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Adaptation level of artificial intelligence (AI) in university curriculums: A case study on Mogadishu located universities

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Abstract

This study examines the adaptation level of artificial intelligence (AI) within university curricula in Mogadishu, Somalia, a post-conflict context characterized by emerging technological momentum yet significant resource constraints. Utilizing a comparative descriptive research design, data were collected from 24 universities through a systematic analysis of curriculum documents and open-ended questionnaires administered to academic staff. The findings reveal that while AI integration is gaining traction, it remains structurally uneven and predominantly theoretical in nature. Quantitative results indicate that although all 24 sampled institutions have integrated at least one AI-related subject, such as Machine Learning, Data Science, or Neural Networks, into their computing departments, only 16 universities (66.7%) offer AI as a standalone subject. Furthermore, qualitative data underscores critical systemic barriers, including a profound absence of national and institutional policy frameworks, a shortage of specialized faculty, and a lack of dedicated AI laboratories for practical application. The study concludes that while there is positive institutional movement toward technological adoption, sustainable AI education requires strategic capacity building, the establishment of standardized academic frameworks, and increased investment in digital infrastructure to align graduate competencies with the demands of a technology-driven global labor market.

Keywords: Artificial Intelligence, University Curriculum, Higher Education, Computer Science, Somalia.

Introduction

Artificial Intelligence (AI) has emerged as a transformative force in higher education, reshaping teaching, learning, research, and institutional governance through technologies such as personalized learning support systems, virtual assistants, automated grading platforms, predictive analytics, and intelligent content recommendation engines (Rajest et al., 2023; Ullah et al., 2025). These innovations enable curricula to become more adaptive, flexible, and learner-centered, addressing long-standing limitations associated with traditional one-size-fits-all pedagogical approaches and enhancing educational inclusivity and responsiveness (Rajest et al., 2023; Ullah et al., 2025). However, such rapid integration also raises profound ethical, pedagogical, and infrastructural challenges, including data privacy concerns, algorithmic bias, issues of model transparency and accountability, academic integrity, and variability in faculty and student readiness to adopt AI tools (Rajest et al., 2023; Ullah et al., 2025; Hong et al., 2025).

Although research on AI adoption in higher education has expanded considerably, the majority of existing studies are situated within high-income countries characterized by advanced digital infrastructures and robust policy frameworks (Hong et al., 2025). Consequently, developing and post-conflict contexts remain underexplored in mainstream literature, leaving vital contextual gaps in understanding how AI can be effectively integrated into teaching, learning, and curriculum design within resource-constrained environments. In Somalia, for example, limited internet penetration, chronic underfunding of public universities, inconsistent academic standards, and weak quality assurance mechanisms have constrained meaningful innovation and slowed systematic curriculum development (Mohamed, 2023; Hong et al., 2025).

Simultaneously, higher education institutions in Mogadishu are beginning to introduce computer science and AI-related programs, reflecting institutional momentum toward technological adoption. Empirical findings from recent surveys reveal that Somali students generally exhibit moderately positive attitudes toward AI, although these attitudes vary significantly with demographic factors such as age and prior exposure to technology (Sancar et al., 2025). Such initial positive dispositions underscore the potential for enhanced digital literacy and workforce readiness, but also highlight the need for contextually sensitive curriculum frameworks that address both opportunities and constraints.

Thus, there is an urgent need to assess the current level of AI adaptation within university curricula in Mogadishu. Such an assessment can inform strategic capacity building, policy formulation, and culturally appropriate implementation plans that prepare graduates for a technology-driven labor market, while ensuring equitable access and ethical use of AI technologies

The integration of AI into higher education curricula reflects a multidimensional transformation that affects pedagogical practices, learner engagement, and institutional policy. AI-driven systems support adaptive, personalized learning environments by analyzing learner data to tailor content, pacing, and assessment strategies, which can improve student engagement, retention, and academic performance (Ullah et al., 2025; Rajest et al., 2023; Wu et al., 2024). Empirical research further suggests that such adaptive learning mechanisms enhance academic outcomes by aligning instructional pathways with individual learner needs, thereby strengthening curriculum relevance and resilience (Ullah et al., 2025; Wu et al., 2024). Moreover, AI tools such as intelligent tutoring systems, virtual teaching assistants, and predictive analytics enable more informed decision making, support evidence-based instruction, and accelerate research productivity, which aligns with global educational priorities including Sustainable Development Goals (SDGs) 4 (quality education), 9 (industry, innovation, and infrastructure), and 16 (inclusive institutions) (Hong et al., 2025).

