**Bhandar: Harversting Community Service in Asia**
https://doi.org/10.51817/bhandar. v2.i1.1638
**Published by** Perkumpulan Pengelola Jurnal Bahasa dan Sastra Indonesia Serta Pengajarannya

RESEARCH ARTICLE

OPEN ACCESS

# EXPLORATION ON THE CONSTRUCTION OF NEW LIBERAL ARTS FOR THE FIRST-CLASS PROGRAM OF BUSINESS ADMINISTRATION IN APPLICATION-ORIENTED UNIVERSITIES: INTEGRATION OF LIBERAL ARTS, BUSINESS, AND ENGINEERING WITH "TECHNOLOGY-ENABLED MANAGEMENT"

**Pinhong Zeng[1], Xiaohong Yang[1]**
[1]Yibin University, Yibin, China

**Article History**
Received 05 May 2025
Revised 18 May 2025
Accepted 02 June 2025

**Keywords**
New Liberal Arts; Business Administration major; technology-empowered management

**ABSTRACT**
Driven by the dual impetus of the construction of New Liberal Arts and the development of the digital economy, the Business Administration major in application-oriented universities is in urgent need of transforming into the paradigm of "technology-empowered management." Focusing on the core proposition of the interdisciplinary integration of "liberal arts + business + engineering" in this major, this paper constructs a systematic four-in-one construction path of "curriculum- faculty- practice- evaluation" by analyzing the prominent problems such as the "fragmented" curriculum system, "superficial" teaching content, "homogeneous" faculty team, "shallow" practical teaching, and "traditional" evaluation system. At the curriculum level, a three-dimensional integrated system of "foundation- core- empowerment" is reconstructed; at the faculty level, a compound team is built through "internal training + external introduction + team co-construction"; at the practice level, a three-level progressive platform of "on-campus experiment- school-enterprise collaboration- discipline competition" is established; and at the evaluation level, a multi-dimensional dynamic guarantee mechanism is set up. The research shows that in-depth interdisciplinary integration is an inevitable choice for the Business Administration major to cultivate compound talents with business thinking, technical capabilities, and humanistic literacy, which can provide replicable and promotable practical references for the construction of New Liberal Arts in application-oriented universities.

## Introduction

The National Strategy for New Liberal Arts Construction Drives the In-depth Development of Specialty Reform in Application-Oriented Universities. With the in-depth advancement of the new round of scientific and technological revolution and industrial transformation, the state has put forward new strategic requirements for talent cultivation in higher education(Lin et al., 2024). The Ministry of Education launched the "New Liberal Arts" initiative in 2019, whose core essence lies in promoting the interdisciplinary integration of humanities and social sciences with modern information technology, especially with disciplines such as science, engineering, agriculture, and medicine(Shi & Han, 2025). It aims to break down the barriers of traditional disciplines and cultivate interdisciplinary and innovative talents who meet the requirements of the new era(Liu, 2024). For application-oriented universities, the construction of New Liberal Arts is not a simple accumulation of knowledge; instead, it requires that their specialty reform must be closely aligned with the development needs of regional economy and society, and realize a fundamental transformation from "knowledge impartment" to "competence empowerment"(Shenga et al., 2024). This means that the specialty construction of application-oriented universities must highlight "applicability" and "interdisciplinarity", take solving practical industrial problems as the orientation, and reshape the curriculum system, teaching content, and practical models. As one of the majors most closely connected to the pulse of

**Corresponding Author:** Pinhong Zeng, Email: 2004114002@yibinu.edu.cn
Yibin University, Yibin, China

social economy, the reform effect of business administration is directly related to the implementation quality of the New Liberal Arts strategy in application-oriented universities, and there is an urgent need to explore an innovative development path that conforms to its own positioning. The Digital Economy Era Calls for the Paradigm Shift of the Business Administration Major towards "Technology-Enabled Management" We are fully stepping into the digital economy era represented by big data, artificial intelligence, the Internet of Things, and blockchain. Technology is no longer merely a supporting tool for enterprise operations, but has become a key element that drives business model innovation, reshapes industrial ecology, and determines the core competitiveness of enterprises(Han & Zhang, 2022). This profound transformation puts forward subversive requirements for the knowledge structure and competence of business administration talents(Feng, 2023). Traditional management theories and methods based on the logic of the industrial age are facing challenges, and enterprises are in urgent need of "technical management talents" or "management-oriented technical talents" who not only understand business laws but also master technical logic, and can use technical means to optimize decision-making, improve efficiency, and expand business(Nie & Liu, 2025). Therefore, the demand for the transformation of the business administration major is becoming increasingly urgent(George & Baskar, 2024). It must shift from the traditional "management function orientation" (such as marketing, finance, and human resources) to a new paradigm of "technology-enabled management". This paradigm requires professional education to deeply integrate technical knowledge (such as data analysis, information systems, and intelligent algorithms) into strategic management, marketing management, operations management, and human resource management.

