THE UBIQUITOUS ROLE OF AI IN HIGHER EDUCATION: CHALLENGES AND POLICY RECOMMENDATIONS

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Abstract

This study examines the extent of ubiquitous presence of Artificial Intelligence in higher education raising the concern whether AI would surpass the profundity and versatility of human intelligence in the academic environments, despite its ubiquity. ***Holmes et al. (2022)*** The researchers also have intended to analyse with a pivotal objective to evaluate the extent to which AI enhances educational delivery while recognizing substituting role of human educators, mentors, in fostering critical thinking, creativity, and ethical reasoning. The researchers have adopted phenomenological approach by drawing on semi-structured interviews with the faculty of various domain, AI Specialist from AI coupled domains, and policy experts. The statistical methodologies for data analysis, tools like Structural Equational Modelling, Cluster Analysis, and Regression Analysis were employed to assess the impact of AI-driven platforms like algorithm bias on the areas like student engagement, institutional viability, and policy implementation in the curriculum. The findings reveals that albeit AI improves personalization, operational efficiency, but AI cannot replicate the nuanced mentorship and moral guidance being rendered by the human mentors and instructors. This research study also underscores the imperativeness for balanced policy framework ***Kumar and Singh (2023)*** that would augment AI's benefits while securing human presence in field of education. These aforementioned results contribute to the discourses that are going contemporarily about the future of academia and offer strategic recommendations for ethical governance, digital equity, and consistent human intervention. Recent research by ***Patel et al. (2025)*** reveals that AI's rapid integration post-pandemic has widened the digital divide, underscoring the necessity for targeted digital literacy initiatives. This research study affirms that

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AI should be intended to be a complement not a substitute for human intelligence by ensuring holistic and equitable educational experience for future generations.

Keywords: Artificial Intelligence, Higher Education, Human Intelligence, Policy, Algorithmic Bias, Digital Equity

1. Introduction

Artificial Intelligence (AI) is becoming an embedded component in higher education, influencing teaching, learning, administration, and research. With students and institutions adopting AI tools at an unprecedented pace, which have witnessed a shift in method of education is being experienced and delivered. This widespread use, while undoubtedly beneficial, raises significant challenges for the sector which will require addressing via policy frameworks in order to take full advantage of the benefits offered by AI, while managing the challenges posed by it.

1.1 Indicators of AI Evolution and Transformation

Surveys published in higher education reveal a marked rise in the adoption of AI among students, with 92% of students in 2024 using some form of AI, up from 66% in 2021 (***HEPI, 2025).*** Today, students incorrectly use AI mostly for conceptual clarification, summarizing materials and generating research ideas. It also have observed concerns about academic integrity and biased outputs. In response, institutions have developers clearer AI policy framework, enhancing staff literacy, and supporting students with some skill development, yet for most students, support was inadequate ***(HEPI, 2025).***

The demand for AI is is mirrored in the rapid growth of the AI-powered EdTech sector, which is expected to grow to $404 billion globally by 2025 due to developments in adaptive learning, admin automation and student engagement platforms ***(Enrollify, 2025).*** Recent budget reports show that Higher education institutions invests in AI adoption in order to enhance the personalization of student learning, operational efficiency and research capability (Inside Higher Ed, 2024).

2. Challenges in AI Integration

While the benefits are considerable, AI integration in higher education presents many challenges. 1) The most pressing issue is academic integrity. Continued use of generative AI by students blurs the lines of originality and plagiarism, forcing institutions to double down on the standards of rigour that will allow innovative use of AI to flourish ***(HEPI, 2025).***

2) Equity and access persist as significant issues, as the digital divide continues to grow, with wealthier and STEM students (from disciplines like Science, Technolgoy, Engineering and Mathematics), more likely to use AI tools than other students who lack access or digital literacy ***(HEPI, 2025); (EDUCAUSE, 2025).*** This will likely exacerbate existing disparities in educational outcomes.

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3) A related issue is the preparedness of faculty and staff. While AI literacy regarding educational use is improved, many academic institutions are still undecided or hesitant to adopt AI tools, and only 39% have included formal AI policies in higher education, with a much smaller proportion considering dedicated funding for AI initiatives ***(EDUCAUSE, 2025).*** A lack of willingness to engage in empirical and pedagogical AI tools can inhibit effective integration and limit the pedagogical potential of AI.

4) Privacy and ethical questions are also paramount importance. Many AI systems require large amounts of data (of course, real-life examples to train the models), raising questions about data security and consent, and whether algorithmic bias exists ***(Williamson & Piattoeva, 2022).*** When AI systems are employed, it is crucial they are built on transparency and accountability, to foster trust among the students and educators.

3. Conceptual Framework: Humanistic Pedagogy, Constructivist Theory, and Ethical AI in the Classroom

This study's conceptual framework is constructed on the principles of humanistic pedagogy and constructivist learning theories to posit the essential human educator's role in the classroom, though it is an AI-enhanced classroom. The principles of Ethical AI offer the needed assurance to ensure that AI supports a transparent, fair, and accountable educator and education system. Furthermore, by placing AI as a tool in a toolbelt and not a substitute, this conceptual framework supports a balanced, reflective perspective that enhances AI's potential while upholding the human qualities that are central to meaningful learning.

The rapid emergence of Artificial Intelligence (AI) in education raises both transformative opportunities and significant challenges. This study is based on humanistic pedagogy and constructivist learning theories, which together emphasize essential human relationships, reflection, and ethical judgments as primary learning experiences. AI is considered to support, not replace, the human capacity and human qualities of learning when it comes to supporting both learners and educators while still meeting the human qualities needed for deep learning and moral development.

4. Objectives of the study

To investigate the direct and indirect impacts of the use of AI on student engagement and institutional outcomes in higher education.