Despite these documented benefits, AI adoption in higher education is encumbered by significant challenges. Ethical concerns including data governance, algorithmic bias, transparency in automated decision making, academic integrity, and equitable access remain central debates within the literature (Rajest et al., 2023; Mahajan et al., 2025; Hong et al., 2025). Implementation hurdles are compounded by infrastructural limitations, insufficient faculty training, low levels of AI literacy, and constrained financial resources, particularly in developing and post-conflict contexts (Mahajan et al., 2025). Organizational resistance, cultural attitudes, and generational differences in technology acceptance further slow institutional adoption (Mahajan et al., 2025).

Technology acceptance frameworks, such as the Unified Theory of Acceptance and Use of Technology (UTAUT), provide analytic lenses for understanding how individual and organizational determinants shape the uptake of novel technologies, emphasizing factors such as perceived usefulness, ease of use, social influence, and facilitating conditions (Venkatesh et al., 2003). These determinants intersect with demographic and contextual variables that influence patterns of acceptance, use, and sustained engagement with AI systems within academic environments.

The literature also identifies key adoption factors that contribute to successful AI integration in higher education settings. Institutional support characterized by strategic leadership, alignment of AI technologies with pedagogical goals, comprehensive professional development for faculty, clear policy guidance, and ethical governance frameworks are frequently cited as critical enablers of meaningful curriculum transformation (Guiral et al., 2025). Systematic research mapping further reveals that AI integration is increasingly conceptualized within global sustainability frameworks, highlighting how AI can support inclusive, equitable, and socially responsive education systems (Hong et al., 2025).

However, significant gaps persist in the literature regarding AI adoption within developing and post-conflict regions. Most research remains concentrated in high-income and select emerging Asian contexts, leaving African and Somali higher

education systems underrepresented (Hong et al., 2025). In Mogadishu, persistent internet connectivity challenges, underfunded public institutions, absence of centralized curriculum regulation, and nascent digital infrastructure limit routine AI-enabled teaching and learning, even as national ICT policies foreground AI and innovation as strategic priorities. Empirical evidence suggesting moderately positive student attitudes toward AI underscores the promise for enhanced digital competencies, yet highlights the importance of robust policy support and pedagogical frameworks that resonate with local realities (Sancar et al., 2025; Venkatesh et al., 2003).

Collectively, these studies underscore the pressing need for context-specific investigations that examine AI integration at the curriculum level. Targeted strategies for sustainable, equitable, and culturally responsive AI implementation require ethical safeguards, pedagogically sound interventions, faculty capacity building, and infrastructure investments. Such efforts can provide actionable guidance for policymakers, institutional leaders, and educators seeking to responsibly leverage AI in post-conflict and resource-limited educational systems.

Methodology

This study employed a comparative descriptive research design to examine the level of artificial intelligence (AI) adaptation within university curricula in Mogadishu. The comparative approach was selected because it allows for systematic examination of similarities and differences across higher education institutions without manipulating variables, making it particularly suitable for curriculum-based studies in natural institutional settings.

Study Context and Population

The study focused on universities located in Mogadishu, the administrative and educational hub of Somalia, where higher education institutions operate under diverse ownership models and academic standards. At the time of the study, 56 universities were identified as operating within the city. These institutions constituted the initial study population.

Sample Selection

All 56 universities were formally contacted and invited to participate in the study. However, due to challenges commonly associated with research in post-conflict contexts—such as restricted institutional access, limited transparency, and reluctance to share academic documents—complete and reliable curriculum data were obtained from 24 universities. These institutions formed the final analytical sample. The reduced sample size reflects systemic governance and access constraints rather than sampling bias and represents a realistic cross-section of accessible higher education institutions in Mogadishu.

Data Collection Methods

Two complementary data collection methods were utilized:

1. Curriculum Document Analysis: Official curriculum documents, including degree structures, course outlines, and subject descriptions, were systematically reviewed. The analysis focused on identifying (a) the availability of AI degree programs, (b) the inclusion of AI-related subjects, and (c) the breadth of computer science–related programs.

2. Open-Ended Questionnaires: An open-ended questionnaire was administered to four academic staff members actively involved in teaching and curriculum-related activities. This instrument was designed to capture expert perspectives on institutional readiness, teaching capacity, infrastructure availability, policy environments, and challenges associated with AI integration.

Data Analysis Techniques

Data analysis was conducted using descriptive and comparative techniques. Quantitative curriculum data were summarized using frequency counts and tables, while qualitative responses from academic staff were analyzed thematically to identify recurring patterns and institutional challenges. The integration of document analysis and expert insights enabled methodological

triangulation, strengthening the credibility of the findings.

