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Pathways and Practical Explorations for Building Smart Education Platforms in Universities

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Abstract: As digitalization strategies in education continue to advance and artificial intelligence technology integrates more deeply with higher education, the development of smart education platforms in universities has become a key driver in building a strong education system. This paper, based on the latest policy requirements and practical university development needs, outlines the core pathways for platform construction, specifies actionable implementation steps from top-level planning to ecosystem integration, and proposes practical strategies for promotion, providing valuable insights for universities' digital transformation. The study examines the technological infrastructure requirements, pedagogical considerations, and organizational frameworks necessary for successful platform deployment. Furthermore, it addresses challenges related to data security, user adoption, and sustainable operation models. By analyzing current best practices and emerging trends, this research offers a comprehensive roadmap for educational institutions seeking to leverage smart technologies to enhance teaching quality, improve learning outcomes, and foster innovation in higher education environments.

Keywords: smart education; digital transformation; higher education; platform construction; educational technology

1. Introduction

Digital transformation in education represents a critical breakthrough for exploring innovative pathways in the development of higher education and establishing unique competitive advantages. The advancement of smart education platforms within universities is not only a response to the essential demands of the national digital education strategy but also a solution to persistent challenges in university informatization. By integrating cutting-edge technologies, these platforms aim to optimize the quality of talent cultivation and improve governance efficiency [1]. Furthermore, they are designed to provide enhanced digital services tailored to the needs of faculty and students, thereby fostering a more dynamic and efficient academic environment. This initiative underscores the importance of leveraging digital tools to support the sustainable and high-quality progression of higher education, ensuring that institutions remain adaptable and forward-thinking in an increasingly digital era [2].

2. Objectives for Building a Smart Education Platform in Higher Education Institutions

2.1. Supporting Innovation in Talent Development Models

The Smart Education Platform aims to transcend the limitations of traditional teaching methods, which are often constrained by time and location, by offering a dynamic framework to enhance the quality of talent cultivation in higher education. This innovative platform aggregates a diverse array of high-quality course resources from multiple disciplines across universities, enabling students from various regions and institutions to access advanced, industry-relevant content. Through its intelligent learning

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assistance system, the platform provides personalized educational experiences by delivering tailored exercises and supplementary materials based on individual student progress and knowledge acquisition [3, 4]. For scenarios involving high costs and risks, such as STEM practical training and medical clinical education, the platform incorporates virtual simulation modules that allow students to practice operations repeatedly. This ensures mastery of techniques while addressing the limitations posed by physical training resources. Furthermore, the platform integrates comprehensive resources for ideological and political education, aesthetic education, and labor education, embedding value-driven guidance into all aspects of teaching. This holistic approach aims to enhance students' overall competencies by fostering intellectual growth, practical skills, and ethical development. By leveraging advanced technologies and systematic resource consolidation, the platform represents a transformative step in modernizing higher education and preparing students for the challenges of an increasingly complex and interconnected world [5, 6].

2.2. Empowering the Upgrade of Campus Governance System

The development of the platform must address critical challenges and inefficiencies in the internal management of universities. By transitioning from fragmented and reactive administrative processes to a more cohesive and proactive operational framework, the platform can significantly enhance institutional efficiency [7, 8]. A key feature of this transformation is the integration of disparate business systems across various departments, including academic affairs, student services, human resources, research, and finance. This integration creates a unified portal for all administrative services, eliminating the need for faculty and students to navigate multiple systems or repeatedly submit identical documentation. Such a streamlined approach facilitates the seamless execution of full-cycle procedures, encompassing everything from enrollment registration to graduation and departure. Furthermore, the platform's centralized data repository enables administrators to monitor real-time performance metrics across departments, swiftly identify bottlenecks in processes, and implement targeted optimizations. By leveraging advanced analytical tools, university leadership can gain valuable insights into disciplinary trends, employment market dynamics for various programs, and the evolving developmental needs of students at different academic stages. These insights provide a robust evidence base for informed decision-making, ultimately enhancing governance efficiency. Additionally, this approach significantly reduces administrative costs, ensuring that resources are allocated more effectively to support the institution's broader academic and operational goals.

