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AI as asset and liability: A dual-use dilemma in higher education and the SPARKE Framework for institutional AI governance

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Abstract

Artificial intelligence (AI) is rapidly transforming higher education by enhancing instructional processes, improving administrative efficiency, and enabling personalized learning experiences. However, it also introduces significant risks related to privacy, authorship, academic integrity, and institutional accountability. As adoption accelerates, universities face an urgent need to establish clear, campus-wide governance structures that define responsible use, protect institutional knowledge assets, and ensure ethical implementation. This study examined this dual-use dilemma through a conceptual document analysis, systematically reviewing and synthesizing institutional policies, academic literature, and global governance frameworks. These sources were compared to identify cross-framework patterns, recurring institutional gaps, and practical requirements for the responsible adoption of AI. Findings reveal weaknesses in academic integrity guidelines, data governance controls, authorship standards, literacy training, and mechanisms for monitoring AI-enabled systems. In response, this study introduces the SPARKE Framework, a six-component model that translates ethical principles into operational safeguards by integrating policy development, privacy protections, integrity rules, literacy initiatives, knowledge management processes, and enforcement mechanisms. The framework contributes to applied knowledge management by offering institutions a structured roadmap for aligning innovation with accountability. By emphasizing transparency, oversight, institutional learning, and responsible use, the SPARKE Framework provides universities with a scalable approach for managing AI across academic and administrative environments. It highlights broader implications for

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academic integrity, institutional trust, and the development of sustainable governance infrastructures that support responsible AI adoption.

Keywords: Artificial Intelligence Governance, Academic Integrity Policy, Higher Education Risk Management, Knowledge Management Frameworks, Responsible AI Adoption, Institutional Safeguards, SPARKE Framework.

Introduction

Artificial intelligence (AI) has rapidly shifted from a specialized technological tool to a central driver of change in higher education. Universities now use AI-powered systems for adaptive learning, plagiarism detection, automated grading, virtual advising, and administrative tasks. These tools provide considerable benefits, including improved learning support, increased operational efficiency, and broader access to personalized services (Fırat, 2023; George & Wooden, 2023). However, the same technologies also pose serious risks to privacy, authorship, academic honesty, cybersecurity, and institutional accountability (Cheatham et al., 2019; Özer, 2024). This creates a dual-use dilemma: AI acts as both an asset and a liability in digital higher education. While many institutions have started integrating AI into teaching and administration (Ghnemat et al., 2022; Hashim et al., 2022), policy development and ethical safeguards often lag behind implementation. Academic misconduct involving AI-generated work, ambiguous authorship, data risks, algorithmic bias, misinformation, and vendor-related vulnerabilities has emerged faster than institutional governance can adapt to. Consequently, a growing gap exists between innovation and oversight. Colleges and universities are adopting AI-driven systems without fully establishing the necessary frameworks to ensure responsible use, compliance, and protection of institutional assets (George & Wooden, 2023; Hashim et al., 2022).

While several international organizations have issued high-level ethical guidelines—including the Organization for Economic Co-operation and Development (OECD) AI Principles, the National Institute of Standards and Technology (NIST) AI Risk Management Framework (RMF), and standards from the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC)—these frameworks generally operate at the policy or national governance level. They offer foundational guidance on fairness, transparency, accountability, and trustworthiness, but they lack practical operational roadmaps for academic institutions (ISO/IEC, 2023; NIST, 2023; OECD, 2019). Additionally, much of the existing literature focuses on technical parameters, legal issues, or broad ethical principles, with limited attention to campus-wide implementation or integration with institutional knowledge management (KM) processes. This highlights the need for a governance approach that is both strategic and operational. AI in higher education involves more than just technology—it encompasses knowledge creation, storage, transfer, and stewardship. Policies, training, and safeguards must protect institutional knowledge assets while ensuring that students, faculty, and administrators use AI responsibly and transparently. Therefore, an applied framework is needed to translate high-level ethical principles into actionable controls appropriate for academic settings.

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Knowledge Management Enhancement

The dual-use dilemma is also a KM challenge. AI adoption disrupts existing processes for creating, documenting, sharing, and maintaining institutional knowledge. When guidelines are unclear, undocumented, or inconsistently communicated, institutions cannot ensure a shared understanding of the responsible use of AI. Weaknesses in KM practices—such as fragmented communication, lack of unified documentation, and missing ongoing training—amplify governance risks. Therefore, effective AI governance needs more than just ethical principles; it requires institution-wide KM frameworks that promote transparency, learning, and consistent policy interpretation (Alavi & Leidner, 2001; Argote, 2013; Davenport & Prusak, 1998; Nonaka & Takeuchi, 1995; OECD, 2019; UNESCO, 2021).

Novelty of The SPARKE Framework

Existing frameworks offer important ethical guidance, but they fall short of turning principles into practical, campus-ready actions. The SPARKE Framework introduced in this study fills this gap by providing an applied, institution-centered model that combines governance principles with KM processes. Unlike earlier guidelines, the SPARKE Framework focuses on operational practicality, cross-unit collaboration, and maintaining institutional knowledge, making it especially suitable for higher education settings.

Purpose of the Study and Contribution

This study proposes the SPARKE Framework, a six-step model designed to assist colleges and universities in operationalizing responsible AI adoption. Based on analysis of academic literature, institutional policies, and international governance standards, the framework combines strategic oversight with practical application steps. Unlike existing guidelines that remain abstract, SPARKE offers an institution-centered model that links policy, literacy, monitoring, and accountability.

