Journal of Intelligent Decision Making and Information Science

www.jidmis.org
eISSN: 3079-0875

Designing An Ai Governance Framework For Generative Ai In Higher Education: Integrating Large Language Models, Academic Integrity, Employability, And National Ai Policies

Choudhry Shahid[1] Nishwa Tasavvar[2], Dr Atif khan[3], Sajjad Ahmad[4], Prof. Dr. Mustafa Bayram[5], Omar Almomani[6], Sohail Ahmad[7],

[1]Professor, Head, Department of English, University of South Asia, Lahore. Email: shahid.mahmood@usa.edu.pk
[2]New Media and Communications, Ibn Haldun University, Istanbul, Türkiye. Email: nishwa.tasavvar@stu.ihu.edu.tr
[3]Assistant Professor, Faculty of Education, University of Barcelona, Barcelona, Spain. Email: atifkhan@ub.edu
[4]Department of Software Development, Biruni University, 34010, Istanbul, Turkey. Email: sajjad.ahmad@biruni.edu.tr
[5]Department of Software Development, Biruni University, 34010, Istanbul, Turkey. Email: mustafabayram@biruni.edu.tr
[6]Department of Networks and Cybersecurity , Hourani Center for Applied Scientific Research, Al-Ahliyya Amman University, Amman, Jordan. Email: o.almomani@ammanu.edu.jo, orcid.org/0000-0003-3160-6542
[7]School Education Department (SED), Govt. of the Punjab, Pakistan. Email: ahmad.sohail664@gmail.com,
Corresponding Author: ahmad.sohail664@gmail.com

ARTICLE INFO

Article history:
Received 12 June 2026
Received in revised form 12 July 2026
Accepted 20 July 2026

Keywords: Generative artificial intelligence (GenAI), large language models (LLMs), higher education, academic integrity, use of AI, institutional accountability, AI governance framework.

ABSTRACT

Generative artificial intelligence (GenAI), particularly large language models (LLMs), is transforming higher education, impacting the way teachers teach, students learn, are evaluated, research is carried out and graduates are prepared. As it gains traction, however, it has raised complex challenges in terms of academic integrity, responsible use of AI, privacy, institutional accountability, employability and national priorities. This study proposed an AI governance framework for the use of generative AI in Higher Education Institutions (HEIs) in Pakistan and validated it. A design of a mixed methods framework-development and expert-validation was used. The study included a systematic review of literature, a comparative analysis of national and international AI policy, content-validity assessment, and a two-round Delphi consultation with 30 experts from the field of higher education administration, AI policy, educational technology, academic integrity, and industry. Content Validity Ratio, Item-Level Content Validity Index, Scale-Level Content Validity Index, Delphi median and interquartile range, Kendall's coefficient of concordance, Friedman test and reliability analysis were used to validate the proposed governance dimensions. Qualitative interviews and Delphi responses were thematically analyzed to give insights into the quantitative results. The research results revealed five interconnected dimensions: Responsible integration of LLM, Academic integrity and assessment governance, AI literacy and graduate employability, Ethical governance and institutional governance, and Alignment with national AI policy. The study suggests a multi-layered governance system that places a strong focus on responsible innovation, human supervision, academic accountability, graduate readiness, institutional accountability, and ongoing policy adaptation in the Pakistani higher education system.

INTRODUCTION

Generative artificial intelligence (GenAI) is becoming a game-changer in today's higher education landscape (Xia et al. 2026). Advanced large language models have powered AI systems to create text, summarize content, translate languages, explain, help with coding, create educational resources, and help users with a wide variety of academic and professional tasks (Myers et al. 2024). Generative AI can be used to create content related to knowledge, unlike previous educational technologies which were used to access information or to communicate. This development has created numerous opportunities for the universities, and has raised new issues in teaching and learning, assessment, authorship, academic integrity, and graduate preparation. Higher education institutions are therefore challenged to design governance mechanisms to support the generation of innovations in higher education without compromising the quality of education and the accountability of the institution (Sandhu et al. 2024).

LLM-based systems have especially affected the student-Academic relationship. Generative AI can help students brainstorm ideas, create outlines, enhance language, get explanations, get feedback, and write entire answers to academic questions (Almufarreh 2026). Teachers can use AI to assist them with lesson planning, creating questions, providing formative feedback, developing curriculum, and providing instructional support. Researchers for literature exploration, coding, language editing, transcription, and organizational activities can use these technologies (Mousa 2025). The possibilities of GenAI improving efficiency, personalization, and accessibility in business applications are numerous, and these are just a few examples. Risks can also exist with the use of the technologies, such as using AI-generated information as a substitute for thinking and using inaccurate, biased or fabricated information generated by AI without fact checking. Therefore, the governance framework in which GenAI is deployed plays a crucial role in the educational impact it can have (Şahin and Karayel 2024).

Integrity is among the biggest challenges of generative AI (Meça and Shkëlzeni 2023). Academic integrity programs were mainly focused on plagiarism, unauthorized collaboration, fabrication and examination misconduct. The classifications are further complicated by the fact that the AI-generated content could be original in language but not in the sense of the student's original work (Fatima and Ahmad 2025). Students can write a very high-quality essay that is not a direct copy of a known source with an AI (Gore 2025). AI systems can give wrong information, bogus citations, or misinterpretations. In such situations, universities must re-think the definitions of authorship, transparency, responsibility and evidence of learning. Traditional plagiarism definitions, then, may not be adequate in an environment where AI is used in education (Gangavarapu 2025).

If generative AI can create much of the content that is needed, it can be challenging to know when the student has written his or her own work for traditional take-home assignments and essays. This has resulted in more emphasis on process-based assessment, oral examination, reflective activities, project based learning, supervised writing and activities that require students to express their thinking (Adewale et al. 2026). It is not necessarily an objective to get rid of AI in assessment but to make sure assessment measures what it says it measures. Governance should then link policies on the use of AI to changes in assessment, as policies will not be effective in safeguarding academic

integrity if assessment is not suitably adapted to the capabilities of generative AI (Uttich, Yee, and Giltner 2025).

In the meantime, the complete prohibition on GenAI could prove to be another educational challenge. As AI tools become increasingly ubiquitous in the workplace, universities are preparing students for success (Midford 2025). As AI-driven tools gain traction in the world, universities are preparing their students for success. Employers should expect that students would know how they interact with AI systems, evaluate information generated by AI, understand its limitations, protect confidential information and make ethical decisions. AI literacy might then be a crucial part of the employability of graduates (Tenhunen 2025). Employability should not be seen as just using AI tools. Students should also possess critical thinking skills, creativity, communication, collaboration, problem solving, and disciplinary expertise and independent decision-making skills. Thus, good governance of AI should support, not replace, human intellectual development, which is the role of higher education (Hallinan 2025).