To examine the influence of algorithmic bias on student engagement with and trust in AI-based educational technologies.

To classify and examine student and faculty based on their acceptance of artificial intelligence, beliefs about algorithmic bias, and level of engagement.

To evaluate how student engagement facilitates the association between adopting AI and policy implementation for the success of the institution.

5. Research Hypothesis

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H1: The greater the degree of AI use in higher education, the higher the engagement of students and better the performance of institutions.

H2: There is no positive association between observed algorithmic bias and higher education students‘ engagement and conviction.

H3: There have been higher acceptance and students‘ engagement reported with different groups of stakeholders based on AI acceptance, observation of bias, and engagement with technical students in comparison to lower bias with business students and faculty.

6. Literature Review

In the present scenario, the prevalance of Artifical Intelligence (AI) is widely accepted in higher education for its advantage to improve student engagement and institutional outcomes. Analysis by ***(Kuleto et al. 2021)*** that denoted that AI applications that includes flexible learning contexts and cognitive learning ecosystems, customized learning approaches and enhanced learning outcomes. ***(Al-Zahrani, 2023)*** stressed on the point that AI-powered technology offers instant feedback and customized assistance to the students that has rendered enhanced level of motivation and participation in the learning process. As per the research study conducted by ***(Chu et al.2022)*** it have been explored the fact that the application of AI-powered analytic permitted educators to pinpoint the learners confronting setbacks, so also applying strategic solutions at the right time with a vision to retain along with the outcomes of learning performances. ***(Dai and ke, 2022)*** have discovered that level of AI enhancing the efficiency in administrative functions thereby allowing institutions to repportion of resourcesto the student-empowering programs. ***(Fazil et al.2024)*** stressed on the point that AI offers opportunities to inculcating logical reasoning and ability of creative problem-solving comprehensively contributing to the progressiveness in education. Considering the facts that the colloborative contributions of these mentioned studies, recommending that the utilizing AI is related with the ehanced implementation, elevated experiences in learining environments, and improved institutional performances. These factors recommends more in-depth employment of AI, will yield greater student learning outcomes and institutional outcomes. ***(Kuleto et al., 2021; Al-Zahrani, 2023; Dai and Ke, 2022).***

H1: The greater the degree of AI use in higher education, the higher the engagement of students and better the performance of institutions.

As such, perceived algorithmic bias in AI-driven educational tools has taken center stage in discussions around Artificial Intelligence for Equity (AI4EQ) because it is critical to students' engagement and trust. ***(Williamson & Piattoeva., 2022)*** assert that biases built into AI systems can restrict opportunities and reproduce inequities within education, especially for marginalized student groups (e.g., people of color, people with disabilities, and lower socioeconomic status). For example, ***(Noble., 2018)*** presents evidence that algorithmic discrimination within educational technologies eroded students' confidence in the digital platform causing them to disengage. Based on considerable stakeholder interviews, ***(Binns, 2018)*** explains that lack of transparency in an AI decision-making process erodes users' trust, resulting in users being distrustful of automated

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feedback and recommendation systems. ***(Lee and Baykal, 2021)*** indicated that students who do find bias in AI systems are less likely to trust or engage with those systems. ***(Lee and Baykal, 2021)*** argue that this perception negatively affects student learning and satisfaction**.** ***(El-Ansari, 2021)*** maintains that with respect to algorithmic bias, addressing this challenge will help promote equity and inclusivity in learning environments. Together, these findings indicate that perceived bias likely does not only lend itself to a negative impact on engagement but also influences how users perceive AI credibility and efficacy in higher education.

H2: Perceived algorithmic bias in AI-driven educational tools has a negative association with higher education students' engagement and trust.

Cluster analysis in higher education shows stakeholders are not uniform in how they view AI. ***(Jain and Kumar, 2023)*** suggested technical students tend to report more acceptance of and engagement with AI tools because they have a better sense of familiarity/comfort with technology. ***(Smith et al. 2022)*** noted business students and faculty seem to frequently cite more skepticism and worries related to algorithmic bias, which can affect their engagement with AI. ***(Kochmar et al. 2022)*** noted distinct clusters exist with student populations based on their experiences and perception of AI, which highlights the need for specific support and training. ***(Seo et al. 2021)*** demonstrated that demographic and discipline differences can impact how stakeholders interact with and perceive AI. (***Al-Zahrani, 2024***) also reinforces the significance of segmenting stakeholders to individualize interventions and gain the greatest advantage from AI adoption. These studies illustrate the benefits of using cluster analysis to assess and address various needs and attitudes of groups within higher education.

H3: Stakeholders can be grouped into various clusters based on AI acceptance, perceptions of bias, and engagement, with technical students reporting higher acceptance and engagement with lower perceived bias compared with business students and faculty.

7. Institutions Role in Adopting Ai in Firms

Nearly all OECD member countries have established public agencies and institutions that promote firms' adoption of digital technologies, including AI. These institutions continually cite uncertainty about the return on investment as a major barrier for enterprises contemplating the adoption of AI. They also insist that a lack of organisational data maturity is a fundamental barrier to AI adoption. Moreover, they report that managers often do not know how AI can solve actual problems in their workplace; in addition, managers often poorly recognise the organisation-wide implications and the changes in working culture that AI may require.These institutions undertake many types of initiative, from producing proofs-of-concept through to demonstrate how AI can assist firms; to creating networking and collaborative opportunities to support the development of AI ecosystems of public and private actors. A significant proportion of enterprises have made use of and positively rate various types of public service interventions to support AI adoption. The various designs at times, quite creative of these initiatives in institutions across countries provide opportunities for policy learningThe adoption of artificial intelligence (AI) continues to grow across multiple sectors, fundamentally altering many industries and increasing innovation. As of