The contribution of this work is threefold:

1. It synthesizes the dual-use dilemma of AI in higher education through a knowledge-management lens.
2. It identifies policy and operational gaps across institutions; and
3. It introduces an applied governance framework that supports ethical, secure, and transparent AI use.

Research Questions

This study is guided by the following research questions:

1. What risks and institutional gaps emerge when higher education institutions adopt AI tools for learning and administrative processes?
2. Which dimensions of AI governance and knowledge stewardship are missing from existing guidelines and institutional policies?
3. How can higher education institutions operationalize responsible AI use through a structured, institution-wide framework?

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Organization of the Paper

The remainder of this paper is organized as follows. The next section reviews related literature on AI adoption, risks, and existing governance and KM frameworks. The methodology section outlines the conceptual document-analysis approach used to examine policies and derive the framework. The findings section presents key institutional gaps that informed the development of the SPARKE Framework. This is followed by a section introducing the SPARKE Framework and its operational components. The discussion section explores implications for faculty, students, administrators, and librarians. The paper then addresses limitations and directions for future research, followed by the concluding remarks.

Literature Review

AI has quickly integrated into higher education, aiding in instructional delivery, assessment, student engagement, and administrative tasks. However, these technologies also pose ethical, operational, and security challenges. This section examines current research on AI adoption in higher education, the dual-use dilemma, associated risks and governance expectations, and the KM foundations that support institutional AI safeguards. The review ends with a comparison of existing governance frameworks and highlights the institutional gaps that led to the creation of the SPARKE Framework.

AI in Higher Education: Opportunities and Benefits

AI technologies offer several benefits to academic institutions, including adaptive learning environments, virtual advising, predictive analytics for student support, plagiarism detection, automated grading, and administrative automation (Alqahtani et al., 2023). Research indicates that these tools can enhance student learning outcomes, broaden access to personalized instruction, and lessen faculty workload. Additionally, institutions use AI to improve operational efficiency, including resource planning, enrollment management, scheduling, and early-warning systems for students at risk. These features showcase the transformative potential of AI as a valuable institutional resource (Kaswan et al., 2024; Saqr et al., 2024).

The Dual-Use Dilemma and Emerging Risks

The benefits of AI in higher education are balanced by significant and emerging risks. AI-generated academic work questions traditional ideas about authorship, assessment validity, and instructional transparency. Privacy issues occur when student data are handled by external vendors or opaque machine-learning systems whose data practices institutions cannot fully verify. Bias, misinformation, and unreliability in AI-produced content further threaten academic integrity, fairness, and institutional trust. At the organizational level, adopting AI widens cybersecurity attack surfaces, creates data-sharing vulnerabilities, and leads to dependencies on opaque third-party contracts, resulting in unclear accountability for AI-driven decisions. Scholars refer to this contradiction as the dual-use dilemma: AI serves as both a driver of innovation and a source of legal, ethical, and operational risks. Documented dangers include hallucinated content (Elsayed, 2024), fabricated citations (Walters & Wilder, 2023), challenges to academic integrity (Barrett, 2022; Mita, 2022), discriminatory proctoring technologies (Teen Vogue, 2022; Wired, 2023), and algorithmic bias in educational decisions (Boateng & Boateng, 2025).

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Governance and Ethical Expectations

International organizations have issued ethical principles and policy guidelines to promote the responsible adoption of AI. The OECD AI Principles highlight transparency, human oversight, and fairness (OECD, 2019). The UNESCO Recommendation on the Ethics of AI focuses on human-centered education, academic fairness, and human rights (Li et al., 2025). The NIST AI RMF provides a structured approach for identifying, assessing, and managing AI risks. The ISO/IEC 42001:2023 AI Management System standard specifies controls for documentation, accountability, and trustworthy deployment (ISO/IEC, 2023; NIST, 2023). While these models are valuable, they generally operate at strategic or national levels. They specify "what should happen" but do not outline detailed steps for "how institutions should implement" AI governance across academic and administrative units. Several universities have started establishing structured AI governance mechanisms, showcasing early models of institutional oversight. For instance, Stanford University established its AI at Stanford Advisory Committee to coordinate governance across administrative, academic, and research divisions, ensuring that AI activities align with ethical and operational standards. Similarly, the University of Michigan established a university-wide AI oversight committee to promote AI literacy, oversee the ethical deployment of AI, and manage the daily use of generative tools by students and staff. At the University of Notre Dame, leaders are reclassifying institutional data structures and engaging the campus community to develop policies for the responsible adoption of AI. These examples reflect a shift from casual adoption to structured and coordinated governance.

Knowledge Management Foundations in AI Governance

AI governance in higher education mainly focuses on KM, which involves creating, storing, sharing, and maintaining governance knowledge over time. From a KM perspective, responsible AI adoption depends on converting tacit knowledge—such as faculty intuition about ethical risks—into explicit knowledge through written policies, training, and monitoring procedures. Universities need to continuously develop knowledge as new AI applications emerge and strengthen knowledge retention with centralized documentation systems that prevent policy drift and loss of institutional memory (Alavi & Leidner, 2001; Argote, 2013; Davenport & Prusak, 1998). Good governance also depends on knowledge transfer, ensuring that students, faculty, librarians, information technology (IT) staff, and administrators share consistent expectations regarding the responsible use of AI. These processes promote broader organizational learning, helping institutions regularly improve their governance structures as technology advances. Applying KM principles provides a solid foundation for institution-wide AI governance and underscores that frameworks, such as SPARKE Framework, must be both strategic and practical. A governance framework should do more than promote ethical principles—it must enable the creation, capture, and controlled sharing of knowledge across the campus. SPARKE Framework views AI governance as applied KM: turning tacit awareness of AI risks into explicit policies, training, documentation, monitoring, and accountability (Nonaka & Takeuchi, 1995).

