Challenges and Innovations of Artificial Intelligence in University Academic Affairs Management Model

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Abstract

In the context of higher education's digital transformation, this study employs a mixed-methods approach to explore AI-driven shifts in academic affairs management from traditional to intelligent paradigms. It finds that while core applications like intelligent scheduling and academic early warning are advancing toward intelligent decision-making, challenges such as technological rigidity and institutional lag persist. Successful transformation, the research reveals, requires synergistic evolution between technological empowerment and organizational innovation. Based on empirical analysis, the paper constructs an "Academic Affairs Management Intelligence Maturity Model" with four stages—digitalization, automation, intelligence, and adaptiveness—to guide development. It also proposes a four-dimensional framework encompassing concepts, technology, organization, and institutions, promoting service empowerment, trustworthy platforms, collaborative structures, and agile governance. This research offers administrators a systematic solution for strategic planning and risk prevention while providing empirical evidence to advance the modernization of education governance.

Keywords: Artificial intelligence; Educational administration; Digital transformation; Human-machine collaboration; Higher education governance

Introduction

In the wave of global digital transformation, the field of higher education is undergoing profound changes. In 2023, China's Ministry of Education issued the Guidance on Digital Education Strategic Action, explicitly advocating for the deep integration of AI with education and teaching (Hartanto et al., 2025; Hrytsenchuk et al., 2025; Xin et al., 2025). University academic affairs management, as a core link connecting teaching, administration, and services, faces unprecedented opportunities and challenges. Traditional academic affairs management models exhibit significant limitations: First, severe information silos hinder data sharing across departments. Second, decision-making relies heavily on experience, lacking data-driven support. Third, service response is lagging, struggling to meet the personalized needs of teachers and students. According to survey data from the China Association of Higher Education in 2023, over 70% of university academic affairs managers believe existing systems suffer from "insufficient intelligence."

The rapid development of AI technology offers new avenues to address these challenges. Machine learning algorithms can process vast amounts of data to uncover hidden patterns; natural language processing technologies can improve human-computer interaction; predictive analytics models can support scientific

decision-making. However, technology introduction also brings new challenges: algorithmic bias may exacerbate educational inequity, over-reliance on technology may erode humanistic care, and data security risks are increasingly prominent.

Research on the application of AI in education management has become a global academic hotspot. International research started earlier and has formed a relatively mature system. Early research mostly focused on the level of Automation, exploring how to use information technology to simplify administrative processes (Brynjolfsson & McAfee, 2014). With the rise of Learning Analytics and Academic Analytics, the research focus shifted towards data- driven decision support. For instance, Sclater (2016) systematically discussed the potential of learning analytics in improving student retention, predicting academic performance, and optimizing learning pathways (Popenici & Kerr, 2017). In recent years, the focus has further evolved towards Intelligence Augmentation and Human-Machine Collaboration. Zawacki-Richter (2019) 's systematic review of AI application research in global higher education pointed out that despite a surge in research volume, most concentrate on the domain of teaching assistance (Sclater et al., 2016). In- depth research targeting education management (especially meso- and macro-level governance) remains insufficient, often exhibiting a "techno-centric" bias with inadequate attention to the changing roles of education managers, organizational culture adaptation, and ethical challenges (Zawacki-Richter et al., 2019). Popenici and Kerr (2017) warned of ethical risks such as algorithmic bias, data surveillance, and educational equity (Li et al., 2020).

Although domestic research in China started later, it has developed rapidly in recent years, driven by national digital education strategies, showing distinct characteristics of policy driven and problem-oriented inquiry. Early research primarily focused on the construction and integration of academic affairs management information systems (Liu, 2018). With the proliferation of big data and AI technologies, research began to delve into specific application scenarios. For example, in intelligent course scheduling, Li Wei (2020) proposed an optimization model based on a multi-objective evolutionary algorithm, effectively resolving resource conflicts (Liu et al., 2020). In academic early warning, Liu Sannvya (2020) constructed a learner profile model integrating multi-source data, providing a basis for precise intervention. In quality monitoring, researchers began exploring the use of natural language processing to analyze student evaluation of teaching texts [8]. Additionally, discussions on the digital divide, data security, and privacy protection have gradually increased (Yang & Wu, 2021).

