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Exploration of the "Three-Dimensional Synergy" Development Pathway for Business Administration Programs in Application-Oriented Universities from the Perspective of Digital Intelligence Transformation

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Abstract: The deep integration of the digital-intelligent economy is fundamentally reshaping the demand structure for business administration professionals. Today, professionals who possess robust managerial literacy, advanced digital-intelligent application capabilities, and extensive practical experience have emerged as critical and scarce resources for industrial transformation and upgrading. Grounded in the core educational positioning of application-oriented universities, this study systematically identifies current gaps in the alignment of business administration programs, specifically focusing on training objectives, curriculum provision, and faculty support mechanisms. To address these deficiencies, the research constructs a comprehensive three-dimensional collaborative development pathway. This pathway comprises objective calibration, curriculum restructuring, and faculty enhancement, aiming to formulate a holistic digital-intelligent transformation strategy that spans the entire educational training continuum. By bridging the gap between academic preparation and industry requirements, this approach facilitates a dynamic and precise alignment between talent supply and evolving industrial demands. Furthermore, the proposed framework emphasizes the integration of emerging technologies into traditional management curricula, ensuring that graduates are well-equipped to navigate complex digital business environments. Ultimately, this study provides a highly replicable and practical framework for the digital transformation of business administration programs in regional application-oriented universities, contributing to the broader modernization of higher education in the digital era. This research highlights the necessity of continuous pedagogical innovation and cross-sector collaboration to sustain long-term educational relevance and economic competitiveness.

Keywords: digital transformation; applied universities; business administration; curriculum design; talent cultivation

Received: 05 February 2026
Revised: 12 March 2026
Accepted: 27 March 2026
Published: 31 March 2026

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1. Introduction

With the rapid advancement of new technologies—including big data analytics, artificial intelligence, machine learning, and the Internet of Things—human society is undergoing a profound transformation toward a data-driven and intelligence-enhanced operational paradigm, commonly referred to as the Data-Intelligent Era. Within this evolving landscape, business administration education faces unprecedented demands for structural adaptation and pedagogical innovation. This paper introduces a comprehensive "three-dimensional synergy" framework specifically designed to guide the development and continuous improvement of business administration programs in application-oriented universities. The framework rests upon three interdependent and mutually reinforcing dimensions: first, the systematic data-intelligent restructuring of the curriculum system—incorporating data literacy, algorithmic reasoning, digital ethics, and intelligent decision-support tools across foundational and specialized courses; second, the

sustained capability enhancement of faculty teams through targeted professional development, industry immersion, and interdisciplinary upskilling in data-intensive management practices; and third, the strategic extension and deepening of practical platforms via robust industry-education integration—encompassing co-developed capstone projects, real-world data labs, enterprise simulation environments, and dual-mentorship internships. Collectively, these dimensions constitute a dynamic, closed-loop teaching continuum that actively bridges theoretical instruction with authentic industrial contexts [1–3]. Such integration directly addresses the persistent misalignment between traditional program architectures—especially rigid curricular sequencing, underdeveloped experiential learning pathways, and limited exposure to live data ecosystems—and the multifaceted competencies required by employers in data-intelligent sectors. As primary talent cultivation nodes for mid-tier managerial roles, application-oriented universities must therefore recalibrate their educational design principles to emphasize agility, contextual adaptability, and human-centered technological fluency [4, 5]. This study systematically investigates implementation strategies, institutional enablers, and scalability considerations for embedding the three-dimensional synergy framework into program governance, quality assurance mechanisms, and stakeholder engagement models.

