Tracing the Digital Path: Academic Information Systems in Indonesian Islamic Universities

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ABSTRAK

Academic Information Systems (AIS) have become a foundational component in higher education, enabling institutions to manage student enrollment, academic records, course scheduling, and assessment processes efficiently. In the context of Indonesian Islamic higher education institutions (PTKIN), the development and adoption of AIS are influenced by unique cultural, technical, and institutional dynamics. This literature review explores the current state of AIS implementation in PTKIN, highlighting challenges and innovations based on a thematic synthesis of 12 peer-reviewed publications and a contextual case study of UIN Datokarama Palu. The findings reveal five critical themes: (1) the functional scope of AIS modules tailored for dual religious and secular curricula, (2) infrastructure and technical limitations in PTKIN institutions, (3) human resource readiness and adaptability, (4) lack of interoperability with national systems such as PDDIKTI, and (5) emerging local innovations in AIS design and management. UIN Datokarama Palu's experience with its internally developed AIS platform, ISEMA, illustrates the complexities and opportunities of homegrown systems in resource-constrained environments. While the platform has yet to be fully integrated with external databases, it demonstrates practical utility and institutional commitment to digital transformation. The review concludes that successful AIS implementation in PTKIN requires a balance between technological capabilities, organizational support, and user engagement. Recommendations include investing in scalable infrastructure, formalizing standard operating procedures (SOPs), enhancing user training, and pursuing national system integration. The experience of UIN Datokarama offers insights that are not only institution-specific but also applicable to similar educational contexts in Indonesia.

1. Introduction

In recent years, Academic Information Systems (AIS), commonly known in Indonesia as "Sistem Informasi Akademik" (SIAKAD), have become a cornerstone in enhancing

administrative and academic workflows within higher education institutions [1], [2]. These systems facilitate critical academic functions such as student registration, course enrollment, grade submissions, and academic reporting, all while supporting institutional objectives related to transparency, digital transformation, and service efficiency.

Within the realm of Indonesian Islamic higher education—known as Perguruan Tinggi Keagamaan Islam Negeri (PTKIN)—the adoption of AIS carries both strategic promise and contextual complexity. Institutions like UIN, IAIN, and STAIN are increasingly implementing AIS to modernize academic management, yet face unique challenges in terms of infrastructure, stakeholder readiness, system integration, and alignment with religious-academic values [3]. Despite their strategic importance, there remains a paucity of literature focused specifically on AIS within PTKIN environments, particularly regarding case-based insights that reflect local nuances.

The University of Indonesia's next-generation AIS (SIAKAD) serves as a benchmark for user interface and integration innovations. Zaafira et al. employed Design Thinking to revamp its user interface, addressing persistent usability challenges among students [4]. This example underlines the significance of user-centric design in AIS adoption trajectories.

UIN Datokarama Palu represents a pivotal institution for examining AIS evolution in Eastern Indonesia. Its ongoing efforts to digitalize academic services—including internal portals and initial LMS integration—provide fertile ground for examining real-world challenges such as limited IT infrastructure, human resource constraints, and interoperability issues. These challenges necessitate a focused literature-based analysis to understand how UIN Palu aligns with broader national trends and where improvements are warranted.

Accordingly, this paper delivers a comprehensive literature review on AIS development in Indonesian Islamic higher education institutions, anchored by the contextual example of UIN Datokarama Palu. The objectives are threefold: to synthesize extant literature on AIS implementation; to identify prevailing themes, opportunities, and constraints; and to position UIN Datokarama within this discourse, offering conceptual insights to inform future research and institutional development strategies.

UIN Datokarama Palu represents a valuable case study in the evolution of academic digital systems within PTKIN. The institution previously relied on a commercial solution (SEVIMA), but later transitioned to developing its own platform, known as ISEMA (https://isema.uindatokarama.ac.id/), due to concerns over licensing costs and data security. The system is currently being developed in collaboration with a third-party developer, Techno Celebes, along with active participation from faculty members and students of the Informatics and Information Systems programs at the Faculty of Science and Technology.

Although still under development with several modules in progress, ISEMA has already been deployed to support academic data management for staff and lecturers. Modules for course planning, student advising, thesis supervision, grading, and class scheduling are actively used. However, integration with PDDIKTI remains unavailable, which necessitates the use of third-party applications for national reporting. Challenges include unstable Standard Operating Procedures (SOP) and an overloaded workforce with limited human resources. Despite these constraints, the university aims to fully integrate its AIS with national education systems while continuing to expand functionality for both mobile and web-based access.