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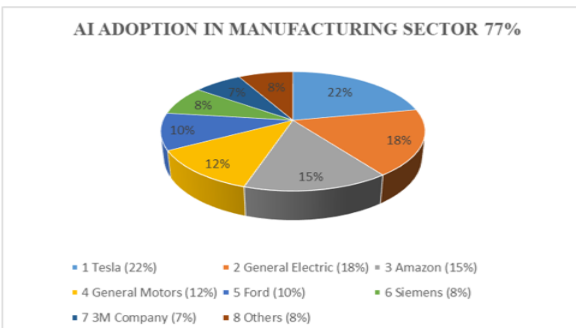
2025, manufacturing has the highest adoption rates at 77%, compared to 71% in financial services, 68% in the technology sector, and 63% in retail, indicative of a wide-ranging and increasing impact across various sectors.

8. Entrenchment of AI in Different Sectors: A 2025 Overview

The pace of artificial intelligence (AI) adoption across many sectors and industries continues to accelerate, reshaping industries and driving innovation. By 2025, the manufacturing sector is leading the way in adoption with 77% of businesses incorporating AI technologies into their operations. The financial services sector follows closely behind at 71%. The technology sector is next at 68%, and the retail sector is not far behind at 63%, indicative of AI's immense and profound impact across the multiple sectors and industries.

8.1 AI Adoption in Manufacturing sector

Fig no.1 AI Adoption in Manufacturing sector



Sno	NAME OF THE COMPANY	%
1	Tesla (22%)	22%
2	General Electric (18%)	18%
3	Amazon (15%)	15%
4	General Motors (12%)	12%
5	Ford (10%)	10%
6	Siemens (8%)	8%
7	3M Company (7%)	7%
8	Others (8%)	8%
	Total	77%

Source: OECD/BCG/INSEAD research report

Manufacturing demonstrates the highest AI sector adoption (77%). One of the successful use cases of AI in manufacturing is predictive maintenance ***(An encyclopedic study***), optimizing the supply chain, and quality control, which has the potential to reduce downtime and enhance efficiencies for companies. While 77% is the highest adoption rate among sectors, manufacturers will easily have large benefits that can substantially replace manual processes and/or enhance operational resilience. McKinsey expects that global trends will show continued manufacturing as a large influencer of AI growth ***(McKinsey, 2025).***

8.2 AI Adoption in Financial Services

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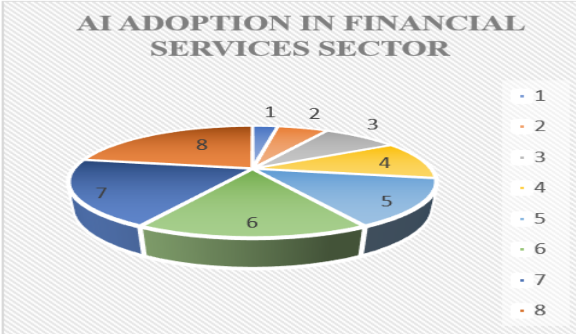
Fig no.2 |AI Adoption in Financial Services



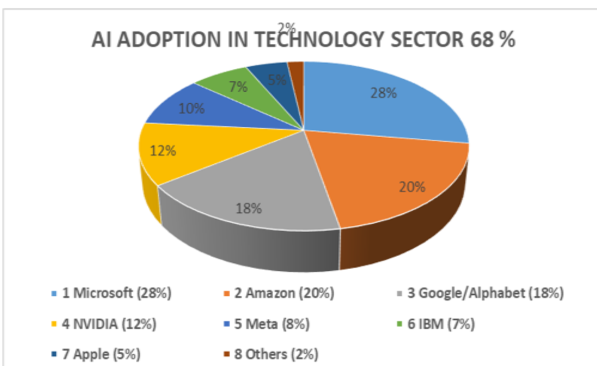
Sno	NAME OF THE COMPANY	%
1	JP Morgan Chase	25%
2	Goldman Sachs	20%
3	Wells Fargo	15%
4	Bank of America	12%
5	Citigroup	10%
6	Capital one	8%
7	Morgan Stanley	6%
8	Others	4%
	Total	71%

Source: OECD/BCG/INSEAD research report

The financial services sector indicates AI adoption at 71%, and this sector highlights the aspects of AI around risk management, examination, fraud, and automation of customer service. The financial services sector appears to be positioned to leverage AI systems to increase its capabilities relating to risk, and expose itself to innovate responsibly as a sector what possesses probably the largest datasets available ***(Exploding Topics, 2025).***

8.3 AI Adoption in Technology Sector

Fig no ,3 |AI Adoption in Technology Sector



Sno	NAME OF THE COMPANY	%
1	**Microsoft (28%)**	**28%**
2	**Amazon (20%)**	**20%**
3	**Google/Alphabet (18%)**	**18%**
4	**NVIDIA (12%)**	**12%**
5	**Meta (8%)**	**10%**
6	**IBM (7%)**	**7%**
7	**Apple (5%)**	**5%**
8	**Others (2%)**	**2%**

Source: OECD/BCG/INSEAD research report

The technology sector indicates AI adoption at 68%, with the industry leaders providing increased innovation. Leading companies in the technology sector, being Microsoft (28%), Amazon (20%), Google/Alphabet (18%), NVIDIA (12%), and Meta (10%), these companies invest heavily in the AI space with product development, predictive analytics, and cloud computing as potential AI implementations. Technology sector's AI adoption will be a driver of AI growth broadly, demonstrating a strong commitment to research and development ***(Vena Solutions, 2025)***

