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Research on Multiple Paths and Governance Logic of Office Efficiency Improvement in Universities from the Perspective of Intelligent Transformation

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Abstract: Intelligent transformation has become a core driver for modernizing internal governance and enhancing operational efficiency in higher education institutions. Grounded in the objective of optimizing administrative efficiency, this study employs the Technology–Organization–Environment (TOE) analytical framework to explore the mechanisms through which intelligent technologies reshape the synergy between administrative management and teaching services. The research identifies three key dimensions in which intelligent empowerment enhances institutional efficiency: transitioning from process automation to intelligent decision-making, evolving from information silos to collaborative sharing, and upgrading from reactive responses to proactive, demand-oriented services. On this basis, the study constructs a multi-dimensional collaborative framework that integrates intelligent administrative systems, refined teaching management, and holistic faculty–student services. It further elaborates concrete implementation strategies for process reengineering, precision evaluation, and service innovation, emphasizing data-driven workflow optimization and evidence-based decision support. In addition, safeguard mechanisms are proposed across three dimensions: data security protection, organizational culture transformation, and performance evaluation feedback, thereby ensuring sustainable and controllable intelligent transformation. By systematically clarifying the governance logic and multiple paths of office efficiency improvement, this research provides theoretical foundations and practical guidance for universities seeking to overcome governance bottlenecks, reduce administrative redundancy, and build smart, efficient, and secure modern administrative ecosystems aligned with the strategic goals of digital higher education.

Keywords: intelligent transformation; office efficiency; higher education governance; technology-organization-environment framework; smart campus; administrative digitalization

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1 Introduction

The strategic emphasis on advancing educational digitalization has elevated the digital transformation of education to a critical national priority. Within this context, higher education institutions, as pivotal hubs for talent cultivation and scientific innovation, play a decisive role in achieving high-quality development. At present, higher education is undergoing a significant phase of connotative development, where traditional hierarchical administrative management models are increasingly challenged by structural inefficiencies. These include overly complex processes, rigid information silos, and fragmented service experiences, which hinder the ability to address the growing demands of resource allocation and cross-departmental collaboration. Despite the widespread adoption of office automation systems over the years, many institutions continue to struggle with issues such as an excessive focus on system construction without adequate integration of business processes and an overemphasis on technology adoption without corresponding process optimization. These challenges have led to persistent data silos, a disconnect between technological applications and operational

needs, and significant barriers to improving institutional efficiency [1]. In light of these challenges, the integration of intelligent technologies has emerged as a critical solution [2, 3]. This approach seeks to transition office models from basic electronic process digitization to advanced intelligent governance. This paper aims to move beyond single-technology perspectives by systematically analyzing the intrinsic mechanisms of intelligent empowerment through the TOE framework [4, 5]. Furthermore, it proposes collaborative implementation pathways involving multiple stakeholders, offering valuable insights for modernizing governance systems in higher education institutions.

2 Theoretical Basis and Analytical Framework

2.1 Theoretical Basis

This study primarily builds upon the principles of process reengineering theory and the framework of new public service theory to conduct its analysis [3]. Process reengineering theory emphasizes the necessity of fundamentally reevaluating and completely redesigning existing operational processes to achieve substantial improvements in critical performance metrics. Within the context of university administration, the integration of intelligent technologies offers the opportunity to transcend traditional hierarchical constraints, enabling more streamlined and adaptive workflows. Meanwhile, new public service theory advocates for a shift from control-oriented mechanisms to service-oriented approaches, prioritizing the needs and experiences of stakeholders [6]. Applied to university governance, this perspective necessitates a transformation of administrative offices from a "management-centric" model to one that is "service-oriented," leveraging advanced technologies to effectively and precisely address the diverse needs of faculty and students, thereby fostering a more responsive and inclusive institutional environment [6, 7] (As shown in Table 1).