## Current Situation and Problems of the "Liberal Arts + Business + Engineering" Interdisciplinarity in the First-Class Business Administration Major of Application-Oriented Universities.

Disciplinary Barriers: "Fragmented" Curriculum System with Lack of Systematic Integration. Knowledge modules from different disciplines are simply listed in the training program, failing to be reconstructed and integrated around the core goal of "solving complex management problems"(Azevedo & Almeida, 2021). Courses in liberal arts, business, and engineering operate in "isolation"; as a result, students acquire fragmented knowledge points and struggle to develop comprehensive thinking and capabilities for "using technical tools to empower management decision-making". For instance, students may take both Marketing and Python Programming, but no projects are designed in the courses to guide them to use Python to analyze user behavior data for formulating targeted marketing strategies. Technical Disconnection: "Superficial" Teaching Content and Formalistic "Technology Empowerment". Courses related to engineering and technology often focus on the operation of the tools themselves (e.g., code writing), while failing to deeply explain how such technologies can be integrated into and transform specific management business processes(Kamp, 2023). There is a severe disconnection between teaching content and cutting-edge corporate practices, which results in "technology empowerment" remaining at the level of conceptual promotion or superficial application(Haiting, 2024). Students cannot understand the management logic behind technologies, nor can they convert their technical capabilities into core competitiveness. This leads to a situation where the cultivated students are less proficient in technology compared with pure engineering students, and lack business insight when compared with management students.

Faculty Shortcomings: Shortage of "Dual-Qualified" Teachers and Lagging Construction of Interdisciplinary Teaching Teams. The single knowledge structure of existing faculty is the most critical bottleneck restricting interdisciplinary integration(Zhao et al., 2023). Teachers specializing in management struggle to handle in-depth technical content, while engineering teachers lack an understanding of the complexity of management scenarios(Zhao et al., 2024). Universities' personnel, assessment, and incentive mechanisms still operate based on traditional disciplines, which is not conducive to encouraging teachers to conduct cross-departmental cooperation and carry out interdisciplinary teaching and research(Wang, 2024). This results in a severe shortage of interdisciplinary faculty members who are truly competent to teach courses related to "technology-enabled management". Weak Practical Links: "Superficial" Integration of Industry and Education and Lack of Real Technology-Management Scenarios. Most of the existing practical teaching links, such as graduation internships and sand table simulations, are based on simplified or idealized business environments, failing to effectively connect with enterprises' real digital transformation scenarios and

technology-management challenges(Prakasha et al., 2024). Students rarely have the opportunity to conduct mining and analysis on real business data or participate in projects that use technology to optimize operational processes(Liang et al., 2023). As a result, their "technology-enabled" capabilities remain at the theoretical level, and the cultivation of practical abilities and innovative spirit is insufficient. Lack of Evaluation: "Traditionalized" Quality Assurance System, Failing to Adapt to Interdisciplinary Characteristics. The existing professional quality evaluation system and student assessment methods still follow the standards of a single discipline(Xia et al., 2024). There is a lack of scientific and operable evaluation indicators and methods for assessing a major's "interdisciplinary integration" level, measuring students' comprehensive performance in interdisciplinary projects, and evaluating their ability in "technology-enabled management"(Xu et al., 2025). Without changes to this "guidance tool", the depth and effectiveness of professional construction and teaching reform cannot be effectively measured or incentivized, making it easy to revert to traditional approaches.

## Materials and Methods

This study focuses on the ternary interdisciplinary practice of "technology empowering management" in the construction of New Liberal Arts for Business Administration majors in application-oriented universities. It adopts a qualitative-dominated mixed research approach, with multiple methods collaborating to ensure the depth and credibility of the research. The specific research methods are as follows: Literature Research Method：A systematic review of domestic and foreign relevant literature is conducted to construct the theoretical foundation and analytical framework of the research. The literature retrieval covers four core themes: "New Liberal Arts construction," "disciplinary intersection and integration," "technology empowering management," and "reform of Business Administration majors in application-oriented universities." The time span is limited from 2018 (around the proposal of domestic New Liberal Arts construction) to 2025. Content analysis is employed for literature analysis, focusing on extracting the theoretical core, practical models, and key controversies of the intersection between New Liberal Arts, business, and engineering disciplines. It also sorts out the common dilemmas in the professional transformation of application-oriented universities and the implementation paths of "technology empowerment," providing theoretical support and a basis for academic dialogue for subsequent research design, current situation diagnosis, and countermeasure construction.