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Limitations of Existing Models and the Need for the SPARKE Framework

While current frameworks set ethical expectations, most are not suited for operational use in higher education. Many institutions depend on informal guidelines, voluntary faculty practices, or limited academic integrity policies that address plagiarism but overlook privacy, security, vendor risk, and literacy. A persistent gap remains between high-level ethical advice and the practical, campus-wide application of these principles.

From Tacit Knowledge to Explicit Governance Practice

AI governance involves turning tacit knowledge—such as faculty intuition about ethical risks—into explicit knowledge documented in policies, guidelines, training materials, and monitoring procedures. Without this process, institutional learning remains fragmented and relies on individual actors rather than organizational systems. Table 1 compares major international AI governance frameworks with the institutional gaps identified in this study, highlighting how the SPARKE Framework addresses areas that existing frameworks do not fully operationalize (See Table 1).

Table 1. Comparison of Existing AI Governance Frameworks and Institutional Gaps Addressed by SPARKE

Framework / Guideline	Primary Focus	Identified Gap in Higher Education Context	SPARKE Contribution
OECD AI Principles	Human-centered values, fairness, transparency	High-level principles, no implementation pathway for universities	Translates ethical principles into actionable policies, training, controls, and monitoring
UNESCO Ethics of AI (Education)	Rights, inclusion, academic equity	Limited operational guidance for data governance, vendor controls, or assessment integrity	Provides institution-wide controls for privacy, authorship, and responsible use standards
NIST AI RMF	Mapping, measuring, and governing AI risk	Designed for national/enterprise systems; lacks campus-specific operational steps	Provides campus-specific governance, literacy frameworks, and compliance steps
ISO/IEC 42001 AI Management System	Documentation, accountability, risk controls	It requires institutional adaptation and technical expertise; many universities lack the capacity.	Provides a structured roadmap and simplified operational workflow for implementation
Institutional AI Policies (various universities)	Responsible-use statements and academic integrity guidelines	Fragmented, inconsistent, rarely addresses monitoring or vendor risk; uneven enforcement	Unifies policy, monitoring, training, reporting, and accountability across stakeholders
Summary of Gap: Existing frameworks outline principles but do not provide a practical, operational method for universities to implement safeguards.			
SPARKE's Contribution: A step-by-step institutional governance model that integrates KM, literacy, monitoring, and policy enforcement.			

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Methodology

This study employs a conceptual document analysis to examine how higher education institutions are responding to the dual-use dilemma of artificial intelligence. The objective was to identify common governance gaps across existing institutional policies and international standards, and to synthesize those findings into a practical framework (SPARKE) for responsible AI integration. This approach follows established guidelines for synthesizing heterogeneous documents and policy frameworks, as conceptual document analysis is well-suited to studies that integrate academic literature, institutional policies, and international governance standards to develop new models and conceptual structures (Snyder, 2019; Webster & Watson, 2002).

Research Design

Given the rapid evolution of AI in higher education and the limited availability of longitudinal empirical studies, a conceptual methodology was used. Conceptual studies are appropriate when a phenomenon is new, distributed across multiple documents, and when the goal is to develop a theoretical or operational model. This approach is consistent with prior research in educational policy and technology governance, where frameworks are derived from patterns in documented standards, institutional policies, and scholarly literature (Snyder, 2019; Tranfield et al., 2003; Webster & Watson, 2002). These methodological procedures were undertaken to directly address the three research questions guiding this study.

Data Sources

The data source for this study consists of three categories of authoritative, peer-reviewed sources. These sources were intentionally selected to provide comprehensive coverage of global governance frameworks, sector-specific institutional guidelines, and scholarly evidence regarding AI adoption and responsible use.

1. International governance frameworks include OECD AI Principles, UNESCO Recommendation on the Ethics of AI, NIST AI RMF, and ISO/IEC 42001 AI Management System Standard.
2. Institutional policies—including publicly available responsible-use policies, academic integrity codes, privacy statements, and AI guidelines from universities across North America, Europe, and emerging economies.
3. Peer-reviewed literature on AI ethics, academic integrity, learning analytics, cybersecurity, and KM.

Selection Criteria

The Documents were included in the corpus if they were written in English, published or updated between 2018 and 2024, and explicitly addressed themes related to AI adoption, governance, or digital academic integrity. Eligible documents also had to originate from a recognized educational institution, an international governance body, or a peer-reviewed scholarly publisher to ensure credibility and relevance. Materials focused exclusively on technical AI development or algorithmic engineering were excluded, as this study examined governance principles, institutional policies, and educational applications rather than algorithm design processes.

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Analytical Procedure

The documents were coded using a deductive–inductive approach. Deductive coding involved predefined categories based on the research questions, including: (1) AI risks and vulnerabilities, (2) governance principles, (3) institutional policy gaps, and (4) knowledge-management processes. Inductive coding permitted additional categories to surface from the documents, such as ambiguity in authorship standards, inconsistent policy communication, and unclear monitoring responsibilities. These categories were used to identify cross-institutional patterns and recurring governance challenges that informed the development of the SPARKE Framework. The analysis proceeded in three structured stages:

1. Mapping of Ethical and Governance Principles - Key concepts—such as transparency, accountability, authorship, privacy, consent, documentation, bias, and monitoring—were extracted from each source.
2. Cross-Document Comparison of Institutional Gaps - Recurring weaknesses in institutional policy were coded, including lack of vendor controls, unclear authorship rules, inconsistent student guidance, insufficient data-governance processes, and limited monitoring or enforcement.
3. Synthesis and Model Construction - The recurring themes were organized into six operational domains, forming the SPARKE Framework. Each domain was defined based on policy patterns observed across institutions and aligned with international governance expectations.

