



The Transformation of Indonesian Higher Education in the Global Knowledge Competition

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ABSTRACT

The transformation of higher education has become a strategic priority in the face of global knowledge competition, which is increasingly determined by the capacity for knowledge production, innovation, digitalisation and the quality of institutional governance. This study aims to analyse the transformation of higher education in Indonesia by integrating the knowledge ecosystem perspective, adaptive learning based on artificial intelligence, and outcome-based governance, to explain how universities can strengthen their global competitiveness without losing relevance to local needs. The study employs a qualitative approach using a library-based research design, involving a critical review for relevance, credibility, and recency. The findings indicate that the transformation of Indonesian higher education cannot be explained by digitalisation, internationalisation, innovation or governance reform in isolation, but requires a systemic integration of the repositioning of universities as knowledge ecosystems, the utilisation of artificial intelligence to develop adaptive learning, the strengthening of data and outcome-based governance, and the interconnection between local knowledge and global networks. These findings expand upon previous studies, which were often fragmented, by positioning interactions among the various dimensions of transformation as the foundation of higher education's competitiveness. Consequently, higher education policy needs to shift from a focus on administrative compliance and technology adoption towards strengthening a knowledge ecosystem that is adaptive, accountable, innovative and impact-oriented.

A. Introduction

The shift in the global economic landscape towards a knowledge-based economy has transformed higher education from an institution that provides educational services into a strategic actor in the production of knowledge and innovation, and in the development of national competitiveness (Wirba, 2022). Within this framework, a country's ability to produce high-quality research, build international scientific networks, develop science-based innovations and cultivate highly capable human resources has become a key determinant of its position in global competition. Higher education institutions are no longer viewed merely as organisations that transmit knowledge but as key nodes within a knowledge ecosystem connecting government, industry, society and the international scientific community (Marchant-Pérez & Ferreira, 2025). The digital revolution is further accelerating these dynamics, including the development of artificial intelligence, the green economic transformation, and the increasing complexity of global challenges, which demand that higher education institutions produce scientific solutions that are interdisciplinary, adaptive and impactful.

In this context, competition between nations no longer hinges on the superiority of natural resources or conventional industrial capacity but rather on the ability to build a sustainable knowledge-production system. Higher education institutions have become centres for the accumulation of intellectual capital, playing a role in producing reputable scientific publications, strengthening international collaboration, developing new technologies, building innovation ecosystems, and transforming research outcomes into social and economic added value. Consequently, the indicators of success in higher education have undergone a fundamental shift. Success is no longer measured solely by access to education or the number of graduates, but rather by an institution's capacity to generate globally recognised knowledge, build academic reputation, accelerate technology transfer, strengthen the impact of research on public policy, and enhance its contribution to the achievement of sustainable development. This shift demonstrates that the transformation of higher education is a multidimensional process encompassing governance reform, changes in academic culture, the strengthening of research capacity, internationalisation, digitalisation and institutional innovation, all occurring simultaneously (Wati et al., 2022).

Indonesia finds itself in a paradoxical position within these dynamics. On the one hand, Indonesia possesses strategic potential in the form of a demographic dividend, a large number of higher education institutions, increased investment in education, the development of digital infrastructure, and expanding opportunities for international collaboration (Karimullah et al., 2022). This potential provides significant capital to strengthen the nation's knowledge-production capacity. However, on the other hand, the competitiveness of Indonesian higher education still faces various structural challenges, reflected in the uneven quality of higher education institutions, disparities in research productivity between institutions, limited sustainable international collaboration, weak commercialisation of research outcomes, and sub-optimal integration between education, research, innovation, and national development needs (Waluyo, 2026; Welch & Aziz, 2022). These gaps indicate that the issues facing Indonesia's higher education sector are not merely about enhancing institutional capacity but also about transforming all components of the higher education system into an interconnected knowledge ecosystem capable of adapting to the rapid pace of global change.

Various national policies have been directed towards addressing these challenges through reforms to higher education governance, strengthening institutional autonomy, academic internationalisation, the digitalisation of learning, increased research funding, the development of collaboration between higher education institutions and industry, and the expansion of international partnerships (Karimullah et al., 2025; Susilawati et al., 2025; Waluyo, 2026). These initiatives demonstrate a policy orientation that increasingly positions higher education as an instrument of knowledge-based development. However, the

implementation of this transformation still exhibits significant fragmentation. Policy reforms often proceed on a sectoral basis. Digitalisation is advancing more rapidly than the transformation of academic culture. Internationalisation is measured more by quantitative indicators than by the quality of scientific collaboration. The promotion of innovation has not yet been fully integrated with the development of research capacity and institutional governance. Consequently, various transformation policies have not always led to systemic changes that could strengthen Indonesia's position in the global knowledge competition.

The literature on higher education transformation has expanded rapidly over the past decade. Most studies position internationalisation as the primary strategy for enhancing academic reputation through student mobility, research collaboration, and international scientific publications (Brilyanti, 2025; Rachman et al., 2024). Other studies emphasise the digitalisation of higher education through learning technologies, learning analytics, artificial intelligence, and data-driven learning models (Arianto et al., 2026; Sianipar & Angelia, 2025). Further studies focus on governance reform, university autonomy, academic leadership, and the strengthening of links between universities and industry to foster innovation. Several studies have also developed perspectives on the entrepreneurial university, the 'knowledge society, the innovation ecosystem and the triple helix as frameworks for explaining the changing role of higher education institutions in knowledge-based economic development (Zakaria, Fauzi, et al., 2025; Zakaria, Fernando, et al., 2025). Although these developments make an important contribution, they reveal a tendency for the transformation of higher education to be understood more frequently through sectoral perspectives, in line with each study's focus.

