into the higher learning institutions our teaching activities are much simplified where students can learn many things at their own time unlike previous time whereby instructors had plenty of activity to undertake to enhance students understanding of the subject matter* [RAI4]*"*

According to RAI4, AI integration in higher education has simplified teaching by enabling students to learn independently at their convenience. Adaptive learning platforms personalize education (Martin et al., 2020), while AI-driven tools automate grading, reducing instructors' workload (Fauzi et al., 2023). This shift enhances accessibility Dua et al. (2016) redefines educators' roles Garrouste-Orgeas et al. (2019), Karki et al. (2023), and improves student engagement (Sajja et al., 2023). However, ethical concerns and AI literacy must be addressed (Chan & Tsi, 2023). Institutions should establish clear AI policies. The responses from RAI6, RAI11 and RAI4 signifies the opportunities brought by AI technologies that are currently transforming the teaching and learning process. Since the adoption is at infancy stage the opportunities are currently faced by fears and challenges.

The instructors further acknowledge and appreciate the opportunities of AI technology in improving educational delivery, reducing the cost of educational delivery, increasing efficiency in facilitating training and improving students. Additionally, there are opportunities that may be obtained when using AI tools including content generation, image analysis tools, text analysis tools, meta-analysis, content moderation platforms, pattern recognition algorithms and others which guarantees a better future of AI usage

4.1.3 AI Tools Employed by Higher Learning Institution in Tanzania

Some of the common AI tools preferred by instructors in higher learning institutions were identified. The review indicate a significant number of AI tools is currently employed instructors in higher learning institutions as summarised in Table 1. Most of these tools are applied in editing of documents, searching of reading materials, analysis of research findings, organising the presentations, organizing references, correcting grammar, grading the assessment, facilitating distance lectures and interactions and writing texts. Apart from facilitating teaching and learning work, some of AI tools assists in administrative work such as timetable planning and related communication functions.

Table 1

AI tools Employed by Higher Learning Institutions

AI Tool Employed by HLIs	Functions in Teaching and Learning	Reviewed Studies
ChatGPT	Provides explanations on various subjects, generates lesson plans, quizzes, and summaries, assists with personalized tutoring and answering students' questions, and helps students with writing assignments and research.	Hostetter et al. (2023); Widianingtyas et al. (2023); Chounta et al. (2022); Zhao et al. (2024)
Grammarly	Enhances writing by correcting grammar, punctuation, and style; checks for correct sentence structure.	Ponera & Madila (2024); Mambile & Mwogosi (2024)
Bing AI	Acts as a search assistant to find reliable educational content, summarizes articles, research papers, and web pages, helps with fact-checking and gathering information, and supports students in research-based assignments.	Ponera & Madila (2024); Zhao et al. (2024)
QuillBot	Paraphrases text to improve writing and avoid plagiarism, assists students in rewriting and summarizing content, enhances vocabulary and sentence structure, and generates different writing styles for essays and reports.	Ponera & Madila (2024); Mambile & Mwogosi (2024)
Bard AI	Provides AI-generated responses for educational queries, brainstorming and content creation, assists with research by generating insights and summaries, and supports interactive learning through question-answering.	Ponera & Madila (2024)
Intelligent Tutoring Systems (ITS)	Provides personalized learning experiences, adapts to students' learning styles and paces, offers real-time feedback and interactive problem-solving, and simulates one-on-one tutoring by assessing and guiding students through complex topics.	Mtebe & Raisamo (2021); Shengelia (2024); Zhao et al. (2024)

These findings is supported by the instructor's interview responses indicated below;

> *Interviewer Number 2* [RAI2] *"Yes, I have used several AI programs to enhance my teaching. For example, I frequently utilize ChatGPT for generating discussion prompts and providing explanations on complex topics. Additionally, I incorporate tools like Grammarly to support students in improving their writing grammar and spelling. Another program I use is Grade scope, which uses AI to assist in grading and providing feedback efficiently."*

Respondent [RAI2] indicated that AI tools like ChatGPT, Grammarly, and Grade scope have transformed teaching by enhancing efficiency and learning outcomes. ChatGPT generates discussion prompts and simplifies complex topics, Grammarly improves students' writing skills, and Grade scope automates grading for faster feedback. These tools reduce educators' administrative workload, allowing for personalized instruction and adaptive learning experiences. However, challenges such as digital literacy, data privacy, and over-reliance on AI must be addressed. Integrating AI responsibly requires training, ethical guidelines, and a balanced pedagogical approach. Proper implementation can enhance teaching efficiency and enrich student learning while ensuring equitable and effective use of AI in education.