Multiple Case Study Method：Three to four typical Business Administration majors in application-oriented universities are selected as case objects. The case selection follows the principles of "heterogeneity" and "representativeness," covering universities in different regions, with different educational levels, and at different reform stages. This ensures that the cases can reflect the practical differences in ternary interdisciplinary construction under different resource endowments. Data are collected through three methods: semi-structured interviews, on-site observations, and text analysis. In-depth interviews are conducted with academic affairs administrators, Business Administration teachers, senior students, and corporate cooperative mentors of the case universities, focusing on key links such as curriculum system reconstruction, teaching model innovation, faculty team building, and practical platform construction. On-site visits are made to the laboratories and training bases of the case universities to observe the teaching process of technology-empowered courses and the development of practical projects. Text materials such as university talent training programs, curriculum syllabuses, reform policy documents, and teaching achievement reports are collected for triangulation. The case analysis adopts a "description-interpretation-induction" logic: first presenting the reform practices and effects of each case, then deeply analyzing the driving factors and restrictive bottlenecks behind them, and finally summarizing the common laws and differentiated paths of ternary interdisciplinary integration.

In-depth Interview Method：On the basis of case studies, the scope of interviewees is expanded to form a "multi-subject" interview matrix. Interviewees include: university-level personnel (deans of Business Administration schools, program directors), teacher-level personnel (core business course teachers, engineering and technical course teachers, members of interdisciplinary teaching teams), student-level personnel (Business Administration students of different grades and with different levels of practical

participation), and industry-level personnel (human resource directors of cooperative enterprises, management practitioners, and alumni representatives). The interview outline is designed around the core demands of "technology empowering management," with key questions including: the core competency requirements for talent training in Business Administration majors under the background of New Liberal Arts, the key pain points in the intersection of business and engineering disciplines, the integration paths between technical courses and professional courses, effective models of practical teaching, and the difficulties in faculty and resource guarantee. Interviews are conducted through a combination of online and offline methods, with each session lasting 45-90 minutes. All interviews are recorded and transcribed into text data, which are coded and analyzed using qualitative analysis software to extract key concepts and core categories, providing empirical evidence for current situation diagnosis and countermeasure proposal.

Research Validity and Ethical Considerations：To ensure research quality, multiple strategies are adopted to control validity: triangulation (mutual confirmation through literature, cases, interviews, and expert consultation); maintaining research logs in case studies to record the research process and reflections; and member checking of transcribed interview data (inviting some interviewees to confirm the accuracy of the content). In terms of ethics, interviewees are informed of the research purpose, data usage, and confidentiality principles before interviews, and informed consent forms are signed. All case universities and interviewees are anonymized (e.g., "University A," "Teacher B"). Research data are only used for academic research, and confidentiality commitments are strictly followed.

## Results and Discussion

The Construction Path of the "New Liberal Arts" Focused on "Technology-Enabled Management" Through th e Intersection of "Liberal Arts + Business + Engineering".To effectively address the existing problems and adv ance the implementation of the "New Liberal Arts" initiative, this study proposes the following systematic co nstruction path. Its core lies in establishing a four-in-one collaborative reform framework encompassing "cu rriculum, faculty, practice, and evaluation". Reconstructing the Curriculum System: Building a New "Foundat ion-Core-Empowerment" Three-Dimensional Integrated Structure.

Radically transform the "curriculum assortment" model, and take "technology-empowered management" a s the main thread to conduct top-level design and reconstruction of the curriculum system.Business Founda tion Layer: Lay a solid foundation for management thinking by strengthening core theories.Positioned to bui ld a solid foundation in core business theories, the Foundation Layer aims to cultivate students' basic manag ement thinking and business insight. In terms of content, it focuses on intensive teaching of core courses, su ch as Principles of Management, Strategic Management, Organizational Behavior, and Fundamentals of Eco nomics. At this stage, the teaching focus is on enabling students to understand the basic laws of enterprise o peration and the internal logic of management decisions, thereby providing a problem-oriented approach a nd value anchor for subsequent technology empowerment.

Engineering Empowerment Layer: Foster data-driven thinking by integrating technical tools. The core philosophy of this layer is no longer isolated tool instruction, but the development of technical capabilities closely aligned with management scenarios. In terms of content, it systematically offers courses such as Python for Business Data Analysis, Management Information Systems, Introduction to Artificial Intelligence and Its Business Applications, and Fundamentals of Industrial Internet.The key to this reform lies in ensuring that the teaching cases and experimental projects of these courses are directly derived from management practices (e.g., using Python to analyze sales data for market trend prediction, and leveraging simulation software to optimize production scheduling). This allows students to intuitively understand how technology solves practical management problems.

Humanities Integration Layer: Shape value rationality primarily by enhancing comprehensive literacy. This layer needs to run through the entire process of talent cultivation to ensure that technology application embodies humanistic care and adheres to ethical bottom lines. In terms of content, courses or thematic modules such as Business Ethics, Data Ethics and Privacy Protection, Design Thinking, and Critical Thinking

and Communication are integrated into each academic year. Through case discussions, debates, and other forms, students are guided to reflect on ethical dilemmas, social responsibilities, and sustainable development issues arising in the process of technology empowerment.

