The 3rd ASEAN School of Business Network International Conference 2026
www.aseansbn.org August 6-7, 2026 Pathum Thani, Thailand

Artificial Intelligence Governance in Higher Education: A Global Bibliometric Mapping of Institutional Adaptation

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ABSTRACT

The rapid diffusion of generative artificial intelligence has created significant governance challenges for higher education institutions worldwide. This study examines global research trends on AI adaptation governance in higher education using a bibliometric approach. Drawing on 1,770 publications indexed in the Scopus database between 2020 and 2025, the analysis maps publication growth, country-level contributions, international collaboration patterns, and keyword co-occurrence networks. The findings reveal a sharp increase in research activity following the emergence of generative AI tools, with four dominant thematic clusters related to ethics and governance, pedagogical adaptation, technical transformation, and applied practices. The results highlight AI governance as a central mechanism shaping institutional adaptation in higher education.

Keywords: AI adoption, bibliometric analysis, global research trends, HE governance

DOI: https://doi.org/10.64458/asbnic.v3.135

INTRODUCTION

The global diffusion of artificial intelligence (AI) has intensified governance tensions within higher education institutions. Students, educators, and researchers across different countries are adopting AI tools at varying speeds and for academic, research, or administrative purposes, often outpacing the development of institutional policies and regulatory frameworks (Al-Zahrani & Alasmari, 2025; Chan & Hu, 2023). Attempts to prohibit or tightly restrict AI use have proven increasingly impractical in many national contexts, as such approaches struggle to keep pace with the global availability of AI technologies (Zaidan & Ibrahim, 2024). Moreover, restrictive governance strategies risk undermining academic creativity (Alhur et al., 2025), international competitiveness (Zaidan & Ibrahim, 2024), and knowledge exchange (Chan & Hu, 2023), which are central to the mission of higher education. Consequently, universities around the world are shifting toward adaptive governance approaches that seek to balance AI usage with academic integrity, ethical responsibility, and institutional accountability (Chan, 2023; Coates et al., 2025; Holmes et al., 2022).

Current research on AI in higher education has expanded rapidly across countries but remains uneven and fragmented. Early studies largely focused on technical implementation and instructional applications, such as intelligent learning systems and automated assessment (Bond et al., 2024; Crompton & Burke, 2023; Salas-Pilco & Yang, 2022). More recent work has increasingly examined pedagogical

transformation (Ali et al., 2024; Chan & Hu, 2023), ethical concerns (Buragohain & Chaudhary, 2025), and institutional responses (Abulibdeh et al., 2025; Farrokhnia et al., 2024), particularly following the global emergence of generative AI tools such as ChatGPT in the university environment. However, governance-related discussions are often embedded within broader pedagogical or technological debates rather than treated as a central analytical focus. There is still limited clarity on how governance operates as a cross-cutting mechanism that enables higher education institutions to adapt strategically to AI-driven disruption at a global scale.

Several gaps in the literature emerge from this context. First, despite the global diffusion of AI, there is a lack of a systematic mapping of how AI governance in higher education is structured across countries and research communities (Bearman et al., 2023). Second, existing studies tend to emphasize localized case studies or national perspectives (e.g., Chan, 2023; Dabis & Csáki, 2024; Wadipalapa et al., 2024), offering limited insight into global research trends, dominant thematic configurations, and comparative governance orientations. Third, while the volume of publications has grown substantially in recent years, there is insufficient synthesis of how scholarly attention has evolved over time and which governance-related themes have become most prominent in the global literature (Bond et al., 2024; Crompton & Burke, 2023). These gaps hinder a comprehensive understanding of AI governance as a global challenge for higher education institutions.

To address these gaps, this study employs a bibliometric approach to examine global research trends on AI adaptation governance in higher education (Kalantari et al., 2017; Zitt et al., 2005). The aim of this study is to map the intellectual structure of this rapidly expanding field by analysing publication growth over time, country-level research contributions, international collaboration patterns, and keyword co-occurrence networks. Through this approach, the study provides a systematic overview of how existing scholarship conceptualises and responds to AI as a disruptive and transformative force shaping governance practices in higher education.

METHOD

Data Sources and Search Strategies

Data mining was conducted during January 2026. Literature data were collected from the Scopus database using a multi-layered search strategy to identify studies relevant to the governance and strategic adaptation of artificial intelligence in higher education (Kumpulainen & Seppänen, 2022; Werbińska-Wojciechowska & Winiarska, 2023). The search strategy comprised four layers, as visualized in Figure 1. The first layer captured general and generative AI technologies to ensure coverage of both foundational and emerging developments. Broad terminology such as *"artificial intelligence," "AI," "machine learning," "deep learning,"* and *"generative AI"* was combined with the primary discussed keywords, including *"large language model*"* and *"ChatGPT."* The second layer focused on the higher education context. Keywords including *"higher education," "university," "universities," "HEI," "HEIs," "tertiary education,"* and *"postsecondary education"* were used to restrict the dataset to the institutional domain of interest.

The third layer targeted organizational, strategic, and policy adaptation perspectives. Core governance and policy terms, such as *"governance," "policy," "institutional decision-making," "institutional framework*," "* and *"organizational response"* were combined with adaptation-related keywords including *"strategic alignment," "organizational strateg*," "organizational adapt*,"* and *"institutional change."* This ensured that the retrieved studies were conceptually aligned with institutional governance and AI adaptation. The fourth layer refined the search results by applying filters for subject area, document type, language, and publication period. Only studies indexed in the Social Sciences, Business and Management, or Decision Sciences were retained. Eligible documents included journal articles, conference proceedings, and book chapters published in English between 2020 and 2025. The final dataset consisted of 1,770 documents included for bibliometric analysis.