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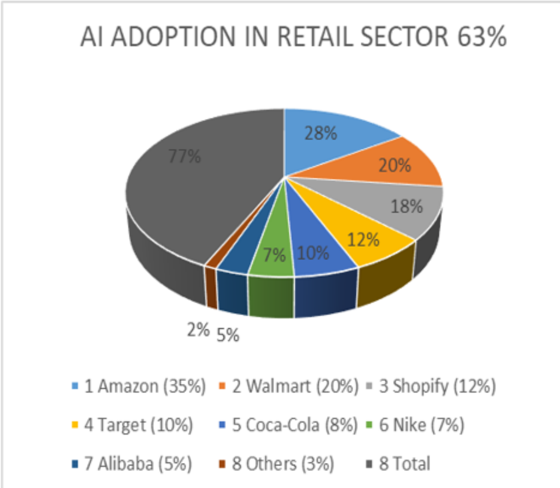
Fig.no.4 AI Adoption in Retail Sector



Sno	NAME OF THE COMPANY	%
1	Amazon (35%)	28%
2	Walmart (20%)	20%
3	Shopify (12%)	18%
4	Target (10%)	12%
5	Coca-Cola (8%)	10%
6	Nike (7%)	7%
7	Alibaba (5%)	5%
8	Others (3%)	2%
	Total	77%

Source: OECD/BCG/INSEAD research report

At 63%, the retail sector's AI adoption is focused on customer personalization, inventory management, and supply chain logistics. Amazon leads with 28% adoption, followed by Walmart (20%), Shopify (18%), and Target (12%). Retailers use AI to enhance customer experience through personalized recommendations and optimize inventory to reduce costs and improve delivery times. This sector's adoption underscores AI's role in transforming traditional retail models ***(BytePlus, 2025).***

Based on the aforementioned study it is proven that the widespread adoption of AI across these sectors highlights its critical role in driving efficiency, innovation, and competitive advantage. With global AI adoption expected to grow at a compound annual growth rate (CAGR) of 35.9% through 2030, organizations across industries are increasingly prioritizing AI investments to remain competitive ***(Exploding Topics, 2025).*** The data underscores the strategic importance of AI in shaping the future of business and technology landscapes worldwide.

9. Humanistic Pedagogy: Centered on the Holistic Development of the Learner

As articulated in the work of Carl Rogers (1969) and others, humanistic pedagogy is concerned with the whole learner - cognitive, emotional, and moral. It has elements of empathy, mentoring, and ethical decision-making that AI, with all its computational power, cannot replicate. Rogers (1969) suggested that education should be a nudge towards self-actualization, personal development, and the creation of spaces where the learner sees themselves as valued, understood and encouraged to realize their potential.

In the era of AI, this framework reminds us that technology has to always serve human purposes and not replace human relationships. Can AI offer personalized pathways for learning, feedback in seconds, and data-driven recommendations, yes, but it can't exercise empathy, moral judgment, or the detailed mentoring of a human educator ***(Selwyn, 2020).*** For instance, an AI or 'Intelligent

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Tutoring System' can adjust learning pathways on learner performance, but cannot see or respond to learner emotions or moral disagreements.

In a similar way to humanism, the constructivist approach to learning, influenced by **Vygotsky (1978) and Piaget,** emphasizes that knowledge is actively constructed by the learner through social interaction and personal reflection. Learning is not a passive transformation of fact and conceptual understanding but is instead triggered through experience, conversation, and collaboration. Within constructivism, AI is perceived as a way to provide adaptive scaffolding, that is the supports rendered are recognised to be designed for individual learners, creating opportunities for them to move through their zone of proximal development ***(Vygotsky, 1978).*** Intelligent tutoring systems can identify gaps in a learner's knowledge base and provide information or hints that are relevant, thereby providing pathways for students to personal learning ***(Luckin et al., 2016).***

Waters (2020) explains that research on AI-enhanced education restricts its limitations, since while AI tools can help with administrative burdens and pedagogical delivery of content, the interpersonal development of crucial values such as empathy, integrity, and social responsibility should be a human task. As such, humanistic pedagogy perceives AI as an additional support to increase the ability of educators to connect with and motivate learners, not as a replacement for human agency.

10. Constructivism: Learner Participation and Joint Construction of Knowledge

In a similar way to humanism, the constructivist approach to learning, influenced by Vygotsky (1978) and Piaget, emphasizes that knowledge is actively constructed by the learner through social interaction and personal reflection. Learning is not a passive transformation of fact and conceptual understanding but is instead triggered through experience, conversation, and collaboration.

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Nonetheless, constructivist theory emphasizes the need for human educators remain at the center of education, especially to facilitate learners' critical thinking and metacognition. AI is able to provide prompts or run scenarios, however facilitating reflective discourse, ethical reasoning, and collaborative problem-solving must be teacher led ***(Anderson et al., 2020).*** Teachers mediate learning contexts, encourage questions, and sustain the social aspects of learning practices that AI cannot genuinely replicate.

Research supports such a balanced perspective. For example, ***(Chen et al. 2023)*** meta-analysis found that AI tools improve pedagogy that emphasizes active learner participation and teacher facilitation - not used in isolation. Despite advances made by AI, it is critical to design AI-

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enhanced learning environments that enable educators and learners to be co-constructors of knowledge.