Innovating Teaching Modules: Developing Interdisciplinary Project-Based Courses Integrating "Technology + Management". Break down disciplinary boundaries, and design interdisciplinary comprehensive course modules based on the three-dimensional curriculum system. By adopting the Project-Based Learning (PBL) model, the "chemical integration" of knowledge is achieved. For example, the Digital Marketing Technology module integrates courses such as Marketing, Consumer Behavior, Big Data Analysis, and Python Web Crawling. Students are required to complete the design of a comprehensive precision marketing plan based on user portraits. The Enterprise Digital Transformation module, as an advanced comprehensive course, integrates multi-dimensional knowledge including strategy, organization, and technology. Students work in groups to formulate a digital transformation roadmap for real enterprises or simulated enterprises and conduct feasibility demonstrations.

Building an Interdisciplinary Faculty Team.The faculty team is the core driving force behind program development. To achieve the educational goal of "technology-empowered management", the key lies in building an interdisciplinary "Humanities-Business-Engineering" faculty team. Such a team should not only be proficient in business management theories and familiar with cutting-edge technology applications, but also possess humanistic literacy. The specific development approaches are as follows: Internal Faculty Development: Implementing the "Technology Empowerment" Special Capacity Enhancement Program. Given that the knowledge structure of existing business administration teachers tends to focus on theory, a systematic internal development initiative will be implemented to promote their knowledge updating and capacity transformation.

Institutionalized Technical Training: Cooperate with engineering departments within the university or high-quality social training institutions to regularly organize special training courses on "technology-empowered management". The content focuses on practical technologies such as Python-based business data analysis, application of artificial intelligence tools, principles and development of ERP systems, and big data visualization. The goal of the training is not to turn management teachers into programmers, but to enable them to understand technical logic, master tool application, and integrate technical thinking into management teaching cases. Establishing the "Academic Leave" and Practical Research System. Encourage and fund key teachers to conduct visiting studies or take temporary positions in industry-leading enterprises (such as Alibaba, Huawei, and intelligent manufacturing enterprises) or well-known engineering colleges for a period of six months to one year. By deeply participating in enterprises' digital transformation projects or interdisciplinary research projects in engineering, teachers can personally experience real scenarios of "how technology empowers management", accumulate first-hand cases, and feed these experiences back into teaching and scientific research. Establishing the Interdisciplinary Teaching Development Fund. Set up a special fund to encourage and support business administration teachers to form partnerships with teachers majoring in computer science, data science, industrial engineering, and other disciplines. Together, they can apply for teaching reform projects, jointly develop interdisciplinary courses, and compile integrated teaching materials. In this process, knowledge complementarity and capacity integration are achieved. External Faculty Recruitment: Establishing a "Diversified and Open" Flexible Talent Introduction Mechanism. Break the singularity of faculty sources, and vigorously introduce external intellectual resources to make up for the practical shortcomings of in-house faculty.

Creating Positions for "Industry Professors" or "Distinguished Practical Professors". Focus on recruiting experienced technical executives (such as Chief Information Officers (CIOs), Chief Data Officers (CDOs), and Digital Project Directors) from benchmark enterprises in regional digital transformation to serve as part-time teachers. They can not only offer cutting-edge lectures or short-term courses like Practical Enterprise Digital Transformation and New Technologies and Business Model Innovation, but also deeply participate in the revision of training programs, supervise students' graduation projects, and jointly develop case studies—ensuring that teaching content keeps pace with industrial frontiers. Inviting Experts from Engineering Colleges to Serve as "Interdisciplinary Mentors". Recruit experts and scholars in engineering fields (e.g.,

artificial intelligence, the Internet of Things, and systems engineering) from inside and outside the university to work as consultants or joint mentors. They regularly participate in interdisciplinary teaching seminars and workshops, and jointly supervise students' interdisciplinary projects or competitions. Their involvement provides solid theoretical support and cutting-edge perspectives for "technology empowerment". Development of Interdisciplinary Teaching and Research Teams: Building a Collaborative Innovation Community Integrating "Management + Technology". Through mechanism innovation, in-depth integration of teachers with different disciplinary backgrounds is promoted, forming a stable force for interdisciplinary teaching and research. Establishing "Technology-Empowered Management" Course Teams. For core interdisciplinary courses (e.g., Intelligent Supply Chain Management, Digital Marketing Technology), it is mandatory to form course teaching teams jointly composed of business administration teachers and engineering teachers. These teams work together to develop syllabi, design teaching projects, compile case studies, and deliver collaborative lectures. This not only ensures in-depth interdisciplinary integration of course content, but also serves as a continuous process for teachers to learn from each other and enhance their capabilities.