This tendency gives rise to at least four conceptual limitations that still leave room for further academic development. Firstly, the majority of studies treat digitalisation, internationalisation, governance, innovation, or the quality of human resources as standalone variables, meaning that the reciprocal relationships between the various dimensions of transformation have not yet been comprehensively explained. Secondly, previous studies have tended to focus more on evaluating policy implementation or measuring institutional performance indicators rather than explaining the conceptual mechanisms linking policy changes to higher education institutions' ability to generate knowledge-based competitive advantage. Thirdly, the majority of studies have been conducted in developed countries or at high-capacity universities. Consequently, the resulting conceptual frameworks are not yet fully capable of explaining the characteristics of developing countries, such as Indonesia, which face challenges including institutional capacity gaps, resource disparities, and governance complexities. Fourthly, global changes driven by the acceleration of generative artificial intelligence, post-pandemic digital transformation, the rise of science diplomacy, and shifts in patterns of international research collaboration have not yet been fully integrated into existing models for analysing higher education transformation. These conditions indicate that developments in the literature remain dominated by fragmentary approaches, and thus have not yet yielded an understanding capable of explaining the transformation of higher education as an interconnected system within global knowledge competition.

This research gap is becoming increasingly significant because knowledge competition in the contemporary era is no longer determined by the success of a single policy or institutional dimension, but rather by the ability to build synergies among elements across the entire higher education system. Policy transformation will not yield competitiveness unless it is accompanied by changes in governance, academic culture, human resource capacity, research quality, internationalisation, and the ability to integrate digital technology into the entire knowledge production process. Conversely, increased publication output or expanded international collaboration will not yield sustainable impact unless supported by institutional reforms that create an adaptive innovation ecosystem. On this basis, this study views the transformation of Indonesian higher education as a systemic process shaped by the dynamic

interaction among policy, governance, internationalisation, innovation, the quality of human resources, and technological developments in building national knowledge-production capacity.

This study aims to critically analyse the transformation of Indonesian higher education in the context of global knowledge competition by developing a conceptual synthesis that integrates the dimensions of policy, governance, internationalisation, innovation, human resource quality, and academic competitiveness into a single, comprehensive analytical framework. Academically, this study is expected to advance theoretical development regarding the transformation of higher education by offering a more systemic perspective on the interrelationships between the dimensions of institutional change within the global knowledge ecosystem. In practical terms, the findings of this study are expected to serve as a scientific foundation for the formulation of more adaptive higher education policies, to strengthen strategies for research and innovation capacity building, to expand substantive internationalisation, and to support the formation of an Indonesian higher education ecosystem capable of producing knowledge, innovation and competitive human resources within the context of constantly changing global dynamics.

B. Method

This study employs a qualitative approach with a library-based research design to develop an in-depth conceptual understanding of the transformation of Indonesian higher education in the context of global knowledge competition through a critical analysis of academic sources, without collecting field data. The focus of the study encompasses policy transformation, governance, internationalisation, innovation, the quality of human resources, and the competitiveness of higher education, which are operationally defined as strategic and systematic changes in the delivery of higher education to strengthen academic capacity, research productivity, innovation, international collaboration, and global recognition. The units of analysis consist of scholarly documents, including articles in reputable journals, academic books, conference proceedings, reports from international organisations, regulations, and policy documents, purposively selected for their relevance, credibility, and recency to the study's focus (Der Tambile et al., 2026).

The research instruments are supported by literature review guidelines and a data extraction matrix, which were systematically developed to identify concepts, themes, indicators and inter-conceptual relationships. The validity of the findings is ensured through triangulation of sources, thoroughness in the literature review, and critical evaluation of the consistency of arguments and the authority of references (Zheng et al., 2026). Data collection was carried out in stages through the identification, selection, evaluation, classification, extraction and synthesis of the literature, whilst data analysis applied content analysis combined with thematic analysis through a process of data reduction, categorisation, interpretation and inductive conclusion-drawing, thereby producing a comprehensive, reflective and argumentative conceptual framework regarding Indonesia's higher education transformation strategies to strengthen its competitive position within the global knowledge ecosystem.

C. Results and Discussion

1. Repositioning the University as a Knowledge Ecosystem Based on Local and Global Integration

The repositioning of universities as knowledge ecosystems is a logical consequence of fundamental changes in the global economic landscape, which increasingly relies on the production, distribution and utilisation of knowledge as the primary source of competitive advantage. Within the knowledge-based economic paradigm, universities are no longer positioned as institutions focused solely on delivering formal education and the internal

development of academic disciplines, but rather as strategic hubs connecting various actors within the innovation ecosystem, including government, the business sector, society, research institutions, the international community, and developments in digital technology.

This shift indicates that a university's capacity is no longer measured solely by the number of graduates or the productivity of scientific publications, but by its ability to integrate the functions of education, research, innovation, community engagement and cross-sectoral collaboration in generating knowledge that possesses scientific value whilst also delivering social, economic and policy impacts. This perspective also addresses the limitations of previous studies, which tended to view the transformation of higher education in a fragmented manner, examining internationalisation, digitalisation, or governance reform in isolation, without explaining how these dimensions collectively form an interdependent knowledge system that operates simultaneously.

In the context of global developments, the concept of the knowledge ecosystem has evolved beyond the traditional university paradigm, which positions higher education institutions as relatively closed producers of knowledge (Angrisani et al., 2023). This model is shifting towards an open knowledge ecosystem, in which knowledge creation occurs through multidirectional interactions among stakeholders with different capacities, interests, and resources. Experience in various countries shows that universities with a global reputation do not achieve their excellence solely through internal academic quality, but through their ability to build extensive collaborative networks, link research to industry needs, support evidence-based policy-making, strengthen social innovation, and create effective knowledge transfer mechanisms.

