

Comprehensive Review and Framework for Ethical, Legal, and Socio-Technical Governance of Artificial Intelligence in Higher Education Information Systems

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Abstract

Artificial intelligence (AI) is increasingly embedded in higher education information systems, shaping decision-making across admissions, learning analytics, student support services, assessment, and institutional management. While AI-driven systems offer significant opportunities for efficiency, personalization, and data-informed governance, they also raise complex ethical, legal, and socio-technical challenges. These challenges are particularly pronounced in African higher education contexts, where historical inequalities, infrastructural constraints, and evolving regulatory frameworks intersect with rapid technological adoption. This paper presents a comprehensive review of the ethical, legal, institutional, and socio-technical dimensions of AI governance in higher education information systems. Drawing on interdisciplinary literature from information systems, higher education studies, AI ethics, and governance scholarship, the study synthesizes existing approaches and identifies critical governance gaps. Building on this synthesis, the paper proposes an integrated, multi-layered governance framework that emphasizes dynamic interactions and feedback loops across ethical principles, regulatory compliance, institutional decision-making, and system design. The framework is intended to support higher education institutions in developing adaptive, context-sensitive, and accountable AI governance structures. The paper contributes to information systems research by advancing a holistic governance model and offering practical guidance for policymakers and institutional leaders seeking to implement responsible AI in higher education, particularly within African contexts.

Keywords: Artificial Intelligence, AI Governance, Ethics, Higher Education Information Systems.

1. Introduction

Artificial intelligence (AI) has become a central component of contemporary information systems in higher education (Schmidt et al., 2025). Universities and colleges increasingly rely on AI-enabled tools for learning management systems (Zawacki-Richter & Latchem, 2018), predictive analytics (Arnold & Pistilli, 2012), automated assessment, academic advising, student retention monitoring, and administrative decision-making (Dubey & Mishra, 2024; Egwuatu, 2025). These developments reflect broader trends in digital transformation and data-driven governance within higher education institutions worldwide.

Despite their potential benefits, AI systems also introduce significant governance challenges (Egwuatu, 2025). Algorithmic bias, opaque decision-making, privacy risks, data misuse, and accountability gaps have raised concerns among scholars, policymakers, and practitioners (Aderibigbe et al., 2023; Al-Zahrani, 2024). In higher education, these concerns are amplified because AI systems influence academic trajectories, student success, and institutional legitimacy. Therefore, the governance of AI in this context extends beyond technical performance to include ethical responsibility, legal compliance, and alignment with academic values. African higher education institutions face distinct challenges in navigating AI governance (Sangwa et al., 2025). Many institutions operate within constrained resource environments, fragmented regulatory frameworks, and uneven digital infrastructure (Nosike, 2024). At the same time, AI is often introduced through externally developed platforms and third-party vendors, limiting

institutional control over system design and data practices (Ataguba et al., 2025; Deepak & Shubham, 2024). These conditions increase the risk of uncritical adoption and governance-by-default, rather than governance-by-design.

The existing literature on AI governance in higher education tends to focus on isolated dimensions, such as ethics, data protection, and technical design. There is a need for an integrated governance perspective that accounts for the socio-technical nature of AI systems and the institutional contexts in which they operate. This paper addresses this gap by offering a comprehensive review and proposing a multi-layered governance framework tailored to higher education information systems, with explicit consideration of African contexts.

2. Methodological Approach and Literature Review Strategy

This study adopts a conceptual review methodology, rather than conducting a systematic empirical meta-analysis. The paper synthesizes interdisciplinary literature to develop an integrative governance framework. The literature review draws on peer-reviewed journal articles, policy reports, and authoritative frameworks published in the fields of information systems, artificial intelligence ethics, higher education governance, data protection law, and socio-technical systems theory. Key themes guiding the review include AI governance models, ethical AI principles, institutional ICT governance, regulatory approaches to AI, and socio-technical design practices.