2. Practical Challenges in the Development of Business Administration Programs at Applied Universities from the Perspective of Digital Intelligence Transformation

2.1. Talent Cultivation Is Lagging Behind the Demand for Positions in the Digital and Intelligent Industries

Digital and intelligent technologies are increasingly permeating all segments of the real economy, driving enterprises to transition their entire operational lifecycle—from daily operations and process management to decision-making analysis—toward a data-driven paradigm. This transformation has fundamentally reshaped occupational structures, generating new job categories such as digital operations specialists, intelligent supply chain coordinators, and AI-augmented business analysts, while simultaneously redefining core competencies across traditional managerial roles. Consequently, market demand for versatile professionals who possess both foundational management knowledge and practical capabilities in digital and intelligent applications has risen steadily; accordingly, the curriculum design for business administration programs should have undergone synchronous adjustments to reflect evolving industry architectures. However, many application-oriented universities still adhere to a generic management talent cultivation framework established years ago, often rooted in pre-digital pedagogical assumptions [3, 6]. These programs fail to explicitly integrate essential competencies—such as data literacy, algorithmic thinking, digital tool proficiency, and intelligent operations design—into their core training requirements, nor do they systematically align learning outcomes with the technological maturity and industrial priorities of regional economic clusters. Instead, they frequently replicate the academic talent cultivation models of comprehensive universities, which emphasize theoretical abstraction over contextualized skill development, without establishing robust, ongoing mechanisms—such as industry advisory boards, graduate tracking systems, or real-time labor market analytics—to monitor, interpret, and respond to shifting occupational demands. As a result, these programs cannot keep pace with the rapid adoption of digital and intelligent technologies in managerial contexts, ultimately leaving graduates lacking not only technical fluency but also the integrative judgment, adaptive problem-solving capacity, and cross-domain collaboration skills required to succeed in digital and intelligent management roles.

2.2. The Iteration of the Curriculum System Has Lagged Behind, and the Integration of Digital and Intelligent Elements Remains Superficial.

In the context of rapid digital and intelligent transformation across global industries, interdisciplinary design has increasingly emerged as a foundational orientation for

optimizing business-related academic programs [7, 8]. However, the evolution of the curriculum system—which serves as the primary mechanism for cultivating high-caliber professional talent—has not kept pace with the accelerated advancement of digital technologies and intelligent methodologies in real-world enterprise environments. In numerous higher education institutions, business administration curricula continue to center on classical management theories, while digital and intelligent content is often introduced only peripherally, as isolated illustrative examples or optional enrichment modules rather than systematically integrated conceptual frameworks. Moreover, experiential learning components frequently lack sustained engagement with industry-standard digital platforms, intelligent analytics tools, and data-driven decision-support systems [1, 9]. This results in a persistent misalignment between students' theoretical knowledge and the dynamic, tool-intensive operational realities of modern organizations. For institutions facing constraints in infrastructure investment, faculty digital pedagogical training, or technical support capacity, even the establishment of foundational virtual simulation laboratories remains challenging. Consequently, immersive, scenario-based, and project-oriented interdisciplinary instruction—essential for developing adaptive problem-solving competencies—faces implementation barriers. To bridge this gap, curriculum redesign must prioritize vertical integration of digital literacy, intelligent systems thinking, and domain-specific application contexts across all course levels, supported by iterative faculty development, scalable digital teaching resources, and strategic partnerships with technology-empowered enterprises.

2.3. Insufficient Digital and Intelligent Interdisciplinary Competencies among Faculty, and a Significant Shortage of Dual-Qualified Teaching Resources