This approach derives its conceptual legitimacy from the development of the Triple Helix, Quadruple Helix, and Quintuple Helix theories, which position universities as central actors in building collaborative relationships among government, industry, society, and the environment. However, recent developments indicate that these relationships are no longer linear, as assumed in the initial models. Digital transformation, artificial intelligence, open science, big data and the increasing mobility of scientists have transformed the mechanisms of knowledge production, making them more open, decentralised and transnational (Zhu et al., 2025). Consequently, the repositioning of universities cannot be adequately understood merely through the expansion of institutional partnerships. Rather, it must be directed towards building adaptive capacities that enable the integration of diverse knowledge sources to generate innovations relevant to local needs whilst remaining globally competitive.

From a comparative perspective, universities in North America and Western Europe have successfully established themselves as hubs of the knowledge ecosystem by strengthening research culture, competitive funding, academic internationalisation, and sustained multidisciplinary collaboration (Rosienkiewicz et al., 2024; Zenkienė & Leišytė, 2024). In East Asia, countries such as South Korea, Singapore, Japan and China have demonstrated a relatively different model of transformation by positioning universities as strategic instruments of national development through long-term investment in research, the development of priority technologies, the enhancement of human resource capacity, and strong synergies between the state, industry and higher education institutions (Fang et al., 2023; Zhuang et al., 2025). Meanwhile, several developing countries are beginning to adopt these models whilst taking into account their respective social, cultural, economic and institutional characteristics. This comparison demonstrates that there is no single universal model for university transformation. Indeed, each country's success is determined by its ability to integrate global academic standards with national development needs, societal characteristics and local potential.

These findings have important implications for Indonesia. Until now, the transformation of higher education has often been perceived as an effort to improve the standing of higher education institutions in international rankings by increasing scientific

publications, accreditation, or international collaborations. Whilst these indicators remain important measures of institutional quality, an approach overly focused on global indicators risks neglecting the strategic role of universities as generators of solutions to various national development challenges. Universities are not only required to meet international standards. Still, they must also be capable of addressing local challenges such as regional development disparities, regional economic transformation, climate change, food security, public health, the digitalisation of government, the strengthening of national industry, and community empowerment. Therefore, the success of university transformation cannot be measured solely by the achievement of international academic indicators but also by its ability to link global knowledge with the real needs of the Indonesian people.

The integration of local and global dimensions forms the cornerstone of repositioning universities as knowledge ecosystems. Local knowledge can no longer be treated merely as an object to be documented or preserved, but rather as a source of innovation that holds scientific value when integrated with modern research methodologies, digital technology and international academic networks (Ramli et al., 2025). Conversely, global knowledge cannot be adopted mechanically without taking into account social, cultural and institutional characteristics, as well as national development needs. This integration results in a reciprocal relationship, whereby local knowledge gains validation, enrichment and dissemination through global networks, whilst global knowledge gains contextual relevance through adaptation to the needs of local communities. Thus, the university serves as an epistemic space that brings together various traditions of knowledge to produce innovations that are more inclusive, contextual and competitive.

This repositioning simultaneously addresses the conceptual gaps identified in previous studies. Previous studies have generally discussed internationalisation, digitalisation, governance, innovation, or human resource development as standalone dimensions. Consequently, the transformation of higher education is often understood as an accumulation of various reform programmes without explaining the mechanisms of interaction between the elements that shape a university's capacity to generate knowledge-based excellence. This discussion demonstrates that all these dimensions are interdependent components within a single ecosystem. Governance reform is a prerequisite for strengthening a research culture. A research culture forms the basis for improving the quality of innovation; innovation expands international networks. International networks enrich academic capacity, whilst the entire process is reinforced by digital transformation and human resource development (Mohamed Hashim et al., 2022).

At the same time, developments in artificial intelligence, machine learning, data analytics and digital infrastructure have fundamentally altered the nature of knowledge production (Karimullah, 2023). Knowledge is no longer generated through linear, exclusive processes but rather through multidisciplinary collaboration that occurs simultaneously across global networks. Universities are required to have the capacity to manage scientific data, utilise digital technology ethically, develop adaptive learning, accelerate cross-national research collaboration, and establish governance structures that can anticipate technological change on an ongoing basis. Therefore, digital transformation cannot be understood merely as the digitisation of administration or online learning, but as a paradigm shift in the entire process of knowledge production, validation, distribution and utilisation.

For Indonesia, strengthening universities as knowledge ecosystems requires a more systemic shift in policy orientation (Ramli et al., 2025). Higher education policy must not merely focus on improving institutional performance indicators. Still, it must build an ecosystem that enables sustained interaction between higher education institutions, government, industry, civil society, the international community, and digital technology. Such reforms encompass strengthening adaptive governance, increasing investment in research, developing human resources, establishing substantive international collaborative networks,

expanding open science, strengthening community-driven innovation, and integrating research findings into the public policy-making process. Such an approach enables universities to carry out their academic functions more strategically as institutions that not only generate knowledge, but also manage, transform and disseminate knowledge to support national development whilst strengthening Indonesia's position in global competition.

2. Digital Transformation and Artificial Intelligence in the Adaptive Learning Ecosystem

Digital transformation and the development of artificial intelligence (AI) have shifted the paradigm of higher education delivery from a linear learning system towards an adaptive learning ecosystem that places data, technology, and human interaction at the heart of the knowledge-creation process. This change is no longer limited to the digitisation of academic administration or the use of learning management systems. Still, it has evolved into a comprehensive transformation of curriculum design, learning strategies, assessment, research, academic services, and even data-driven institutional decision-making. From a knowledge economy perspective, artificial intelligence functions as an enabling technology that accelerates the production, distribution and personalisation of knowledge, thereby enabling higher education institutions to develop learning systems that are more flexible, responsive and tailored to individual needs (Kuleto et al., 2021).