Special attention is given to literature addressing the Global South and African higher education contexts, including studies on digital inequality, capacity constraints, and institutional governance challenges. This approach ensures that the proposed framework is not merely abstract but grounded in the contextual realities of emerging and developing higher education systems.

3. An Integrated Governance Framework for AI in Higher Education Information Systems

3.1 Conceptual Foundations

The proposed governance framework conceptualizes AI governance in higher education information systems (HEIS) as a multi-layered socio-technical system, rather than a one-off policy or compliance checklist. Governance is understood as an ongoing institutional process that shapes, monitors, and adapts AI use in alignment with ethical norms, legal

obligations, institutional priorities, and technical realities. The framework is informed by information systems governance theory, AI ethics literature, and socio-technical systems theory, emphasizing that AI adoption affects human actors, organizational routines, and system outcomes in interconnected ways.

3.2 Conceptual Foundations

Interpret the results and compare it with earlier works. Fig. 1 illustrates the integrated governance framework for artificial intelligence in higher education information systems proposed in this study. The framework depicts AI governance as a multi-layered socio-technical system encompassing ethical, legal-regulatory, institutional, and socio-technical design layers, linked through dynamic feedback loops.



Fig. 1. Integrated Governance Framework for Ethical, Legal, Institutional, and Socio-Technical AI Governance in Higher Education Information Systems

The framework is structured around four interrelated layers: (i) Ethical Governance, (ii) Legal & Regulatory Governance, (iii) Institutional Governance, and (iv) Socio-Technical Design, connected through dynamic feedback loops that allow continuous learning and adaptation. The Institutional Governance Layer occupies the core of the framework, coordinating and reinforcing ethical, legal, and technical considerations. Each layer addresses distinct but interdependent governance responsibilities, ensuring that AI adoption is both responsible and contextually appropriate. The following section (Section 3.3) elaborates on each governance layer and explains how their dynamic interactions support adaptive, context-sensitive AI governance in higher education institutions, particularly in African contexts.

3.3 Governance Layers and Dynamic Interactions

The Ethical Governance Layer provides the normative foundation for the use of AI in higher education information systems, emphasizing

principles such as fairness, transparency, accountability, privacy protection, inclusivity, and human oversight. As AI systems increasingly influence admissions, learning analytics, academic advising, and student monitoring (Khairullah et al., 2025), ethical governance becomes essential to prevent bias, exclusion, and unaccountable automation (Cotilla Conceição & van der Stappen, 2025). African higher education contexts amplify ethical risks due to historical inequalities, uneven data quality, and persistent digital divides (Guadu et al., 2025). Ethical governance within the framework is therefore institutionalized through ethical impact assessments, participatory stakeholder engagement, and continuous monitoring of AI-driven outcomes to ensure alignment with academic values and social justice objectives.

The Legal & Regulatory Governance Layer defines the formal compliance environment for AI-enabled higher education information systems. It encompasses data protection legislation, sector-specific higher education regulations, and emerging AI governance policies. Legal governance establishes minimum standards for lawful data processing, accountability, and transparency. However, the framework recognizes that legal compliance alone is insufficient to ensure responsible AI adoption, particularly in African contexts characterized by fragmented regulation and uneven enforcement. Legal governance is therefore reinforced by ethical oversight, institutional accountability structures, and technical safeguards to address contextual risks and implementation gaps.

The Institutional Governance Layer operationalizes ethical principles and legal requirements through policies, decision-making structures, and accountability mechanisms. This layer clarifies roles and responsibilities for AI-related decisions and integrates AI oversight into existing governance bodies, such as ICT committees, academic councils, and ethics boards. In resource-constrained African universities, governance capacity can be strengthened incrementally through leadership commitment, staff training, and cross-functional coordination (Hanson & Léautier, 2011). Institutional governance ensures that AI systems are aligned with institutional missions, academic integrity, and public accountability, providing the core coordination across all layers.