> *Interviewee number 5* [RAI5]*"Yes, I have used AI programs like Perusal, which promotes collaborative reading and annotations using AI-driven insights, to engage students in humanities and social science discussions. I also use ChatGPT for creating examples and explanations that are accessible and contextually relevant. Furthermore, tools like Grammarly are encouraged for student writing, improving clarity and coherence."*

Respondent RAI5, sees, AI tools like Perusal, ChatGPT, and Grammarly enhance teaching and learning in humanities and social sciences. Perusal fosters collaborative reading and discussion, ChatGPT generates accessible explanations, and Grammarly improves writing clarity. These tools boost student engagement, comprehension, and writing skills while reducing educators' workload. However, challenges such as digital literacy, data privacy, and over-reliance on AI must be addressed. Proper integration, training, and ethical guidelines are essential for maximizing AI's benefits in education while maintaining pedagogical balance.

> *Interviewee number 6* [RAI6]. *"Yes, I incorporate AI tools into my teaching. I use tools like Scite.ai for teaching students about citing and understanding academic papers effectively. Additionally, ChatGPT assists in generating research ideas and simulating peer review exercises. I also rely on plagiarism detection tools, such as Turnitin's AI features, to guide students in maintaining academic integrity."*

Respondent RAI6, has a view that AI tools like Scite.ai, ChatGPT, and Turnitin have transformed teaching and reinforced academic integrity. Scite.ai helps students understand citations and scholarly literature, ChatGPT generates research ideas and facilitates peer review exercises, and Turnitin detects plagiarism to uphold academic ethics. These

tools enhance research skills, critical engagement, and ethical writing practices. However, challenges such as digital literacy, data privacy, and over-reliance on AI must be addressed. A balanced approach combining AI tools with traditional teaching methods along with proper training and ethical guidelines, ensures effective integration of AI in education while maintaining high academic standards and fostering independent learning.

> *Interviewer 9* [RAI9]. *"Absolutely, I integrate AI programs into my teaching. For instance, I use Tableau's AI capabilities to teach data visualization and business analytics. ChatGPT is another tool I employ to provide examples of business strategies or marketing content during class discussions. Additionally, I've introduced students to AI-driven financial tools like Bloomberg Terminal AI features to analyse market trends."*

Instructor, respondent, RAI9, views, AI tools like Tableau, ChatGPT, and Bloomberg Terminal's AI features have revolutionized business education by enhancing data analysis, strategy formulation, and financial market analysis. Tableau aids in teaching data visualization, ChatGPT generates business strategy examples, and Bloomberg Terminal equips students with real-world financial insights. These tools improve analytical skills, conceptual understanding, and financial literacy. However, challenges such as digital literacy, data privacy, and AI dependency must be addressed. A balanced integration of AI with traditional teaching methods, along with proper training and ethical guidelines, ensures AI enhances business education while maintaining academic integrity and practical industry relevance.

The widespread adoption of AI tools in higher learning institutions has significantly improved teaching efficiency, research processes, and administrative functions. Tools such as ChatGPT, Grammarly, and Perusal enhance student engagement, writing skills, and collaborative learning, while AI-driven financial and data visualization tools like Bloomberg Terminal and Tableau enrich business education. However, challenges such as digital literacy, data privacy, and over-reliance on AI must be addressed. Proper integration requires training, ethical guidelines, and a balanced pedagogical approach to ensure AI complements traditional teaching methods while maintaining academic integrity, fostering independent learning, and enhancing education quality across disciplines.

4.1.4 Impacts of Integrating AI Applications in Enhancing Higher Learning Teaching and Learning

The synthesis of the reviewed studies indicate a significant impacts of AI usage in teaching and learning in higher learning institutions. The impacts include increasing teaching and assessment efficiency, improved teaching resources accessibility, facilitating real time teaching feedback and improved overall students' academic performance. The reviewed studies and the respective specific AI impacts is summarized in table 2 below