This shift also demonstrates that the competitiveness of higher education is no longer determined solely by the availability of digital infrastructure, but by an institution's ability to integrate smart technologies with academic capacity, governance, and a scientific culture that supports sustainable innovation. Global developments indicate that digital transformation in higher education has entered a different phase than a decade ago (Akour & Alenezi, 2022). Whilst first-generation digitalisation focused on providing information technology infrastructure and online learning, the next generation of digital transformation is more directed towards the utilisation of artificial intelligence, learning analytics, cloud computing, big data, semantic technologies and predictive analytics to build learning systems that are adaptive to the characteristics, needs and development of each learner. In this model, students are no longer positioned as passive recipients of learning material, but rather as learners who receive a personalised academic experience based on their learning achievements, learning styles, level of competence, and professional development needs.

Various countries have developed distinct approaches to integrating digital transformation and artificial intelligence into higher education, aligned with the characteristics of their respective national systems (Syafie et al., 2026; Wahyudi et al., 2025). The United States positions universities as centres of technological innovation by integrating artificial intelligence into the learning process, research, technology development, and collaboration with the digital industry. This approach is supported by a strong culture of innovation, substantial investment in research, and an academic entrepreneurial ecosystem that enables rapid technological development. Conversely, European countries tend to develop digital transformation through an approach that is more focused on governance, ethics, data protection, and the development of human-centred artificial intelligence. Consequently, the use of artificial intelligence in European higher education institutions is not only aimed at improving the efficiency of learning, but also at ensuring that technology remains aligned with the principles of transparency, accountability, inclusivity and the protection of students' rights.

In East Asia, the digital transformation of higher education is progressing through national strategies that are highly integrated with innovation-based economic development policies. Singapore is developing the 'Smart Nation' concept, which positions universities as laboratories for digital innovation through the integration of AI, data analytics, virtual

learning, and close collaboration with the global technology industry (Foong et al., 2024). South Korea is utilising its national digital infrastructure to build 'smart learning' systems that connect universities, research centres, industry and government within a single, fully integrated digital ecosystem (Brings et al., 2026). Japan is driving the transformation of higher education through the Society 5.0 framework, which positions artificial intelligence as a tool to enhance human capabilities rather than replace them, ensuring that learning remains focused on creativity, complex problem-solving and multidisciplinary collaboration (Luu et al., 2026). Meanwhile, China is demonstrating a model of transformation underpinned by substantial investment in digital infrastructure, the development of AI research centres, and the nationwide integration of smart technologies into learning, research, and university management (Demidova, 2026). This comparison demonstrates that the success of digital transformation is determined not only by the level of technology adoption, but also by the alignment between national strategy, institutional capacity, academic culture, and long-term investment in human resource development.

In contrast to these countries, Indonesia remains in a transitional phase towards a fully digitised adaptive learning ecosystem. Various higher education institutions have developed learning management systems, hybrid learning, digital libraries, academic information systems, and artificial intelligence-based learning platforms (Harahap et al., 2025; Miranda, 2025). Some institutions have also begun utilising AI to support the development of learning materials, the analysis of research data, academic administrative services, chatbot development, and academic support for students (Suhardi, 2025). However, the maturity of these implementations varies considerably. Most of the transformation remains focused on the digitisation of services. It has not yet fully evolved into adaptive learning that can utilise real-time data to identify students' learning needs, personalise learning materials, and support analytics-based academic decision-making. This situation indicates that the digital transformation of Indonesian higher education still faces challenges in integrating technology, curriculum, pedagogy, and institutional governance.

These differences are influenced not only by technological capacity but also by the readiness of institutions to foster a digital academic culture. Experience from various countries shows that successful digital transformation is always preceded by a shift in the learning paradigm, the enhancement of lecturers' competencies, the strengthening of students' digital literacy, the establishment of sound data governance, and the development of institutional policies that support sustainable innovation. Conversely, transformation that focuses solely on providing technological tools tends to result in administrative digitalisation without bringing about substantive changes in the quality of learning. Therefore, the main challenge for Indonesian higher education is not merely to expand the use of artificial intelligence, but to build institutional capacity so that this technology can create learning experiences that are more personalised, collaborative, reflective, and oriented towards developing 21st-century competencies.

In the context of adaptive learning, artificial intelligence offers immense potential for enhancing the quality of the educational process. AI enables the analysis of individual students' learning patterns, allowing the system to recommend learning materials, methods and levels of difficulty tailored to each learner's needs (Murtaza et al., 2022). This technology also facilitates the early identification of students at risk of academic difficulties, enabling lecturers to provide faster and more targeted interventions. Furthermore, AI can support the development of authentic assessments, provide immediate feedback, facilitate simulation-based learning, and expand access to global learning resources through machine translation, intelligent literature searches, and data-driven information analysis. However, the use of artificial intelligence also presents academic, ethical and institutional challenges that cannot be ignored.

Various countries have highlighted that the use of AI in higher education raises concerns about academic integrity, data security, privacy, algorithmic transparency, systemic bias, and changes to lecturers' roles in the learning process (Maleki, 2026). Higher education institutions are no longer merely tasked with teaching how to use technology. Still, they must also build students' capacity to use AI responsibly, critically, and in accordance with the principles of academic ethics. In the Indonesian context, these challenges are becoming increasingly significant because the digital literacy gap, regional disparities in infrastructure, and the uneven capacity of lecturers to utilise technology have the potential to widen the gap in the quality of higher education if digital transformation is not accompanied by strategies to strengthen human resources and adequate governance.

The direction of Indonesia's higher education transformation needs to shift from a technology-adoption paradigm to an intelligent knowledge ecosystem paradigm. Higher education institutions must not only integrate artificial intelligence into learning activities. Still, they must also develop an ethical framework for AI governance, enhance the digital competencies of lecturers and students, strengthen the interoperability of academic data, expand international collaboration in the development of educational technology, and develop curricula that integrate digital literacy, data literacy, AI literacy, creativity, critical thinking and the ability to solve complex problems. Through this approach, digital transformation will not only yield operational efficiencies but also shape Indonesian universities into adaptive learning ecosystems that sustainably link local knowledge with global developments in science and technology. This perspective emphasises that artificial intelligence should be positioned as a strategic tool to enhance the quality of learning, broaden access to knowledge, and boost the competitiveness of Indonesian higher education in the global knowledge arena, without neglecting the ethical values, inclusivity and academic responsibility that form the cornerstone of higher education provision.