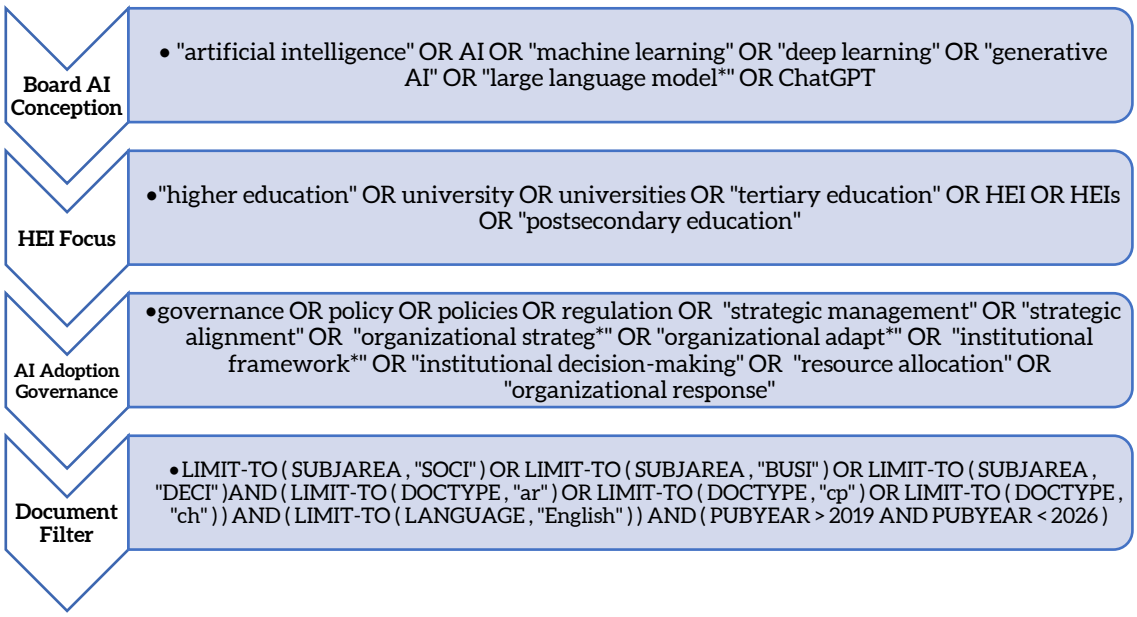


Figure 1. Search Query Layers

Bibliometric Maps

The selected dataset was exported into VOSviewer to construct and visualize bibliometric maps (van Eck & Waltman, 2010). Keywords and country affiliations were used as analytical units. Two types of analyses were conducted: co-occurrence and co-authorship analyses. The co-occurrence analysis illustrates the strength of association between keywords based on how frequently they co-occur in the same documents, enabling the identification of thematic clusters (Klarin, 2024; van Eck & Waltman, 2010). The co-authorship analysis maps collaboration patterns between countries, linking two countries when authors affiliated with those countries have jointly published a document (Isfandyari-Moghaddam et al., 2023). In addition to VOSviewer outputs, this study used Scopus's analysis features to complement the bibliometric visualization and present publication trends over time, distribution by subject area, document type, and document source.

Co-Authorship Analysis

The co-authorship mapping reveals how research collaboration on AI governance and strategic adaptation in higher education is distributed across countries. A minimum threshold of 30 co-authored publications per country was applied to include only countries with substantial collaborative activity. Of the 124 affiliated countries in the dataset, 20 (approximately 16.1 %) met this threshold and were included in the network visualization. The relatively small proportion of countries that meet the threshold indicates that cross-country collaboration on AI governance and strategic adaptation in higher education remains limited, with most efforts concentrated in a small number of countries.

Co-Occurrence Analysis

The co-occurrence analysis initially identified 7,635 unique keywords from the dataset. To focus on the most frequently discussed concepts, a minimum co-occurrence threshold of 35 was applied, such that only keywords that co-occurred at least 35 times across the documents were included. This selection resulted in 40 high-frequency keywords. Prior to visualization, synonymous and overlapping terms were reviewed and consolidated to prevent conceptual duplication and improve analytical clarity; for example, *"higher education" and "high education,"* or *"artificial intelligence"* and *"AI,"* were counted as single keywords. Following this consolidation, 36 keywords were retained for the co-occurrence mapping.

RESULTS

Publication Output and Growth

During the 2020–2025 period, 1,770 publications on AI adaptation in higher education were identified. Figure 2(a) shows that academic journal articles accounted for 1,194 publications (67.5 %), followed by conference papers with 316 publications (17.9 %) and book chapters with 260 publications (14.7 %). Journals, therefore, represent the primary publication outlet for this topic, reflecting both increasing editorial attention to AI-related themes and authors' preference for journals due to wider access and citation potential.

Research on AI in higher education is mostly situated within the social sciences, as illustrated in Figure 2(b). The social sciences accounted for 1,484 publications (40.3 %), followed by computer science (709, 19.3 %) and business and management (271, 7.4 %). Although this distribution is partly influenced by the search strategy, which excludes highly technical and medical domains that do not directly address higher education, the pattern suggests that AI in higher education is significantly framed as a human- and social-adaptation issue rather than a purely technical or organizational matter.