In summary, existing research shows the following trends and gaps:

- Shift from descriptive to explanatory and design- oriented research: Moving from describing "what is" to exploring "why" and "how to design."
- Shift from single technology application to systemic ecosystem construction: The focus expands from isolated tools to the overall ecosystem where technology integrates with organization, institutions, and culture.
- Deepening interdisciplinary integration: Collaboration among scholars from educational technology, computer science, management, ethics, and other disciplines is becoming essential.

However, significant shortcomings remain in existing research: First, localized theoretical frameworks and empirical studies tailored to the unique organizational structures, institutional environments, and cultural contexts of Chinese universities are relatively scarce. Second, most research focuses on the "possibility" and "effectiveness" of technology application, providing insufficiently deep analysis of the "dark side" of the

transformation process, such as complex organizational resistance, interest conflicts, and institutional inertia. Finally, there is a lack of long-term vision and prospective design for the new forms and functions of academic affairs management driven by AI (Saxena & Gautam, 2025; Truyol et al., 2025; Wang et al., 2025). This study aims to address these gaps by constructing a systematic challenge analysis and innovation framework grounded in solid local cases and survey data, relevant to the Chinese higher education context.

The theory of process reengineering provides an important perspective for understanding the change of management mode brought about by artificial intelligence. The core idea of process reengineering proposed by Hamer and Ciampi is to achieve significant performance improvements through fundamental rethinking and thorough redesign. In the educational management scenario, artificial intelligence not only optimizes existing processes, but also creates new processes. Technology Acceptance Model (TAM) helps to analyze the factors influencing the adoption of artificial intelligence systems (Zheng & Yang, 2021). The two core variables of perceived usefulness and perceived ease of use proposed by Davis need to be extended to contextual factors such as organizational environment and technical characteristics in the context of intelligent educational management (Zhu & Hu, 2022).

Data-driven decision theory emphasizes evidence-based management practices. In educational management, this means moving from empirical decision-making to data decision- making, from reactive management to predictive intervention.

Methodology

Intelligent Course Scheduling Systems utilize constraint satisfaction algorithms, comprehensively considering hundreds of constraints such as classroom capacity, faculty availability, and student course selections. Advanced systems, like Tsinghua University's "Smart Schedule," can reduce scheduling time from the traditional manual 2-3 weeks to 2-3 hours, increasing classroom utilization by approximately 15%. Academic Early Warning and Intervention Systems are based on learning analytics technology, constructing multi- dimensional warning indicators. Beijing Normal University's system integrates data on grades, library borrowing records, online learning platform activity, etc., achieving an early warning accuracy rate of over 85%. Early intervention has increased the graduation rate of academically at-risk students by more than 12%.

Intelligent Q&A and Service Robots utilize natural language processing technology to provide 24/7 service. Fudan University's "Academic Affairs Assistant" handles over 100,000 inquiries annually, resolving 95% of common questions and freeing up approximately 30% of human resources. Intelligent Teaching Quality Monitoring employs multimodal data analysis, including classroom video analysis, assignment text analysis, and semantic analysis of student evaluations. Zhejiang University's system can identify teaching behavior patterns, providing personalized improvement suggestions for instructors.

Table 1. Current Status of Ai Application in University Academic Affairs Management (N=150)

Academic Affairs Management Application Scenario	Already Implemented	Plan to Implement	Satisfaction (1-5)
Intelligent Course Scheduling	45.3%	32.7%	4.2
Academic Early Warning	38.0%	41.3%	4.0
Intelligent Q&A	52.7%	28.0%	4.3

Academic Affairs Management Application Scenario	Already Implemented	Plan to Implement	Satisfaction (1-5)
Quality Monitoring	28.7%	38.0%	3.8
Decision Support	22.0%	45.3%	3.6

Analysis of Application Characteristics:

- Clear Phased Characteristics: Applications show an evolution from "service automation" towards "decision intelligence."
- Significant Regional Differences: Application rates in eastern universities are generally about 20 percentage points higher than in central and western regions.
- Prominent Scale Effect: The application rate in universities with over 20,000 students is 2.3 times that of universities with fewer than 10,000 students.