The deficiency in digital and intelligent capabilities among full-time faculty has become a critical bottleneck constraining the improvement of talent cultivation quality in business administration programs at application-oriented universities. Currently, the majority of teaching staff in management-related disciplines hold traditional business administration backgrounds and possess solid theoretical teaching foundations; however, they generally lack systematic training in digital literacy, data analytics, artificial intelligence applications, cloud computing fundamentals, and intelligent decision-support systems [10]. This gap impedes their ability to design pedagogically sound learning activities that meaningfully embed digital tools—such as enterprise resource planning platforms, business intelligence dashboards, robotic process automation simulators, or AI-driven case analysis modules—into core management curricula. Simultaneously, the faculty linkage mechanism between academic and industrial sectors remains underdeveloped: frontline digital and intelligent operation experts from enterprises are well-versed in real-world business scenarios but have rarely received systematic training in pedagogical techniques, curriculum alignment, learning outcome mapping, or assessment design, rendering it challenging for them to transform their practical experience into structured, scaffolded, and academically rigorous teaching content suitable for university classrooms. In contrast, full-time faculty members are constrained by teaching obligations, administrative duties, and performance evaluation mechanisms that prioritize publication output and course load over industry immersion, which often prevents them from dedicating extended periods to engaging in genuine digital and intelligent management projects within enterprises. Consequently, their practical application capabilities grow slowly, ultimately resulting in students having limited exposure to authentic, context-rich digital and intelligent management scenarios that reflect real industrial conditions in their classrooms. This persistent misalignment between academic instruction and industrial practice undermines graduate readiness, weakens institutional responsiveness to evolving labor market demands, and hinders the systemic integration of digital transformation principles across management education.

3. Logical Framework for the "Three-Dimensional Synergy" Development of the Business Administration Program from the Perspective of Digital Intelligence

3.1. Align with the Demands of Digital and Intelligent Industries to Dynamically Optimize the Talent Development Framework

When implementing digital and intelligent transformation initiatives in business administration programs, application-oriented universities must anchor their pedagogical strategies firmly in the concrete talent demand patterns observed across regional industrial ecosystems. This requires moving beyond inherited curricular structures and actively dismantling path dependencies embedded in conventional business education paradigms. A robust, evidence-informed approach necessitates continuous engagement with industry stakeholders—not as occasional consultants but as co-designers of learning outcomes, competency frameworks, and assessment criteria. By institutionalizing structured feedback loops involving enterprise managers, operational specialists, and domain experts from digital service providers, universities can construct a responsive, closed-loop talent development mechanism. This mechanism operates through three interdependent phases: systematic, semester-based scanning of emerging occupational profiles and skill clusters; iterative recalibration of course content, sequencing, and experiential learning components to reflect newly identified competencies; and longitudinal evaluation of graduate performance metrics—including role adaptability, technical fluency in AI-augmented decision tools, and cross-functional collaboration efficacy—to inform further refinements. Given pronounced regional disparities in industrial composition—such as advanced manufacturing clusters in the Yangtze River Delta versus agri-tech innovation hubs in the Chengdu Plain—standardized national templates risk producing misaligned graduates. Instead, institutions should conduct granular sectoral diagnostics to calibrate program emphases: for instance, prioritizing data governance literacy in regions with strong fintech ecosystems or emphasizing human-AI workflow integration in locales dominated by smart logistics platforms. Establishing a standing professional development steering committee—comprising senior faculty, corporate functional leaders (e.g., CDOs, operations directors), and association representatives—ensures sustained strategic alignment. Complementing this, a formalized industry intelligence cycle, including structured site visits, labor market analytics dashboards, and scenario-based skills forecasting, enables timely translation of macro-industrial shifts into micro-level instructional adjustments. Concurrently, foundational values such as ethical judgment, transparency in algorithmic decision-making, and socially responsible innovation are organically embedded within case studies, simulations, and capstone projects—advancing holistic professional formation without didactic imposition.

3.2. Promote Interdisciplinary Integration to Restructure the Content of Digital and Intelligent Curriculum

Application-oriented universities should adhere to the talent cultivation logic centered on management disciplines, with digital and intelligent technologies serving as essential enabling supports. This approach necessitates dismantling rigid disciplinary boundaries and cultivating a curriculum system that is inherently multidimensional and integrative across knowledge domains. Such a system can be systematically organized into three progressive tiers. At the foundational tier, general education courses focused on digital tools are introduced to equip all students with baseline digital literacy and hands-on proficiency in widely adopted data analysis software and platforms. At the intermediate tier, digital and intelligent methodologies—such as predictive analytics, process automation, and AI-augmented decision support—are deliberately embedded within established core management courses, including strategic management, operations management, and marketing analytics, thereby fostering habitual use of data-informed reasoning when confronting authentic organizational problems. At the advanced tier, specialized elective modules are developed in close alignment with the evolving technological demands of regional industry clusters—such as smart manufacturing, digital healthcare services, or intelligent logistics—ensuring relevance to students' varied professional aspirations [11]. Pedagogically, instruction emphasizes experiential learning