3. Restructuring Higher Education Governance Based on Outcomes and Global Competitiveness

The restructuring of higher education governance is a fundamental prerequisite for the successful transformation of universities amid global competition for knowledge. Changes in the international higher education landscape indicate that a university's competitiveness is no longer determined solely by administrative capacity or regulatory compliance, but rather by its governance's ability to foster an institutional environment that supports innovation, collaboration, organisational flexibility, and measurable societal impact. This reflects a paradigm shift from rule-based governance towards outcome-based governance. This model prioritises academic achievement, research quality, the relevance of innovation, contributions to development, and international reputation as the primary focus of higher education provision. From this perspective, governance is no longer understood as a set of bureaucratic mechanisms for controlling university activities, but rather as an institutional system that integrates strategy, leadership, resources, collaborative networks, and accountability mechanisms to generate public value through education, research, and innovation.

This transformation is evolving in tandem with the increasing complexity of the strategic environment for higher education. The globalisation of knowledge, the rapid development of digital technology, international academic mobility, competition to attract the best talent, and growing demands for the commercialisation of research outcomes have transformed universities into organisations that must adapt rapidly to external changes. Under such conditions, a governance model characterised by hierarchy, procedural rigidity, and a focus on administrative compliance is becoming increasingly inadequate, as it tends to slow decision-making, restrict organisational innovation, and reduce the institution's capacity to respond to global dynamics (Suwarni et al., 2024). Conversely, several highly competitive universities demonstrate that institutional flexibility, strategic leadership, evidence-based

decision-making, and outcome-oriented evaluation systems are more decisive factors than a high level of formal regulation.

International experience shows that countries with competitive higher education systems share relatively similar governance characteristics, even though these have been developed through different institutional approaches. The United States has developed a governance model that grants universities extensive academic and institutional autonomy, thereby enabling them to design development strategies aligned with their respective competitive strengths (Leisyte & Dee, 2012). Accountability mechanisms focus more on measuring academic outcomes, research quality, innovation success, and contributions to society than on compliance with administrative procedures. Conversely, European countries have developed a 'steering at a distance' approach, whereby the government continues to set the strategic direction through a national policy framework, whilst granting universities the freedom to determine their operational strategies, provided they meet agreed performance indicators (Pereira-Puga & Sanz-Menéndez, 2024). This approach strikes a balance between autonomy, accountability and public responsibility, ensuring that universities have sufficient scope to innovate without losing their legitimacy as public institutions.

In East Asia, governance transformation is taking place through a model that is more closely integrated with national development strategies. Singapore has developed a higher education governance system that positions universities as strategic partners of the state in building an innovation-based economy (Tang, 2022). The government sets a long-term development vision, whilst universities are granted a high degree of flexibility in academic management, human resource development, international collaboration and the strengthening of research capacity. South Korea demonstrates a similar approach through substantial investment in the development of research universities, a performance-based funding system, and evaluations that emphasise research outputs, innovation, and industry collaboration (Shin et al., 2023). Meanwhile, Finland positions university governance as a mechanism to strengthen academic creativity by streamlining bureaucracy, fostering collaborative leadership, and integrating education, research, and innovation (Holmén, 2022). These various experiences demonstrate that the success of higher education governance does not depend on a specific institutional form, but on the system's ability to strike a balance between institutional autonomy, public accountability, organisational flexibility and a results-oriented approach.

In the Indonesian context, reforms to higher education governance have seen significant progress through increased university autonomy, regulatory reform, the digitalisation of academic services, and the strengthening of quality assurance systems (Mu'alimin, 2026)vv. However, these transformations still exhibit a predominant focus on meeting administrative indicators rather than achieving outcomes with broad impact on society and national development. Various evaluation mechanisms still place a heavy emphasis on compliance with procedural standards, the completeness of documentation, and the achievement of quantitative indicators, whilst the measurement of the quality of innovation, the impact of research on public policy, contributions to regional development, and the ability to generate solutions to national issues have not received proportionate attention. Consequently, universities are often more driven to meet administrative targets than to build academic capacity that genuinely brings about institutional transformation and enhances global competitiveness.

This situation indicates that the main challenge facing Indonesian higher education does not lie in a lack of regulation, but in the need for a paradigm shift in governance. The compliance-based governance approach needs to be restructured into outcome-based governance that prioritises academic and social impact as the primary measures of an institution's success. Under this paradigm, performance indicators no longer stop at the number of publications, accreditations, or the volume of international collaborations, but are

expanded to include the quality of research, contributions to national innovation, the level of adoption of research outcomes by industry and government, the success in producing graduates who are adaptable to changes in the global labour market, and the university's ability to strengthen sustainable development.

This restructuring of governance also demands changes to the university leadership system. In an increasingly complex environment, academic leadership can no longer rely solely on administrative capacity. It must be able to act as a strategic leader who shapes the institutional vision, integrates cross-disciplinary resources, fosters a culture of innovation, and develops national and international collaborative networks. The experience of leading universities shows that adaptive leadership can create an organisational culture that supports creativity, continuous learning, evidence-based decision-making, and the courage to undertake institutional experimentation. Therefore, strengthening leadership capacity is an integral part of higher education governance reform in Indonesia.