2.2 Applicability of the TOE Analysis Framework

The Technology-Organization-Environment (TOE) framework systematically explains how the adoption of organizational technology is shaped by three interconnected dimensions: technological advancements, organizational structures, and environmental factors [5]. The technological dimension includes internal resources such as artificial intelligence and big data, which serve as critical tools for innovation and operational enhancement [8, 9]. The organizational dimension focuses on institutional structures, resource allocation strategies, and the competency of faculty members, all of which play pivotal roles in determining the success of technological integration. The environmental dimension encompasses broader external influences, such as regulatory frameworks and the evolving service expectations of students and faculty [9, 10]. This framework offers a comprehensive perspective for examining the intelligent transformation of university operations, highlighting how the integration of advanced technologies fosters significant improvements in office efficiency by aligning organizational processes with external environmental conditions. (As shown in Table 1)

Table 1 Dimensions of the TOE Framework and Their Application in Office Intelligence in Higher Education Institutions

dimension	primary coverage	Specific manifestations
Technical dimension	New technology features, maturity, and compatibility	The application of technologies such as AI, big data, cloud computing, RPA, and blockchain in administrative, educational, and service scenarios
Organizational Dimension	Organizational structure, resources,	Cross-departmental collaboration leadership group, data governance

	systems, and personnel	system, digital literacy training, process reengineering
Environmental dimension	Policy, Competition, and Social Expectations	Digitalization Strategy for Education, Requirements for Connotative Development, Policy Orientation of "One-Stop Online Service", and Satisfaction Demands of Teachers and Students

3 The Intrinsic Mechanism of Intelligent Empowerment on University Office Efficiency

Intelligent transformation represents a comprehensive and systematic initiative that goes beyond the mere application of advanced technologies. It initiates profound structural changes in university office models, reshaping traditional workflows and operational paradigms. The enhancement of office efficiency unfolds through three interconnected and progressive dimensions, establishing a cohesive logical framework that integrates technological advancements with governance strategies [6]. This synergy fosters a more adaptive, streamlined, and effective administrative environment, ensuring sustainable improvements in institutional performance [4, 11].

3.1 From Process Automation to Intelligent Decision Making

Traditional office automation emphasizes the standardization of workflow processes and document handling to replace repetitive manual tasks. Its primary focus has been on achieving operational efficiency through rule-based automation, which often prioritizes speed and consistency over deeper problem-solving capabilities. However, with the integration of advanced artificial intelligence algorithms and sophisticated big data analytics models, office systems have undergone a significant evolution. This transformation has shifted the focus from simple task execution to intelligent decision-making support, redefining management paradigms. By leveraging comprehensive data mining techniques and predictive analytics, these systems enable informed decision-making in critical areas such as resource allocation for teaching, distribution of research funding, and optimization of campus energy usage. Decision-making processes have transitioned from relying on subjective experience to being guided by data-driven insights derived from empirical evidence. In this context, data has evolved from being a secondary byproduct of operations to becoming a pivotal factor in organizational strategy. Intelligent systems utilize advanced analytical methods, such as pattern recognition and temporal analysis, to extract meaningful insights from extensive datasets. These insights empower managers with a holistic understanding of current conditions and actionable strategic recommendations. For example, in planning academic discipline development, systems can autonomously generate detailed assessment reports based on historical achievements, recruitment metrics, and industry trends, thereby supporting leadership in formulating long-term strategies [12]. This advancement elevates office systems from merely executing tasks to actively analyzing and solving complex problems, fostering a transition from operational efficiency to strategic empowerment [7, 10]. Such systems provide robust theoretical and technical foundations for enhancing decision-making processes in administrative contexts.

3.2 From Information Silos to Collaborative Sharing

Traditional university informatization initiatives often rely on a "department-led, single-point development" model, which results in significant physical and logical barriers between academic affairs, student affairs, human resources, and financial systems. These barriers create numerous isolated data ecosystems that hinder efficient resource utilization and obstruct cross-departmental collaboration and governance. Modern smart office platforms, leveraging cloud computing, IoT, and microservices architecture, effectively dismantle these boundaries and barriers, initiating a comprehensive

restructuring of data ecosystems [8]. By implementing unified data standards, robust identity authentication mechanisms, and centralized data exchange frameworks, these platforms facilitate seamless real-time data sharing and collaborative operations across departments and hierarchical levels [2]. This transformation transcends mere technical integration, driving profound optimization of organizational structures and workflows. Inspired by the principles of systemic communication architecture, this approach compels organizational restructuring, aligning discrete functional units into a cohesive, task-oriented collaborative governance network. For example, in scenarios involving student evaluations, data from academic systems, student affairs systems, and logistics systems are integrated to create multi-dimensional profiles. These profiles enable comprehensive analysis and provide valuable insights for developing streamlined service systems. Such restructuring significantly enhances operational efficiency, reducing transaction costs associated with interdepartmental collaboration [10]. Furthermore, it establishes a robust architectural foundation for the advanced collaboration pathways discussed in subsequent sections, ensuring sustainable and scalable governance models.