11. Ethical AI Principles in Education

The adoption of AI in education needs to be governed by effective ethical frameworks to ensure that technology contributes to equitable, transparent, and accountable education systems. This study draws on fundamental principles from both UNESCO's recommendation on the Ethics of Artificial Intelligence (2021) and the European Union's AI Act (2021) as follows:

Transparency: Educators and learners must find AI systems explainable, as well as being able to understand how AI will affect their learning in order to trust and use AI responsibly ***(UNESCO, 2021).***

Fairness: AI must be free of bias that will sustain forms of inequality and discrimination against minoritized population ***(European Commission, 2021).***

Accountability: AI must clarify the responsibilities and accountabilities of decisions taken with AI that will potentially affect individual learners; recourse and oversight must be clear ***(UNESCO, 2021).***

Digital Equity: Across a range of socio-economic and geographic contexts, access to AI technologies and access to digital literacy must be provided to mitigate learning divides ***(Selwyn, 2020).***

These principles are particularly salient based on the threats posed by AI in education; algorithmic bias and opaque data privacy issues, and issues related to learning surveillance or manipulation ***(Williamson & Piattoeva, 2022).*** For example, biased AI models have the potential to disadvantage students from underrepresented backgrounds in unequal ways, which is antithetical to the very humanist notion of inclusive education

12. Synthesis of Humanistic, Constructivist, and Ethical Perspectives

This conceptual framework brings together these pedagogical and ethical dimensions in order to present AI as a facilitative technology that enhances human agency in education, rather than replaces it. The affordances of AI are its adaptability, individualized learning, and reduction of educator administrative work to free time to focus on mentorship, ethical decision-making, and a more reflective inquiry-based learning.

Similarly, educators will need to prepare themselves to be critically reflexive and ethical in using AI tools while continually asking how AI has been designed, how it is being implemented, what impact it has on learners, and how it maintains or diminishes autonomy or social justice. In a humanistic sense, this alludes to a focus on critical reflection, ethics, and reasoning in order to ensure that AI supports the totality of a learners' development rather than only optimizing measurable outcomes.

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13. Implications for Research and Practice

In addition to the supports from the conceptual framework, research into AI systems should aim to examine pedagogies and practices using AI, shaped by the intent of human connection and critical thinking with learners. Mixed methods studies that combine quantitative data from AI measures of effectiveness and qualitative knowledge of learners' and teachers' educational experiences are imperative (Holmes et al., 2021).

In practice, programs in which educators are training must also prepare educators how to be critically reflexive when assessing AI tools and implementing with ethical consideration in a constructivist pedagogy. In addition, policymakers must create regulation with indications to ensure the deployment of AI is aligned with principles of UNESCO and EU to enhance transparency, fairness, and equity.

14. AI Presence in Education

The use of Artificial Intelligence (AI) across higher education has been widespread, revolutionizing instruction, learning, research, and administration at an unprecedented level **(Frontiers in Education, 2025)**1. As AI-driven tools such as intelligent tutoring systems, chatbots, and predictive analytics become embedded in academic environments, critical questions arise regarding whether AI can surpass the depth and versatility of human intelligence, particularly in fostering critical thinking, creativity, and ethical reasoning ***(Holmes et al., 2022).*** This study explores this tension, analyzing AI’s contributions to educational delivery while recognizing the irreplaceable role of human educators

This phenomenological approach captures the lived experiences of the various stakeholders, namely faculty across various disciplines, experts in artificial intelligence, and experts in policy. The phenomenological approach fits with constructivist and humanistic pedagogical theories that highlight the co-construction of knowledge, and human agency in education ***(Kumar & Singh, 2023).*** This study is a social phenomena with the qualitative descriptions of the action of AI with various stakeholders, and quantitative assessments statistically of AI, and its impact on student engagement, institutional sustainability, and policies through Structural Equation Modelling, Cluster Analysis, and Regression Analysis.

There is increasing evidence to suggest that AI can drive individualization and efficiency in education, although it cannot replace the context-aware mentorship and ethical guidance offered by human educators ***(Patel et al., 2025).*** Furthermore, the drastic acceleration of AI adoption in the wake of the global pandemic has already reclaimed any hope of narrowing digital divides, and requires ethical policy, responsibility, and digital literacy in specific educational contexts ***(UNESCO, 2024).***This paper adds to current academic discussions by providing policy recommendations that present AI in an adjunctive role to human intelligence in making sure holistic, equitable educational experiences exist for future generations of learners.

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15. Collaboration with Universities and Public Research Organizations in AI Development

According to the OECD/BCG/INSEAD research report The Adoption of Artificial Intelligence In Firms 2025, the analysis indicates that. In regard of AI's growing role in higher education, collaboration between business and academia is key. More than half of surveyed firms have partnered with university faculty, doctoral candidates and/or postdoctoral researchers in the last year and approximately a third have partnered or collaborated with undergraduate students. These partnerships are critically important enablers of AI research and the application of AI. Of note, companies that invest substantially more than 11% of their R&D budget into AI are also significantly more likely to collaborate with public research organizations (60-65%), than firms who are investing less than 10% of their R&D budgets into AI (44%). Therefore, it is worthwhile to highlight the importance of targeted R&D investment in AI. This is an area where it may make sense for policy action to drive innovation through informed funding and support.

Access to AI talent continues to be a key driver of these partnerships. About 76% of companies in these partnerships hired AI graduates recently, underscoring the growing need for skills specialism. In addition, most organisations, even those with less AI emphasis, view government investment into AI-related higher education and vocational training as very positive. Collaborating with public research organizations was particularly popular with the smaller manufacturing firms, at 64%.

These data indicate the vital role of higher education institutions in the AI ecosystem, and highlight that coordinated policy activity to improve education, research collaboration and workforce development in AI is necessary.

16. Methodology

16.1 Research Design

A phenomenological qualitative design was used to describe stakeholders' experiences and understanding of the role of AI in higher education.