2.3. Building an Open and Shared Educational Service Ecosystem

The long-term objective of the platform is to integrate seamlessly with the national smart education system, thereby broadening the scope and accessibility of higher education services across the country. This university smart education platform is not designed to function as an isolated campus system; rather, it is intended to interconnect with the national smart education public service platform under unified standards. Such integration facilitates the nationwide sharing of educational resources, ensuring that high-quality resources are directed toward institutions in remote and ethnic regions. This approach aims to promote regional educational equity and inclusivity. Furthermore, the platform can make non-confidential course materials and training content publicly accessible, offering tailored learning opportunities for professional skill development and lifelong learning, particularly for the elderly population. This initiative enhances the social service functions of universities by addressing diverse learning needs. Additionally, the platform is well-positioned to meet the practical demands of industries and enterprises by collaborating on the development of customized curriculum systems and practical training resources [9, 10]. This collaboration strengthens the integration of industry and education, ensuring that talent cultivation aligns more closely with real-world workforce requirements. Such efforts foster a mutually beneficial cycle among universities,

enterprises, and students, ultimately contributing to a more dynamic and responsive educational ecosystem.

3. Pathways for Building Smart Education Platforms in Universities

3.1. Top-Level Architecture Coordination Planning

The school should establish a dedicated construction team led by the deputy principal responsible for overseeing the initiative. This team should include key personnel from the Information Management Department, Academic Affairs Department, Student Affairs Department, Research Management Department, and Finance Department. To ensure the platform design aligns with the practical needs of its users, the team must also incorporate at least five frontline teachers from various academic disciplines and ten student representatives from different grade levels. This diverse composition will help address the unique requirements of all stakeholders. The team's initial task should involve a thorough analysis of the official integration standards outlined by the National Smart Education Public Service Platform. This includes understanding data interface specifications, digital resource upload protocols, and school service integration requirements to ensure the campus platform integrates seamlessly with the national system. Such preparation will minimize the need for redundant modifications and streamline the development process. Furthermore, the team should conduct a detailed review of the existing campus information systems. This review must map out the functionalities of departmental systems, assess the current state of data storage, and identify pending service integrations. Based on these findings, a prioritized list for system consolidation should be developed to maximize the reuse of existing infrastructure and prevent unnecessary expenditure on duplicate developments. To ensure the project remains on track, a phased implementation plan spanning three years should be devised. This plan must outline annual priorities, establish clear evaluation criteria, allocate budgets effectively, and assign responsibilities to specific departments. By setting measurable milestones, the project can progress systematically, avoiding delays and ensuring alignment with the overall strategic objectives of the institution.

3.2. Tiered Construction of the Technical Foundation

A robust technical foundation is essential for ensuring the stable operation of intelligent education platforms, which should be implemented progressively through a tiered development approach. Initially, the foundational cloud resource layer must be established. Schools are required to scale their cloud server computing power, distributed storage resources, and outbound bandwidth in alignment with current student and teacher populations, as well as anticipated business growth over the next three years. This layer must also adhere to compliance standards, including obtaining Level 3 Cybersecurity Protection Certification, to effectively manage high access volumes and securely store sensitive data. Following this, the core capability intermediate layer should be developed. This involves prioritizing the deployment of a unified identity authentication system that integrates account systems across all campus platforms, enabling seamless "one-sign-on, full-network access" functionality. Additionally, a standardized data middle platform should be constructed to unify data collection standards and storage formats across departments. Historical data from academic administration, student affairs, research, and financial systems must be gradually migrated to eliminate data silos. A visual process engine should also be implemented, allowing non-technical staff to modify workflows directly, thereby reducing development costs. Finally, the comprehensive security protection layer must be deployed. This layer should include data encryption, hierarchical permission controls, and abnormal access alerts, alongside regular data backup and disaster recovery drills. Standardized functional expansion interfaces should be reserved to facilitate future integration of advanced technologies, such as educational big models, while avoiding redundant modifications. These measures collectively ensure a scalable, secure, and efficient technical foundation for intelligent education platforms.