Validation Procedure

Although empirical testing was beyond the scope of this conceptual study, the framework underwent a two-stage validation process. First, an alignment-based review was conducted to ensure that the SPARKE Framework is consistent with established international AI governance standards, including those issued by NIST, OECD, ISO, and UNESCO. Second, an expert-informed plausibility check was performed by comparing the framework's operational steps with institutional practices documented in the academic literature and university policy repositories (George & Wooden, 2023; Hashim et al., 2022). This comparison confirmed that each component of the framework reflects a realistic and implementable academic or administrative procedure. The analytical process was further guided by KM theory, which informed the examination of institutional documents for evidence of knowledge creation, documentation practices, retention mechanisms, and knowledge transfer processes. This KM-oriented approach enabled an assessment not only of what governance policies state but also of how institutions preserve, distribute, and operationalize AI-related knowledge across organizational units. As a conceptual and document-based study, the methodological focus is on synthesizing policy, governance, and scholarly sources rather than collecting empirical data. A complete discussion of study limitations and directions for future research is presented in the dedicated Limitations and Future Research section.

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Findings

The conceptual document analysis revealed consistent patterns across institutional policies, governance frameworks, and scholarly literature. These patterns highlight structural weaknesses in the management of AI adoption by higher education institutions. Although AI is increasingly integrated into teaching, assessment, and administrative processes, institutional governance has not evolved at a comparable pace (Ahmad et al., 2022; George & Wooden, 2023). The analysis yielded findings that directly address the three research questions guiding this study, particularly regarding institutional risks, governance gaps, and knowledge-management weaknesses. Six major findings emerged from the analysis, each reflecting a gap between AI use and the institutional capacity to support responsible implementation.

1. **AI Adoption Outpaces Policy Development -** Across institutions, AI tools are frequently deployed prior to the establishment of comprehensive governance structures. Many universities permit faculty to use AI-enabled systems at their discretion without institution-wide disclosure standards, documentation procedures, or monitoring mechanisms. As a result, expectations for responsible use vary across departments, creating inconsistent learning environments and uneven enforcement of academic-integrity standards (Mysechko et al., 2024; Özer, 2024). This pattern demonstrates a misalignment between technological innovation and institutional oversight, underscoring the need for integrated governance frameworks that formalize AI-related roles, responsibilities, and accountability structures. Similar concerns have been documented across institutions, where ambiguity regarding AI-generated work has resulted in inconsistent interpretation of academic integrity policies and authorship standards (OECD, 2019; UNESCO, 2021). Several universities—including Stanford and Michigan—have acknowledged that faculty and students lack clear institutional guidance on how AI-assisted work should be disclosed or attributed. From a KM perspective, this reflects a failure to convert tacit faculty knowledge about responsible AI use into explicit institutional guidance accessible to all users.
2. **Weak Privacy and Data-Governance Controls -** The analysis uncovered significant deficiencies in privacy and data-governance policies. Institutional policies seldom specify how AI vendors store, retain, or repurpose student data; nor do they offer transparent consent mechanisms or clear data-retention schedules (Alqahtani et al., 2023; Elsayed, 2024). In many instances, universities rely on third-party AI tools without conducting formal risk assessments or reviewing vendor compliance with privacy laws (Schaeffer et al., 2024). These gaps leave institutions vulnerable to legal risks, especially when AI systems handle sensitive educational records, biometric data, or behavioral analytics. The lack of clear data-governance frameworks also suggests limited knowledge-management processes for documenting and sharing privacy expectations across departments. These institutional shortcomings align with risks identified in the NIST AI RMF and in cases like the University of Notre Dame, which recently began restructuring its data-classification system in response to emerging AI challenges. Overall, these gaps reveal a breakdown in institutional knowledge retention, as universities lack centralized repositories to document how AI systems collect, process, and store data.
3. **Ambiguous Authorship and Academic-Integrity Standards -** Academic integrity policies have not kept pace with advancements in generative AI technologies. Many institutional guidelines were established before AI-assisted writing and content generation became

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widespread, leading to confusion about what is allowed and what is not (Barrett, 2022; Mita, 2022; Walters & Wilder, 2023). Most policies do not specify when AI assistance must be disclosed, how AI-generated content should be credited, or what counts as unauthorized use. This lack of clarity affects both students and faculty, increasing the risk of unintentional misconduct and inconsistent enforcement. These issues underscore the need for clear authorship policies that include disclosure requirements, documentation procedures, and educational guidance within an institution's KM system. This inconsistency exemplifies what the OECD (2019) calls "policy drift," where institutions publish guidelines without effective mechanisms for knowledge retention, documentation, or consistent communication across departments. It reveals weak knowledge transfer processes, as policies are neither systematically shared nor uniformly understood across organizational units.