In addition to leadership, the restructuring of governance also requires a transformation of data management and decision-making systems. Globally competitive universities are increasingly relying on evidence-based governance through big data, institutional analytics, and artificial intelligence to support strategic planning, performance evaluation, risk management, and the development of academic policy (Souli & Pierrakeas, 2025). This approach enables institutions to identify trends in student development, research productivity, learning effectiveness, future skills requirements, and opportunities for international collaboration with greater accuracy. In the Indonesian context, the use of data remains largely administrative and fragmented (Bernot et al., 2024). Consequently, it has not yet been fully utilised as a strategic tool for building institutional excellence. Therefore, the restructuring of governance must be directed towards developing an interoperable information system, comprehensive institutional analytics, and a culture of data-driven decision-making that can sustainably improve the quality of academic policy.

The restructuring of Indonesia's higher education governance should be directed towards developing an adaptive, outcome-based governance model that combines institutional autonomy, public accountability, strategic leadership, data-driven decision-making, cross-sectoral collaboration, and impact-based evaluation (Karimullah et al., 2023; Mahrus & Karimullah, 2022). This model enables universities not only to meet national and international quality standards, but also to generate knowledge, innovation and human capital capable of addressing Indonesia's development needs whilst competing within the global knowledge ecosystem. Thus, governance transformation is no longer understood as administrative reform but rather as a process of institutional reconstruction that strengthens universities' capacity to sustainably create scientific, social, and economic value. This perspective broadens the discourse on higher education governance by positioning it as the cornerstone for creating universities that are outcome-oriented, adaptable to global change, and possess sustainable international competitiveness.

D. Conclusion

The transformation of Indonesian higher education within the context of global knowledge competition must be understood as a systemic process that integrates the repositioning of universities as knowledge ecosystems, the utilisation of digital transformation and artificial intelligence in adaptive learning, and the reconstruction of governance based on outcomes and global competitiveness. This synthesis addresses the limitations of previous studies, which tended to treat the dimensions of governance, internationalisation, technology, innovation, and human resource development in isolation, by demonstrating that the competitiveness of higher education is shaped by the dynamic interconnections among these elements within a single adaptive institutional ecosystem. Conceptually, this study reinforces the perspective of higher education transformation through the integration of the logic of the

knowledge ecosystem, adaptive governance, and artificial intelligence-based learning within the context of developing countries.

In practical and policy terms, the findings point to the need to strengthen accountable autonomy, data-driven governance, digital capacity, substantive international collaboration, and a performance orientation that assesses academic, social and innovative impact, rather than merely administrative compliance. However, as the study is based on library research, the conclusions remain conceptual and have not yet been empirically tested for variations in capacity across higher education institutions, causal relationships between dimensions, or the effectiveness of the model in different institutional contexts. Further research should therefore test this framework through cross-national comparative studies, mixed-methods approaches, and longitudinal analyses to assess its validity, dynamics, and the institutional conditions that determine its success. Consequently, the strategic position of Indonesian higher education in global competition does not depend primarily on the ability to replicate international standards, but on the capacity of universities to integrate local resources, technology, governance and global knowledge networks into sources of academic excellence, innovation and sustainable public value.

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References

- Akour, M., & Alenezi, M. (2022). The future of higher education in the era of digital transformation. *Education Sciences*, 12(11), 784. <https://doi.org/10.3390/educsci12110784>
- Angrisani, M., Cannavacciuolo, L., & Rippa, P. (2023). Framing the main patterns of an academic innovation ecosystem. Evidence from a knowledge-intensive case study. *International Journal of Entrepreneurial Behavior & Research*, 29(11), 109-131. <https://doi.org/10.1108/IJEBr-12-2022-1088>
- Arianto, F., Sumarno, A., Setyaedhi, H. S., Shofiana, F. R., & Hanif, M. (2026). Deep digital learning (DDL) model effect on higher education critical thinking and problem-solving skills: a quasi-experimental study. *Jurnal Eduscience*, 13(1), 39-50. <https://doi.org/10.36987/jes.v13i1.8272>
- Bernot, A., Tjondronegoro, D., Rifai, B., Hasan, R., Liew, A. W.-C., Verhelst, T., & Tiwari, M. (2024). Institutional dimensions in open government data: A deep dive into Indonesia's Satu Data initiative and its implications for developing countries. *Public Performance & Management Review*, 47(6), 1399-1429. <https://doi.org/10.1080/15309576.2024.2377609>
- Brilyanti, F. A. (2025). Strategy for internationalizing Indonesian higher education institutions to enhance global competitiveness. *The Journal of Indonesia Sustainable Development Planning*, 6(2), 281-296. <https://doi.org/10.46456/jisdep.v6i2.693>
- Brings, C., Theis, D., & Park, J. H. (2026). Digital Literacy and AI Textbooks: South Korea's Approach and Its Relevance for Germany. In *Digital Education and Innovation: Perspectives on Governance, Technologies and Competencies for the Future of Learning* (pp. 193-221). Springer. https://doi.org/10.1007/978-3-032-26816-7_7
- Demidova, S. E. (2026). Intellectual Education as the Basis of Technological Sovereignty: Lessons from Chinese Model in the Era of Digital Transformation. In *Digital Transformation: What Kind of Smart Life do we have today? Volume 1* (pp. 273-286). Springer. https://doi.org/10.1007/978-3-032-20582-7_19
- Der Tambile, E., Fielmua, N., & Ekuban, C. A. A. (2026). A bibliometric and systematic review of trends, gaps, and future directions in environmental sustainability research in