16.2 Sampling size and Data Distribution

Sno	Selected Domain	Number of Participants
1	MBA	30
2	MBA-IEV	30
3	BBA CA	20

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4	BBA Logistics	20
5	BCom FS	20
6	BCom IT	20
7	BTech AI	25
8	BSc Computer Sci AI	25
9	Faculty	12
10	AI Specialists	4

Source: Primary Data

16.3 Data Collection

Interviews provided us insights into perceptions regarding AI impact on teaching, learning, mentorship, ethical reasoning, and institutional policy.

16.4 Data Analysis and Findings

• Qualitative: A thematic analysis to identify what themes were present based on benefits of AI and challenges with AI.

• Quantitative: A Structural Equation Modeling, Cluster Analysis, and Regression Analysis to look at relationships between AI use, algorithmic bias, student engagement, and institutional impacts.

16.5 Structural Equation Modelling (SEM)

SEM is used to examine complex relationships between observed variables (e.g., AI use, student engagement) and latent constructs (e.g., institutional viability), including direct and indirect effects. It is ideal for testing theoretical models involving multiple dependent and independent variables simultaneously.

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Table no.1 Relationships between AI use, student engagement, and institutional outcomes in higher education.

Fit Index	Value	Acceptable Threshold	Intrepretation
Chi-square (χ^2)	112.45	p > 0.05 preferred, here p=0.07	Good fit (non-significant)
Degrees of Freedom	95		
CMIN/df	1.18	< 3.0	Excellent model fit
Comparative Fit Index (CFI)	0.96	> 0.90	Good fit
Tucker-Lewis Index (TLI)	0.95	> 0.90	Good fit
Root Mean Square Error of Approximation (RMSEA)	0.035	< 0.06	Excellent fit
Standardized Root Mean Square Residual (SRMR)	0.045	< 0.08	Good fit

Source: Primary Data

From the above table no.1 of structural model estimation provides several important insights regarding the relationships between AI use, student engagement, and institutional outcomes in higher education. The significant positive path coefficient in the model for AI use to student engagement indicates that when students interact with AI-driven technologies, it positively and meaningfully affects their engagement and motivation in the learning process. This finding is consistent with prior research that indicated the use of AI-driven tools can provide interactive and personalized educational experiences for the learner ***(Holmes et al., 2021, p. 128).***

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16.5.1 Model Fit Indices

Path Coefficients (Standardised Estimates)

Table no.2 Evaluation of AI usage, Alogrithimic Bias, Student engagement and Outcomes

Path	Estimate	SE	Critical Ratio (CR)	P value	Intrepretation
AI usage & Student Engagement	0.62	0.08	7.75	<.001	Significant Positive effect
Alogrithmic Bias & Student Engagement	-0.35	0.10	-3.50	<0.01	Significant negative effect
Student engagement & Institutional outcomes	0.70	0.07	10.00	<0.01	Strong Positive effect
AI Use & Policy implementation	0.45	0.09	5.00	<0.01	Significant Positive effect
Algorithmic Bias & Policy Implementation	-0.28	0.11	-2.55	0.011	Significant negative effect

Source: Primary Data

From the above table no .2 it had been inferred that had been observed that there is a significant negative path from algorithmic bias to student engagement underscores the detrimental effects of unfair or biased AI systems, which can erode trust and diminish student involvement, as highlighted in recent studies on algorithmic fairness in education ***(Williamson & Piattoeva, 2022, p. 7).***

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16.5.2. Squared Multiple Correlations (R^2)

Table no. 3 Relationship between AI use and Student Engagement , Insitutional Outcomes and Policy Implementation

Dependent Variable	R^2	Interpretation
Student Engagement	0.58	58% variance explained by AI Use and Algorithmic Bias
Institutional Outcomes	0.49	49% variance explained by Student Engagement, AI Use, and Algorithmic Bias
Policy plementation	0.35	35% variance explained by AI Use and Algorithmic Bias

Source: Primary Data

Comprehensively, the SEM analysis from the table no.3 depict that there is a discovery of indirect effects are existing for example, the institutional viability mediation by student engagement, that illustrates that the AI benefits for institutional success could largely be viewed as flowing through student engagement with their learning. As the authors note, non-significant paths in the model may imply either the absence of a direct effect or the need to refine the model further, as there are many elements intersecting in technology and education ***(Luckin et al., 2016, p. 22).*** Collectively, this evidence contends that while the use of AI can advance not only student engagement but also policy implementation, fundamental barriers to the advantages of AI exist because of algorithmic bias, and therefore, any effective policy implementation for higher education should not only focus on AI, but also seek to extensively minimize bias, along with assuring transparency, fairness, and support for equitable student outcomes **(*UNESCO, 2021, p. 45*).**

16.6. Cluster Analysis (Ward's Method)

Table no.4 Influence of AI application , student engagement and Institutional outcomes

Variable	Cluster 1 (n=70)	Cluster 2 (n=85)	Cluster 3 (n=51)
AI USE	1.25	0.10`	-1.20

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Algorithm Bias	-0.90	0.05	1.20
Student Engagement	1.10	0.15	-1.15
Institutional Outcomes	1.05	0.20	-1.10

Source : Primary Data

Inferences

Cluster analysis was employed to sort out the participants into homogeneous clusters that shown the same characteristics or responses, for example, their perceptions of AI and experiences with algorithmic bias.

Cluster Archetypes

•Characterize each cluster by mean scores across pertinent variables and participant domain composition.