2. Theoretical Background and Related Works

2.1 Definition and Purpose of Academic Information Systems

Academic Information Systems (AIS) are digital platforms developed to manage and streamline academic and administrative functions in higher education. These systems typically include modules for student registration, academic record keeping, course management, curriculum tracking, and academic reporting [6]. In an increasingly data-driven educational environment, AIS play a strategic role in improving institutional governance, service transparency, and decision-making efficiency [7].

AIS serve not only as a repository of academic data but also as a facilitator for seamless communication between stakeholders—students, lecturers, administrative staff, and external bodies such as government education authorities. A well-implemented AIS reduces administrative workload, minimizes data redundancy, and enhances user access to real-time information. The system is often integrated with Learning Management Systems (LMS), finance systems, and national higher education databases to support interoperability and comprehensive reporting.

In Islamic higher education institutions (PTKIN), AIS implementation reflects an institutional commitment toward digital transformation while maintaining educational integrity and accountability in accordance with religious and academic mandates. Therefore, AIS adoption in this context is not merely a technical upgrade but also a strategic initiative that aligns with broader educational and spiritual values.

2.2 System Architecture and Technological Trends

The architectural design of AIS has evolved from monolithic, client-server models to web-based applications and, more recently, cloud-native microservices. Traditional AIS frameworks often suffered from scalability issues, limited accessibility, and poor integration capabilities. Today, with the emergence of cloud computing, containerization, and API-first development, AIS platforms are increasingly modular, responsive, and interoperable [8].

Modern AIS platforms employ RESTful APIs, centralized authentication (e.g., SSO), and role-based access control to enable secure, scalable, and user-specific experiences. They are often developed using open-source technologies such as Laravel, Spring Boot, or Node.js, allowing greater customization and lower implementation costs. In some cases, commercial systems are adopted and adapted locally to fit institutional needs.

User interface and user experience (UI/UX) design are also gaining attention as key factors in system usability. A study by Zaafira et al. [4] emphasized the role of design thinking in improving SIAK-NG's user interface at Universitas Indonesia, revealing how interface friction can hinder student engagement. In the context of PTKIN, where digital literacy levels vary, the use of intuitive and mobile-friendly AIS interfaces becomes a necessity to ensure effective adoption and usage.

2.3 AIS Implementation in Indonesian PTKIN

The deployment of AIS in Indonesian Islamic higher education institutions faces varying degrees of success depending on institutional capacity, policy commitment, and technical support. Rahmatika et al. [9] documented that many PTKIN campuses struggle with limited bandwidth, insufficient server infrastructure, and human resource challenges in system

maintenance. Furthermore, top-down policy implementation without adequate user training can result in resistance or underutilization of AIS features.

One major concern in PTKIN is the lack of integration between local AIS and national academic databases like PDDIKTI. Prasetyo et al. [10] highlight that despite regulatory mandates, many institutions still experience delayed or inaccurate data submissions due to fragmented systems and manual reporting. This lack of interoperability not only hampers compliance but also limits the potential of data analytics for policy-making and academic improvement.

Nevertheless, some PTKIN have demonstrated innovation and commitment. For example, UIN Sunan Kalijaga Yogyakarta has implemented AIS modules that support bilingual interface, enabling smoother adoption among Arabic and Bahasa Indonesia users. Such initiatives indicate that tailored development based on institutional context can enhance system performance and user engagement.

2.4 Socio-cultural and Organizational Challenges

Beyond technical hurdles, AIS implementation in PTKIN is deeply affected by organizational culture, leadership commitment, and user perception. Harun and Yuliana [11] found that at IAIN Tulungagung, administrative staff exhibited hesitation in using the system due to a lack of familiarity, fear of error, and hierarchical communication patterns that discouraged innovation. These barriers are not uncommon in public institutions where administrative digital transformation is still nascent.

Another issue is the misalignment between policy enforcement and operational readiness. While national education policies push for digital transformation, many PTKIN operate with outdated infrastructure or decentralized decision-making that hinders timely adaptation. Additionally, inconsistent training programs and the absence of continuous support further demotivate users, leading to shallow system utilization.

Organizational leadership plays a critical role in overcoming such barriers. Institutions with proactive leaders, clear digital roadmaps, and inclusive change management strategies tend to achieve more sustainable AIS integration. Cultivating a digital culture that empowers users at all levels is essential for long-term success.

2.5 Innovations and Best Practices in AIS

Despite the challenges, several PTKIN institutions have emerged as innovators in AIS adoption. UIN Maulana Malik Ibrahim Malang developed an integrated mobile academic assistant app that syncs directly with its AIS platform, allowing students to access academic calendars, course notifications, and grade reports in real-time [12]. This kind of innovation demonstrates the growing trend toward mobility and personalization in academic systems.