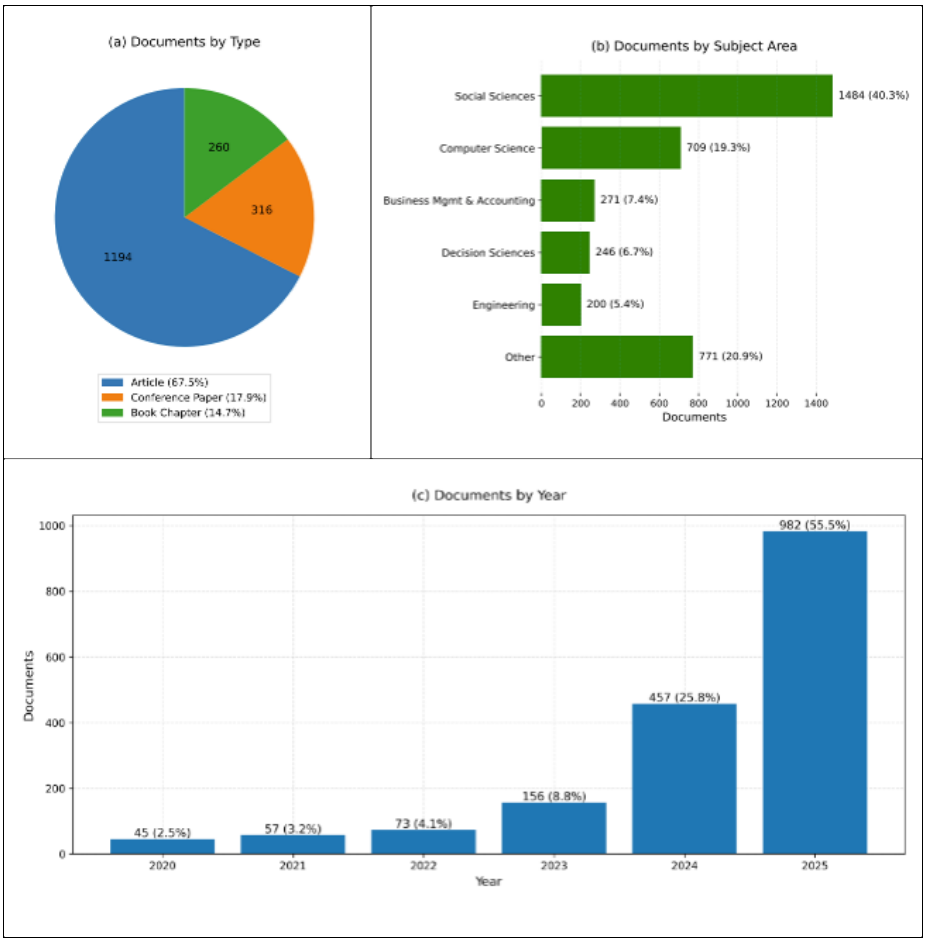


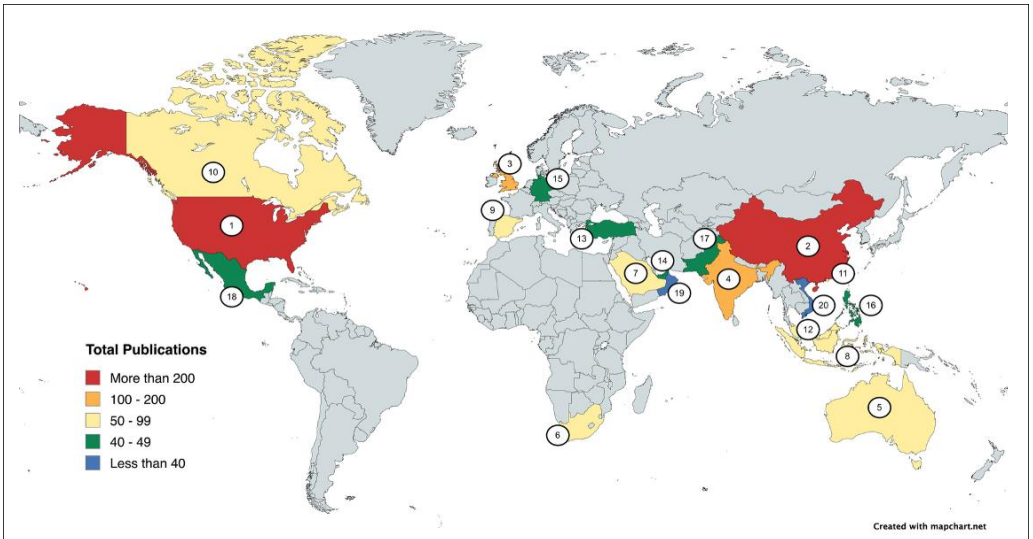
Figure 2. Hypothesized model

Figure 2(c) shows a substantial increase in publications beginning in 2023. Publication volume rose from 73 in 2022 to 156 in 2023 (an increase of 113.7 %), then to 457 in 2024 (an increase of 192.9 % from 2023), and to 982 in 2025 (an increase of 114.9 % from 2024). This represents an overall growth of 529.5 % between 2023 and 2025. The trend indicates that AI adaptation in higher education has rapidly become a focus of research, particularly following the introduction of generative AI tools such as ChatGPT in late 2022 (Qian, 2025).