4. **Limited Monitoring and Accountability Mechanisms -** Institutional documents rarely specify who is responsible for overseeing AI-enabled systems, auditing vendor compliance, or investigating errors and biases. Often, responsibility is delegated informally to IT units or individual instructors, neither of whom has full authority over institutional data or academic standards. Without formal monitoring, institutions cannot guarantee the accuracy, reliability, or fairness of AI-driven outcomes—especially in high-stakes areas like admissions, advising, or assessment (Boateng & Boateng, 2025; Cheatham et al., 2019). This gap highlights a broader lack of organizational processes for tracking, assessing, and reporting AI-related risks across departments. UNESCO's (2021) Recommendation on the Ethics of AI also notes that institutions often deploy AI tools without establishing transparent oversight or data-management protocols. From a KM perspective, poor monitoring indicates insufficient organizational learning, where institutions fail to capture, analyze, or respond to emerging risks.
5. **Insufficient AI Literacy and Knowledge-Management Structures -** The review found little evidence of systematic AI literacy programs for students, faculty, librarians, or administrators. Most training opportunities are informal or optional, leaving users to depend on personal judgment or peer guidance (Campus Technology, 2024; Oyelude, 2024). The lack of structured training reflects broader weaknesses in KM processes: institutions are not consistently capturing, documenting, or sharing knowledge about the responsible use of AI. This gap leads to variability in practice and weakens the sustainability of governance efforts. Recent reports from universities in North America and Europe indicate that low AI literacy among students and faculty contributes to misuse, ethical violations, and unintended policy breaches, consistent with findings in the scholarly literature on digital academic integrity (Elsayed, 2024; Fırat, 2023; Hassell, 2024). Literacy issues also expose weaknesses in knowledge creation and sharing, hampering the institution's ability to develop a shared understanding of responsible AI use.
6. **Vendor Dependence and Algorithmic Uncertainty -** Many universities increasingly rely on third-party vendors for AI-enabled systems, including remote proctoring platforms, learning management system analytics, automated tutoring services, and accessibility tools. These vendor-supplied AI systems are often proprietary, opaque, and lack meaningful institutional oversight, limiting universities' ability to fully understand how algorithmic decisions are made (Hogan & Sellar, 2021; Saqr et al., 2024). Empirical and legal analyses have documented risks associated with vendor tools, including algorithmic bias, inaccurate outputs, and

discriminatory outcomes that disproportionately affect marginalized student populations (Lyerly, 2025; Teen Vogue, 2022; Wired, 2023). These concerns align with international governance guidance, including the NIST AI RMF and ISO/IEC 42001, which warn that externally developed AI systems introduce increased uncertainty, bias, and diminished institutional control when governance mechanisms are absent. From a knowledge-management perspective, vendor dependence weakens institutional learning and accountability by externalizing critical knowledge about algorithmic behavior, system limitations, and risk profiles. When such knowledge remains inaccessible or undocumented, institutions cannot effectively evaluate AI performance, share insights across units, or develop internal capacity for responsible AI governance.

Synthesis of Findings and Implications for Framework Development

Collectively, these findings show that institutional AI governance challenges stem not only from ethical, legal, and regulatory concerns but also from weaknesses in organizational knowledge-management processes. Many institutions lack systematic mechanisms for creating, documenting, disseminating, and preserving knowledge about the responsible use of AI, leading to fragmented policy interpretation and inconsistent implementation across departments. These findings corroborate international guidance that emphasizes the need for transparent documentation, knowledge-sharing systems, and institution-wide governance structures to manage AI responsibly (NIST, 2023; OECD, 2019; UNESCO, 2021). These insights form the conceptual foundation for the SPARKE Framework, which integrates governance principles with knowledge-management structures to support consistent, institution-wide operationalization of responsible AI practices. Figure 1 depicts the three AI-enabled pillars of educational efficiency, illustrating how AI is transforming institutional operations, instructional practices, and learner-support systems. These functions underscore why governance structures must evolve in parallel with adoption to ensure that institutional benefits do not outpace safeguards (See Figure 1).

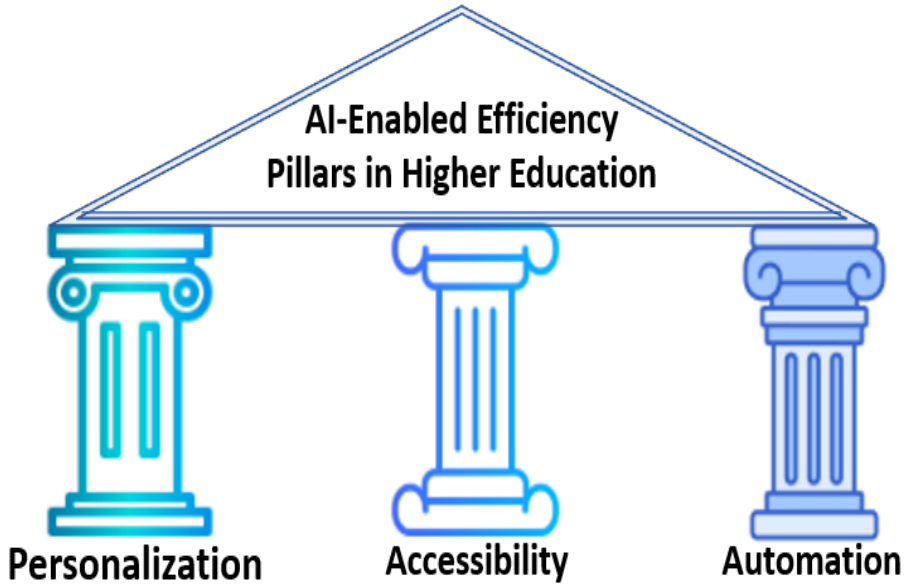

Figure 1. Three AI-Enabled Pillars

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The SPARKE Framework

The SPARKE Framework was developed to address governance and knowledge-management gaps identified through analysis of conceptual documents. It offers a structured, campus-wide approach for implementing responsible AI in higher education. Unlike broad ethical guidelines, SPARKE combines strategic governance principles with practical steps, helping institutions turn abstract ideals into consistent, enforceable practices. Fundamentally, SPARKE functions as a KM system: it supports the creation, documentation, sharing, and preservation of institutional knowledge regarding AI policies, risks, and responsibilities. This focus sets SPARKE apart from other governance models and makes it a practical framework designed for the decentralized and diverse environment of higher education.