Governance is even more complex in a developing HE system that has significant differences in technological resources and institutional capacities (Ni, Yang, and Razzaq 2022). The educational, technological, financial and organizational settings of Pakistani universities vary. Some institutions have a better digital infrastructure and a better access to technological expertise, while others have fewer resources and less staff development. There is also a range of disparity among students in their exposure to high-quality digital technologies and paid AI services. Therefore, the governance system of an international university is not a copy of the system in Pakistan. The current Pakistani system should recognize the different institutions, digital divide, language, faculty capacity, student needs and shifting priorities of the national AI agenda (Khan, Ahmed, and Sodhar 2024).

National AI policy is an important aspect of this governance framework. National strategies can be developed that establish broad objectives for AI research and technological innovation, digital transformation, AI skills building, economic development and responsible AI. The principles of national policy, however, do not always reflect good practice at the university level (Khan, Ahmed, and Sodhar 2024). There is need for mechanisms in institutions that can convert national priorities into policies concerning classroom use, assessment, academic integrity, data protection, staff development, procurement, student guidance and institutional accountability. The Higher Education Commission and universities thus have an important role in the implementation between the national strategic goals and daily education practice (Ikram, Kenayathulla, and Saleem 2025).

Comparative lessons can be learned from other countries' experiences in this new governance challenge. The U.S., U.K., China and Saudi Arabia have different strategies for adopting AI, using it responsibly, ensuring academic integrity, digital transformation and preparing the workforce. Some focus on institutional autonomy and experimentation, others are more indicative of centralized regulatory structures. The variations highlight the impact of national education systems, regulatory practices, technological capabilities, and policy agendas on AI governance (Dixon 2023). Pakistan can take lessons from the international experiences but adaptation is required instead of copying for effective policy development. Comparative analysis is therefore required to separate out principles

of governance, which have a wider application from governance practices that are more context-specific (Masud and Khan 2024).

The other critical dimension is ethical governance. Generative AI systems can cause privacy, data protection, IP rights, bias, transparency, accountability and access problems. Students or staff may inadvertently provide confidential research, personal information, exam papers or institutional documents to external AI providers. The universities are therefore in need of clarity regarding what information can be fed into AI systems and when (Al-Kfairy et al. 2024). Another challenge for ethical governance is the possibility of biased and misleading AI-generated content. This requires human intervention, particularly in situations where AI-powered systems affect student learning outcomes, guidance, admission, or other crucial institutional decisions (Uddagiri and Isunuri 2024).

There is a need for a comprehensive governance structure. Academic integrity cannot be the sole focus of a policy and a policy focused on innovation without regard for academic integrity will not benefit institutional credibility, and a policy focused on employability will not benefit academic integrity (Cao, Jiang, and Zhao 2023). Without institutional implementation mechanisms, a national AI strategy can be ineffective (Andleeb et al. 2025). The effective governance of technology, academic integrity, assessment, AI literacy, employability, ethics, privacy, accountability, and national policy alignment are all areas that must be linked to effective governance. These dimensions should not be regarded as institutional issues in isolation (Cheema et al. 2026).

The study introduces a multi-layered institutionally for AI governance. The framework foresees the embedding of responsible use of LLM, academic integrity and assessment governance, AI literacy and graduate employability, ethical and institutional accountability, and national AI policy alignment. The framework does not consider the use of generative AI in universities to be in opposition to regulation but to establish a framework that allows universities to gain from generative AI while preserving academic integrity and values. The study thus contributes to the existing body of literature on AI governance in higher education institutions by suggesting a governance framework that is relevant to the local context of Pakistan.

Research Objectives

1. To understand the opportunities, risks and governance requirements of LLM and Generative AI in HEIs of Pakistan.
2. To define how academic integrity, assessment governance, AI literacy and graduate employability can be integrated into the Responsible AI governance framework.
3. To design and test a contextually relevant AI governance framework that meets institutional needs and the priorities of the national AI policy of Pakistan.

Research Questions

1. What are the opportunities, risks and governance concerns associated with the adoption of LLM and generative AI in the higher education landscape in Pakistan?
2. Academic integrity, assessment governance, AI literacy and graduate employability all play a part in responsible generative AI governance.

3. What would be the best governance model for the integration of AI that would be suitable for institutional needs and Pakistan's priorities for AI policy?

Significance of the Study

The study is significant as it is addressing the new governance issues raised by generative AI in Higher Education in Pakistan. The framework covers LLM adoption, academic integrity, assessment, employability, ethical governance and national policy alignment, and provides a holistic basis for institutional decision-making. It can support universities in developing responsible AI policies, assist policy-makers in making national priorities more concrete in the education sector, and support faculty and students in developing their AI skills without compromising the quality, fairness and accountability of education.

LITERATURE REVIEW

Generative AI has generated a lot of interest in higher education because of its ability to create content that closely mimics human writing and interact with users through increasingly sophisticated large language models. These systems have been shown to provide significant educational benefits such as personalized learning, writing support, tutoring, formative feedback, language development, instructional design, research support, and administrative efficiency (Yigci et al. 2025). Generative AI can be an active participant in content creation, creating a new interaction between learners, teachers, knowledge, and technology, unlike traditional digital tools. This capability has led to a rethinking of technology's role in education and shifted the focus from technology adoption to governance, responsibility and institutional adaptation (Farrelly and Baker 2023).

Accessibility and flexibility are strongly tied to the educational potential of LLMs. Conversational AI systems can be used by students to ask for explanations, provide examples, structure thoughts, get feedback, and look for alternative viewpoints. Teachers to create teaching materials, design assessment questions, design activities and give initial feedback can use similar technologies (Lopez-Gazpio 2025). Tools and technologies for coding, language editing, information organization and other research supporting activities, powered by AI. These can be used for improvement of efficiency and for learning that is more individual. However, AI-provided outputs are not necessarily accurate. Systems can generate incorrect information, bogus citations, skewed explanations, and overconfident answers. Therefore, it is emphasized in the literature that it is important to keep a human assessment and a disciplinary knowledge in the use of AI (Mzwri and Turcsányi-Szabo 2026).

With the rise in the number of technologies being developed, the need for responsible AI governance has grown, and it has become an alternative to technology-specific regulation (Currie et al. 2025). Governance frameworks tend to be more about principles than specific tools, including human oversight, responsible innovation, privacy, security, fairness, transparency and accountability. The principles must be put into practice in higher education in terms of working procedures (Ghosh, Saini, and Barad 2025). Universities need to establish who should be accountable for decisions regarding AI, how students should indicate their use of AI, how to ensure the confidentiality of personal information, and how to oversee the use of AI in academic work. Governance is therefore an

institutional process, policy, and training, protection of ethics, assessment and ongoing monitoring (Ahmad et al. 2025).

Academic integrity is one of the most apparent concerns that can be seen in the literature. While generative AI can produce content that is not necessarily plagiarized, it can be a new creation, which presents a challenge to the traditional definition of plagiarism. The question here is not only one of originality but also one of intellectual authorship and responsibility (Liang et al. 2025). If students create large sections of academic work using AI without attribution, then a paper might not reflect the learning outcomes the assessment was designed to assess. This has led to the re-emergence of ideas like authorship, transparency, process, accountability and responsible disclosure (Boretti 2026).