Leading Countries, Institutions, and International Collaboration

Figure 3 presents countries with the highest publication output on AI adaptation in higher education. The United States and China are the only countries with more than 200 publications, with the United States recording the highest overall output (United States: 247; China: 230). However, publication volume does not fully correspond to citation impact. Hong Kong and the United Kingdom show the highest cumulative citation counts, each exceeding 3,000 citations (Hong Kong: 3,639; United Kingdom: 3,388), suggesting that authors frequently reference work originating in these research environments. The United States and China are major developers of AI technologies (Babina et al., 2024; Ozkaya & Demirhan, 2023), which may explain the strong academic interest in examining their implications in higher education. While they dominate publication volume, their citation performance trails behind Hong Kong and the United Kingdom. This discrepancy may be linked to various factors beyond the scope of this analysis, such as authors' credibility and reputation, journal placement, thematic relevance, or perceived methodological rigor associated with research outputs from these environments, which make them more frequently referenced in subsequent studies (Khatoon et al., 2024; Kousha & Thelwall, 2024).

The distribution of contributing countries shows strong representation from Asia. China (230), India (104), Saudi Arabia (67), and Indonesia (67) appear within the top ten for total publications, indicating that Asian research communities are actively engaging with AI adaptation issues in higher education. This pattern contrasts with regions such as South America and Africa, which are not represented among the top twenty countries in publication output, except for South Africa (rank 6 with 78 publications). The notable presence of Southeast Asian countries, including Indonesia, Malaysia, the Philippines, and Vietnam, as well as Middle Eastern contributors such as Saudi Arabia, the United Arab Emirates, and Oman, reflects strong and growing research momentum in these regions.



Rank	Country	Total Publication	Total Citation	The Most Productive Academic Institution (Publications)	Rank	Country	Total Publication	Total Citation	The Most Productive Academic Institution (Publications)
1	United States	247	2613	University of Georgia (7)	11	Hong Kong	52	3639	Chinese University of Hong Kong (18)
2	China	230	1588	Beijing Normal University (13)	12	Malaysia	51	481	Universiti Sains Malaysia (6)
3	United Kingdom	158	3388	King's College London (10)	13	Turkey	49	368	Anadolu Universitesi (9)
4	India	104	1062	Symbiosis International Deemed University (5)	14	UAE	47	199	Zayed University (10)
5	Australia	97	1442	Monash University (23)	15	Germany	46	496	Rheinisch-Westfälische Technische Hochschule Aachen (5)
6	South Africa	78	627	University of South Africa (27)	16	Phillipines	44	237	Cebu Technological University (5)
7	Saudi Arabia	67	571	Prince Sultan University (8)	17	Pakistan	40	251	Sukkur IBA University (5)
8	Indonesia	67	379	Binus University & Universitas Negeri Malang (8)	18	Mexico	40	793	Tecnológico de Monterrey (25)
9	Spain	65	951	International University of La Rioja (7)	19	Oman	39	500	Sultan Qaboos University (8)
10	Canada	52	516	University of Calgary & University of Toronto (9)	20	Vietnam	33	876	Hanoi University of Science and Technology (5)

Figure 3. Publication Statistics by Countries

The co-authorship network in Figure 4 further illustrates the association between publication output and international collaboration. The network shows that the United States and the United Kingdom act as central connectors in the global research network, each forming co-authorship links with a wide range of countries, including Australia, Canada, South Africa, and Germany. These two research hubs anchor collaboration across regions, suggesting that scholars working on AI adaptation in higher education frequently engage with partners located in established academic environments. China is also

positioned as a significant node with extensive cross-regional links, particularly with Hong Kong, the United States, the United Kingdom, and Australia, reflecting sustained cooperation between institutions in East Asia and Europe.