Table 2

Impact of AI Application in Enhancing Higher Learning Training Processes

AI Impact in Tanzanian Higher Learning Institutions (HLIs)	**Reviewed Studies**
AI improved accessibility to training resources	Mtebe & Raisamo (2014); Lashayo (2023); Ponera & Madila (2024); UNESCO (2021); Mtebe & Raisamo (2021); Lwoga (2022); Mgendi et al. (2020)
AI simplified assessment and grading of students' work	Komba & Mtebe (2023); Mambile & Mwogosi (2024)
AI tools provide real-time feedback	Komba & Mtebe (2023); Mambile & Mwogosi (2024)
AI improved data analysis and synthesis	Lukwaro (2021)
AI improved students' academic performance	Means et al. (2014); Rosak-Szyrocka (2024)
AI facilitates transition from traditional teaching to digital teaching	Popenici & Kerr (2017); Mnyanyi, Bakari & Mbwette (2010); Mnyanyi (2016); Danli (2022); Soykan (2020)
AI improves efficiency in teaching	Niu et al. (2023); Chounta et al. (2021); Mandal and Mete (2023); Billy and Anush (2023); Barret and Pack (2023); Hostetter et al. (2023); Zulkarnain and Yunus (2023); Shirin (2022); Alijohani (2020); Joshi, Rambola, and Churi (2020); Lwoga (2022); World Bank (2020)

The reviewed studies finding concerning Impact of AI in teaching and learning concur with the most of the key informant observations. For instance the efficiency of AI tools in teaching is noted by Interviewee numbe2 as pointed out

> *"AI programs have been instrumental in transforming online education. Adaptive learning systems like Knewton personalize the learning experience, ensuring students receive content suited to their skill levels. AI-driven chatbots and virtual assistants provide immediate support, enhancing student engagement and reducing response times for questions. Additionally, AI tools like Otter.ai and transcription services make course materials more accessible to diverse learners, improving inclusivity and participation* [RAI9]*"*

According RAI9, AI has revolutionized online education by personalizing learning, enhancing engagement, and improving accessibility. Adaptive learning systems like Knewton tailor content to student needs, improving comprehension and retention. AI-driven chatbots provide immediate support, fostering engagement and reducing response times. Tools like Otter.ai enhance accessibility by transcribing lectures, benefiting diverse learners. These advancements promote inclusivity and continuous learning. However, challenges such as data privacy, digital literacy, and AI dependency must be addressed. Proper implementation, training, and ethical considerations ensure AI's effective integration into online education, maximizing its benefits while maintaining a balanced and secure learning environment for students.

Interviewee number 10 had the similar observation and had this to say;

"AI applications like ChatGPT and Google Bard are increasingly popular for generating teaching materials, brainstorming ideas, and facilitating student engagement. Tools like Turnitin are widely used for plagiarism detection, while adaptive learning platforms, such as Moodle with AI plugins, help in personalizing the learning experience. Additionally, Microsoft Azure AI and Tensor Flow are being adopted for teaching AI and machine learning concepts [RAI10]*."*

According to respondent RAI10, AI applications like ChatGPT, Google Bard, and Moodle with AI plugins are transforming education by enhancing content creation, student engagement, and personalized learning. Turn tin ensures academic integrity through plagiarism detection, while Microsoft Azure AI and Tensor Flow facilitate AI and machine learning education. These tools improve efficiency, uphold academic standards, and equip students with practical skills. However, challenges such as digital literacy, data privacy, and AI dependency must be addressed. Proper integration, training, and ethical guidelines are necessary to maximize AI's benefits while maintaining a balanced, inclusive, and responsible approach to its use in higher education. The evidence indicate AI applications is transforming teaching and learning in higher learning institutions. The impacts implies a need to embrace the technology by all instructors at HLIs and their respective students for further positive teaching and learning results

Furthermore, it has been noted that AI tools have added value to teaching and learning by improving access to learning resources, Improving data analysis, simplified assessment and grading process, improve efficiency in teaching and thereby improving students' academic performance. However, several challenges emerged in the course of adoption and application of AI technology. These challenges among others include limited infrastructure, lack of internet connectivity, ethical concerns of cheating and plagiarism, lack of skills among instructors and lack of guiding policy and framework in most of the HLIs.

4.1.5 Challenges of Integrating AI in higher learning training processes

Despite positive impact of AI application in teaching and learning. The adoption of the technology is attributed to different challenges. For instance, it has been found that limited access to reliable internet and computing facilities slows adoption of the technology (Billy & Anush, 2023). It is further noted that a significant proportion of faculty and administrative staff lack the necessary skills to implement and use AI tools effectively (Sarakikya & Kitula, (2024); Ponera & Stephen Madila, 2024)).Many HLIs face budgetary limitations, preventing them from acquiring and maintaining advanced AI systems (Ndibalema, 2022). Concerns around data privacy and the lack of clear policies on AI use in education further complicate adoption (Almaiah & Alyoussef, 2019).