3.3 From Passive Response to Active Service

Traditional administrative service models often rely on a reactive approach, requiring students and faculty to actively search for service portals and navigate complex procedures [6]. This method frequently results in extended service chains and slower response times, ultimately diminishing the overall user experience. Recent advancements in technologies such as natural language processing, user profiling, and recommendation algorithms have enabled office systems to achieve substantial improvements in service delivery, offering continuous personalized and proactive smart services. Intelligent customer service platforms now autonomously address common inquiries regarding administrative processes and policy-related questions by utilizing comprehensive knowledge bases, thereby significantly reducing the need for manual intervention [12]. Furthermore, these systems can proactively deliver task lists, policy updates, or tailored services based on user roles, behavioral trends, and historical interactions. For example, graduating students are automatically provided with notifications regarding departure procedures and employment opportunities, while newly recruited faculty members receive detailed guidance on research project applications and office equipment usage [9]. This evolution from a model where individuals seek information to one where information is dynamically delivered to users signifies a pivotal shift in university governance philosophy—from a management-focused approach to one centered on service. This transformation not only accelerates service response times but also greatly enhances user satisfaction. A deeper analysis of this mechanism underscores the fundamental principle of technology serving human needs, aligning directly with strategies aimed at optimizing user experiences and empowering knowledge-driven service innovations for both students and faculty.

4 Multi-dimensional Collaborative Approaches for Enhancing Administrative Efficiency in Higher Education Institutions

Universities must transcend the narrow confines of technological instrumentalism and embrace a holistic framework that integrates efforts across three pivotal dimensions: administrative management, teaching management, and faculty-student services. This approach necessitates a systematic alignment of resources, policies, and practices to foster synergy among these domains [5, 11]. By prioritizing interconnected strategies, institutions can optimize operational workflows, enhance pedagogical outcomes, and improve the overall academic experience [3]. This chapter will delve into the practical methodologies and essential elements required to implement these collaborative approaches effectively.

4.1 Process Reengineering and Precision Governance

The intelligentization of administrative management extends far beyond the simple digitization of approval processes [5]. It involves the strategic application of advanced

technological tools to decentralize the focus of management and enhance decision-making authority [6]. This approach facilitates the development of modernized governance capabilities, enabling institutions to operate with greater efficiency, precision, and adaptability in addressing complex administrative challenges [11].

First, an intelligent administrative approval system should be established by integrating Robotic Process Automation (RPA) and blockchain technology. For tasks that are highly repetitive and governed by clear rules, such as financial reimbursements, personnel onboarding, and document circulation, RPA can be extensively applied to automate workflows, validate rules, and generate alerts for anomalies. This automation alleviates administrators from monotonous duties, allowing them to focus on higher-value activities [5]. By utilizing blockchain's tamper-proof and traceable characteristics, trust chains can be created at critical approval points to ensure transparency and credibility in administrative operations. Furthermore, intelligent compliance verification modules can be introduced to automatically compare policies and regulations during the approval process, identifying potential risks of non-compliance. This shift from reliance on "human oversight" to "technological safeguards" significantly reduces risks related to integrity and compliance while lowering associated costs in administrative management [12].

Second, a dynamic resource scheduling platform based on the Internet of Things (IoT) should be developed. By leveraging IoT technology to connect physical spaces such as classrooms, laboratories, meeting rooms, and other venues, a comprehensive network for monitoring resource status with full-domain awareness can be created. Through the analysis of historical usage patterns and real-time demands using big data, predictive models can be developed to enable intelligent scheduling and dynamic allocation of facilities and equipment [8]. For example, the system can automatically optimize classroom distribution plans based on course schedules and extracurricular activity data, effectively addressing issues of resource underutilization and shortages [3]. Additionally, energy consumption monitoring and smart regulation can further reduce operational costs, promoting sustainable campus operations. This initiative not only enhances the utilization rates of assets but also provides measurable improvements in management efficiency.

Third, a university-level decision-making cockpit should be established, supported by a data middle platform. By integrating institutional data such as enrollment statistics, academic discipline development, financial operations, and talent management systems, a university-wide data warehouse and analytical platform can be constructed [7]. This visualized decision cockpit offers university leaders a comprehensive "one-screen overview" capability to monitor institutional dynamics effectively. Through multidimensional data mining and correlation analysis, real-time tracking of key performance indicators (KPIs), such as trends in student-to-faculty ratios and returns on research funding investments, provides quantitative support for academic planning, resource allocation, and risk forecasting [7]. This approach ensures that decision-making is evidence-based and strategically aligned with the university's long-term development objectives, fostering a more robust and forward-looking administrative framework.