The assessment practices have therefore become an important area of governance regarding AI. Classics like essays, take-home exams, and other written tests could be susceptible to AI-generated content (Chauhan and Currie 2024). There is an increasing number of process-based assessment, oral defense, supervised activities, project-based tasks, reflective writing and assessment designs that require students to explain their reasoning. These can support some of the meaning that AI has in the students' learning environments and can enable students to acknowledge its presence. The aim is not to get rid of AI, but to restructure assessment to ensure that the skills being measured are still in sight and traceable to the student (Shaw 2025)t.

AI-detection technology is proposed to combat academic dishonesty enabled by AI, there are uncertainties about its accuracy and fairness (Mansoor 2026). Human-written text can fool automated detectors and/or AI-generated text can be edited by the user and not be detected by the automated detector. Thus, the results of detectors should not be taken as conclusive evidence of academic dishonesty. A more robust governance approach integrates a variety of evidence, such as student explanations, drafts, learning histories, oral discussion, and instructor judgment. This perspective places the education process and academic accountability over technological surveillance (Cheng et al. 2025).

AI literacy is more than just being able to converse with a chatbot. Students should understand the limitations of generative systems, hallucinated information, how to assess sources, understand bias, safeguard sensitive information, and make ethical choices regarding the use of AI. Professional development is also needed for faculty on the topic of pedagogy and assessment with AI, academic integrity, and responsible data practices (Hadinejad, Sperling, and McGrath 2025). AI literacy needs to be embedded in curriculum and staff training, not seen as a technical skill to be learned (Kumar, Ahmad, and Lodhi 2024).

As AI-driven systems take over in the workplace, the connection between generative AI and employability has grown in significance. Graduates might be required to interact with AI, to comprehend information generated by AI, to carry out repetitive tasks with the help of AI, and to make decisions where human judgment is needed. The development implies that universities have a responsibility to prepare their students for the future of work, where AI is a major factor. However, employability is not limited to “skills.” The need for critical thinking, creativity, communication, adaptability, problem solving, ethical judgment and disciplinary expertise are still important (Tan

2025). To ensure that AI-assisted learning is encouraged while safeguarding human capabilities, effective governance should foster this balance (Dubey 2026).

The literature on employability also indicates that AI skills need to be tailored to the discipline and professional area. Business may have a unique approach to responsible use of AI compared to other fields like engineering, education, law, medicine, or the humanities. Universities thus require principles of governance at the institution level, but still allow each department to have its own standards. This can help ensure that the basic ethical standards are adhered to and differences in professional practice are acknowledged (Portocarrero Ramos et al. 2025).

Privacy and data governance are another key aspect. Users can enter confidential information to external AI systems without knowing how it will be used; information can also be entered into the AI system as personal data, unpublished research, exam questions, institutional documents, and more. Therefore, it is crucial that there are clear rules and regulations in place for the university regarding data entry, confidentiality, IP and external AI services (Ramisetty 2025). Ethical governance should also take into account bias, transparency, accessibility and accountability. AI systems can be especially sensitive when deployed in situations that affect students or staff, and need human oversight (Mehta 2026).

Equity is also a factor as generative AI is not available equally. Students can be using the high end paid systems, or the lower end free systems. Institutional needs can therefore create new inequalities in education, implicitly universal access. Universities need to be mindful of the fairness of access to AI-supported learning opportunities and institutional alternatives (Brunton et al. 2025). Language and cultural differences should also be taken into account as AI can perform differently across languages and contexts. For responsible governance, technological inclusion needs to be complemented by educational inclusion (Lodhi, Rusconi, and Ahmad 2026).

National strategies usually set out overall priorities for technological development and innovation, research, skills, digital transformation and economic development. However, at the national level, strategies need to be institutionalized for implementation (Wei et al. 2025). The universities need to convert strategic goals into policies related to teaching, assessment, research, procurement, data governance, staff development and student support. The literature thus supports the idea of closer connections between the national priorities of AI and the implementation of AI at the university level (Mpofu and Chasokela 2025).

Higher education institutions in the United States have been reacting in many different ways, particularly by experimenting, modifying assessment and the responsible use of AI (Amnie 2026). The UK has seen a greater emphasis on responsible adoption and institutional guidance. China has created a more centralized technological and regulatory landscape, and Saudi Arabia has been firmly linking AI development to national transformation and capacity building. The contexts highlight the relationship between governance models and national priorities and institutional structures. These are some ways in which Pakistan can learn from it, but it is crucial to realize that international models must be tailored for the local context (Zreik, Iqbal, and Yadav 2027).

The Pakistani HE system is unique in terms of institutional diversity, technological capability, preparedness of faculty, access of students and changing national policy (Ul Hassan, Murtaza, and Rashid 2025). A framework from another country will not be able to consider these contextual factors. Pakistan thus needs a governance model that is based on international principles and takes into account the educational reality in Pakistan. Such a model should take into account the role of universities as educational institutions, as well as their contribution to the technological development of a country (Zehra et al. 2026).

The literature offers a glimpse of the idea that good governance of GenAI should be multi-dimensional. Academic integrity is an integral part of responsible LLM integration; assessment reform should be linked to academic-integrity policy; assessment reform should be linked to employability; employability should be linked to AI literacy and human competencies; and all institutional practices should be linked to ethical responsibilities and national policy priorities. The interdependence is the conceptual framework for a multi-layered governance model where technological innovation, academic accountability, ethical protections, graduate preparation, and national strategic alignment are not policy silos, but complementary.

RESEARCH METHODOLOGY

Research Design

The researchers employed mixed methods, framework-development and expert-validation design to develop an AI governance framework for the use of generative AI in higher education institutions in Pakistan. In order to make the framework theoretically sound, contextually relevant and empirically tested, rather than descriptively reviewed, the researchers employed a systematic literature review, comparative policy analysis, and a structured expert validation process of content-validity assessment and multi-round Delphi consensus process.

Literature Review and Data Sources

In the initial stage, the researchers have conducted a systematic review of the peer-reviewed literature, institutional policy documents and national AI strategy papers from 2020 to 2026, focusing on four thematic pillars: (1) integration of LLM; (2) academic integrity; (3) graduate employability; and (4) national AI policy alignment. The sources were retrieved from Scopus, Web of Science and Google Scholar and Boolean operators of the relevant keywords were used to filter the sources according to the pre-defined inclusion and exclusion criteria. This phase informed the initial draft of governance dimensions and indicators, which were submitted for expert validation.

Comparative Policy Analysis

In the second phase, the researchers have performed a comparative study between the national AI policy of Pakistan and Higher Education Commission (HEC) guidelines and the AI policies of countries having solid AI governance frameworks such as the United States of America, the United Kingdom, China, and Saudi Arabia. The purpose of this comparison was to find out commonalities, gaps and best practices in the regulatory aspect in the higher education context in Pakistan.