3.3. Orderly Implementation of Core Scenarios

The implementation of the smart education platform should adopt a structured and phased approach to ensure optimal outcomes. Initially, the focus should be on addressing the most pressing needs of faculty, students, and administrative staff, thereby delivering rapid and impactful results. To achieve this, the development team must conduct comprehensive needs assessments involving all stakeholders. This process should identify high-frequency functions with significant usage rates, such as course registration, grade inquiries, and departure procedures for students; project submissions, credit calculations, and plagiarism checks for teachers; and approval workflows and data reporting for administrative departments. These prioritized functions should be organized into a timeline based on their urgency and relevance. Following this, pilot programs should be initiated in one or two colleges equipped with advanced IT infrastructure, granting priority access to high-demand features. Dedicated personnel should be assigned to collect detailed user feedback, enabling iterative refinements to functionality and workflows. This proactive approach minimizes compatibility issues during broader deployment. Once pilot programs demonstrate success, features should be systematically rolled out in batches, beginning with administrative services, followed by teaching resources, and concluding with governance tools. To facilitate user adoption, clear and accessible guides should be disseminated through campus WeChat accounts, class groups, and departmental communication channels. Offline workshops should also be organized to address user queries and provide hands-on training. Each feature rollout must include a one-week monitoring period to promptly resolve user concerns and rectify system bugs, ensuring seamless integration and user satisfaction.

3.4. Resource and Ecosystem Integration

The integration of resource ecosystems represents a pivotal strategy for broadening the functional scope of university smart education platforms. This process should be systematically implemented, beginning with top-down alignment and progressing outward from internal systems. Initially, it is essential to ensure compliance with the National Smart Education Public Service Platform by adhering strictly to the interface specifications established during the planning phase. Emphasis should be placed on incorporating public modules such as the national platform's premium MOOC repository, virtual simulation experiment resources, and student employment services. This integration allows faculty and students to access high-quality national resources seamlessly, without requiring additional navigation. Furthermore, universities can contribute their unique premium courses to the national platform, thereby enhancing their academic influence and visibility in specialized disciplines. Interoperability within regional university alliances should also be prioritized. This involves establishing connections with smart education platforms of other institutions within the same province or alliance, facilitating the mutual sharing of course resources from leading disciplines and enabling access to training bases. Over time, this approach can support cross-institutional course selection, mutual credit recognition, and the shared utilization of regional educational resources. Additionally, industry-specific resource portals should be developed through collaborative agreements with leading enterprises in relevant sectors. These portals can integrate advanced practical training programs, internship opportunities, and targeted training courses, fostering deeper industry-education collaboration. To maintain the vitality and relevance of the resource pool, a dynamic update mechanism must be established. This mechanism should include quarterly reviews of resource utilization across all portals to identify and remove low-quality resources with minimal engagement. Simultaneously, new high-quality content should be added to ensure the resource pool remains robust and aligned with evolving academic and industry needs.

4. Practical Strategies for Smart Education Platforms in Universities

4.1. Coordinated Efforts by the Task Force with Clear Accountability Implementation

The successful implementation of a smart education platform in universities hinges on the establishment of a robust accountability framework designed to eliminate inefficiencies such as departmental buck-passing. To achieve this, universities should build upon existing task forces by assigning a dedicated full-time liaison specialist to each administrative department involved in the platform's development. These specialists must possess a dual skill set: a deep understanding of their department's core operational workflows and fundamental IT operational expertise [11–13]. Their responsibilities include overseeing the integration of departmental services into the platform, addressing user feedback, and ensuring the continuous optimization of platform functionalities. Clear responsibility matrices should be established to delineate departmental roles and boundaries. For example, the IT department would focus on technical maintenance, bug resolution, and feature updates, while the academic affairs department would handle resource review, content uploads, and the deployment of smart courses. Meanwhile, the student affairs department would prioritize enhancing student service scenarios and systematically collecting feedback to inform platform improvements. Each task must be assigned to specific individuals with clearly defined deadlines to ensure accountability. Weekly coordination meetings involving all liaison specialists should be conducted to identify and address platform issues, facilitate cross-departmental collaboration, and assign follow-up responsibilities for unresolved challenges. To further ensure the success of these initiatives, universities should integrate performance metrics such as platform integration rates, user satisfaction levels, and task processing efficiency into annual evaluations. Recognizing outstanding departments and individuals while holding underperforming ones accountable will foster a culture of excellence and ensure the full realization of the platform's potential. This structured approach will not only streamline operations but also enhance the overall user experience, driving the adoption and effectiveness of smart education platforms.