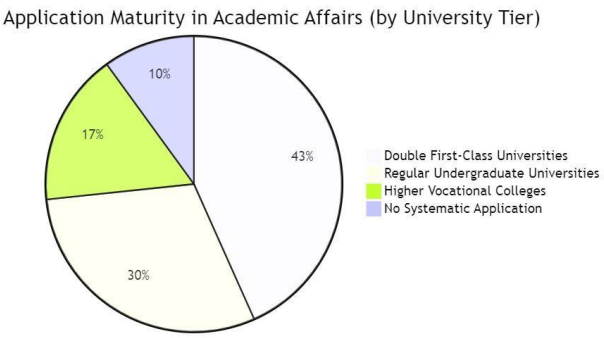

Fig 1. Distribution of AI application maturity under different conditionsn.

Analysis of Major Challenges Posed by AI

Technical Challenges

Data quality issues are most prominent. Surveys show that 67% of universities suffer from "data silos," with inconsistent data standards across academic affairs, student affairs, and logistics systems. Data completeness is inadequate, with only 58% of historical data being digitized. Problems of algorithm transparency and fairness are increasingly evident. Among surveyed faculty, 42% express skepticism towards algorithmic decision-making, fearing "black box" operations. Research finds that some intelligent recommendation systems exhibit implicit biases, such as favoring popular courses, potentially exacerbating the Matthew effect. High system integration complexity. Traditional academic affairs system architectures are rigid, making integration with new AI tools difficult. The average integration cycle exceeds 6 months, with costs often exceeding budgets by over 30%.

Organizational and Personnel Challenges

Job role restructuring causes anxiety. Research indicates demand for basic data processing roles may decrease by about 40%, while demand for data analysis and system maintenance roles may increase by 60%. Staff face significant pressure for skill transition, with insufficient willingness for retraining. Difficulties in

cross-departmental collaboration. Unclear responsibilities and authorities among academic affairs, IT departments, and faculties create a "triple helix" dilemma. The implementation of an intelligent scheduling system at one 985 Project university lagged by 18 months due to resistance from faculties. Lack of leadership and strategy. Only 35% of universities have developed clear intelligent transformation roadmaps; most remain at the level of technology procurement.

Results and Discussion

Case Selection and Profiles

Three universities at different stages of transformation were selected: University A (Exploratory Stage): A provincial key university with 25,000 students. Initiated intelligent transformation in 2019, having deployed intelligent Q&A and a basic data platform. University B (Integration Stage): A 211 Project university with 38,000 students. Established a Digital Academic Affairs Center in 2020, achieving intelligent coverage of main business processes. University C (Reshaping Stage): A 985 Project university with 42,000 students. Launched the "Smart Academic Affairs" project in 2018, currently building a new human-machine collaborative management model. Text heads organize the topics on a relational, hierarchical basis. For example, the paper title is the primary text head because all subsequent material relates and elaborates on this one topic. If there are two or more sub-topics, the next level head (uppercase Roman numerals) should be used and, conversely, if there are not at least two sub-topics, then no subheads should be introduced. Styles named “Heading 1,” “Heading 2,” “Heading 3,” and “Heading 4” are prescribed.

Cross-Case Comparative Analysis

Table 2. Comparative Analysis of AI Application in Three Universities

Comparative Analysis of Artificial Intelligence Applications in Three Universities			
Comparison Dimension	University A (Exploratory)	University B (Integration)	University C (Reshaping)
Strategic Positioning	Technology tool supplement	Business process optimization	Management model reshaping
Organizational Structure	IT Center responsible	Cross-departmental project team	Independent digital department
Investment Scale	Annual investment 3 million RMB	Annual investment 8 million RMB	Annual investment 15 million RMB
Data Governance	Basic standardization	Platform integration	Asset-oriented operation
Personnel Training	Sporadic training	Systematic training	Job role restructuring training
Faculty-Student Involvement	Passive acceptance	Partial participation	Co-design

Analysis of Success Factors:

- Leadership support is the primary condition for transformation. University C's president personally chaired the project leadership group.
- A step-by-step approach is more feasible. University B adopted a three-step strategy of "pilot, promotion, deepening."
- Organizational culture alignment is crucial. University C emphasized the value orientation of "technology serving people."