Expert Panel and Framework Validation

During the third phase, the researchers convened a purposive group of 30 experts from the fields of higher education administration, AI policy, educational technology, academic integrity, and industry. The panel evaluated the relevance, necessity and feasibility of the governance indicators that were identified in the two previous phases through a structured ordinal rating instrument. The content validity was assessed at the indicator and framework levels. Content Validity Ratio (CVR) was calculated for each indicator and according to the table (from Lawshe) for panel size of 30, the indicators with CVR below the corresponding critical value (around 0.33) were identified for revision or deletion. Then, the Item-Level Content Validity Index (I-CVI) and Scale-Level Content Validity Index (S-CVI) were calculated and a score of 0.78 and 0.90 were determined as the minimum acceptable index. The 30-member panel then went through a two-round Delphi consensus building exercise on the indicators that were retained. Ordinal data were obtained in the Delphi process and the median was used to represent the central tendency and the interquartile range (IQR) was used to represent the dispersion; a priori, experts' consensus was determined as a median score ≥ 4.0 on a five-point scale, with an IQR of ≤ 1.0. Indicators, which did not meet these criteria in the first round, were revised in light of panel feedback and re-circulated in the second round of the process, with Round 1 and Round 2 ratings compared to assess the extent of convergence that was achieved by iterative consultation. The overall level of agreement between the 30 experts on the governance indicators was measured using Kendall's coefficient of concordance (W), while the Friedman test was used to determine whether there was a significant difference in the relative importance of the major governance dimensions among the experts. When appropriate, the internal consistency of indicators measuring the same underlying construct was computed by an appropriate reliability coefficient. Effect size and coefficient size were used in conjunction with statistical significance.

Qualitative Data Collection and Analysis

The researchers also held semi-structured interviews with a sub-set of panel members and gathered open-ended responses for the Delphi rounds in parallel with the quantitative validation procedure. Qualitative data analysis using the inductive thematic coding process was used to interpret the statistical results and give context to the expert judgments and to identify themes, which were not fully captured in the numerical ratings.

Framework Synthesis and Validation

The researchers then used a triangulation approach to synthesize the results of the literature review, comparative policy analysis, content-validity procedures, Delphi consensus statistics, and thematic analysis to create a multi-layered AI governance framework for the Pakistani higher education sector. This synthesized framework was then presented to the expert panel for final coherence, completeness and feasibility check prior to finalization.

Ethical Considerations

Prior to data collection, ethical approval was obtained and informed consent was gained from all 30 participants in the interview and expert-validation process. All responses from participants were anonymized before analysis, to ensure confidentiality.

RESULTS AND DATA ANALYSIS

The results were analyzed based on the design of the study, which is framework-development and expert-validation. The analysis was done in four complementary phases: content-validity analysis, Delphi-based consensus analysis, inferential examination of inter-expert agreement, and dimension-level priorities, and qualitative thematic analysis. The quantitative analysis was performed by analyzing the responses of 30 higher education administration, AI policy, educational technology, academic integrity, and industry experts. The initial framework included 25 governance indicators in five key areas: responsible integration of LLM, academic integrity and assessment governance, AI literacy and employability of graduates, ethical and institutional governance, and national AI policy alignment. Evidence for the relevance of the individual indicators, as well as the overall structural coherence of the proposed framework, was provided by content-validity indices, Delphi statistics and non-parametric inferential procedures.

Content Validity Ratio Analysis

The first step was to find out whether the expert panel considered the proposed governance indicators to be essential. Each indicator was determined as Content Validity Ratio (CVR). The results showed that the majority of the indicators obtained values higher than the set critical value, which means that there is a high level of consensus about the need for these indicators. Three indicators initially had relatively low CVR values and so were revised rather than added to the final framework.

Table 1. Content Validity Ratio of Initial Governance Indicators

Governance Dimension	Indicator	CVR	Decision
LLM Integration	Defined categories of permitted AI use	0.87	Retained
LLM Integration	Human verification of AI outputs	0.93	Retained
LLM Integration	Institutional guidance for prompting	0.73	Retained after revision
LLM Integration	Transparency in AI-assisted work	0.87	Retained
LLM Integration	Monitoring of high-risk AI applications	0.67	Revised
Academic Integrity	AI-use disclosure requirements	0.93	Retained
Academic Integrity	AI-sensitive assessment redesign	0.87	Retained
Academic Integrity	Student authorship responsibility	0.93	Retained
Academic Integrity	AI detection as sole misconduct evidence	0.27	Removed
Academic Integrity	Process-based assessment	0.80	Retained
Employability	Institutional AI-literacy competencies	0.87	Retained
Employability	Critical evaluation of AI outputs	0.93	Retained
Employability	AI-supported professional competencies	0.80	Retained
Employability	Human-AI collaboration skills	0.87	Retained
Employability	AI certification as graduation requirement	0.40	Revised
Ethical Governance	Data privacy and confidentiality	0.93	Retained

Ethical Governance	Transparency and accountability	0.93	Retained
Ethical Governance	Human oversight	0.93	Retained
Ethical Governance	Equity of AI access	0.80	Retained
Ethical Governance	Institutional AI governance committee	0.87	Retained
Policy Alignment	Alignment with national AI priorities	0.93	Retained
Policy Alignment	HEC-level policy integration	0.87	Retained
Policy Alignment	Institutional-national policy mapping	0.80	Retained
Policy Alignment	Periodic policy review	0.87	Retained
Policy Alignment	International policy benchmarking	0.67	Revised

The CVR analysis demonstrated that the majority of proposed indicators were regarded as necessary components of an institutional AI governance framework. The strongest agreement was observed for human verification, AI-use disclosure, student authorship responsibility, data privacy, transparency, human oversight, and national policy alignment. In contrast, the proposition that AI detection should constitute the sole evidence of academic misconduct received insufficient support and was removed. Similarly, mandatory AI certification and unrestricted reliance on international benchmarking were reconsidered. The results indicate that experts favored governance mechanisms emphasizing accountability, educational judgment, and contextual adaptation rather than technological surveillance or rigid standardization.

Content Validity Index

Following CVR-based screening, the relevance of the retained indicators was examined through Item-Level Content Validity Index (I-CVI) and Scale-Level Content Validity Index (S-CVI). The results indicated strong content validity across all five dimensions.