Another notable example is UIN Syarif Hidayatullah Jakarta, which introduced analytics dashboards for deans and program heads to monitor academic performance metrics across semesters. These dashboards are linked to the AIS database and serve as tools for evidence-based policy formulation and academic planning.

These best practices show that with the right investment, governance, and user orientation, AIS can go beyond basic administrative tools and become strategic assets for institutional development. They also offer inspiration and potential blueprints for campuses like UIN Datokarama to emulate in future system enhancements.

2.6 Relevance to UIN Datokarama Palu

UIN Datokarama Palu offers a distinctive case of homegrown AIS development within the PTKIN ecosystem. The university formerly utilized a commercial AIS service (SEVIMA), but concerns over recurring subscription costs and data sovereignty led to a strategic decision to build an in-house system. The current AIS platform, named ISEMA (https://isema.uindatokarama.ac.id/), is the product of a collaboration between a local software firm, Techno Celebes, and internal academic teams, particularly involving lecturers and students from the Faculty of Science and Technology.

ISEMA is under active development, with several functional modules already in use. These include academic advising, thesis supervision, lecture scheduling, grading, and weekly teaching logs. Dosen (lecturers) can upload syllabi (RPS), monitor attendance, update course descriptions, and define grading formulas directly via the platform. Although mobile responsiveness has been achieved through browser-based access, native mobile app development remains a future possibility.

However, the system currently lacks direct integration with PDDIKTI, necessitating the use of third-party applications for compliance reporting. This gap underscores a broader issue faced by many PTKIN institutions: the technical and regulatory complexity of syncing internal systems with national platforms. Organizationally, the institution also faces challenges such as inconsistent SOPs and limited IT staffing capacity, resulting in delays and fragmented workflows.

Nevertheless, the commitment to internally manage and grow the AIS ecosystem reflects a long-term digital vision. The involvement of local academic talent in system development is not only cost-effective but also promotes a sense of ownership and contextual relevance. Future improvements are expected to focus on PDDIKTI integration, API-based interoperability, and expanded features for student engagement. UIN Datokarama's trajectory highlights the potential of localized AIS development when supported by leadership, collaboration, and clear digital governance.

4. Findings and Thematic Synthesis of Academic Information Systems in PTKIN

4.1 Functional Scope and Core Modules

Academic Information Systems (AIS) are widely implemented to manage administrative and academic processes in higher education institutions. Core modules typically include student registration (KRS), grade input (KHS), academic advising, thesis management, course scheduling, and transcript generation [1], [6], [7]. In many Indonesian institutions, additional functionalities such as academic calendars, grading formulas, syllabus upload (RPS), and attendance tracking have become standard features. This broad scope enables institutions to streamline services, reduce paperwork, and provide timely academic information to students and faculty.

Within PTKIN, these modules are further tailored to accommodate the dual nature of the curriculum—secular and religious. For example, UIN Malang integrates modules for Tahfidz and Sharia-based coursework, which require specific credit structures and assessment criteria [12]. Similarly, modules for religious thesis examination (munaqasyah) or pesantren-based academic activities are increasingly being embedded in AIS platforms. These contextual

adaptations reflect the need for flexible systems that align with both national standards and Islamic academic traditions.

4.2 Infrastructure and Technical Readiness

Infrastructure plays a foundational role in the reliability and performance of AIS. Across PTKIN, disparities in server capacity, internet stability, and hardware availability often result in slow system response, downtime, and data synchronization failures. Studies show that campuses in eastern and rural Indonesia face greater challenges due to limited funding and outdated infrastructure [9], [10]. These constraints hamper system responsiveness and discourage users from fully adopting digital workflows, reinforcing dependence on manual processes.

At UIN Datokarama Palu, the development of the ISEMA platform illustrates both progress and limitation. Although basic modules are operational, the system is still undergoing iterative feature updates. The limited number of IT personnel combined with an external development partnership means updates are dependent on third-party scheduling. Furthermore, system performance occasionally suffers from hosting limitations and inconsistent access speeds, especially during academic peak periods such as KRS or grade entry. These conditions underscore the need for capacity building and server optimization at the institutional level.

4.3 Human Resource and User Adaptability

The effectiveness of AIS depends not only on technology but also on the people who operate and interact with the system. One common issue in PTKIN is the gap between available technology and the readiness of human resources to utilize it optimally. Many staff and lecturers, particularly in older age brackets, are accustomed to manual documentation and require significant support to transition to digital workflows [11]. Training programs are often one-off events, lacking follow-up sessions or user manuals tailored to varying technical proficiencies.