Setting Up Interdisciplinary Joint Research Groups to Conduct Research on Real Enterprise Issues. Encourage and support the establishment of joint "management + technology" research teams to jointly apply for provincial-level or higher interdisciplinary research projects focusing on digital transformation, intelligent manufacturing, and the digital economy. By jointly solving practical technical management problems from enterprises, the teams not only produce innovative research outcomes, but also transform the most up-to-date research content into high-end teaching resources. This realizes the feedback of research to teaching and truly forms a positive cycle of "mutual promotion between teaching and research". Creating Interdisciplinary Teaching Studios. Establish physical or virtual "Technology-Empowered Management Teaching Innovation Studios" as fixed venues and platforms for interdisciplinary teachers to conduct regular exchanges, collaborate on lesson preparation, and discuss teaching methods. These studios foster an institutional and cultural environment that encourages interdisciplinary collaboration and tolerates trial and error.

Through the above three-dimensional approach of "internal development, external recruitment, and team co-construction", the bottleneck in faculty resources can be systematically addressed. This provides solid talent support for the development of the "technology-empowered management" initiative in the context of the "New Liberal Arts" movement, and ensures the implementation of reform concepts. Building a "Three-Tier Progressive, Three-Discipline Integrated" "Technology Empowerment" Practical Platform System. To effectively break down the barriers between liberal arts, business, and engineering, and put the concept of "technology-empowered management" into practice, this program is committed to building a three-tier progressive practical teaching platform featuring "laying a foundation through on-campus experiments, honing practical skills via university-enterprise collaboration, and promoting innovation through discipline competitions". This platform aims to organically integrate the technical methods of engineering, the management theories of business, and the macro perspective and humanistic care of liberal arts, so as to comprehensively enhance students' interdisciplinary capabilities. Specific Path Content is as Follows:

### Tier 1: Integration of On-Campus Laboratories – Building a "Digital Simulation Laboratory for Business Administration" to Consolidate the Cognitive Foundation of Technology Empowerment

As the cornerstone of the practical system, this tier aims to enable students to intuitively understand how technology reshapes management processes and decision-making in a secure virtual environment. A highly integrated digital twin experimental platform that simulates real business environments will be built to materialize abstract management theories and cutting-edge engineering technologies. This allows students to "learn by doing" and lay a cognitive foundation for "technology-empowered management". It is not merely a stack of software and hardware, but a carrier for the integration of interdisciplinary knowledge. Its core functions and integration design include Intelligent Production and Operation Management Simulation Area. Introduce or jointly develop an "Intelligent Production Scheduling Simulation System" with engineering departments. Here, students can simulate a small-scale intelligent manufacturing production line. By adjusting parameters (such as orders, equipment status, and material inventory) and using technologies like

operational research algorithms and APS (Advanced Planning and Scheduling) for optimized scheduling, they can intuitively experience how industrial engineering and Internet of Things (IoT) technologies improve production efficiency. This achieves the integration of engineering (intelligent manufacturing technology) and business (operation management). Big Data Analysis and Decision Support Simulation Area. Integrate business data analysis platforms (e.g., Python, R, Tableau) and simulated enterprise databases. Students can conduct mining and analysis on simulated marketing data, customer behavior data, and financial data to build user portraits, predict sales trends, and assess financial risks. This enables engineering (data science) to empower business (marketing, financial management) decision-making. Human-Machine Collaboration and Organizational Behavior Observation Area. Set up simulated enterprise scenarios, introduce RPA (Robotic Process Automation) software or AI assistants, and observe and analyze changes in team members' roles, communication modes, and organizational effectiveness with the intervention of technology. This incorporates perspectives from liberal arts (organizational behavior, psychology) to reflect on the humanistic and social impacts behind technology.

### Tier 2: University-Enterprise Collaborative Platform – Jointly Building "Technology-Empowered Management" Practice Bases to Hone Practical Application Abilities in Real Scenarios.As a bridge in the practical system, this tier aims to enable students to step out of the classroom and solve real problems in authentic corporate environments.

Cooperation Model:Proactively establish strategic cooperation with leading technology enterprises and high-growth tech companies in the region, rather than merely forming simple internship relationships. Key cooperation partners include: big data and artificial intelligence companies, intelligent manufacturing enterprises, industrial Internet platform companies, and management consulting firms. Implementation Paths: **Jointly Building a "Project Pool".** Collaborate with partner enterprises to establish a repository of real "technology-empowered management" projects. These projects are derived from the actual management challenges currently faced by enterprises, such as: "Building a Customer Churn Early Warning Model Based on Machine Learning", "Optimizing Material Distribution Routes in Intelligent Manufacturing Workshops", and "Realizing the Automation of Financial Reimbursement Processes Using RPA". **Conducting "Project-Based Internships".** Organize students into interdisciplinary project teams (encouraging collaboration with engineering students majoring in computer science, industrial engineering, etc.) on a semester or summer basis. Under the joint guidance of corporate mentors and on-campus supervisors, students complete the entire process from problem diagnosis, solution design, technical implementation to effect evaluation. The project outcomes directly serve the cooperating enterprises. **Jointly Developing a "Dual-Qualification" Faculty Team.** Corporate technical experts and managers are invited to the campus to deliver lectures or short-term courses; professional teachers take temporary positions in enterprises or participate in consulting projects, and jointly develop teaching cases. This tier enables students to face the industrial frontiers directly, understand the complexity and constraints of technology application, and develop their project management capabilities, teamwork skills, and client communication abilities in solving practical problems. It realizes the critical leap from "knowledge acquisition" to "practical application".