Table 2. Content Validity of the Proposed Framework

Governance Dimension	**Indicators Retained**	**Mean I-CVI**	**Minimum I-CVI**	**S-CVI/Average**
Responsible LLM Integration	5	0.93	0.87	0.93
Academic Integrity and Assessment	4	0.95	0.90	0.95
AI Literacy and Employability	5	0.91	0.87	0.91
Ethical and Institutional Governance	5	0.95	0.90	0.95
National AI Policy Alignment	5	0.92	0.87	0.92
Overall Framework	**24**	**0.93**	**0.87**	**0.93**

The content-validity results provided strong evidence that the retained indicators were relevant to the proposed governance construct. All five dimensions exceeded the predetermined S-CVI criterion of 0.90, while the lowest dimension-level I-CVI remained above the minimum acceptable level. Academic integrity and ethical governance achieved the strongest content-validity results, reflecting the experts' perception that these areas represented particularly central components of responsible

GenAI governance. The overall S-CVI of 0.93 indicated substantial agreement regarding the conceptual adequacy of the framework and supported progression to the Delphi consensus stage.

Delphi Round One

The 24 retained indicators were subsequently evaluated through the first Delphi round. Experts rated the importance of each indicator on a five-point ordinal scale. Median scores and IQRs were examined simultaneously. The results demonstrated generally strong agreement, although several indicators exhibited comparatively greater dispersion.

Table 3. Delphi Round One Results by Governance Dimension

Governance Dimension	Median	IQR	Indicators Meeting Consensus	Consensus Rate
Responsible LLM Integration	4.50	0.50	5/5	100%
Academic Integrity and Assessment	4.75	0.50	4/4	100%
AI Literacy and Employability	4.25	1.00	5/5	100%
Ethical and Institutional Governance	4.50	0.50	5/5	100%
National AI Policy Alignment	4.25	1.00	5/5	100%
Overall	**4.50**	**0.50**	**24/24**	**100%**

The first Delphi round demonstrated a high degree of consensus across the framework. All 24 retained indicators achieved the predefined consensus criterion of a median score of at least 4.0 and an IQR not exceeding 1.0. Academic integrity and assessment governance achieved the highest median rating, followed by ethical governance and responsible LLM integration. Although all dimensions met the formal consensus threshold, the relatively wider IQR associated with employability and national policy alignment indicated greater variation in expert perspectives, providing a rationale for further clarification during the second Delphi round.

Delphi Round Two and Consensus Convergence

The second Delphi round incorporated revised wording and summarized group feedback. Experts reassessed the same indicators after considering the Round One results.

Table 4. Convergence Between Delphi Rounds

Governance Dimension	Round 1 Median	Round 2 Median	Round 1 IQR	Round 2 IQR	Change in IQR
Responsible LLM Integration	4.50	4.75	0.50	0.50	0.00
Academic Integrity	4.75	4.88	0.50	0.25	-0.25
AI Literacy and Employability	4.25	4.50	1.00	0.50	-0.50
Ethical Governance	4.50	4.75	0.50	0.50	0.00

National Policy Alignment	4.25	4.50	1.00	0.50	-0.50
Overall	**4.50**	**4.68**	**0.50**	**0.50**	**-0.25**

The second Delphi round demonstrated further convergence among the experts. The overall median increased from 4.50 to 4.68, while the overall dispersion declined. The largest convergence occurred in AI literacy and employability and national policy alignment, where the IQR decreased from 1.00 to 0.50. This pattern suggests that structured feedback and clarification of indicator definitions reduced uncertainty among panel members. Academic integrity also demonstrated increased consensus, with its IQR declining from 0.50 to 0.25. The results supported the retention of all 24 indicators in the final framework.

Kendall's Coefficient of Concordance

Kendall's coefficient of concordance (W) was calculated to assess the extent of agreement among the 30 experts across the governance indicators.

Table 5. Kendall's Coefficient of Concordance

Delphi Round	Kendall's W	χ^2	df	p-value	Interpretation
Round 1	0.68	469.20	23	< .001	Substantial agreement
Round 2	0.81	559.71	23	< .001	Strong agreement

The Kendall's W results demonstrated statistically significant and substantively strong agreement among the expert panel. Concordance increased from W = 0.68 in Round One to W = 0.81 in Round Two, indicating that the iterative Delphi procedure substantially improved agreement. The statistically significant chi-square values confirmed that the observed level of concordance was unlikely to have resulted from random variation. More importantly, the increase in W demonstrated convergence rather than merely statistical significance, supporting the methodological effectiveness of the second Delphi round in stabilizing the framework.

Relative Importance of Governance Dimensions

A Friedman test was conducted to determine whether experts assigned significantly different levels of importance to the five major governance dimensions.

Table 6. Friedman Test of Governance-Dimension Priorities

Governance Dimension	Mean Rank	Median	IQR	Rank
Academic Integrity and Assessment	4.31	4.83	0.50	1
Ethical and Institutional Governance	3.92	4.75	0.50	2
Responsible LLM Integration	3.37	4.67	0.50	3
National AI Policy Alignment	2.89	4.50	0.50	4
AI Literacy and Employability	2.51	4.42	0.75	5

Statistic	**Value**
Friedman χ^2	42.76
df	4
p-value	< .001
Kendall's W effect size	0.36

The Friedman test identified statistically significant differences in the relative priority assigned to the five governance dimensions. Academic integrity and assessment received the highest mean rank, followed by ethical and institutional governance, whereas AI literacy and employability received the lowest rank. Nevertheless, the median scores remained high across all dimensions, indicating that lower ranking did not imply low importance. The effect size indicated a moderate degree of association among rankings. The results suggest that experts considered protection of academic standards the most immediate governance priority while recognizing employability as an important complementary dimension.

Reliability Analysis

Internal consistency was assessed separately for each dimension because the framework contained conceptually distinct governance constructs.

Table 7. Internal Consistency of Framework Dimensions

Dimension	**Number of Indicators**	**Cronbach's Alpha**
Responsible LLM Integration	5	0.88
Academic Integrity and Assessment	4	0.91
AI Literacy and Employability	5	0.86
Ethical and Institutional Governance	5	0.92
National AI Policy Alignment	5	0.89
Overall Framework	**24**	**0.94**

The reliability analysis demonstrated high internal consistency across the framework dimensions. Coefficients ranged from 0.86 to 0.92, while the overall coefficient reached 0.94. These values indicate that the indicators within each dimension were sufficiently consistent for framework validation. At the same time, the separate dimension-level coefficients demonstrate that the framework was not treated as a single undifferentiated construct. The results support the conceptualization of GenAI governance as a multidimensional structure involving related but distinguishable institutional responsibilities.

QUALITATIVE THEMATIC ANALYSIS

Semi-structured interviews and open-ended Delphi comments were qualitatively analyzed, resulting in six major themes. These themes were utilized to help explain and put into perspective the quantitative results, and helped shape the final governance framework.

Theme 1: From Prohibition to Responsible Integration

Experts always divided responsible usage of AI and the over-reliance on AI. While some participants argued for a blanket prohibition on generative AI in all educational activities, others considered differentiated guidelines based on purpose and context. Brainstorming, formative feedback and language assistance and idea development were generally seen as legitimate, whereas submission of work generated by AI without indication was seen as problematic. This theme resonated with the quantitative finding that explicit institutional categories are needed for the process of responsible integration of LLM.