UIN Datokarama Palu exemplifies this challenge. The institution's academic staff, though committed, are relatively few in number and often carry multiple responsibilities. The absence of fixed Standard Operating Procedures (SOP) in AIS usage also leads to inconsistent data input and fragmented processes. However, a promising trend is the active involvement of informatics students in the system’s development and maintenance. This not only provides hands-on experience for students but also creates a culture of collaborative problem-solving and strengthens institutional ownership of the platform.

4.4 System Integration and Interoperability

One of the critical dimensions of AIS development is its ability to integrate with external systems, especially the national higher education database, PDDIKTI. Without such integration, institutions are forced to manually re-input data or rely on third-party bridging applications, which increases workload and the risk of inconsistency [5], [10]. Interoperability challenges stem from differences in database schemas, lack of standardized APIs, and misaligned data structures across systems.

UIN Datokarama Palu currently operates ISEMA independently of PDDIKTI, resulting in the need for auxiliary applications to fulfill government reporting requirements. This workaround, while practical, introduces additional complexity for operators and contributes to data processing delays. Establishing seamless integration with PDDIKTI remains a top priority, but requires not only technical alignment but also policy-level support and perhaps

joint development with national education authorities. The case highlights a broader call for open standards in AIS development across Indonesian higher education.

4.5 Local Innovation and Institutional Autonomy

Despite structural and technical limitations, PTKIN institutions have shown noteworthy innovations in their AIS implementations. UIN Maulana Malik Ibrahim Malang, for instance, has launched a mobile assistant integrated with their academic system, enabling students to access personalized academic information in real-time [12]. Meanwhile, UIN Jakarta has deployed analytics dashboards that draw from AIS data to support strategic decision-making. These developments signal a shift from AIS as a passive record-keeping system toward a more intelligent, dynamic, and user-driven platform.

At UIN Datokarama Palu, innovation emerges through necessity and collaboration. The decision to abandon SEVIMA in favor of an internally developed system reflects institutional autonomy and a desire for data security and customization. The collaboration between Techno Celebes and academic stakeholders, including students and lecturers, illustrates a model of participatory development. Although still maturing, ISEMA represents an investment in institutional resilience and local talent. This grassroots approach may serve as a replicable model for other PTKIN institutions with similar constraints but strong internal motivation.

5. Conclusion and Recommendations

This literature review examined the development and implementation of Academic Information Systems (AIS) in Indonesian Islamic higher education institutions, with a contextual focus on UIN Datokarama Palu. Through a thematic synthesis of 12 academic sources and institutional insights, five major dimensions were identified: core functionalities of AIS, infrastructure and technical readiness, human resource challenges, system integration, and local innovation. Collectively, these themes reveal that while AIS adoption has progressed significantly across PTKIN institutions, numerous structural and operational challenges remain—particularly in areas such as interoperability, digital literacy, and sustainable system governance.

The case of UIN Datokarama Palu provides a compelling example of grassroots AIS development in a resource-limited setting. The university's transition from a commercial vendor to an in-house platform (ISEMA), supported by local academic collaboration, underscores the importance of institutional autonomy and contextual adaptability. Despite the absence of full integration with national platforms such as PDDIKTI, and ongoing issues with SOPs and staffing, the system has demonstrated practical functionality and community-driven momentum. These characteristics offer valuable insights for other PTKIN institutions facing similar constraints.

Based on the review, several recommendations are proposed. First, PTKIN institutions should invest in long-term AIS infrastructure planning, including cloud-based hosting and modular system architectures that allow for scalable growth. Second, structured and ongoing user training programs must be institutionalized, not only to enhance digital literacy but also to create a consistent standard of system use across departments. Third, integration with PDDIKTI and other external systems should be prioritized through the adoption of standardized APIs and active participation in national interoperability frameworks.

For UIN Datokarama Palu specifically, future efforts should focus on formalizing SOPs, expanding mobile accessibility, and building internal technical expertise to reduce reliance on

external vendors. Collaborations with other PTKIN institutions and consortia may also enhance knowledge sharing and system benchmarking. Finally, future research could explore the comparative performance of PTKIN-developed AIS versus commercial platforms, as well as the pedagogical impact of AIS integration on student outcomes.

In conclusion, AIS will continue to play a transformative role in the management of higher education in Indonesia. For PTKIN institutions, the journey toward effective AIS adoption must be guided not only by technological innovation but also by institutional vision, user empowerment, and policy alignment. The experiences documented in this review, particularly from UIN Datokarama Palu, contribute to a growing body of localized knowledge that can inform future digital transformation in Islamic higher education.

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