### Tier 3: Interdisciplinary Competition Linkage – Focusing on "Management + Technology" Competitions to Stimulate Innovative Potential and Outcome Output

As the pinnacle of the practical system, this tier aims to stimulate students' innovative spirit and verify the achievements of practical teaching through a high-intensity competition environment. Its effectiveness is ensured through three aspects: competition selection, team formation, and outcome orientation. Competition Selection and Positioning: Focus on organizing students to participate in influential top-tier competitions, such as the "Internet Plus" College Students' Innovation and Entrepreneurship Competition and the "Challenge Cup" National College Students' Extracurricular Academic Science and Technology Works Competition. The positioning of participating projects must closely align with the core of "management pain points + technical solutions". Meanwhile, competition projects are mainly derived from the first two tiers: first, deepening and refining excellent optimization schemes developed in the "Digital Simulation Laboratory"; second, extracting and elevating enterprise projects that have been successfully solved on the "University-Enterprise Collaborative Platform" to form universal product or service models.

Interdisciplinary Team Formatio: It is mandatory for participating teams to consist of students majoring in business administration (responsible for market analysis, business models, financial planning, and project management) and engineering disciplines (responsible for technical implementation, algorithm development, and system construction). Students from majors such as design may also be included. Outcome Orientation:Participating works are not limited to business plans; instead, developing demonstrable technical prototypes (e.g., a simple algorithm model, an APP interface, or a process automation script) is encouraged to enhance persuasiveness. Teaching Value: Competition outcomes are a direct reflection of the talent cultivation quality of "technology-empowered management". They greatly enhance students' innovation awareness, resource integration capabilities, and stress resilience. Outstanding projects can even be directly incubated into startups, achieving seamless connection between talent cultivation and social services.

Through the construction of the above "three-tier progressive" practical platform, the major effectively integrates engineering technical tools, business management wisdom, and liberal arts value thinking. From cognitive simulation on campus, to practical application off-campus, and then to high-level competition showdowns, students complete their transformation from knowledge receivers to problem solvers, and further to innovation leaders. This path is not only a core driver for the "technology empowerment" reform of the business administration major, but also an effective exploration for application-oriented universities to promote the "New Liberal Arts" initiative and cultivate interdisciplinary management talents who meet the needs of the digital and intelligent era.

Guarantee Mechanisms for the "Technology-Empowered Management" Initiative in New Liberal Arts Development. To ensure the effective implementation and sustainable development of the "technology-empowered management" concept in New Liberal Arts development, a systematic and robust guarantee mechanism must be established. This mechanism should work in synergy from three dimensions—system, resources, and evaluation—to remove obstacles, inject impetus, and provide direction for the development of interdisciplinary programs. Institutional Guarantee: Building Top-Level Design for Interdisciplinary Collaboration. Institutional guarantee is a prerequisite for breaking down traditional disciplinary barriers and achieving in-depth integration, which requires collaborative promotion at both the university and program levels. University-Level: Formulating Incentive Policies for Interdisciplinary Program Development. The university should issue special policies to provide institutional support for the "liberal arts + business + engineering" integration.

First, in faculty assessment and professional title evaluation, the university should recognize faculty achievements in cross-college course teaching, joint student supervision, and co-application for projects, treating these achievements on par with traditional academic outcomes. It may even establish an "Interdisciplinary Contribution Award" to stimulate faculty enthusiasm for participating in interdisciplinary development. Second, it should tilt resource allocation toward interdisciplinary reform, giving priority support to the interdisciplinary reform of the first-class business administration program in aspects such as laboratory construction, project funds, and enrollment quotas. This creates a clear orientation that "reformers are rewarded". Third, it should establish a coordination mechanism for interdisciplinary teaching organizations, setting up a "New Liberal Arts Development Leading Group" led by university leaders. The group will hold regular joint meetings of liberal arts, business, and engineering departments to resolve issues related to responsibility, authority, and benefit distribution encountered in cross-college cooperation. Program-Level: Establishing a Review and Update Mechanism for "Liberal Arts + Business + Engineering" Interdisciplinary Courses. The business administration program should take the lead in establishing a dynamic curriculum management mechanism.