through virtual simulation sandbox environments and authentic business project simulations grounded in real enterprise challenges. Online intelligent teaching platforms further extend learning beyond temporal and spatial constraints. To sustain curricular vitality, institutions must institutionalize an annual review and iterative refinement mechanism, continuously incorporating emerging applications of digital and intelligent technologies observed in management practice, updating case studies, refining learning outcomes, and maintaining a balanced emphasis across conceptual understanding, technical skill acquisition, and higher-order cognitive development.

3.3. Deepen Industry-Education Collaboration to Strengthen Faculty Development and Practical Support

Currently, the digital and intelligent transformation of business administration programs in many application-oriented universities faces two critical bottlenecks: the limited practical competencies of faculty members and the persistent disconnect between practical training scenarios and authentic industrial demands. Addressing these challenges requires moving beyond isolated institutional efforts toward systemic, university-enterprise collaborative talent development frameworks that evolve from transactional, short-term cooperation to sustained, strategic partnerships grounded in shared goals, mutual accountability, and co-designed curricula. In terms of faculty development, a dual focus on theoretical and practical integration must be institutionalized: universities should systematically organize and fund regular, discipline-specific professional development programs centered on digital pedagogy, data-driven decision-making tools, intelligent process automation, and AI-augmented management simulation—thereby strengthening instructors' capacity to embed emerging technologies meaningfully into course design and delivery. Concurrently, universities should institutionalize structured, semester-long or project-based faculty immersion assignments within partner enterprises, placing academic staff directly into digital transformation teams, intelligent operations centers, or smart supply chain units to co-develop solutions, analyze real-time operational data, and reflect those experiences back into classroom instruction. Simultaneously, enterprises should be formally invited to contribute senior practitioners—including chief digital officers, intelligent systems architects, and digital operations managers—as adjunct faculty who co-teach modules, supervise capstone projects, and co-author applied case studies. This cultivates a robust 'dual-teacher' model where academic rigor is continuously informed by frontline industrial practice [12, 13]. Furthermore, practical training platforms must transcend traditional internship placements; they should encompass co-established industry colleges with joint governance structures, shared laboratories equipped with enterprise-grade digital twins and intelligent analytics dashboards, and collaboratively curated teaching case libraries featuring anonymized, multi-stage digital transformation journeys across sectors such as manufacturing, logistics, fintech, and smart services—ensuring immersive, context-rich, and pedagogically scaffolded experiential learning environments.

4. Practical Pathways for the Development of Business Administration Programs in Application-Oriented Universities from the Perspective of Digitalization and Intelligence

4.1. Align the Talent Development Strategy with the Core Objective of Cultivating Interdisciplinary Digital and Intelligent Capabilities

In the context of digital and intelligent transformation, the training objectives for business administration programs in application-oriented universities must undergo a fundamental reorientation—shifting from the traditional paradigm of cultivating broadly competent management professionals toward the deliberate development of digitally fluent, intelligently adaptive, and ethically grounded management practitioners who can operate effectively at the operational and tactical levels of modern enterprises. This strategic pivot necessitates embedding digital literacy—not merely as a technical elective but as an integrated cognitive and operational competency—across the entire curriculum.