Unlike existing guidelines such as the OECD AI Principles, the NIST AI RMF, or ISO/IEC 42001—which mainly operate at national or enterprise governance levels—SPARKE Framework addresses the specific realities of higher education. It bridges the gap between abstract ethical principles and their actual implementation by integrating policy development, documentation structures, instructional processes, and operational enforcement. While current models highlight what responsible AI involves, SPARKE offers a step-by-step plan for how universities can put responsible governance into practice across academic, administrative, and student-facing areas. Its unique focus on organizational knowledge processes, rather than merely on technical controls, makes SPARKE a practical, ready-to-use governance framework suited to the decentralized and diverse environment of higher education.

Each component of the SPARKE Framework is based on essential knowledge-management processes that support institutional learning and continuity. Safeguards and policy structures (S and P) promote knowledge creation and retention by formalizing expectations in clear, accessible formats. The application of controls and responsible-use literacy (A and R) enhances knowledge transfer by ensuring that users across departments share a common understanding of responsible AI practices. Knowledge security and monitoring (K) foster organizational learning by capturing insights from audits, incidents, and vendor assessments, which are then integrated into governance cycles. Evaluation and oversight processes (E) help preserve institutional memory by documenting decisions, revisions, and accountability measures. Through these mechanisms, the SPARKE Framework integrates KM principles into every operational level of AI governance within higher education institutions. The framework includes six interconnected components:

S — Safeguard / Governance Structures

This component emphasizes establishing cross-functional governance bodies responsible for AI oversight. Such structures include AI ethics committees, data governance boards, and risk review teams. These entities develop institution-wide standards and ensure accountability across academic and administrative units. Governance structures also operationalize KM processes by guaranteeing that documentation, policy updates, and risk assessments are systematically stored and accessible.

P — Policies and Classification Protocols

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SPARKE Framework supports comprehensive policies that set standards for AI use, authorship, privacy, and disclosure. This involves creating an institutional inventory of AI tools classified by risk level, data sensitivity, purpose, and oversight needs. Clear classification processes ensure consistent decisions and foster the sharing of AI knowledge across departments, preventing isolated adoption practices.

A — Application of Security Controls

Security controls include data minimization, encryption, authentication requirements, vendor-risk assessments, and regular audits to maintain the integrity of AI-enabled systems. This component aligns institutional practices with privacy regulations and international standards. It also provides opportunities to document processes and share security-related knowledge, supporting institutional memory and cross-unit coordination.

R — Responsible Use Literacy

AI literacy is a fundamental part of responsible adoption. SPARKE Framework emphasizes mandatory training for students, faculty, librarians, and staff on ethical use, prompt engineering, privacy regulations, authorship standards, and the verification of AI-generated content. Librarians, in particular, play a key role in literacy initiatives because of their expertise in information governance, academic integrity, and evidence assessment. Incorporating literacy efforts into institutional KM systems helps ensure knowledge is retained across cohorts and staff changes.

K — Knowledge Security and Monitoring

Knowledge security involves processes that safeguard the integrity, accuracy, and traceability of AI-related decision-making. This includes ongoing monitoring of AI-powered systems, mechanisms for reporting misuse or bias, and regular audits of vendor compliance. Such activities strengthen institutional learning by allowing the documentation and sharing of insights about performance issues, risks, and best practices.

E — Evaluation and Oversight

The final component establishes procedures for evaluating policy compliance, assessing ethical implications, and ensuring alignment with legal frameworks such as the Family Educational Rights and Privacy Act (FERPA), the General Data Protection Regulation (GDPR), the California Consumer Privacy Act (CCPA), and Web Content Accessibility Guidelines (WCAG). Oversight processes include policy-review cycles, transparency requirements, and reporting structures that promote accountability. This component formalizes institutional KM processes by ensuring that evaluations, revisions, and decisions are recorded and shared across governance cycles.

Strategic and Operational Integration

The SPARKE Framework is designed with both strategic and operational layers. The strategic layer articulates the overarching principles that guide institutional AI governance, while the operational layer translates these principles into concrete, actionable steps. This distinction avoids redundancy and clarifies how high-level governance goals are connected to the day-to-day activities required for implementation. This dual-layer structure also aligns with established knowledge-management models that distinguish between knowledge principles—such as

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governance values, ethical commitments, and institutional norms—and knowledge practices, which include the concrete processes through which policies are documented, communicated, applied, and refined across the institution. Together, these complementary layers support long-term institutional planning while enabling consistent, practical, and scalable compliance across academic and administrative units. Figure 2 depicts the integrated SPARKE Framework, illustrating how its six components function collectively as a structured response to the dual-use dilemma of AI. The framework emphasizes that responsible AI governance requires both conceptual guidance and operational mechanisms. By organizing the model around a clear acronym, SPARKE Framework enhances institutional understanding and facilitates the translation of complex governance principles into actionable policies and procedures. This integrated structure helps institutions bridge the gap between strategic intentions and operational realities, enabling them to maximize the benefits of AI while systematically mitigating its risks (See Figure 2).