- Ghana. *Discover Environment*, 4(1), 173. <https://doi.org/10.1007/s44274-026-00703-6>
- Fang, B., Zhang, P., & Kim, S. (2023). National human resource development in China: government-industry-university relations and roles. *European Journal of Training and Development*, 47(1-2), 183-202. <https://doi.org/10.1108/EJTD-07-2021-0110>
- Foong, Y. P., Pidani, R., Sithira Vadivel, V., & Dongyue, Y. (2024). Singapore smart nation: journey into a new digital landscape for higher education. In *Emerging technologies in business: Innovation strategies for competitive advantage* (pp. 281-304). Springer. https://doi.org/10.1007/978-981-97-2211-2_13
- Harahap, F. S., Ramadhan, I., Suhailah, S. C., & Dewiyana, H. (2025). Comparison of the library Information System Implementation based on Artificial Intelligence at the Universitas Pendidikan Indonesia (UPI) and UIN Syarif Hidayatullah Jakarta. *TADWIN: Jurnal Ilmu Perpustakaan Dan Informasi*, 6(2), 227-237. <https://doi.org/10.19109/tadwin.v6i2.29788>
- Holmén, J. (2022). The autonomy of higher education in Finland and Sweden: Global management trends meet national political culture and governance models. *Comparative Education*, 58(2), 147-163. <https://doi.org/10.1080/03050068.2021.2018826>
- Karimullah, S. S. (2023). The Importance of Family Education in Early Detection of Mental Health Disorders in Children. *Jurnal Al-Fikrah*, 12(2), 159-175. <https://doi.org/10.54621/jiaf.v12i2.667>
- Karimullah, S. S., Amin, M., & Munawwarah, U. D. (2022). Strengthening Spiritual Education Based on the Qur'ān in Building Character in the Digital Age. *Devotion Journal of Community Service*, 3(14), 2785-2794. <https://doi.org/10.36418/dev.v3i14.316>
- Karimullah, S. S., Ghani, A., Nuruzzahri, N., & Diana, D. (2025). The Influence of Religious Education in Muslim Families on Understanding Peace and Tolerance. *Belajea: Jurnal Pendidikan Islam*, 10(1), 67-86. <https://doi.org/10.29240/belajea.v10i1.10949>
- Karimullah, S. S., Wati, T. P., Najib, A., & Wahyudi, W. (2023). Iksan Kamil Sahri's Perspective on Dualism of the Education System in Indonesia. *Devotion Journal of Community Service*, 4(3), 737-748. <https://doi.org/10.36418/devotion.v4i3.422>
- Kuleto, V., Ilić, M., Dumangiu, M., Ranković, M., Martins, O. M. D., Păun, D., & Mihoreanu, L. (2021). Exploring opportunities and challenges of artificial intelligence and machine learning in higher education institutions. *Sustainability*, 13(18), 10424. <https://doi.org/10.3390/su131810424>
- Leisyte, L., & Dee, J. R. (2012). Understanding academic work in a changing institutional environment: Faculty autonomy, productivity, and identity in Europe and the United States. In *Higher Education: Handbook of Theory and Research: Volume 27* (pp. 123-206). Springer. https://doi.org/10.1007/978-94-007-2950-6_3
- Luu, P. T., Ho, M., Nguyen, H. T., Nguyen, D., Le, N. B., & Pham, H. (2026). Between Society 5.0 and Educational Traditions: Exploring Cultural and Philosophical Misalignment in Japan's Integration of Generative AI. *European Journal of Education*, 61(1), e70487. <https://doi.org/10.1111/ejed.70487>
- Mahrus, M., & Karimullah, S. S. (2022). Analysis of Educational Policy in the Framework of Learning Efficiency and Effectiveness. *FIKROTUNA: Jurnal Pendidikan Dan Manajemen Islam*, 16(02), 1-17. <https://doi.org/10.32806/jf.v16i02.6179>
- Maleki, A. (2026). Rethinking ethical academic integrity ecosystems in higher education in the age of artificial intelligence. *Discover Artificial Intelligence*, 6(1), 145. <https://doi.org/10.1007/s44163-026-00887-z>
- Marchant-Pérez, P., & Ferreira, J. J. (2025). Integrating historical approaches of university ecosystems: reviewing the literature streams and future directions. *Management Review Quarterly*, 75(4), 3555-3614. <https://doi.org/10.1007/s11301-024-00467-4>
- Miranda, E. (2025). A Systematic Review Of Artificial Intelligence Integration In Digital Learning For Higher Education: Technologies, Personalisation, And Implementation