Theme 2: Reconstructing Academic Integrity

Academic integrity has been called out as a key factor for the potential of generative AI to go beyond traditional plagiarism detection. Authorship, disclosure, intellectual responsibility and evidence of learning were stressed. The use of process oriented assessment, oral defense, reflective statements and drafts were identified as more educationally meaningful than relying on the AI-detection software. This theme directly addressed the issue of the elimination of AI detection as the only evidence of academic dishonesty and strengthened the academic-integrity part of the framework.

Theme 3: AI Literacy as Graduate Competence

The definition of AI literacy was understood as a general graduate competence, rather than learning how to use a specific AI tool. The participants emphasized the need for rapid formulation, output verification, identifying biases, source verification, privacy, ethical issues, and collaboration between humans and AI. The theme demonstrated that the governance of employability should not only make AI more readily available for use by graduates, but also facilitate their critical evaluation and responsible use of AI.

Theme 4: Human Oversight, Privacy, Accountability

Experts determined that one of the primary ways to protect against inappropriate automation is through human oversight. Particular attention was given to confidentiality of information, confidential institutional information, student information, research materials, transparency and accountability. The importance of having clear responsibility for decisions regarding AI use in universities and reporting and reviewing problematic use was highlighted. This theme had high scores for content validity in ethical and institutional governance.

Theme 5: Connecting AI Governance and Employability

It was noted that graduates are increasingly required to work in environments impacted by Artificial Intelligence. However, being employable was defined as being able to use AI and have communication, creativity, critical thinking, disciplinary knowledge, ethical reasoning, and problem solving skills. As a result, the participants who were not in favor of the methods that would replace human competence with AI. This theme underscored the emphasis of the graduate capabilities in the framework on being supported by rather than replaced by AI.

Theme 6: Bridging National Policy and Institutional Practice

The last theme was about the link between national ambitions for AI and the implementation at university level. National strategies provide direction, but are insufficient for classroom use, assessment, procurement, privacy or student use of AI, experts said. Institutional governance mechanisms are thus needed to implement national principles into the operation of universities. This theme directly influenced the policy-alignment dimension and was a motivation for the focus in the framework on continuous institutional review and policy mapping.

Integrated Framework Validation

The quantitative and qualitative results were then combined to create the final AI governance framework. The CVR analysis revealed that the majority of the proposed indicators were crucial and the CVI analysis revealed that the relevance and content of the indicators were high. The level of consensus in the two rounds of the Delphi results was high with Kendall's W value ranging from 0.68 to 0.81. The Friedman test also revealed that academic integrity and ethical governance were considered as important aspects. Qualitative results added to these statistical patterns included institutional accountability, the need for assessment reform, human oversight, and responsible AI literacy.

Table 8. Final AI Governance Framework

Layer	Governance Dimension	Core Governance Mechanisms	Primary Objective
1	Responsible LLM Integration	Permitted-use categories, human verification, transparency, risk classification	Responsible adoption
2	Academic Integrity	AI disclosure, authorship, assessment redesign, process-based evaluation	Protection of academic standards
3	AI Literacy and Employability	AI literacy, critical evaluation, human-AI collaboration, professional competence	Graduate readiness
4	Ethical and Institutional Governance	Privacy, accountability, transparency, equity, human oversight, governance committee	Institutional responsibility
5	National Policy Alignment	HEC integration, national policy mapping, benchmarking, policy review	Strategic coherence
6	Continuous Monitoring	Periodic evaluation, stakeholder feedback, policy revision	Adaptive governance

It is obvious from the final framework that good governance of GenAI is not a one-off policy on academic integrity or technology use. Instead, governance should consist of a system of institutional structures that cross-technological, pedagogical, ethical, professional and policy boundaries. Academic integrity is the primary concern of the experts, involving assessment reform, AI literacy,

transparency, and institutional accountability. Similarly, a national policy of any sort must be translated into operational procedures at the university level.

The overall results are convergent with the validity and coherence of the proposed framework. High content-validity indices indicate that the indicators were appropriate for the governance construct to be studied, and the results of the Delphi process indicate that there was agreement among the experts. The same is true for the consensus, which was also found to be growing with the rounds of iterative feedback (increasing Kendall's W). The qualitative findings offer further understanding of the reasons why experts considered human oversight, academic integrity, responsible AI literacy, privacy, and policy coordination to be important. Thus, the framework provides a multi-dimensional governance model, which can provide technological innovation and academic excellence, employability of graduates, ethical responsibility and national strategic priorities in Higher Education in Pakistan.

DISCUSSION

The findings suggest that there is a need for a holistic institutional governance framework for the use of generative AI in higher education institutions in Pakistan, not just for academic integrity, but also for the overall governance of the AI. The Delphi consensus and the very high content-validity results indicate that experts believed that the five governance needs for integrating LLMs were interrelated. Academic integrity was the most significant dimension, which was linked to issues of authorship, assessment validity and independent learning. However, the qualitative results showed that limiting the use of AI would not be enough to solve the new education environment. Other important aspects of responsible AI adoption were emphasized, including AI literacy, human oversight, privacy, transparency, and preparing graduates for the future. The Delphi levels of agreement also rose over rounds, due to iterative expert consultation, which helped to increase the level of agreement among the experts on the concepts. The outcomes, therefore, support the need to shift from prohibitionist to differentiated categories of AI-use, and to reform assessment practices, institutional accountability and regular policy review to ensure adaptive governance. Importantly, the national policy alignment is not only a symbolic reference to the national policy but is also a mechanism of implementation in the framework. This renders the proposed model quite relevant in the context of Pakistan where there is a significant difference between institutions and technological preparedness of the universities.

CONCLUSION

The study developed and piloted an AI governance framework that integrates multiple dimensions to address the role of generative AI in higher education in Pakistan. To develop a framework that goes beyond the binary arguments about the use of generative AI in universities, the study followed a comprehensive methodological approach, such as systematic literature analysis, comparative policy analysis, content analysis, Delphi consensus, and qualitative thematic analysis. The findings align with the five dimensions of governance identified: responsible LLM integration, academic integrity and assessment governance, AI literacy and employability of graduates, ethical and institutional governance, and national AI policy alignment. The framework recognizes the importance of

innovation as well as regulation for the sustainable adoption of AI. To equip students and academics with meaningful AI skills, while maintaining transparency, accountability, and intellectual integrity in academic practices, universities must offer opportunities to build these skills. With AI technologies and their educational applications rapidly advancing, issues of privacy, equity, human oversight, and continuous monitoring should also be part of the governance of institutions. The framework lays the groundwork for Pakistan to implement the vision of AI in universities by creating policies and processes. It has a key connection between technology adoption and educational quality, ethical responsibility, graduate readiness and national priorities. Moving forward, there is a need to engage stakeholders in an ongoing consultation process and to empirically evaluate at different Higher Education Institutions in Pakistan.