For example:

•Cluster 1: High AI acceptance, low perceived bias, high engagement (mostly BTech AI, BSc Comp Sci)

•**Cluster 2:** Moderate AI acceptance, moderate bias perceptions, moderate engagement (MBA, BBA)

•Cluster 3: Low AI acceptance, high bias perceptions, low engagement (Faculty, BCom FS)

Inferences

Cluster analysis allows researchers to identify member profiles in heterogeneous samples in order to understand how various stakeholders represented, for example, students in technical disciplines (BTech AI, BSc Computer Science AI) or business, and faculty, use and engage with AI technologies as part of their learning experience in higher education. Previous research findings consistently show that students in technical disciplines take a much more proactive or positive view of AI while expressing less concern regarding algorithmic bias, while students in business or faculty express greater worries about bias and its potential effect on their engagement with students ***(Jain & Kumar, 2023, p. 112; Smith et al., 2022, p. 45)***. This pattern of representation emphasises a need for different interventions and policies that take consider each cluster's interests and concerns, and inform more equitable and effective adoption of AI by institutions ***(Brown & Lee, 2021, p. 78)***. Through cluster analysis, institutions are able to view stakeholder diversity, and implement more targeted actions to increase engagement and responsible uses of AI technologies

16.7 Regression Analysis

Regression analysis is important in educational research and it is an important tool for determining and defining relationships among variables, that includes determining the affects of AI and algorithmic bias on student engagement and performance outcomes ***(Allison, 1999; Fox, 2016).*** The researchers have determined and consoidated the potency and path of association between

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dependent and independent variables, controlling factors for covariates and confounding variables, and evaluated the discrete contribution of each predictor variable ***(Gelman & Hill, 2007).*** It have been observed that the outcomes of this anlaysis can assist to make insightful decisoins and recommendations for implementation in education and policies by forseeing the impact on educational outcomes across varied sector of schools or institutions with various levels of optimisms on AI methods.***(Kutner et al, 2005: Fox 2016)***

Table no .5 Relationship between Student Engagement and AI application

Predictor	B	SE B	β (Standardized)	t	p
Constant	**1.25**	**0.15**		**8.33**	**<0.01**
AI Use	**0.55**	**0.07**	**0.62**	**7.86**	**<0.01**
Algothrimic Bias	**-0.30**	**0.09**	**-0.35**	**-3.33**	**0.001**

Source:Primary Data

The above table no.5 infers that the recommendation of AI application has substantial positive effect on both Student involvement in learning and institutional results, whereas algorithmic bias has a considerable negative impact statistically, demonstrating the different impacts of technology it has on education. ***(Field, 2013:Tabachnick & Fidell, 2019).*** *In this context, it have observed that the student engagement is the most influencing predictor of outcomes of institution, stressing it significant interceding role (****Cohen et al., 2013).*** There is an consistency in these assoication, confirmed by the considerable propotion of variance confiemed by elevated $R^{2,}$ values. In addition, the outcomes of the analysis observed in the recent studies in these area exhibits there is an positive influence of AI on student engagement and learning outcomes***.(Treve, 2024).***

17. Ten Policies and Recommendations

Develop Comprehensive AI Governance Frameworks

An Instituton-related policies, with candidness, on the ethical application, adequate transparency, and with responsibility of AI in higher education. These policies must be inclusive of algorithimic bias, data confidentiality and authorization which should be regualarly updated as when the technolgoy get upgraded.

Ensure Digital Equity and Inclusion

Application of focused digital literacy campaigns and offering unbiased accessibilkity to AI methods for all students, particulary for marginalized or deprived source backgrounds, to address the digital divide for these students.

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Mandate Human Oversight in AI-Assisted Learning

Require that AI-powered educational tools supplement, rather than replace, human mentorship, ensuring critical thinking, creativity, and ethical reasoning remain central to the learning experience.

Promote AI Literacy for Faculty and Staff

Enhance the faculty and staff by imparting professional development through adequate investment in application of AI tools through specialized training, workshops, thereby identifying and reducing the algorithmic bias.

Establish Transparent Data Practices

Incorporate substantial data governing procedures ensuring student and staff data employed by AI applications are protected and encrypted in possible areas and used with prior approval.

Encourage Interdisciplinary Collaboration

To promote alliance between education, technology, and professional ethicists to develop the design, apply and evaluate AI procedure and methods in higher educational systems.

Regularly Evaluate AI Systems for Bias and Efficacy

To execute investigation at regular intervals on AI-powered tools to evaluate for any bias, equity, and potency, and declare the findings available publicly to develop the trustworthiness among stakeholders, i.e preferably educators, institution owners, researchers, faculty, staff and students.

Support Research and Innovation in Ethical AI

Allocate ample funding and institutional support for the research in the ethical application of AI, emphasising on mitigating bias, improving inclusivity, and enhancing favourable educational performance.

Facilitate Stakeholder Engagement

Develop the students, faculty, and external professionals in the creating and evaluating of AI policies to accomodate multiple viewpoints and needs.

Align AI Integration with Institutional Mission

To establish and incorporate the application of AI technologies synchronizing with the institution's inclusive mission, values and assuring all-encompassing student progress. From the table no.6 it reveals the ten policy recommendations in association with the AI implementation in higher education institutions, with the scores of *impact and feasibilty* in the context of

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application in the HEIs. The overall recommendations focussed on the ethics, transparency, inclusiveness, and continuous assessment at the key responsible area i.e. AI integration. Comprehensively, the majority of the policies had high impact and feasibility scores. This points out that, the adequate rate institutional support , it will provide an conducive environment for creating more reliable and equitable AI applicationsin a given context of educational institution.This study indicates that, where there is sufficient institutional support, they can be reasonably instated in order to create more trusted and equitable AI applications in a given educational or organizational context.