Identification of Common Obstacles:

- Resistance from middle managers is widespread, due to concerns about power restructuring and skill obsolescence.
- Cross-system integration is a Technical difficulties, typically requiring interfacing with 8 or more legacy systems.
- Difficulty in evaluating effectiveness, making it hard to quantify the long-term value brought by intelligence.

Construction of an Innovation Framework for University Academic Affairs Management Models

Design Principles

People-oriented principle: technology application always serves the development needs of teachers and students. Data-driven principle: Establish a mechanism for data collection, analysis and application throughout the process. Progressive iteration principle: Adopt agile development model, small steps and continuous optimization.

Four-Dimensional Innovation Framework

Conceptual Innovation Layer: Shift from "management control" to "service empowerment." Establish a learner-centric service philosophy, viewing academic affairs management as an enabling platform supporting teaching innovation. University C's practice shows that conceptual change can increase acceptance among teachers and students by over 30%. Technological Innovation Layer: Construct an intelligent technology architecture with "cloud-edge-device" collaboration. The cloud provides powerful computing; the edge processes real-time data; devices enable convenient interaction. Focus on breakthroughs in key technologies like multi-source data fusion, trustworthy algorithm design, and natural interaction.

Organizational Innovation Layer: Establish a flexible matrix organization. While retaining traditional functional departments, set up cross-departmental digital project teams. Promote the cultivation of "business + technology" compound talents, and establish human-machine collaborative workflows. Institutional Innovation Layer: Develop an agile institutional system (Hadjielias et al., 2021; Sætre et al., 2024; Yang & Wang, 2023). This includes data governance norms, algorithmic ethics review, digital literacy standards, and innovation fault-tolerance mechanisms. Institutional design must allow for flexibility to adapt to rapid technological iteration.

Implementation Pathway Recommendations

Short-term (1-2 years): Foundation-laying stage. Focus on building the data middle platform and unifying data standards; select 2-3 high-frequency scenarios for pilot projects; carry out digital literacy training for all staff. Medium-term (3-5 years): Comprehensive integration stage. Achieve intelligence in main business processes; establish cross-departmental collaboration mechanisms; form a preliminary system of institutional norms. Long-term (5+ years): Ecosystem reshaping stage. Construct a new smart academic affairs ecosystem; cultivate a human-machine collaborative culture; output mature experience and standards

Conclusion

First, artificial intelligence is profoundly changing the form and content of university academic affairs management, driving the transformation from experience-based management to data-driven intelligent management. The application of this technology exhibits clear characteristics of being scenario- based and phased. Second, the transformation process faces multifaceted challenges in technology, organization, and institutions. Among these, organizational inertia and institutional lag pose greater obstacles than the technology itself. Successful transformation requires the simultaneous advancement of technological empowerment and organizational change. Third, innovation should be systematic. The four- dimensional framework proposed in this study emphasizes the collaborative innovation of concept, technology, organization and system, and a single-dimensional breakthrough is difficult to achieve lasting results. Fourth, the path of differentiation is an inevitable choice. Colleges and universities should choose the appropriate transformation rhythm and focus according to their own foundation, and avoid blindly following the trend.

Theoretical innovations include: proposing a "technology- organization-institution" co-evolution perspective on digital transformation in education management; constructing a university academic affairs management intelligence maturity assessment model. The practical innovation is reflected in: providing a scenario-by-scenario and phased implementation guide; developing an index system for the evaluation of the current situation; summarizing typical cases that can be replicated.

The research samples are mainly from undergraduate colleges and universities, and there is insufficient attention to higher vocational colleges. Limited follow-up time and insufficient assessment of long-term impact. Future research should: expand the coverage of institutional types; carry out longitudinal follow-up research; strengthen international comparative research; pay attention to the impact of new technologies such as generative AI. With the continuous evolution of technology, the integration of artificial intelligence and educational administration will be more in-depth. The possible trends in the future include: the educational administration management system is developing towards platform and ecology; human- machine collaboration has become the normal working mode; the educational administration management function expands from execution to innovation. Colleges and universities need to maintain strategic determination, adhere to the original intention of educating people while embracing technology, and embark on a road of modernization of educational management with Chinese characteristics.

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