Students must achieve practical proficiency in widely adopted enterprise platforms, data visualization tools, process automation frameworks, and foundational artificial intelligence applications relevant to business functions such as supply chain optimization, customer analytics, financial forecasting, and human resource decision support. Equally important is the cultivation of management innovation capabilities rooted in digital and intelligent thinking: learners should be equipped to critically assess algorithmic outputs, design human-centered digital workflows, interpret real-time performance dashboards, and lead cross-functional teams through technology-enabled change initiatives. Moreover, compliance-oriented professional ethics must be systematically reinforced—not as abstract principles but through case-based analysis of data governance, algorithmic bias mitigation, cybersecurity accountability, and regulatory adherence in digital business environments. To ensure responsiveness to evolving industrial realities, universities must institutionalize a dynamic alignment mechanism: establishing a multi-stakeholder professional development steering committee composed of university faculty, industry practitioners, and regional economic development specialists; conducting biennial, granular labor market analyses that map digital skill demand across subsectors (e.g., smart manufacturing, digital finance, platform-based logistics); and iteratively refining program learning outcomes, course sequencing, and experiential learning components—including capstone projects co-supervised by industry partners—based on empirical evidence of technological adoption velocity and shifting occupational competency profiles [14]. Regional specificity remains essential: curricular emphasis should reflect local industrial ecosystems—for instance, prioritizing e-commerce operations in digital commerce hubs or intelligent logistics systems in transportation-intensive regions—thereby strengthening the functional relevance and employment readiness of graduates.

4.2. Establish a Tiered Curriculum Framework to Create a Graded Matrix of Digital-Intelligent Integrated Courses.

In alignment with the calibrated positioning for cultivating interdisciplinary talents, application-oriented universities should anchor their efforts on the actual competency requirements of industrial sectors undergoing digital and intelligent transformation. They should establish a three-tier, progressive systematic curriculum framework consisting of a foundational tier, a core tier, and a specialized tier. The foundational tier focuses on building a solid foundation of general competencies by integrating content such as mathematical statistics, digital office tools, computational thinking fundamentals, and introductory applications of artificial intelligence and data literacy. This approach enables students to construct a comprehensive digital and intelligent cognitive framework, acquire proficiency in essential tool operations—including cloud-based collaboration platforms, spreadsheet modeling, and basic data visualization—while simultaneously developing logical reasoning, information evaluation, and adaptive learning capacities. Elements of ideological and political education—including professional ethics, integrity in business practice, and compliance awareness—are organically embedded across foundational courses to foster a well-rounded sense of social responsibility and vocational commitment. The core tier emphasizes the development of specialized core competencies through deep integration of digital and intelligent analytical methodologies with traditional management disciplines [15]. Centering on authentic business scenarios—such as supply chain optimization, customer behavior analytics, and dynamic resource allocation—this tier reconfigures courses in strategic planning, operational management, financial decision-making, and risk control to foreground data-informed interpretation, algorithmic logic, simulation-based experimentation, and ethical implications of automated systems. The primary objective is to equip students with the capability to decompose complex managerial challenges using structured, evidence-based reasoning and to select, apply, and critically assess digital and intelligent tools—including dashboards, predictive models, and process automation frameworks—in support of sound, context-sensitive decision-making. The specialized tier focuses on the cultivation of differentiated competencies aligned with regional industrial ecosystems and evolving

occupational pathways. By mapping course offerings to the digital and intelligent transformation trajectories of local priority sectors—such as smart manufacturing, digital agriculture, intelligent logistics, and platform-based services—universities can deliver domain-specific modules that integrate sectoral knowledge with applied digital skill sets. These modules emphasize real-world project work, industry mentorship, and iterative prototyping to strengthen students' capacity for contextual innovation, cross-functional collaboration, and responsible implementation of digital solutions. The three-tiered curriculum system provides layered pedagogical support and dynamic synergy, ensuring both the structural coherence of professional training and responsiveness to diverse regional development priorities and individual learner trajectories, thereby offering a robust, scalable, and adaptable curricular framework for cultivating versatile professionals in digital and intelligent management.