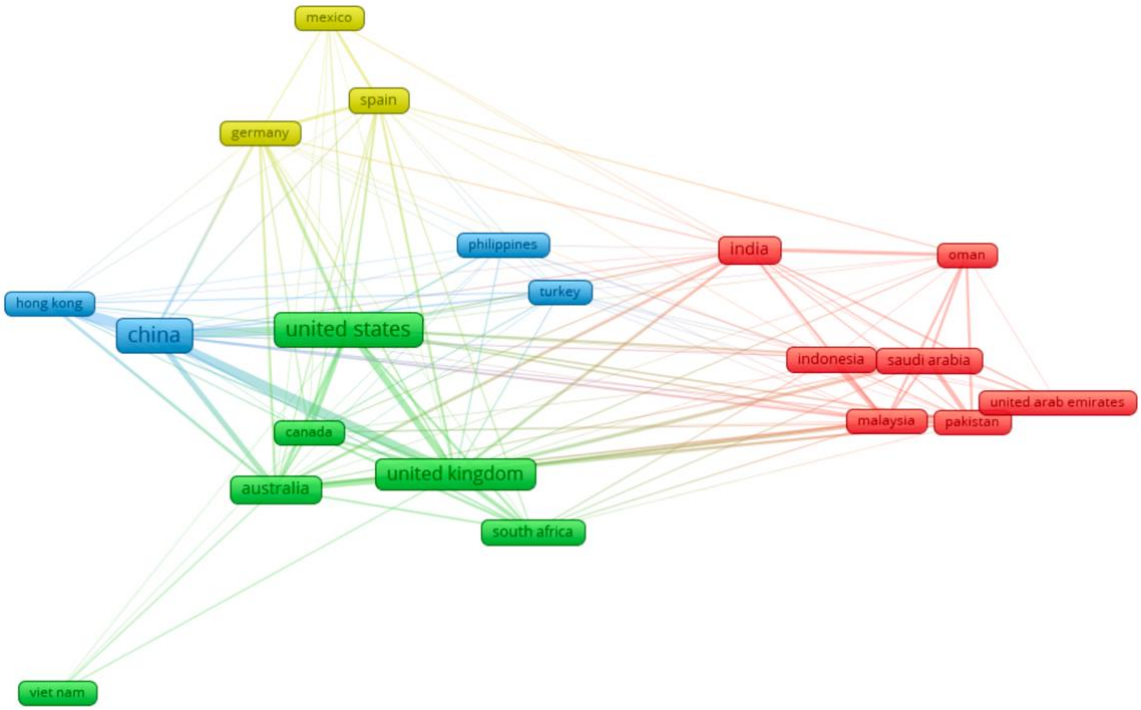


Figure 4. Co-Authorship by Country Network

The regional clusters visible in the network indicate that cooperation is shaped not only by research capacity but also by geographical proximity and shared regional agendas. India, Indonesia, Saudi Arabia, Malaysia, Pakistan, the United Arab Emirates, and Oman form a dense network of collaboration, reflecting strong research interconnections across South and West Asia. Southeast Asian participation is also evident, although links tend to flow through larger nodes such as the United States, United Kingdom, and China rather than forming an independent network. Countries such as Vietnam and Mexico appear more peripheral, participating in collaboration but with fewer visible linkages.

Journal Contribution

This study identified the 10 most frequently selected journals in the dataset and ranked them in Table 1 by total publication count. The British Journal of Educational Technology (41), Sustainability Switzerland (38), and Education Sciences (29) emerged as the three most productive outlets. However, publication volume does not fully correspond to citation impact. Among the top three journals by output, only the British Journal of Educational Technology consistently demonstrated a high citation count, with 1,305 total citations, indicating that frequent publication does not necessarily translate into strong academic influence in this field.

A clearer relationship appears between citation performance and journal quality metrics. Journals with higher CiteScores, such as British Journal of Educational Technology (17.6), Computers and Education: Artificial Intelligence (28.7), and Education and Information Technologies (11.8), recorded the highest cumulative citations. These journals are predominantly associated with major publishers, including Wiley, Elsevier, and Springer, suggesting that authors in this field may place considerable emphasis on journal performance and publisher credibility when selecting publication venues (Csomós & Farkas, 2023; Okagbue & Teixeira da Silva, 2020).

Table 1. Top Ten Contributed Journals

No	Journal	Total Publication	Total Citation	Cite Score	The Most Cited Articles	Times Cited	Publisher
1	British Journal of Educational Technology	41	1305	17.6	Promoting students' learning achievement and self-efficacy: A mobile chatbot approach for nursing training (Chang et al., 2022)	209	Wiley
2	Sustainability Switzerland	38	863	7.7	Educational Design Principles of Using AI Chatbot That Supports Self-Regulated Learning in Education: Goal Setting, Feedback, and Personalization (Chang et al., 2023)	218	MDPI
3	Education Sciences	29	783	5.5	Challenges and Opportunities of Generative AI for Higher Education as Explained by ChatGPT (Michel-Villarreal et al., 2023)	551	MDPI
4	Education and Information Technologies	29	1013	11.8	Adoption of artificial intelligence in higher education: a quantitative analysis using structural equation modelling (Chatterjee & Bhattacharjee, 2020)	475	Springer
5	Computers and Education Artificial Intelligence	26	1143	28.7	Future research recommendations for transforming higher education with generative AI (Chiu, 2024)	285	Elsevier
6	Australasian Journal of Educational Technology	23	694	8.8	Roles and research trends of artificial intelligence in higher education: A systematic review of the top 50 most-cited articles (Chu et al., 2022)	154	ASCILITE
7	International Journal of Learning Teaching and Educational Research	23	107	2.3	Harnessing Artificial Intelligence for Advancing Sustainable Development Goals in South Africa's Higher Education System: A Qualitative Study	62	Society for Research and Knowledge Management

No	Journal	Total Publication	Total Citation	Cite Score	The Most Cited Articles	Times Cited	Publisher
					(Opesemowo & Adekomaya, 2024)		
8	Cogent Education	20	105	2.9	Investigating the adoption of AI in higher education: a study of public universities in Indonesia (Helmiatin et al., 2024)	23	Taylor & Francis
9	Frontiers in Education	20	195	3.7	The ethical implications of using generative chatbots in higher education (Williams, 2024)	105	Frontiers
10	Discover Education	16	111	0.8	Beyond the hype: exploring faculty perceptions and acceptability of AI in teaching practices (Ofosu-Ampong, 2024)	42	Springer

Table 1 also lists the most cited articles within each of the top ten journals. Several highly cited articles focus on chatbot deployment in higher education, whereas others adopt a literature review or trend analysis perspective. Two papers examine country cases of AI adoption in South Africa and Indonesia, highlighting the relevance of local context in understanding adaptation processes. Although the topics of these individual papers may not fully represent the diversity of research within the dataset, their selection as the most-cited works suggests that practical applications of generative AI and critical reflections on emerging research directions are particularly influential in advancing discourse on AI adaptation in higher education. Topic patterns observed across the entire dataset are analysed in more detail in the co-occurrence subsection.