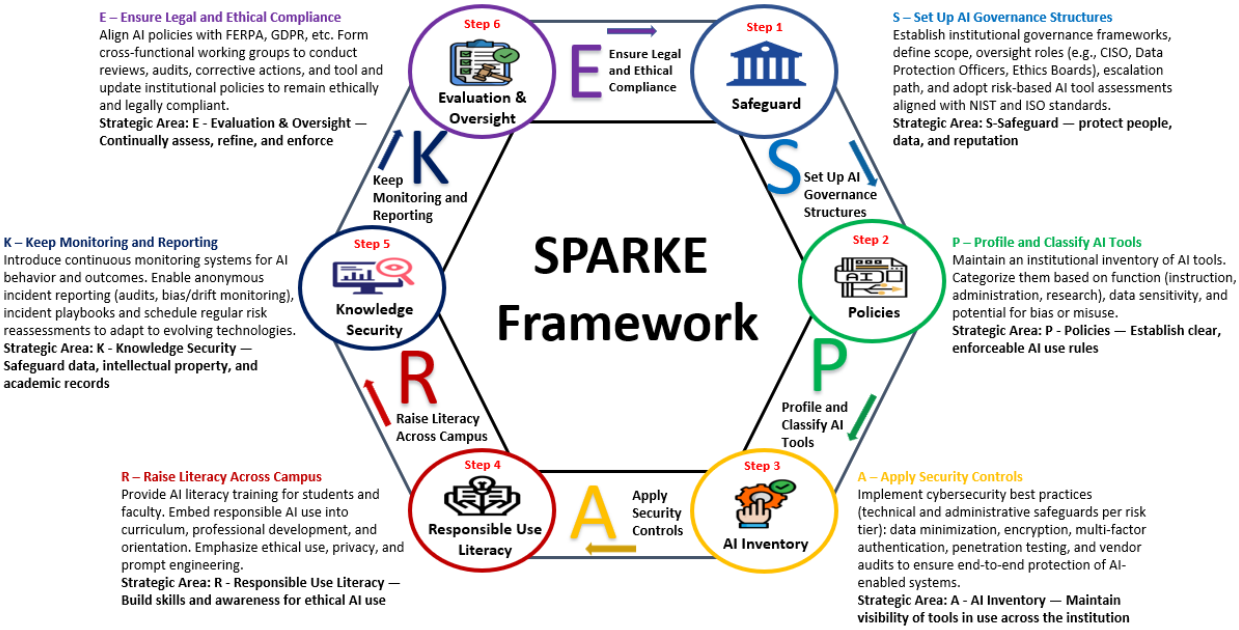

Figure 2. The Integrated SPARKE Framework for Institutional AI Governance

Discussion

The findings of this study reveal that AI adoption in higher education is shaped by complex interactions among institutional policies, governance structures, and knowledge-management processes. Collectively, these results directly address the three research questions by identifying the risks associated with AI adoption, revealing persistent gaps in institutional governance and knowledge stewardship, and establishing the need for a structured, system-level framework. The discussion synthesizes these findings, interprets their implications for academic practice, and situates SPARKE Framework as a potential response to the recurring governance challenges identified.

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Interpreting the Governance Gap

The rapid integration of AI into instructional and administrative processes has exposed a widening gap between technological innovation and institutional preparedness. While universities have embraced AI's potential to enhance learning and streamline operations, they have struggled to establish governance mechanisms that ensure ethical, consistent, and transparent implementation. This gap reflects an underlying KM challenge: institutions often lack systematic processes for capturing, storing, and transferring knowledge about AI-related risks, policies, and standards. As a result, AI practices become fragmented, inconsistent, and vulnerable to misuse. This dynamic reflects what Nonaka describes as the breakdown of tacit–explicit knowledge conversion, where institutional understanding of AI risks remains unarticulated and therefore cannot be shared, retained, or operationalized.

Implications for Stakeholders

The governance gap affects institutional stakeholders differently:

- **Faculty** face uncertainty about how AI should be integrated into assessment, authorship, and instructional design. Without clear guidelines, faculty adopt divergent practices, leading to inconsistent expectations for students.
- **Students** encounter ambiguous academic-integrity standards, unclear disclosure requirements, and varying course-level interpretations of AI use. This contributes to confusion, unintentional misconduct, and inequitable learning environments.
- **Administrators** must balance innovation with accountability, yet often lack the structures needed to coordinate policy development, vendor assessment, and risk management across decentralized units.
- **IT and security teams** handle the technical components of AI systems but may not have authority over academic integrity, privacy standards, or instructional policies—areas where AI exerts significant influence.
- **Librarians** play a critical yet often overlooked role in AI governance. Their expertise in information literacy, data stewardship, academic integrity, citation standards, and evidence evaluation positions them as essential contributors to AI literacy initiatives and policy interpretation.

Viewed through a KM lens, these stakeholder challenges demonstrate that institutions lack the mechanisms described by Alavi and Leidner (2001) for supporting knowledge creation, dissemination, and use across distributed organizational units.

The Role of SPARKE Framework in Addressing Institutional Needs

The SPARKE Framework responds to these challenges by integrating governance, literacy, policy development, oversight, and KM processes into a unified institutional model. Its design ensures that knowledge about AI risks and responsibilities is not isolated within individual departments but is distributed, retained, and continually accessible. By formalizing documentation processes, establishing literacy structures, and supporting cross-unit communication, the SPARKE Framework helps institutions build sustainable governance that evolves with technological change.