4.2 Model Integration and Precision Evaluation

The optimization of teaching management efficiency focuses on improving both instructional quality and administrative effectiveness through advanced intelligent methodologies. This transition facilitates the evolution of teaching management from traditional experience-based practices to a modern framework rooted in data-driven strategies, ensuring a more systematic and precise approach to educational governance [2, 7].

On one hand, a comprehensive smart teaching ecosystem is established, characterized by data-driven closed-loop management. Utilizing an intelligent teaching platform, the system integrates pre-class preparation, in-class engagement, and post-class assessment into a seamless workflow. Pre-class activities are enhanced through AI-

powered resources designed to support preliminary learning, while interactive tools enable dynamic evaluation during lessons [4, 8]. Post-class assignments are personalized based on detailed analyses of learning behaviors, ensuring tailored educational experiences. This holistic data collection framework not only improves teaching efficiency but also provides granular insights into instructional processes [3]. By employing advanced learning analytics technologies, the platform identifies common challenges and individual needs among students, enabling educators to deliver differentiated instruction and targeted interventions [7]. This methodology significantly enhances overall teaching quality while fostering a deep integration between educational processes and administrative operations, creating a synergistic environment for both educators and learners.

On the other hand, precision evaluation reforms are implemented based on principles emphasizing measurable educational outcomes. Traditional summative assessment models are transformed into multidimensional evaluation systems that incorporate both process and outcome metrics. Through the application of learning analytics technologies, students' learning trajectories, interaction patterns, and assignment performance are modeled to generate comprehensive competency profiles [4]. These profiles accurately pinpoint knowledge gaps and skill deficiencies, enabling educators to refine instructional strategies and provide targeted support. Additionally, AI-assisted grading and evaluation systems alleviate administrative workloads for teachers, allowing them to concentrate on pedagogical innovation and academic pursuits. Teaching administration departments benefit from dynamic course quality monitoring facilitated by data-driven mechanisms, which support the establishment of admission and exit protocols for courses. This institutional framework optimizes resource allocation and ensures the continuous improvement of educational management efficiency.

4.3 Experience Optimization and Knowledge Empowerment

Teacher-student service innovation forms the foundation for improving administrative efficiency within higher education institutions [5]. This approach prioritizes the redesign of service processes with a user-centric perspective, aiming to foster a welcoming and inclusive campus service environment that meets the diverse needs of its community [11].

First, the "One-Stop Online Service" initiative will be advanced to streamline service processes comprehensively. Adhering to the principle of minimizing physical visits, cross-departmental procedures will be thoroughly reviewed and standardized. A hybrid online-offline student service center will be developed, incorporating features such as detailed service guides, online application systems, real-time progress tracking, and feedback channels [5, 9]. By removing the constraints of physical service windows, instant approval and processing mechanisms will be introduced to enable seamless handling of high-frequency tasks [4]. For example, integrating academic administration, logistics, and library systems will allow automated online verification of student departure procedures, replacing outdated manual processes [11]. This transformation will significantly improve service efficiency and satisfaction by eliminating unnecessary delays and enhancing user convenience.

Secondly, a knowledge management and collaboration platform will be established to harness the extensive tacit knowledge accumulated within universities. By utilizing advanced technologies such as Web 2.0 and knowledge graphs, internal knowledge repositories and collaborative communities will be created to encourage the sharing of expertise among faculty and students [7]. Intelligent search systems and personalized recommendation algorithms will facilitate the efficient circulation and reuse of high-quality resources. This initiative will transform universities into dynamic learning organizations, fostering an innovative organizational culture. The approach not only enhances operational efficiency but also unlocks collective creativity and vitality, driving continuous improvement and innovation.

Finally, a comprehensive lifecycle service system will be implemented to address the evolving needs of teachers and students [9]. By developing precise user profiles that map the entire journey of teachers from onboarding to retirement and students from enrollment to alumni status, the system will deliver tailored service packages at each stage [10]. For instance, new faculty members will automatically receive guidance on research startup fund applications, while graduating students will be matched with employment opportunities alongside their graduation procedures. This proactive, teacher-student-focused service model shifts from reactive responses to anticipatory care, fostering a stronger sense of belonging and engagement within the campus community [11].