Results

The results of this study are presented using both narrative explanation and tabular summaries to enhance clarity and empirical transparency. The tables provide a structured overview of curriculum characteristics across the sampled universities and are explicitly referenced in the interpretation below.

The findings reveal notable variation in the level and structure of AI curriculum adaptation across Mogadishu-based universities.

Degrees Offered

As shown in Table 1, eighteen universities (75%) offer more than one computer science–related degree, indicating a relatively higher level of curricular diversification, while six universities (25%) offer only a single computing-related program.

All sampled universities offered at least one computer science–related degree. However, program diversity varied considerably. Eighteen universities offered more than one computing-related degree, indicating broader curricular diversification, while six universities offered only a single program, typically Bachelor of Computer Science or Information Technology.

Table 1. Number of Degrees Offered

No. of CS-Related Degree	Universities
More than one degree	18
One degree only	6
Total	24

Across the sampled universities, a wide range of computer-related degree programs were identified. These programs span undergraduate levels and cover diverse areas within computing and information technology. The degrees that currently offered by universities are shown in table 2.

Table 2. Degrees Offered

No. of CS-Related Degree	Universities
Information Technology	9
Computer Science	9
Computer Security and Forensics	1
Networking and Security	2
Software Engineering	6
Computer Multimedia	3
Telecommunication Technology	1

Table 2 presents the distribution of computer science–related degree programs across the sampled universities. Information Technology and Computer Science programs are the most prevalent, each offered by nine universities, followed by Software Engineering, which is available in six institutions. More specialized programs such as Computer Security and Forensics, Telecommunications Technology, and Networking and Security are offered by only a small number of universities, reflecting limited specialization within the current higher education landscape.

On the other hand, Among the eighteen universities offering more than one computer-related degree, curriculum documents were collected from different academic departments. Specifically, curriculum data from 9 universities were obtained from Information Technology departments, while curriculum data from the remaining 9 universities were obtained from Computer Science departments. This balanced distribution ensured representation of AI-related content across the two most dominant computing disciplines.

Availability of AI as a Standalone Subject

As indicated in Table 3, sixteen universities offer Artificial Intelligence as a standalone subject, while eight universities do not. This finding suggests that although AI is increasingly recognized as an important academic field, its formal inclusion as an independent subject has not yet been universally adopted across universities in Mogadishu.

Table 3. Availability of AI Subjects

AI Program Availability	Frequency
AI Subject Offered	16
No AI Subject	8
Total	24

Even in universities that do not offer AI as a standalone degree, AI-related subjects are incorporated within existing curriculums. All 24 universities included at least one AI-related subject under computer science or closely related departments. This demonstrates that AI concepts are being introduced at the course level, ensuring partial exposure to AI knowledge even in the absence of full AI degree programs.

AI-Related Subjects Identified in Curriculums

mportantly, all universities included at least one AI-related subject within their curricula, primarily embedded within computer science or IT programs. Identified subjects included Machine Learning, Neural Networks, Data Science, Data Mining, Computer Vision, Natural Language Processing, Robotics, and Intelligent Systems. These courses varied in depth, ranging from introductory theoretical coverage to limited applied content.

Table 4. Availability of AI-related Subjects

AI-related Subjects	Universities
Machine Learning	3
Data Science	3
Neural Networks	4
Data Mining	2
Intelligent Systems	1
Robotics	1
Computer Vision	1
Natural Language Processing	1

Academic Staff Perspectives

Academic staff responses revealed that AI instruction remains predominantly theoretical due to limited access to specialized laboratories and advanced computing infrastructure. While respondents acknowledged the potential of AI to enhance student performance and learning outcomes, they emphasized that insufficient institutional support and lack of structured implementation strategies constrain its impact.

1. Availability of AI Laboratories and Practical Training

Academic staff responses indicate that practical training opportunities related to Artificial Intelligence remain limited across universities. Most respondents reported that AI education is predominantly theoretical, with insufficient access to specialized AI laboratories. While a small number of institutions have basic computing labs, these facilities are not adequately equipped to support advanced AI experimentation or hands-on learning. As a result, students often rely on conceptual understanding rather than practical application of AI techniques.

2. Impact of AI on Student Performance

Regarding the impact of AI on students' academic performance, the majority of academic staff agreed that AI can significantly enhance students' learning outcomes, test scores, and overall academic performance when used appropriately. However, respondents emphasized that AI tools are not yet widely integrated into teaching and assessment practices. Consequently, the positive impact of AI on student performance remains limited by restricted access, low institutional adoption, and lack of structured implementation strategies.