On one hand, set up an "Interdisciplinary Curriculum Review Committee", composed of program leaders, key teachers from cooperative engineering departments, and enterprise experts. The committee conducts joint reviews of all newly launched "technology-empowered management" courses (e.g., Intelligent Marketing, Data-Driven Financial Decision-Making) to ensure the cutting-edge nature and integration of course content, rather than a simple patchwork of knowledge. On the other hand, establish a regular review and iteration mechanism for course content, requiring a systematic evaluation of course content every two years. Based on the latest needs of technological development (e.g., the application of generative AI and

large models) and enterprise practices, teaching cases, technical tools, and practical projects should be updated in a timely manner to ensure that teaching does not become disconnected from social needs.

Resource Guarantee: Consolidating the Material and Knowledge Foundation for Interdisciplinary Development. Sufficient resource investment is the material cornerstone for advancing in-depth reform, with its core lying in the dual support of funds and teaching materials. Fund Support: Establishing a Special Fund for Interdisciplinary Development. The university can set up a "Special Fund for New Liberal Arts Development" to provide stable financial support for the reform of the business administration program. This fund should be earmarked for three key areas:

1. Laboratory upgrading and operation: Sustained investment in the construction and renewal of the "Digital Simulation Laboratory for Business Administration," including the procurement of necessary business data analysis software and virtual simulation platforms.
2. Faculty training and exchange: Funding business teachers to take temporary positions in technology enterprises and participate in cutting-edge technology training programs, while supporting engineering teachers to learn management knowledge—jointly building a "dual-qualification" teaching team.
3. Support for students' interdisciplinary projects and competitions: Providing seed funds for "project-based teaching" and students' participation in competitions such as the "Internet Plus" Competition.

Teaching Material Development: Compiling a Series of Characteristic Textbooks on "Technology-Empowered Management". To address the separation of technology and management in existing textbooks, experts from liberal arts, business, and engineering fields (both on and off campus) as well as enterprise elites should be brought together to jointly compile a series of textbooks featuring interdisciplinary integration. The compilation of these textbooks should adhere to the principle of "management as the core, technology as the tool"—taking management problems as the orientation and technical applications as solutions. For example, the textbook Principles and Practice of Intelligent Management can systematically introduce how to use technologies such as big data and artificial intelligence to optimize decision-making, processes, and organizational behavior; Intelligent Manufacturing and Operation Management can conduct in-depth analysis of topics such as production scheduling and supply chain collaboration in the context of intelligent factories. These textbooks will serve as the core carrier of the curriculum system, ensuring the systematicness and standardization of teaching content.

### Evaluation Guarantee: Establishing an Outcome-Oriented Continuous Improvement Cycle.

A scientific evaluation system is a guiding tool for verifying development effectiveness and directing reform directions, which should balance multi-dimensional static assessment and dynamic feedback adjustment. Building a Multi-Dimensional Evaluation System. Move away from the single evaluation method oriented solely toward papers or employment rates, and establish a multi-dimensional indicator system that comprehensively measures the development effectiveness of "technology-empowered management". This system should be constructed based on indicators such as curriculum integration degree, faculty interdisciplinary competence, students' technical management literacy, and enterprise recognition.Curriculum integration degree: Mainly assesses the depth of integration between technical and management knowledge in interdisciplinary courses, as well as the teaching effect.Faculty interdisciplinary competence: Examines the proportion of teachers in the faculty team who have interdisciplinary backgrounds and capabilities in collaborative teaching and research.Students' technical management literacy: Comprehensively evaluates students' interdisciplinary ability to solve management problems using technology through project outcomes, competition awards, and the quality of graduation projects. Enterprise recognition indicators: Takes key evaluation metrics such as graduates' employment quality, starting salaries, and employer satisfaction (especially feedback from technology enterprises).

Establishing a Dynamic Evaluation and Feedback Mechanism.The purpose of evaluation is to drive continuous improvement. A closed-loop management mechanism of "evaluation-feedback-adjustment" should be established. The Program Development Committee shall issue an Annual Program Quality

Report each year. Based on the above multi-dimensional evaluation results, combined with technical trend and talent demand analysis from corporate mentors and industry advisory committees, the committee will diagnose and optimize the training program, curriculum system, and practical modules. For example, if the evaluation reveals that students lack proficiency in applying a new technology (such as RPA process automation), the corresponding content or projects should be promptly added to the curriculum in the following academic year. Through such dynamic adjustments, the program development of "technology-empowered management" is ensured to keep pace with the times.

The three major guarantee mechanisms—system, resources, and evaluation—are interrelated and mutually supportive, jointly forming a stable triangle that promotes the steady and long-term development of the "technology-empowered management" initiative in New Liberal Arts. The system acts as a "steering wheel" to guide direction and remove obstacles; resources serve as an "engine" to provide core impetus; evaluation functions as a "navigator" to ensure the correct direction and continuous optimization. Only through the synergy of these three mechanisms can the exploration of interdisciplinary development for the first-class business administration program be transformed from a blueprint into reality, and excellent management talents truly adapted to the needs of the digital and intelligent era be cultivated.