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In doing so, the SPARKE Framework aligns with KM frameworks that highlight the importance of structured repositories, shared standards, and iterative organizational learning as foundational elements of institutional effectiveness.

Implications for Knowledge Management Research

The findings of this study reinforce that AI governance in higher education is fundamentally a knowledge-management challenge. The SPARKE Framework's emphasis on documentation, communication, and cross-unit coordination aligns with established KM theories that describe how organizations create, store, share, and apply knowledge. Nonaka's SECI model highlights the importance of transforming tacit knowledge—such as informal faculty intuition about responsible AI use—into explicit institutional policies and structured guidance. Similarly, Alavi and Leidner (2001) and Davenport (1994) emphasize that effective KM systems depend on organizational mechanisms that support knowledge retention, transparency, and accessibility. The SPARKE Framework contributes to this literature by offering a governance model that embeds these KM principles directly into institutional workflows. Each component of the framework corresponds to a KM function: safeguards and policies formalize explicit knowledge; literacy structures enable knowledge transfer; monitoring processes support organizational learning; and oversight mechanisms preserve institutional memory. As a result, the SPARKE Framework not only advances AI governance practice but also extends KM scholarship by demonstrating how knowledge processes can be operationalized within complex academic ecosystems.

Broader Significance

The dual-use dilemma of AI mirrors earlier digital transformations in higher education but is intensified by the speed and opacity of AI-generated outputs. The emergence of large language models, automated decision-making systems, and AI-enabled analytics creates unprecedented opportunities and risks. The analysis underscores that effective AI governance must move beyond technical protections to encompass cultural, pedagogical, and organizational learning. This echoes Davenport's view that information technologies are only effective when embedded within coherent knowledge processes that support interpretation, coordination, and action. The SPARKE Framework contributes to this space by offering a structured, KM-informed governance pathway tailored to the complexities of higher education environments.

Limitations and Future Research

This study has several limitations that should be acknowledged. First, it is conceptual and document-based; no empirical data were collected from institutional stakeholders or organizational settings. Although conceptual analyses are appropriate for emerging research domains, the lack of empirical testing limits the ability to assess the real-world feasibility, effectiveness, or scalability of the SPARKE Framework. Future research should implement the SPARKE Framework in diverse institutional contexts to evaluate its operational impact on AI governance, academic integrity, and organizational learning. Conceptual models, such as the SPARKE Framework, also require iterative refinement; as institutions experiment with implementation, feedback loops and real-world practice will help further shape, expand, or recalibrate the framework's components. Second, the document corpus was restricted to English-language sources from 2018 to 2024. This

may exclude innovative AI governance practices emerging in non-English-speaking regions, particularly in Africa, Europe, and Asia, where AI adoption is accelerating. Comparative studies across linguistic and cultural contexts would deepen understanding of how AI governance frameworks must be adapted for different educational systems. Third, institutional policies evolve rapidly in response to technological advances and regulatory changes. Some of the policies reviewed may have been updated after analysis. Longitudinal research examining policy evolution over time would provide insight into how universities adapt to ongoing developments in AI.

Beyond validating governance effectiveness, empirical research is also needed to assess whether the SPARKE Framework measurably improves organizational learning—particularly in areas such as knowledge retention, cross-unit communication, documentation quality, and policy interpretation. Such studies would help determine how effectively the framework supports the KM processes that underlie sustainable AI governance.

Future empirical research should test:

- The usability and adoption of the SPARKE Framework across universities with varying resources;
- The impact of AI literacy programs on student and faculty behavior;
- The effectiveness of the SPARKE Framework's monitoring and documentation components in improving accountability;
- Cross-institutional benchmarking to assess the generalizability of the framework.

Conclusion

AI is reshaping the core functions of higher education by transforming instructional practices, administrative operations, and knowledge-creation processes. In addressing the three research questions, this study demonstrates that AI governance challenges in higher education are rooted not only in ethical and regulatory concerns but also in institutional knowledge-management weaknesses that require structured, campus-wide responses. These technologies also introduce ethical, legal, and operational risks that challenge traditional academic norms and institutional responsibilities. The study further shows that these challenges are rooted not only in technological uncertainty but also in governance and knowledge-management gaps that limit institutions' ability to respond effectively. Through a conceptual document analysis of international frameworks, institutional policies, and scholarly research, the study identified recurring weaknesses in data governance, authorship policies, monitoring systems, literacy structures, and institutional accountability. These gaps signal the need for a governance approach that integrates ethical principles with practical implementation mechanisms.

The SPARKE Framework contributes to this emerging field by offering a structured, KM-informed model that transforms high-level ethical expectations into actionable, campus-wide safeguards. Its emphasis on governance structures, policy development, literacy training, monitoring, and compliance provides a coherent roadmap for institutions seeking to adopt AI responsibly. The framework bridges the divide between innovation and accountability, supporting institutions in developing a culture of transparency, ethical stewardship, and informed decision-making. As AI continues to evolve, higher education institutions must develop adaptive

governance models that preserve academic integrity and institutional trust. SPARKE Framework provides a foundation for such efforts; however, empirical validation is necessary to refine its components, assess its scalability, and evaluate its impact across diverse contexts. This study, therefore, represents an initial step toward developing practical, institution-centered models for responsible AI governance in higher education. By embedding processes for knowledge creation, documentation, retention, and cross-unit knowledge transfer, the SPARKE Framework advances the field of KM by demonstrating how AI governance can function as an institution-wide KM system that strengthens organizational learning and supports sustainable digital transformation.

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