4.2. Pilot Initiatives First, Followed by Gradual Full Coverage

In managing the pace of platform implementation, a gradual and incremental approach is essential to minimize the risks associated with a full-scale launch. To ensure a smooth transition, it is recommended to begin with pilot initiatives in a controlled environment. Specifically, 2–3 colleges with advanced IT infrastructure and a demonstrated ability to adapt quickly should be selected as pilot sites for teaching scenarios. Simultaneously, the Academic Affairs Office and Student Affairs Office, which handle high-frequency administrative services, should be designated as university-wide pilot units. This dual approach ensures that a wide range of usage scenarios is covered, facilitating comprehensive feedback collection. To support these pilots, a dedicated liaison specialist should be assigned to each unit. These specialists will conduct weekly on-site training sessions to address operational challenges, collect user feedback, and communicate recommendations to technical teams for immediate adjustments. After one month, a thorough evaluation should be conducted, analyzing backend data, stakeholder satisfaction, and process efficiency through field surveys. This evaluation will identify areas for functional and procedural improvement before expanding the rollout. The deployment should proceed in phases, starting with student services, followed by faculty services, and finally administrative services. Each new feature must undergo at least three full-scale stress tests to ensure reliability [14]. Additionally, operational guidelines should accompany each release to facilitate a seamless transition and maintain system stability.

4.3. Tiered Training to Enhance Usage Skills

To promote the effective adoption and mastery of platform functionalities, it is essential to design tailored training programs that address the specific needs of distinct user groups. A generic, one-size-fits-all approach often fails to yield practical outcomes, making it necessary to categorize training into three distinct tiers: administrative staff, frontline instructors, and students. For administrative staff, the training should emphasize operational management, including tasks such as accessing backend data, modifying service workflows, and troubleshooting user issues [15, 16]. Frontline instructors require

training focused on teaching-related functionalities, such as uploading educational materials, utilizing smart teaching tools, and managing online grading systems. Students, on the other hand, need guidance on fundamental operations, including submitting service requests, navigating learning resources, and reviewing grades. The training content must align closely with the actual scenarios these groups encounter to ensure relevance and applicability. To accommodate diverse learning preferences, training formats should include permanently accessible recorded tutorials, periodic in-person workshops, and the appointment of 1–2 student representatives from each college to act as platform ambassadors. These ambassadors can serve as a first point of contact for addressing common user inquiries. To evaluate the effectiveness of the training, post-training assessments should be conducted, requiring participants to pass basic operational tests to confirm their proficiency. Additionally, a dedicated support hotline staffed by trained personnel should be established to address any ongoing issues. This comprehensive approach ensures that all users, regardless of their role, can achieve a high level of competency in platform operations, thereby enhancing overall system efficiency and user satisfaction.

4.4. Dynamic Monitoring and Continuous Optimization/Upgrading

For the sustained operation and maintenance of the platform, it is essential to establish a robust and comprehensive monitoring and optimization mechanism [6]. This ensures that the platform's functionalities consistently align with the evolving needs of faculty and students. The operational monitoring system should incorporate clearly defined core metrics, such as daily active user counts, average service processing times, issue resolution speeds, and user satisfaction scores. These metrics should be automatically compiled into daily visual reports generated by the backend system, enabling intuitive and efficient platform status monitoring without the need for manual data collection. To facilitate user feedback collection, multiple channels should be implemented, including a one-click feedback button integrated into the platform, a dedicated feedback section within the campus official account, and feedback mechanisms managed by college representatives. A specialized team should systematically compile weekly feedback lists, categorizing issues by type and assigning them to the appropriate departments for resolution. For feature updates and optimization, quarterly update plans should prioritize addressing the most frequently reported user concerns. Minor adjustments should be developed and deployed within one week, while major upgrades should undergo rigorous pre-launch testing to ensure compatibility and functionality before full deployment. In terms of security operations, weekly system audits, monthly comprehensive data backups, and quarterly high-concurrency stress tests are imperative. Additionally, proactive bandwidth expansion preparations should be made for peak periods, such as the start of academic semesters and course registration seasons, to ensure uninterrupted platform performance. These measures collectively support the platform's long-term reliability and user satisfaction.

5. Conclusion

The development of a smart education platform represents a multifaceted and ongoing process that demands strategic planning, phased execution, and adaptability to the unique requirements of higher education institutions. Such platforms are poised to leverage advancements in artificial intelligence to seamlessly integrate diverse application scenarios, ranging from personalized learning environments to administrative optimization. As these technologies mature, the platform's capabilities will expand to include predictive analytics, adaptive learning algorithms, and enhanced data-driven decision-making tools. These advancements will not only modernize governance structures within higher education but also contribute to the cultivation of highly skilled talent equipped to meet the demands of an increasingly complex global landscape. Future research should focus on refining these systems to ensure scalability, inclusivity, and ethical AI deployment, thereby maximizing their transformative potential.

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