Keywords Co-Occurrence

A co-occurrence analysis was conducted using VOSviewer to examine how frequently two keywords co-occur in the dataset and to identify dominant thematic patterns (van Eck & Waltman, 2010). The resulting network, shown in Figure 5, reveals four primary thematic groups derived from the 36 most frequent terms, with major keywords clustered.

The keyword statistics identify artificial intelligence as the most dominant term in both occurrence (646) and total link strength (1,738), positioning it as the central phenomenon driving scholarly attention. This prominence reflects the disruptive effects of AI in higher education, motivating researchers to examine its challenges (Chan & Hu, 2023; Michel-Villarreal et al., 2023), implementation pathways (Alghazo et al., 2025; Camacho-Zuñiga, 2024), benefits (Blahopoulou & Ortiz-Bonnin, 2025), and implications (Gruenhagen et al., 2024; Lund et al., 2025) for pedagogical practices, institutional strategy, and academic work. The rapid surge of interest following the release of generative AI tools further strengthened the centrality of this keyword (Kim, 2023). Higher education ranks second in both occurrence (447) and link strength (1,157), indicating that academic institutions are among the primary contexts in which AI adaptation is being theorized and investigated. Among education-related terms, student stands out with a high link strength (1,317) and occurrence (290), highlighting intensive research attention on how AI affects student learning, engagement, and academic behaviors (Chan & Lee, 2023; Johnston et al., 2024). Pedagogical concepts such as teaching, curricula, and academic integrity further emphasize interest in how AI reshapes educational design and assessment practices (Gruenhagen et al., 2024; Luo, 2024).

Although technical terminology was not directly targeted in the search strategy, several technically oriented keywords, including learning system, ChatGPT, educational computing, e-learning, and machine learning, remain highly frequent (Tiukhova et al., 2024; Wagner et al., 2023). This suggests that research on AI in higher education remains strongly influenced by technical perspectives. At the same time, emerging non-technical keywords, such as ethical technology, academic integrity, and personnel training, indicate a gradual broadening of research attention toward social, ethical, and organizational dimensions of AI adaptation.



Figure 5. Co-Occurrence Network

The analysis generated four clusters representing groups of keywords that are strongly linked and reflect thematic configurations within the dataset. These clusters indicate how research on AI in higher education is conceptually organized and where scholarly attention is concentrated.

Cluster 1 – Institutional and Ethical Adaptation to Generative AI

The first cluster (blue) is centred on artificial intelligence and generative AI, which form the conceptual core of the dataset. Keywords such as higher education, academic integrity, ethics, and ChatGPT indicate that current research is primarily concerned with how generative AI reshapes academic practices and norms. Strong links between artificial intelligence, ChatGPT, and academic integrity suggest that concerns about plagiarism, authorship, and assessment validity have driven significant scholarly debate since the emergence of generative models (Acosta-Enriquez et al., 2024; Dabis & Csáki, 2024; Slimi & Villarejo Carballido, 2023). Ethical technology and AI literacy are emerging terms that highlight efforts to conceptualize AI use beyond technical functionality, encompassing responsible use, value alignment, and skill development for students and educators. This cluster therefore captures the normative and institutional implications of AI adoption in universities.

Cluster 2 – Pedagogical and Curricular Adaptation through AI-Enabled Learning

The second cluster (orange) focuses on pedagogical and curricular adaptation. Terms such as teaching, curricula, engineering education, and educational technology indicate a strong focus on instructional design and course-level changes triggered by AI. The presence of data privacy, personalized learning, e-learning, and computer-aided instruction suggests a continuation of earlier digital learning themes that predate generative AI, now reframed through the integration of intelligent systems (Le et al., 2025; Malik et al., 2021). Personnel training also appears in this cluster, suggesting that capacity-building initiatives for lecturers and staff are part of pedagogical adaptation strategies (Awadallah Alkouk & Khlaif, 2024; Ichikawa et al., 2025). Overall, this cluster highlights the reconfiguration of teaching and learning practices in response to AI-driven changes in assessment, content creation, and academic skill requirements.

Cluster 3 – AI-Driven Digital and Technological Transformation in Higher Education

The third cluster (green) represents the technical and computational foundations that remain influential despite the study's non-technical search scope. Keywords such as machine learning, deep learning, decision-making, and learning systems indicate that methodological and algorithmic concerns continue to underpin discussions of AI in higher education (Tiukhova et al., 2024; Wagner et al., 2023). The prominence of sustainability and sustainable development within this cluster suggests that AI is also positioned as an enabler for long-term educational and societal goals (Fošner, 2024; Tanveer et al., 2020). The presence of digital transformation connects technical advancements to organizational change efforts, illustrating how AI-enabled technological developments are becoming embedded in broader institutional initiatives.