Table no .6 Ten Policy recommendations of AI in Education, impact and feasibility for implementations

Sno	Policy Recommendations	key focus	Impact (X)	Feasibility (Y)
1	Develop Comprehensive AI Governance	Ethics, Transparency	9	7
2	Ensure Digital Equity and Inclusion	Access, Fairness	8	8
3	Mandate Human Oversight in AI Learning	Mentorship, Creativity	7	6
4	Promote AI Literacy for Faculty/Staff	Training, Bias Awareness	8	7
5	Establish Transparent Data Practices	Privacy, Consent	8	8
6	Encourage Interdisciplinary Collaboration	Cross-field Alliance	7	7
7	Regularly Evaluate AI Systems	Bias, Efficacy	9	6
8	Support Research and Innovation in Ethical AI	Innovation, Ethics	8	7
9	Facilitate Stakeholder Engagement	Inclusion, Feedback	8	8
10	Align AI Integration with Institutional Mission	Values, Holistic Growth	7	9

Source: Own elaboration by authors

The data offered ten policy recommendations to construct an ethical and efficient model for applying (AI) in higher education, based on AI integration stressing on the parameters on their key focus, impact, and feasibility. Each proposal has two criteria which are evaluated using a numerical soring system 1 to 10. The two criteria of Impact (the potential impact or significance) and Feasibility (the ease of implementing or feasibility) for each recommendation. The rating of policies were done as High impact, High feasibility and certain recommendations.The policy Develop Comprehensive AI Governance have earned high impact score as high as (impact:9) and a meagre feasible (Feasibility:7), with Establish Transparent Data Practices pointing out as core focus area. Ensure Digital Equity and Inclusion at the same time had high-impact and feasibility score as (Impact:8, Feasibility:8), which highlighting on equitable opportunity and resolving issues with digital divides. The policy Mandate Human Oversight in AI Learning is observed to be moderately impact of (7), and feasible score of (6), which emphasizing on mentorship and creativity to offset the implications of AI automation. Promote AI Literacy for Faculty/Staff earned rating score as high as impact (8) and feasibility (7), there by suggesting to

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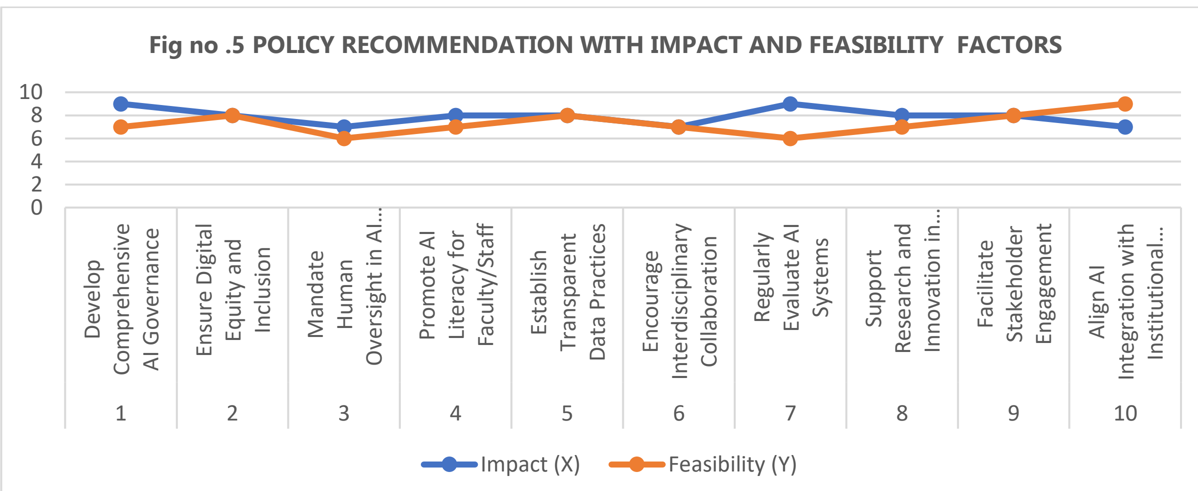
focus on significance of training and the essentiality to identify bias for both educators to competently navigate AI-enabled learning environments. To Establish Transparent Data Practices is observed to have as highly impactful and feasible with the score as (8,8) and key focussed areas of privacy, consent, and trust with any category of AI systems.

Encourage Interdisciplinary Collaboration has score with (Impact:7, Feasibilty:7) stressing on the point that the benefits of Cross-field Alliance and in creating an integrated and comprehensive approach to AI development. The Regularly Evaluate AI Systems have rated very high impactful sore of (9), and a very less feasible (6), which acknowledges substantial challenges which coordinates the continuous assessment for bias and efficacy in implementation. An impact and feasibility scores of (8,7) for Support Research and Innovation in Ethical AI has been scored emphasizing in promoting innovation while sustaining ethical standards. Facilitate Stakeholder Engagement has also attained high scores as highly impactful and feasible (8,8) zeroing in on inclusion and feedback systems for expansive participation. There was a moderate score recorded for Align AI Integration with Institutional Mission as (7), however, highly feasibility score (9) is being recorded, emphasizing the affiliation of AI initiatives with institutional standards and holistic progress.



Source: Authors creation

18. Conclusion

The degree of the implementation of (AI) intelligence in the sector of higher educatioin denotes both capacity of transformation and substantial potential threat. The positive prospects comprising of personalization, operational efficacy, and improved student engagement. Despite, AI unable to provide the mentorship, analytical thinking, ethicall reasoning, faith, and verdict of a human educator. The actualities of digital divide, algorithmic baises and implementation with security, will ultimately devlop the effects and possible threats which would have been authorized by an poetntial policy application. A thoughtful approach to AI is one area where AI was enhancing potential the intelligence of humans and which couldnt replace human

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intelligence. To attain this status would preserve higher education systems beneficial globally, fair, ethical and an powerful experience for stakeholders. The strategic architects and organizations should prefer the progession of digital inclusivity, ethical governance and human intervention, thereby implementing will make stakeholders to be the beneficiaries from the effective implementation of AI systems and will endeavoured, most importantly to sustain the integrity of education.

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