- Challenges. 2025 11th International HCI and UX Conference in Indonesia (CHIuXiD), 1–6. <https://doi.org/10.1109/CHIuXiD68326.2025.11323807>
- Mohamed Hashim, M. A., Tlemsani, I., & Matthews, R. (2022). Higher education strategy in digital transformation. *Education and Information Technologies*, 27(3), 3171–3195. <https://doi.org/10.1007/s10639-021-10739-1>
- Mu'alimin, M. (2026). Rethinking quality management in higher education: experiences from Indonesia. *Quality Assurance in Education*, 34(3), 468–482. <https://doi.org/10.1108/QAE-07-2025-0223>
- Murtaza, M., Ahmed, Y., Shamsi, J. A., Sherwani, F., & Usman, M. (2022). AI-based personalised e-learning systems: Issues, challenges, and solutions. *IEEE Access*, 10, 81323–81342. <https://doi.org/10.1109/ACCESS.2022.3193938>
- Pereira-Puga, M., & Sanz-Menéndez, L. (2024). Steering at a distance: research centre funding schemes as instruments for university change. *Science and Public Policy*, 51(4), 643–653. <https://doi.org/10.1093/scipol/scae005>
- Rachman, A. A., Heryadi, R. D., Rachman, J. B., & Yani, Y. M. (2024). Challenges and opportunities in higher education diplomacy of World Class Universities in Indonesia: analysing the network environment of public diplomacy. *Cogent Social Sciences*, 10(1), 2384537. <https://doi.org/10.1080/23311886.2024.2384537>
- Ramli, R., Razali, R., Gadeng, A. N., Diana, N., & Hariadi, J. (2025). Integrating local knowledge into higher education: A qualitative study of curriculum innovation in Aceh, Indonesia. *Education Sciences*, 15(9), 1214. <https://doi.org/10.3390/educsci15091214>
- Rosienkiewicz, M., Helman, J., Cholewa, M., Molasy, M., Górecka, A., Kohen-Vacs, D., Winokur, M., Amador Nelke, S., Levi, A., & Gómez-González, J. F. (2024). Enhancing technology-focused entrepreneurship in higher education institutions ecosystem: Implementing innovation models in international projects. *Education Sciences*, 14(7), 797. <https://doi.org/10.3390/educsci14070797>
- Shin, J. C., Jung, H., & Lee, S. J. (2023). Performance-based research funding and its impacts on academics' publication patterns in South Korea. *Higher Education Policy*, 36(1), 144–163. <https://doi.org/10.1057/s41307-021-00245-x>
- Sianipar, A., & Angelia, W. (2025). AI in Education and Online Learning-Educational Leadership for Human-Centred Digital and Artificial Intelligence Transformation. *Perspektif Ilmu Pendidikan*, 39(2), 174–186. <https://doi.org/10.21009/PIP.392.10>
- Souli, S. P., & Pierrakeas, C. (2025). Contemporary trends in university administration with the integration of digital/new technologies. *Administrative Sciences*, 15(11), 437. <https://doi.org/10.3390/admsci15110437>
- Suhardi, M. (2025). Optimizing educational management with artificial intelligence in Indonesian higher education: A qualitative exploration. *Journal of Educational Management and Instruction (JEMIN)*, 5(2), 265–280. <https://doi.org/10.22515/jemin.v5i2.11046>
- Susilawati, S., Supriyatno, T., Yasin, A. F., Chakim, A., Hani'ah, Z., Putri, C. A., & Sabri, A. (2025). Educational technology-based strategies for the internationalization of Islamic higher education in Indonesia and Brunei Darussalam. *Nazhruna: Jurnal Pendidikan Islam*, 8(2), 1–18. <https://doi.org/10.31538/nzh.v8i2.63>
- Suwarni, S., Karimullah, S. S., Kaniah, K., Amanat, T., Safar, M., & Tjahyadi, I. (2024). Inclusive Sexual Education: Integrating Gender Approaches in Learning. *AL-ISHLAH: Jurnal Pendidikan*, 16(1), 416–427. <https://doi.org/10.35445/alishlah.v16i1.4690>
- Syafie, A., Ilyasovna, M., & Laksmi, N. D. (2026). Character Education in the Shadow of Global Competition. *Jurnal Pelita Raya*, 2(1), 30–40. <https://doi.org/10.65586/jpr.v2i1.62>
- Tang, H. H. (2022). The strategic role of world-class universities in regional innovation system: China's Greater Bay Area and Hong Kong's academic profession. *Asian Education and*

- Development Studies*, 11(1), 7-22. <https://doi.org/10.1108/AEDS-10-2019-0163>
- Wahyudi, Mahrus, Kurniyadi, Munawwarah, U. D., & Khoiruddin. (2025). Carl Rogers' Humanistic Approach in Character Education in Pesantren. *Jurnal Pelita Raya*, 1(1), 31-45. <https://journal.mahkotascience.org/index.php/jpr/article/view/10>
- Waluyo, B. (2026). Governance Transformation in Indonesian Islamic Higher Education: Autonomy, Institutional Reform and Global Competitiveness. *Muslim Education Review*, 5(1), 165-202. <https://doi.org/10.56529/mer.v5i1.495>
- Wati, T. P., Naimah, N., Karimullah, S. S., & Anggita, I. S. (2022). Consistency of Balinese Family Education in Forming a Love of Culture From an Early Childhood. *Devotion Journal of Community Service*, 3(11), 1-126. <https://doi.org/10.36418/dev.v3i11.221>
- Welch, A., & Aziz, E. A. (2022). Higher education in Indonesia. In *International handbook on education in South East Asia* (pp. 1-30). Springer. https://doi.org/10.1007/978-981-16-8136-3_41-1
- Wirba, A. V. (2022). Transforming Cameroon into knowledge-based economy (KBE): The role of education, especially higher education. *Journal of the Knowledge Economy*, 13(2), 1542-1572. <https://doi.org/10.1007/s13132-021-00776-z>
- Zakaria, H., Fauzi, M. A., Kamarudin, D., Suki, N. M., & Kasim, M. A. (2025). The triple, quadruple, and quintuple helix models: A bibliometric analysis and research agenda. *Journal of the Knowledge Economy*, 16(4), 15491-15539. <https://doi.org/10.1007/s13132-024-02554-z>
- Zakaria, H., Fernando, Y., Kamarudin, D., & Zainuddin, Y. (2025). Uncovering new frontiers: a scientometrics investigation of synergies between the helix model and open innovation theories. *Journal of Science and Technology Policy Management*, 1-27. <https://doi.org/10.1108/JSTPM-10-2024-0415>
- Zenkienė, L., & Leišytė, L. (2024). Strengthening university capacity in regional innovation ecosystem through the participation in the European Universities initiative. *European Journal of Higher Education*, 14(sup1), 88-108. <https://doi.org/10.1080/21568235.2024.2410358>
- Zheng, S., Mu, C., & Zhou, X. (2026). Fostering Critical Thinking and Argumentative Writing in EFL Learners: A Collaborative Reading-Based Creative Writing Approach. *Thinking Skills and Creativity*, 102243. <https://doi.org/10.1016/j.tsc.2026.102243>
- Zhu, Y., Zhu, Z., Xu, W., & Zhu, Y. (2025). Cross-border higher education cooperation under the dual context of artificial intelligence and geopolitics: opportunities, challenges, and pathways. *Frontiers in Education*, 10, 1656518. <https://doi.org/10.3389/feduc.2025.1656518>
- Zhuang, T., Oh, M., & Kimura, K. (2025). Modernizing higher education with industrial forces in Asia: a comparative study of discourse of university-industry collaboration in China, Japan and Singapore: T Zhuang et al. *Asia Pacific Education Review*, 26(1), 195-210. <https://doi.org/10.1007/s12564-024-10033-y>