The Socio-Technical Design Layer translates governance principles into technical architecture, system functionality, and human-AI interaction design. This layer emphasizes privacy-by-design, transparency-by-design, explainability, and human-in-the-loop controls for high-stakes decisions. Socio-technical governance also addresses infrastructural variability, legacy systems, and dependence on third-party AI vendors, which are common in African

higher education institutions. By embedding governance in system design, AI systems support informed human judgment rather than replacing it (Zlotnikova & Hlomani, 2025), ensuring that technical implementation reinforces ethical and institutional objectives.

4. Discussion: Implications for Higher Education Information Systems

4.1 Theoretical Implications

The framework contributes to information systems scholarship by advancing a holistic governance perspective that integrates ethical, legal, institutional, and technical dimensions. It extends socio-technical systems theory by explicitly incorporating governance feedback loops and contextual sensitivity, demonstrating how institutional structures, design choices, and normative principles co-evolve.

4.2 Governance Layers and Dynamic Interactions

For institutional leaders and policymakers, the framework provides guidance for designing AI governance structures that move beyond compliance toward responsible innovation. It highlights the importance of institutional ownership, stakeholder engagement, and adaptive governance, particularly in African higher education systems. Implementing the framework involves establishing clear decision rights, strengthening AI literacy, embedding ethical review processes, and designing systems that support human oversight.

Table 1 synthesizes key literature on AI governance in higher education information systems across ethical, legal-regulatory, institutional, and socio-technical dimensions. By mapping prior studies by application area and governance focus, the table highlights persistent fragmentation in the research, with many studies addressing isolated governance concerns and predominantly in Global North contexts. The limited integration of African higher education perspectives further underscores the need for a holistic, context-sensitive governance approach. The synthesis presented in Table 1 directly informs the development of the integrated governance framework proposed in this study.

Table 1 Literature Synthesis on AI Governance in Higher Education Information Systems

Author(s) & Year	AI Application Area	Higher Education Context	Governance Dimension	Key Insights Relevant to This Study
(Floridi et al., 2018)	General AI systems	Cross-sector (incl. education)	Ethical Governance	Proposes foundational ethical principles for AI (fairness, accountability, transparency) that inform normative governance in higher education contexts.
(Holmes et al., 2022; Mittelstadt, 2019)	Algorithmic decision-making	Public sector & education	Ethical & Legal	Highlights risks of opacity, bias, and accountability gaps, reinforcing the need for ethical oversight in AI-driven student decision systems.
(Maimela & Mbonde, 2025; Mienye et al., 2024)	AI in education systems	Global (including Africa)	Ethical & Policy Governance	Emphasizes human-centered AI, inclusivity, and capacity-building, particularly relevant to African higher education institutions.
(Slade & Prinsloo, 2013)	Learning analytics	Higher education	Ethical Governance	Demonstrates the ethical risks of student data analytics, underscoring the need for privacy protections and informed consent mechanisms.
(Selwyn, 2019)	AI in teaching and administration	Higher education	Socio-Technical Governance	Argues that AI systems reshape power relations in universities, requiring socio-technical and institutional governance approaches.
(Dwivedi et al., 2021)	AI-enabled information systems	Organizational contexts	Integrated Governance	Calls for holistic AI governance frameworks that integrate ethics, law, institutions, and system design, which directly inform this study's framework.
(Zawacki-Richter et al., 2019)	AI applications in education	Higher education	Institutional & Technical	Identifies fragmented AI adoption in universities and limited governance readiness, reinforcing the need for coordinated institutional oversight.

5. Conclusion

This paper presents a comprehensive review and an integrated governance framework for AI in higher education information systems. By foregrounding ethical responsibility, legal compliance, institutional accountability, and socio-technical design, the framework offers a practical and theoretically grounded approach to responsible AI governance. Dynamic feedback loops ensure that governance remains adaptive, responsive, and context-sensitive, particularly in African higher education environments. The framework provides a pathway for institutions to implement AI responsibly, aligning technological innovation with academic integrity, social justice, and public accountability. Future research should empirically test the framework, evaluate longitudinal outcomes, and explore comparative governance practices across diverse higher education contexts.

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