RECOMMENDATIONS

The Pakistani universities should establish dedicated AI governance committees, establish policies for the use of AI, revise the vulnerable assessment and include AI literacy in the curriculum. Continuous training of faculty and students in the responsible use, verification, privacy and academic integrity of AI is needed. Institutions should have well-defined disclosure and accountability processes, and promote equitable access to learning with AI. Policymakers must provide flexible national leadership and universities must regularly re-examine governance structures to respond to changes in the workplace, in education and in ethics, and technological changes.

REFERENCES

[1] Adewale, Ojo Amos, Jayesh Rane, Martina Oluchi Ogbonna, and Nitin Liladhar Rane. 2026. "Pedagogy with generative artificial intelligence: Opportunities and challenges in education." *International Journal of Applied Resilience and Sustainability* 2 (2):339–366.

[2] Ahmad, Sajjad, Saira Khurram, Aseel Smerat, Nazish Andleeb, Syeda Aysha, Ausima Sultan, and Sohail Ahmad. 2025. "An investigation into the relationship between emotional intelligence and academic success among university students." *Pegem Journal of Education and Instruction* 15 (1):555–571.

[3] Al-Kfairy, Mousa, Dheya Mustafa, Nir Kshetri, Mazen Insiew, and Omar Alfandi. 2024. "Ethical challenges and solutions of generative AI: An interdisciplinary perspective." Informatics.

[4] Almufarreh, Ahmad. 2026. "Understanding How Large Language Models Influence Student Motivation and Academic Performance: A Behavioral Framework for Sustainable Education." *Sustainability* 18 (11):5759.

[5] Amnie, Asrat Genet. 2026. "AI-resistant and AI-resilient assessment in higher education: a systematic review of validity-grounded strategies, institutional frameworks, and equity implications." *Assessment & Evaluation in Higher Education*:1–23.

[6] Andleeb, Dr Nazish, Dr Naeem Fatima, Amir Ali, DR TARIQ KHAN, Ms Maria Tanvir, Dr Sameena Iqbal, Waqas Mahmood, Dr Muhammad Shahzad Ashfaq, and Sohail Ahmad. 2025. "The effects of AI-powered language translation on human communication: A psycholinguistic analysis." *TPM–Testing, Psychometrics, Methodology in Applied Psychology* 32 (S4 (2025): Posted 17 July):1671–1682.

[7] Boretti, Alberto. 2026. "Hallucinations in generative AI: A threat to scholarly integrity and the urgent need for publisher-led academically supervised verification." *Energy Research & Social Science* 136:104720.

[8] Brunton, Ryan J, Soukaina Rhazzafe, Raymond Moodley, Stefan Kuhn, Fabio Caraffini, Sara Wilford, Rachel Higginbottom, Simon Colreavy-Donnelly, and Mario Gongora. 2025. "Using generative artificial intelligence to enhance the performance of disadvantaged students in secondary education." *Social Sciences & Humanities Open* 12:102110.

[9] Cao, Yuan, Yuwei Jiang, and Yong Zhao. 2023. "A study on the content of integrity policies and research integrity management in Chinese universities." *Frontiers in Research Metrics and Analytics* 8:943228.

[10] Chauhan, Chhavi, and George Currie. 2024. "The impact of generative artificial intelligence on research integrity in scholarly publishing." *The American journal of pathology* 194 (12):2234–2238.

[11] Cheema, Ejaz Ullah, Sarah Rehman, Rabia Altaf, and Zaheer Ahmad. 2026. "Promoting the Culture of Academic and Research Integrity in a Higher Education Environment in Pakistan: A Qualitative Study: Promoting the Culture of Academic and Research Integrity in a Higher Education Environment in Pakistan: a Qualitative Study." *Journal of Academic Ethics* 24 (1):11.

[12] Cheng, Adam, Yiqun Lin, Gabriel Reedy, Christine Joseph, Samantha Wirkowski, Viviane Mallette, Vikhashni Nagesh, David Krieser, and Aaron Calhoun. 2025. "Ability of AI detection tools and humans to accurately identify different forms of AI-generated written content." *Advances in Simulation* 10 (1):66.

[13] Currie, Wendy L, Jan Marco Leimeister, Daniel Schlagwein, and Leslie Willcocks. 2025. Rethinking technology regulation in the age of AI risks. SAGE Publications Sage UK: London, England.

[14] Dixon, Ren Bin Lee. 2023. "A principled governance for emerging AI regimes: lessons from China, the European Union, and the United States." *AI and Ethics* 3 (3):793–810.

[15] Dubey, Varnita. 2026. "Generative AI in the Workplace: A Systematic Review of Productivity Effects, Employment Perceptions, and Job Insecurity." *the Workplace: A Systematic Review of Productivity Effects, Employment Perceptions, and Job Insecurity (March 17, 2026)*.

[16] Farrelly, Tom, and Nick Baker. 2023. "Generative artificial intelligence: Implications and considerations for higher education practice." *Education Sciences* 13 (11):1109.

[17] Fatima, Naeem, and Sohail Ahmad. 2025. "Formulaic language in high-stake research writing: Investigating the semantic implications of collocations and fixed expressions in postgraduate dissertation." *Research Journal in Translation, Literature, Linguistics, and Education* 1 (4):36–47.

[18] Gangavarapu, Rajendra. 2025. "How to evaluate GenAI models: unlocking their potential for unique tasks." In *Mastering AI Governance: A Guide to Building Trustworthy and Transparent AI Systems*, 21–27. Springer.

[19] Ghosh, Arjun, Ankit Saini, and Himanshu Barad. 2025. "Artificial intelligence in governance: recent trends, risks, challenges, innovative frameworks and future directions." *AI & SOCIETY* 40 (7):5685–5707.

[20] Gore, Ashish. 2025. "GenAI in Practice: Applications and Challenges."

[21] Hadinejad, Neda, Katarina Sperling, and Cormac McGrath. 2025. "Generative AI chatbots in higher education: Student experiences and perceived ethical challenges." *Computers and Education Open*:100311.

[22] Hallinan, Kevin P. 2025. *University Revolution: Artificial Intelligence and the Transformation of Learning*.

[23] Ikram, Maryam, Husaina Banu Kenayathulla, and Syed Muhammad Umer Saleem. 2025. "Unlocking the potential of technology usage in fostering education quality and students' satisfaction: a case of Pakistani higher education." *Kybernetes* 54 (3):1938–1965.

[24] Khan, Khan Khalil Akhtar, Mumtaz Uddin Ahmed, and Shahzad Mumtaz Sodhar. 2024. "Organizational commitment and higher education institutions functions: An aspect of modern business education in Pakistan." *Bulletin of Business and Economics (BBE)* 13 (3):190–196.

[25] Kumar, Dileep, Sohail Ahmad, and Kashif Lodhi. 2024. "Exploring the Role of Digital Technology in Enhancing Learning Experiences in Pakistani Classrooms." *International Journal of Language and Literary Studies* 8 (2):380–393.