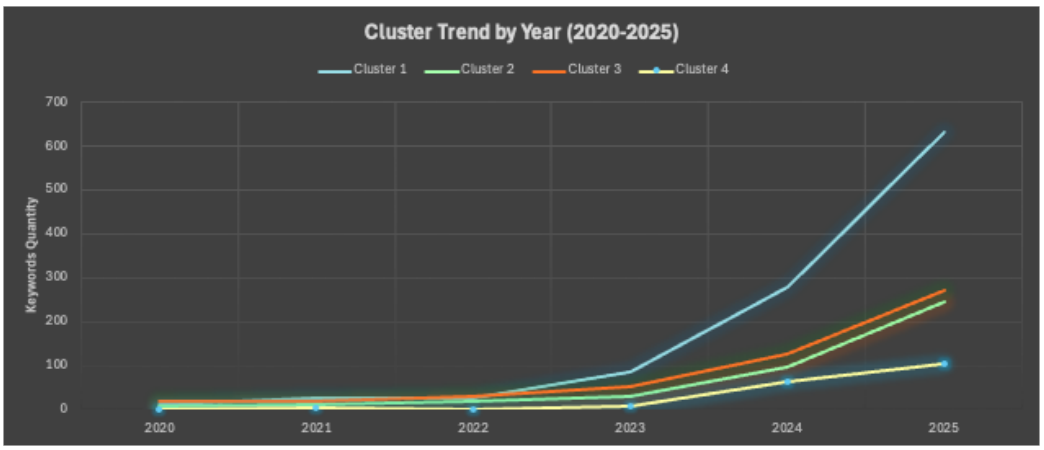
Cluster 4 – Student Experience and Applied AI Practices in Academic Contexts

The fourth cluster (yellow) connects student and institutional domains with specific AI-related behaviours. University students, teaching and learning, and case studies appear alongside terms such as federated learning, adversarial machine learning, and contrastive learning, which represent more specialized technical approaches (Jin et al., 2025; Wang et al., 2024; Yesmin, 2023). This configuration suggests that applied studies linking student experience to emerging AI techniques are beginning to develop, though they remain less dominant than pedagogical or ethical themes. The cluster indicates a pathway in which institutional and behavioural inquiries intersect with technical trends, particularly in research examining how students and teachers interact with AI-enabled tools.

The four clusters demonstrate that research on AI adaptation in higher education is currently structured around a central concern with generative AI and institutional implications (blue), evolving pedagogical practices and curriculum design (orange), technical foundations and transformation strategies (green), and emerging student-focused applications with methodological intersections (yellow). The configuration shows a field that is rapidly expanding beyond early technical explorations, moving toward the integration of ethical, educational, and organizational dimensions as AI technologies are increasingly embedded in academic work.

Cluster Trends

Based on the four clusters identified in the keyword co-occurrence analysis, the temporal dynamics of each cluster were examined across publication years (Figure 6) and by the top five contributing countries (Figure 7). Consistent with Scopus database coverage, all clusters showed growth, with a marked acceleration in keyword usage from 2023 onward.



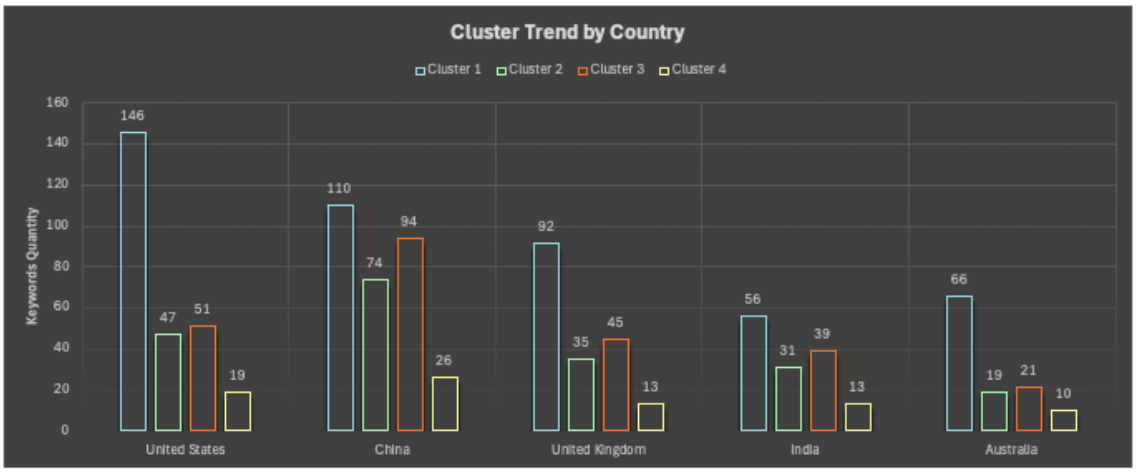
Clusters	Years					
	2020	2021	2022	2023	2024	2025
Cluster 1	12	26	26	86	280	631
Cluster 2	8	12	18	29	96	246
Cluster 3	18	20	28	50	126	273
Cluster 4	1	3	1	7	63	103

Figure 6. Cluster Trend by Year

Cluster 1 emerged as the most dominant cluster across all years, showing a particularly sharp increase in 2025, with 603 keywords identified. This rapid growth is largely attributable to the inclusion of two central keywords, artificial intelligence and higher education, which form the core focus of this study and were grouped within Cluster 1. These keywords frequently appeared in article titles, abstracts, author keywords, and exhibited strong co-occurrence links with a wide range of related terms. In addition to these central concepts, Cluster 1 also contained a substantial number of ethics-related keywords, including academic integrity (80), ethical technology (61), ethics (37), and AI literacy (28). Although the prominence of Cluster 1 is partly influenced by the study's search strategy and thematic focus, the strong presence of ethics-oriented terms underscores the growing importance of ethical considerations in discussions of AI adaptation in university environments.