5 Support and Evaluation Mechanisms for Intelligent Transformation

The success of pathway implementation is contingent upon the establishment of a comprehensive safeguard system and an iterative evaluation-feedback mechanism [12]. Higher education institutions should develop multifaceted safeguard strategies encompassing institutional policies, organizational frameworks, advanced technological infrastructure, and targeted talent cultivation initiatives [4]. These measures are essential to ensure the seamless execution of transformative processes, fostering adaptability and resilience within academic and operational environments.

5.1 Technology and Data Security Foundation

Data security serves as the cornerstone for intelligent transformation, ensuring the integrity and reliability of digital ecosystems. Higher education institutions must prioritize the establishment of robust data governance frameworks, incorporating structured systems to oversee data management and protection [4]. This includes the implementation of Chief Data Officer systems to streamline accountability and the precise delineation of data ownership, access rights, and operational standards. Advanced technological measures, such as end-to-end encryption, dynamic access control mechanisms, and privacy-preserving computing, should be integrated to safeguard data throughout its lifecycle—from initial collection and transmission to storage and utilization. Sensitive information related to faculty and students necessitates tiered classification protocols, reinforced by stringent anonymization techniques and comprehensive audit mechanisms. On the management front, institutions should develop proactive cybersecurity contingency plans, conduct regular security awareness programs, and perform penetration testing to identify vulnerabilities [2]. It is imperative to ensure that advancements in performance and efficiency are never achieved at the expense of data security and privacy. Security systems must be seamlessly aligned with operational workflows to establish a resilient digital infrastructure that supports smart office environments and fosters sustainable innovation.

5.2 Organizational and Personnel Capacity Building

The foundation of intelligent transformation is centered on the development of human resources, with the enhancement of workforce capabilities serving as the cornerstone of progress [11]. Establishing a dedicated "Digital Transformation Task Force" under the leadership of school administrators is essential to ensure robust top-level design and seamless cross-departmental coordination. This initiative aims to dismantle departmental silos and foster a unified collaborative framework. A comprehensive "Digital Literacy Enhancement Program" should be implemented through tiered training strategies. For management personnel, the focus should be on cultivating advanced data-driven thinking and refining process optimization skills. Technical staff should be equipped with expertise in architectural design and operational maintenance, while frontline educators should receive targeted training to master the use of intelligent teaching tools. Promoting a culture of data-driven decision-making and innovation is vital to overcoming organizational inertia and cognitive barriers, ensuring sustained talent development and intellectual support for the transformation journey [1].

5.3 Establishing a Scientific Performance Evaluation System

Higher education institutions should develop a robust evaluation framework that integrates technical performance, operational value, user experience, and social impact. This framework should incorporate third-party assessment mechanisms and utilize the PDCA cycle model, which involves baseline comparison, continuous monitoring, feedback optimization, and iterative improvement. By leveraging evaluation results as essential references for departmental performance reviews and system enhancements, institutions can establish a self-sustaining loop of evaluation, feedback, improvement, and reassessment. Such evaluations not only validate existing accomplishments but also serve as a foundation for identifying challenges and refining processes. Through closed-loop management, measurable and sustainable improvements in institutional efficiency can be achieved, ensuring that system development transcends superficial efforts. This method fosters enduring governance effectiveness and supports the intelligent transformation of organizational structures [7, 10].

6 Conclusion

Enhancing administrative efficiency in higher education institutions represents a multifaceted challenge that requires the integration of technology, management practices, cultural shifts, and organizational restructuring. In the era of intelligent transformation, the pivotal strategy centers on leveraging data flow as a catalyst for achieving seamless integration of technological advancements, process refinement, and innovative service delivery. This study employs a structured framework to illuminate the mechanisms driving this transformation and proposes a comprehensive implementation pathway that harmonizes administrative functions, academic processes, and service systems. Looking forward, advancements in generative AI are poised to unlock unprecedented opportunities for revolutionizing campus administration. Future research should delve into the application of large-scale AI models to tackle intricate tasks such as dynamic document creation and enhanced decision-making support. Additionally, exploring sustainable frameworks that foster synergy among technology, human expertise, and organizational dynamics will be critical in driving institutional governance toward superior quality, operational excellence, and a more human-centered approach.

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