[26] Liang, Yongzhi, Jun Zhang, Jiayu Chen, Jiayu Wu, Hui Shen, and Wenrui Liang. 2025. "Generative large language models and academic integrity: ethical risks, detection challenges, and Governance in the age of AI." *Ethics & Behavior*:1–19.

[27] Lodhi, Kashif, Gianfranco Rusconi, and Sohail Ahmad. 2026. "The Significance of Emotional Intelligence in Student Success and Its Integration into Educational Curricula." *Journal of Religion and Society* 5 (01):187–193.

[28] Lopez-Gazpio, Inigo. 2025. "Integrating large language models into accessible and inclusive education: access democratization and individualized learning enhancement supported by generative artificial intelligence." *Information* 16 (6):473.

[29] Mansoor, Sheikh Inam Ul. 2026. "Generative AI and the Doctrine of Academic Integrity: A Legal Perspective of Plagiarism, Originality and Liability." In *Generative AI in Higher Education Assessment: Theory, Practice, and Ethical Implications*, 23–42. Springer.

[30] Masud, Shafaq, and Ahmad Khan. 2024. "Policy implementation barriers in climate change adaptation: The case of Pakistan." *Environmental Policy and Governance* 34 (1):42–52.

[31] Meça, Alba, and Nirvana Shkëlzeni. 2023. "Academic integrity in the face of generative language models." International Conference for Emerging Technologies in Computing.

[32] Mehta, Arjun. 2026. "Privacy-Preserving AI Systems: Strategies for Responsible and Ethical Data Governance." *Journal of Data and Digital Innovation (JDDI)* 3 (2):1–11.

[33] Midford, Sarah. 2025. "Is the essay history? Rethinking effective assessment in the age of generative AI." *History Australia* 22 (4):563–567.

[34] Mousa, Mojahed. 2025. "AI-supported formative assessments: Enhancing student-centered learning and teacher perceptions." *Journal of Pedagogy and Education Science* 4 (02):127–141.

[35] Mpofu, Sibongile, and Doris Chasokela. 2025. "Data-informed decision-making: using analytics to drive strategic management in higher education." In *Building Organizational Capacity and Strategic Management in Academia*, 103–138. IGI Global Scientific Publishing.

[36] Myers, Devon, Rami Mohawesh, Venkata Ishwarya Chellaboina, Anantha Lakshmi Sathvik, Praveen Venkatesh, Yi-Hui Ho, Hanna Henshaw, Muna Alhawawreh, David Berdik, and Yaser Jararweh. 2024. "Foundation and large language models: fundamentals, challenges, opportunities, and social impacts." *Cluster Computing* 27 (1):1–26.

[37] Mzwri, Kovan, and Márta Turcsányi-Szabo. 2026. "Bridging LMS and generative AI: dynamic course content integration (DCCI) for enhancing student satisfaction and engagement via the ask ME assistant." *Journal of Computers in Education* 13 (2):585–622.

[38] Ni, Zehua, Jingyi Yang, and Asif Razzaq. 2022. "How do natural resources, digitalization, and institutional governance contribute to ecological sustainability through load capacity factors in highly resource-consuming economies?" *Resources Policy* 79:103068.

[39] Portocarrero Ramos, Heily Consepción, Omer Cruz Caro, Einstein Sánchez Bardales, Lenin Quiñones Huatangari, Jonathan Alberto Campos Trigoso, Jorge Luis Maicelo Guevara, and River Chávez Santos. 2025. "Artificial intelligence skills and their impact on the employability of university graduates." *Frontiers in Artificial Intelligence* 8:1629320.

[40] Ramisetty, Sreenivasulu. 2025. "Data Governance for AI-Powered Pega Applications: Compliance, Privacy & Reliability." *International Journal of Advanced Research in Computer Science & Technology (IJARCST)* 8 (1):11574–11580.

[41] Şahin, Osman, and Durmuş Karayel. 2024. "Generative artificial intelligence (GenAI) in business: A systematic review on the threshold of transformation." *Journal of Smart Systems Research* 5 (2):156–175.

[42] Sandhu, Ramandeep, Harpreet Kaur Channi, Deepika Ghai, Gagandeep Singh Cheema, and Mandeep Kaur. 2024. "An introduction to generative AI tools for education 2030." *Integrating generative AI in education to achieve sustainable development goals*:1–28.

[43] Shaw, David. 2025. "The digital erosion of intellectual integrity: Why misuse of generative AI is worse than plagiarism." *AI & society* 40 (8):5819–5821.

[44] Tan, Samson. 2025. "The rise of generative AI: Implications for work and learning." In *Handbook of artificial intelligence in higher education*, 442–459. Edward Elgar Publishing.

[45] Tenhunen, Marja-Liisa. 2025. "THE AI-DRIVEN UNIVERSITY: HIGHER EDUCATION IN 2030." *Euromentor Journal* 16 (3):22–37.

[46] Uddagiri, Chandrasekhar, and Bala Venkateswarlu Isunuri. 2024. "Ethical and privacy challenges of generative AI." In *Generative AI: Current trends and applications*, 219–244. Springer.

[47] Ul Hassan, Mehboob, Ammara Murtaza, and Khalid Rashid. 2025. "Redefining higher education institutions (HEIs) in the era of globalisation and global crises: A proposal for future sustainability." *European Journal of Education* 60 (1):e12822.

[48] Uttich, Laurie, Kevin Yee, and Elizabeth Giltner. 2025. "The essay is dead (and other thoughts about assessing in the era of AI)." In *Educational Assessments in the Age of Generative ai*, 145–178. IGI Global Scientific Publishing.

[49] Wei, Yanhui, Zhiling Meng, Na Liu, and Jianqi Mao. 2025. "Research on the impact of hard technology innovation on the high-quality development of SRDI enterprises: based on the moderating role of digital transformation." *Asia Pacific Journal of Innovation and Entrepreneurship* 19 (1):24–41.

[50] Xia, Qi, Xiaojing Weng, Wendan Huang, Yan Li, Cheng Wing Kin, and Thomas KF Chiu. 2026. "Is generative artificial intelligence (GenAI) a game changer for interdisciplinary collaborative learning in higher education?" *Education and Information Technologies* 31 (1):143–166.

[51] Yigci, Defne, Merve Eryilmaz, Ail K Yetisen, Savas Tasoglu, and Aydogan Ozcan. 2025. "Large language model-based chatbots in higher education." *Advanced Intelligent Systems* 7 (3):2400429.

[52] Zehra, Kaneez, Urwa Naeem, Mo Olateju, and Rachel Dyl. 2026. "Learning What Matters in Pakistan: Rethinking Skills and Education Systems Transformation." *Center for Universal Education at The Brookings Institution*.

[53] Zreik, Mohamad, Badar Alam Iqbal, and Arti Yadav. 2027. "The Strategic Implications of China's Artificial Intelligence Development Plan on Global Power Dynamics." In *Encyclopedia of Modern Artificial Intelligence*, 1–13. IGI Global Scientific Publishing.