Apart from low application there is a perception among academic staff that the technology promote cheating and plagiarism, lack of privacy, and a dearth of well-defined laws governing its utilisation (William et al., 2024; Chung, 2004; Mambile & Mwogosi, 2024). Many educators and administrators lack the necessary skills to implement AI tools effectively (Stuart, 2024). Procuring and maintaining AI technologies remain financially challenging for many institutions (Chounta et al., 2022). Inadequate technological infrastructure, and lack of advanced hardware, hampers AI adoption in many institutions (Kondo & Diwani, 2023). Many educators and administrators lack the technical expertise required to effectively implement and utilize AI tools, posing a significant barrier to adoption (Mulyani et al., 2025).Procuring, implementing, and maintaining AI technologies is expensive, making it challenging for resource-constrained institutions to adopt these innovations (Wang'ang'a, 2024). Additionally table3 summarizes other studies that discussed the challenges related to AI application in Higher learning Institutions.

Table 3

Challenges of Integrating AI in Higher Learning Training Processes

Findings	Reviewed Studies
AI Challenges in Tanzanian HLIs	
Infrastructure Limitations	Komba & Mwandanji (2016); Mtega et al. (2020)
Cost of Implementation	Brynjolfsson & McAfee (2014)
Skill Gaps that Call for Capacity Building	Schleicher (2018); Shirin (2022); Mtebe & Raisamo (2014); Chounta et al. (2021); Mtitu & Mwalukasa (2022); Ndume et al. (2021); Mgendi et al. (2020)
Ethical and Data Privacy Issues	Baker & Smith (2019); Rugambwa et al. (2023)

The integrations of AI in Tanzania higher learning institution encountered several challenges including infrastructure which hinder the adoption of AI. The inadequate digital resources and internet connectivity resulted to the low adoption of digital technology and AI in higher learning institutions. (Mathew & Mgina, 2024); (Borokini et al., 2023). The high charge of AI and digital execution remain an obstacle that avoid improvement in in digital and AI technologies in Tanzania (Acosta-Enriquez et al., 2025). The expertise variation among the students and instructors indicate the demands for training that raise creativity among them (Lashayo et al., 2023); Mtebe & Raisamo, 2014). Moreover, the data ethical privacy and security raised the demands related to AI application and implementation in higher learning institutions (Arntz et al., 2016; Baker, 2021; Rugambwa & Mwaikokesya, 2023).

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

The digital and AI incorporation in Tanzania higher learning institution and administrative activities is encouraging. The implementation of digital and AI in teaching and learning is in advancement day by day in low income countries specifically Tanzania between the instructors. Additionally, most of the higher learning institutions are still in the initial stages in terms of digital and AI implementation however the challenges based in income, infrastructure use and expertise. The significance of AI integrations in higher learning institutions area obvious that in advancement of students skills and knowledge specifically in individual learning and investigation skill effectiveness. The availability of digital and AI facilities including learning platforms for implementation of teaching and learning improves teaching and learning in this digital era. The limitations such as inadequate AI and digital technologies, slow change among the academicians and administrators indicated worries on the security and ethical consequences in AI and digital repacutions in higher learning institutions are valuable and still wanting.

5.2 Recommendations

The effective sustenance of AI and digital implementation in higher learning institutions, the important effort towards digital and AI infrastructure including internet accessibility, availability of computers and other learning devices for digital and AI integration and improving institutional teaching and learning facilities is a demand. The endless training programs to faculty members appreciate the current use and implementation of digital and AI intergration in higher learning institutions. The training provides should be directly focused on practical skills but also includes methodological approaches that bring the equilibrium between the digital and AI application with the outdated teaching and learning approach.

The learners are required to be given prior training and coordination the use and application of AI and digital platforms effectively. Students should be provided with proper orientation and training on how to use AI tools effectively. The safeguarding of AI and digital programs are manageable and available to the learners irrespective of technological variations that enhances higher students' commitment and performance. The higher learning institutions are required to enact AI ethical guiding principles including rules, regulations and policies directed to information security and privacy, exclusion bias, and commitment in the AI implementations. Additionally, the administrators, instructors and students should be trained on the ethical consequences and the possible outcomes on the integration of AI in higher learning institutions

The higher learning should work together with both government and private institutions safeguard income, teaching and learning resources, company supports to mitigate financial limitations encountered by low developing countries including Tanzania. The supports form companies and associations brought the advancement of AI resources .Thus the higher learning institutions should emphasize on AI creativity and innovative integration that enhances curiosity in investigating and solving societal problems. .

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