3. Existence of Laws, Policies, and Guidelines

Findings from the academic staff responses reveal a lack of formal laws, policies, or standardized guidelines governing the use of AI in universities. All respondents indicated that there is no common regulatory framework at either the institutional or national level to evaluate, guide, or monitor AI adoption in higher education. This absence of policy was viewed as a major barrier, contributing to inconsistent AI integration practices across universities and limiting long-term planning for AI education.

4. Challenges in Incorporating AI into University Curriculums

Academic staff identified several challenges hindering the incorporation of AI into university curriculums. A frequently mentioned challenge was the shortage of skilled and specialized faculty

capable of teaching advanced AI concepts. In addition, limited financial and technical resources, lack of AI laboratories, and insufficient curriculum space were highlighted. Some respondents noted that existing curriculums already contain a large number of compulsory courses, making it difficult to introduce new AI-focused subjects without comprehensive curriculum revision.

5. Suggested Steps to Improve AI Adoption

When asked about steps needed to improve AI adoption in Mogadishu-based universities, academic staff emphasized the importance of strategic and coordinated interventions. Key recommendations included the establishment of well-equipped AI laboratories, capacity-building programs to train academic staff, and the development of formal policies and guidelines to regulate AI use in higher education. Some respondents also suggested the creation of a national AI center and systematic curriculum evaluation to ensure that AI courses are integrated effectively and sustainably.

Discussion

The findings demonstrate that AI curriculum adaptation in Mogadishu universities is emerging but uneven, reflecting both institutional initiative and systemic limitations. The presence of AI as a standalone subject in a majority of sampled universities suggests growing awareness of AI's relevance to labor market demands and national development goals. However, the absence of standardized curriculum frameworks has resulted in fragmented and inconsistent implementation.

The universal inclusion of AI-related subjects indicates baseline exposure to AI concepts across institutions, aligning with global trends emphasizing digital competencies in higher education. Nevertheless, the predominance of theoretical instruction highlights capacity constraints common in post-conflict educational systems, including limited infrastructure, scarcity of specialized faculty, and restricted financial resources.

Qualitative insights from academic staff further reveal that institutional willingness alone is insufficient for sustainable AI integration. Without coordinated policy guidance, faculty development programs, and investment in practical learning environments, AI education risks remaining superficial and misaligned with industry requirements.

These findings align with broader literature on technology adoption in low-resource contexts, which emphasizes the role of governance, institutional leadership, and enabling conditions in determining the depth and effectiveness of curriculum innovation.

Conclusion

This study assessed the level of artificial intelligence adaptation in university curricula in Mogadishu and found that while AI integration is progressing, it remains structurally uneven and institution-dependent. Although a significant proportion of universities have introduced AI-related courses and standalone subjects, comprehensive and practice-oriented AI programs are not yet consistently implemented.

The findings underscore the need for national-level curriculum coordination, improved institutional transparency, and enhanced access to curriculum documentation. Furthermore, the absence of formal policies and standardized guidelines continues to limit coherent AI integration across higher education institutions.

By providing curriculum-level empirical evidence from a post-conflict context, this study contributes uniquely to the literature on AI adoption in higher education and offers a foundation for informed policy development and institutional planning.

In conclusion, during the analysis of this study, Hormuud University announced that a new Department for Artificial Intelligence is being established, which makes Mogadishu universities show positive movement toward AI integration, but stronger institutional collaboration, improved curriculum accessibility, and clearer academic frameworks are necessary to ensure sustainable and comprehensive AI education in higher learning institutions.

Recommendations

Based on the study's findings, the following recommendations are proposed:

1. Structured AI Curriculum Development: Universities should design standardized AI curricula that balance theoretical foundations with applied learning and align with national ICT strategies.

2. Establishment of AI Laboratories: Investment in specialized AI laboratories is essential to support hands-on learning and practical skill development.

3. Faculty Capacity Building: Continuous professional development programs should be introduced to enhance academic staff expertise in AI-related fields.

4. Policy and Regulatory Frameworks: Educational authorities should develop formal policies and ethical guidelines governing AI use in higher education.

5. Institutional Collaboration: Universities should strengthen collaboration through curriculum sharing, joint research initiatives, and resource pooling.

6. Phased Introduction of Advanced AI Courses: Advanced AI subjects should be gradually integrated following systematic curriculum evaluation.

7. National-Level Strategic Support: Establishing a national AI coordination body could enhance curriculum standardization, research capacity, and alignment with development priorities.

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