The trend dynamics of Clusters 2, 3, and 4 offer a more objective basis for comparison. The results show a consistent pattern of gradual growth across these three clusters, with a stable ranking in terms of discussion volume. Cluster 3 was the most frequently discussed cluster each year, followed closely by Cluster 2, then Cluster 4. Cluster 2 is characterized by a strong emphasis on technical and digital transformation themes, with frequently occurring keywords such as learning systems (29), machine learning (8), and decision making (17). Cluster 3 exhibited a parallel growth pattern with a primary focus on pedagogical and curricular adaptation. Prominent keywords in this cluster include teaching (95), e-learning (35), curricula (38), personalized learning (22), and personnel training (24). The similar growth trajectories observed in Clusters 2 and 3 suggest a close alignment between technological development and pedagogical transformation in the AI adaptation process. This alignment indicates that research on AI in higher education increasingly recognizes the need to integrate technical systems with teaching practices and curriculum design.

In contrast, Cluster 4 demonstrated a comparatively slower growth trend than Clusters 2 and 3. This cluster primarily captures contextual aspects, student behavior, and applied AI practices. The relatively lower volume of keywords suggests that, to date, these themes have received less attention, possibly because early stages of AI adaptation in higher education have prioritized foundational issues such as ethical governance, pedagogical redesign, and system development. Nevertheless, the upward trend observed in Cluster 4 indicates a potential future research trajectory focused on the impacts, applications, challenges, and best practices of AI implementation in higher education, opening broader discussions on behavioral and managerial dimensions of AI-driven transformation.



Clusters	Country				
	United States	China	United Kingdom	India	Australia
Cluster 1	146	110	92	56	66
Cluster 2	47	74	35	31	19
Cluster 3	51	94	45	39	21
Cluster 4	19	26	13	13	10

Figure 7. Cluster Trend by Country

The clusters were also examined from a country-level perspective. This study focuses on the top five contributing countries from the country analysis results, as illustrated in Figure 7. While the year-based (Figure 6) analysis revealed a relatively consistent and parallel growth pattern across clusters, the country-level analysis shows more heterogeneous and contrasting patterns, particularly between the two dominant contributors, the United States and China. Cluster 1 is most dominant in the United States, indicating a strong research focus on ethical considerations and foundational debates in higher education about AI. In contrast, China shows stronger dominance across Clusters 2, 3, and 4, surpassing the United States in these areas. This pattern suggests that Chinese research places greater emphasis on adaptation-oriented themes, particularly the alignment between technical systems and pedagogical transformation, as reflected in Cluster 2 (74 keywords) and Cluster 3 (94 keywords). A similar dominance of Cluster 1 is also observed in other Western countries. In the United Kingdom, Cluster 1 accounts for 92 keywords, representing 49.7% of the total, while in Australia it comprises 66 keywords, or 56.9% of the total. This pattern suggests that research in Western higher education systems emphasizes ethical, normative, and governance-related discussions of AI, alongside broader conceptual framing of AI in university contexts.

Beyond these dominant patterns, additional insights emerge from the distribution of Clusters 2 and 3 across countries. The relatively balanced presence of technical and pedagogical clusters in China suggests a more integrated approach to AI adaptation, where system development and teaching innovation progress in parallel. In contrast, the United Kingdom, India, and Australia show a consistent but lower intensity of engagement in these two clusters, indicating a more cautious or incremental approach to technical and pedagogical transformation.

CONCLUSION

AI's rapid development is fundamentally reshaping how humans interact with and depend on technology, creating profound governance challenges for higher education institutions. The widespread diffusion of AI across society has introduced new challenges for universities, requiring continuous adaptation rather than outright restriction. Attempts to prohibit AI use are increasingly impractical and may even hinder knowledge creation and development. Consequently, the dominant response within higher education has shifted toward adapting to AI advancements while maintaining academic integrity and ethical standards.

This study provides a synthesis of current research on AI adaptation governance in higher education by examining global scholarly contributions through a bibliometric approach. The findings reveal a clear and rapidly increasing global research interest in this area. Four major thematic areas were identified, encompassing ethical and governance considerations, technical systems, and pedagogical adaptation. While countries such as the United States and China lead research output in this field, the growing participation of many other countries underscores AI's global impact on higher education and the widespread scholarly attention it has attracted. Several years after the introduction of generative AI tools such as ChatGPT, research on how higher education institutions adapt to AI continues to expand and is likely to remain a prominent topic in the years ahead.

Despite these contributions, this study has several limitations that should be considered when interpreting the results. First, the analysis relies solely on the Scopus database, which may not capture the full breadth of relevant publications. Future studies could incorporate additional reputable databases to provide a more comprehensive overview of the literature. Second, the search strategy was designed to minimize the inclusion of highly technical or engineering-oriented publications, thereby maintaining focus on organizational, pedagogical, and governance perspectives. While this approach is scope-justified, it may have excluded engineering-focused studies that are nonetheless relevant to AI adaptation in higher education. Future research may benefit from explicitly examining this intersection. Finally, bibliometric analysis is inherently dependent on quantitative indicators such as publication counts and keyword frequencies. Complementing this approach with qualitative content analysis would enable a deeper, more nuanced understanding of how higher education institutions adapt to the evolving AI landscape.

ACKNOWLEDGEMENTS OR NOTES

This research was supported by a grant from Pusat Pengembangan Manajemen (PPM), Universitas Islam Indonesia, providing financial assistance and institutional support that made this study possible.

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