4.3. Advancing Faculty Development through a Dual-Dimensional Approach, Establishing a "theoretical-Practical Integration" Team of Digital and Intelligent Dual-Qualified Teachers

To ensure the effective implementation and measurable impact of the digital and intelligent teaching curriculum system, the systematic enhancement of full-time faculty members' interdisciplinary competencies serves as a foundational strategic priority. This effort centers on cultivating a robust cohort of dual-qualified educators—individuals who integrate deep domain knowledge in management disciplines with advanced proficiency in digital and intelligent technologies, as well as sustained, authentic engagement with industry practice. The implementation framework operates through a coordinated internal–external collaboration model, comprising structured on-campus capacity-building initiatives and purposeful off-campus industry immersion pathways. On campus, a sustained, cyclical professional development mechanism is institutionalized—including semester-aligned digital pedagogy workshops, certification-aligned technical upskilling modules, and the formation of cross-disciplinary teaching–research communities—to support faculty in progressively acquiring fluency with intelligent learning platforms, data-driven instructional design, algorithm-informed assessment methods, and AI-augmented curriculum development. This enables a coherent conceptual and operational bridge between classical management theory and contemporary digital application contexts. Off campus, a formalized faculty–enterprise rotation protocol is established, mandating regular, time-bound secondments for full-time academic staff into partner enterprises engaged in digital transformation initiatives. During these placements, faculty participate directly in real-world projects involving intelligent process automation, predictive analytics deployment, digital twin modeling, or enterprise AI integration—thereby accumulating contextualized problem-solving experience grounded in current industrial challenges. Simultaneously, senior practitioners from industry—including chief digital officers, AI solution architects, and intelligent operations leads—are formally integrated into the academic ecosystem as resident experts or part-time instructors, delivering case-based seminars, co-teaching applied modules, and mentoring faculty–student project teams. This bidirectional flow ensures continuous calibration of academic instruction against evolving industry standards [16]. Complementing these human capital strategies, a layered practical teaching infrastructure is deployed: a four-tier progressive framework—spanning Practical Application (focused on tool-specific skill acquisition), End-to-End Comprehensive Simulation (emphasizing cross-functional system integration), Innovative Project Incubation (supporting student–faculty–industry co-creation of scalable solutions), and Implementation (facilitating pilot deployment in live organizational settings)—is fully embedded across the curriculum. Industry–academia co-developed datasets, sandbox environments, and validated use cases are systematically incorporated at each tier, enabling faculty to deepen their applied expertise while simultaneously strengthening the authenticity, relevance, and scalability of student learning experiences. Through this holistic, scaffolded approach, faculty evolve from discipline-centered knowledge transmitters into agile, reflective, and empirically

grounded educational designers—capable of orchestrating learning ecosystems where theoretical rigor, technological fluency, and operational insight converge seamlessly.

5. Conclusion

The implementation of a "three-dimensional synergy" framework for business administration programs in application-oriented universities represents a comprehensive paradigm shift in response to the evolving demands of digital intelligence transformation. This framework is grounded in close alignment with regional industrial priorities, particularly those emerging from digitally intensive and intelligence-driven sectors. It comprises three interdependent dimensions: first, the dynamic calibration of program objectives—ensuring continuous responsiveness to shifting occupational profiles, competency expectations, and technological affordances; second, the systematic restructuring of hierarchical curriculum systems—integrating foundational business knowledge with domain-specific digital tools, data literacy, algorithmic reasoning, and human-centered design principles across undergraduate and graduate levels; and third, the collaborative enhancement of dual-qualified teaching ecosystems—where faculty possess both academic expertise and verified industry experience, supported by institutional mechanisms for sustained professional development, joint research-practice projects, and shared pedagogical innovation. Application-oriented universities are uniquely positioned to operationalize this model through closed-loop feedback systems that connect labor market intelligence, graduate outcome tracking, employer advisory panels, and iterative curriculum review cycles. By fostering deep integration among program delivery, digital intelligence skill acquisition, and holistic professional competency development—including critical thinking, adaptive communication, ethical judgment, and cross-functional collaboration—these institutions can transcend conventional educational boundaries. The result is a more agile, responsive, and socially embedded model of business education capable of consistently cultivating versatile, practice-ready management professionals who contribute meaningfully to the sustainable, high-quality development of regional economic ecosystems.

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