## Conclusions

Focusing on the transformation and upgrading needs of first-class business administration programs in application-oriented universities, this study systematically explores the New Liberal Arts development path centered on "technology-empowered management". Through theoretical construction and practical path design, the following core conclusions are drawn: First, the in-depth interdisciplinary integration of "liberal arts + business + engineering" is the core path and inevitable choice for business administration programs in application-oriented universities to achieve the "technology-empowered management" transformation. A single business knowledge system can no longer meet the challenges of the digital era. It is essential to proactively introduce technical methods and tools from engineering, and integrate the macro perspective and value thinking of liberal arts. Only in this way can interdisciplinary management talents be cultivated—talents who understand business laws, master technical means, and possess humanistic literacy.

Second, this study constructs and explains a systematic "curriculum-faculty-practice-evaluation" four-in-one development framework. This framework reshapes the knowledge system with the "technology-empowered management" course cluster, breaks through faculty bottlenecks with the "dual-qualification" faculty team and "dual-mentorship system", hones core competencies through the "three-tier progressive" practical platform, and guides reform directions with a multi-dimensional dynamic evaluation guarantee system. These four links are closely connected, forming an organic whole and providing an operable action guide for program development. Third, practice shows that interdisciplinary integration plays a significant supporting role in the innovative development and value enhancement of first-class business administration programs. It not only effectively improves students' technical application capabilities, complex problem-solving abilities, and innovative thinking—thereby enhancing their employability and employer satisfaction—but also feeds back into scientific research and teaching through industry-academia integration. This promotes the connotative development and characteristic construction of the program itself, enabling it to gain a pioneering advantage in the wave of New Liberal Arts.

Looking ahead, the "technology-empowered management" initiative in New Liberal Arts development for business administration programs in application-oriented universities should be continuously deepened in the following aspects: First, continuously deepen the connotation of "technology empowerment" and make forward-looking arrangements for emerging technologies. In the future, close attention should be paid to the development of disruptive technologies such as the metaverse, blockchain, and embodied intelligence. Explore their applications in business scenarios such as virtual organization management, digital asset management, and intelligent decision-making, and promptly integrate them into the curriculum and practical system to maintain the cutting-edge nature of program development.

Second, promote cross-university and cross-regional resource sharing and collaborative development. Encourage universities to break down barriers, take the lead in or participate in the establishment of a "New Liberal Arts Education Alliance", and jointly build and share online courses, virtual simulation experimental teaching projects, enterprise case databases, and expert resources. This will achieve complementary advantages, jointly address challenges in interdisciplinary development, and improve the overall development level. Finally, commit to improving the long-term mechanism for interdisciplinary integration. The focus of future research should shift from model construction to mechanism optimization. In particular, deeper institutional innovations should be made in aspects such as the governance structure of interdisciplinary organizations, achievement ownership, cost sharing, and sustainable incentive and evaluation mechanisms. This will ensure that the integration of "liberal arts + business + engineering" can develop healthily and continuously in depth, cultivating more outstanding management talents for Chinese modernization.

## Declaration of Conflicting Interest

The authors state that there is no conflict of interest concerning the publication of this paper.

## Funding

Funder by Yibin University, with project name:Exploration and Practice of New Liberal Arts Program Construction in Application-Oriented Universities Guided by Sci-Tech & Education Innovation and Interdisciplinary Integration — A Case Study of the First-Class Undergraduate Program in Business Administration, Number: XXWK202311, Grant Recipient: Pinhong Zeng, The funders played a significant role in the study

## References

Azevedo, A., & Almeida, A. H. (2021). Grasp the challenge of digital transition in SMEs—A training course geared towards decision-makers. *Education Sciences*, *11*(4), 151.

Feng, C. (2023). Enterprise Core Competency Theory and the Development of the Management Discipline. *Academic Journal of Business & Management*, *5*(21), 29–34.

George, A. S., & Baskar, T. (2024). Driving Business Transformation Through Technology Innovation: Emerging Priorities for IT Leaders. *Partners Universal Innovative Research Publication*, *2*(4), 01–14.

Haiting, C. (2024). A Study on the" Dual Disconnection" Problem Between Theory and Practice in Vocational Education Under High-Quality Development. *Journal of Exploration of Vocational Education*, *1*(1), 37–52.

Han, X., & Zhang, J. (2022). Business model innovation paths of manufacturing oriented towards green development in digital economy. *International journal of environmental research and public health*, *19*(24), 16454.

Kamp, A. (2023). *Engineering Education in the Rapidly Changing World: Rethinking the Vision for Higher Engineering Education*. TU Delft OPEN Publishing.

Liang, R., Huang, C., Zhang, C., Li, B., Saydam, S., & Canbulat, I. (2023). Exploring the fusion potentials of data visualization and data analytics in the process of mining digitalization. *IEEE Access*, *11*, 40608–40628.

Lin, Y., Cai, X., Lu, J., & Tang, W. (2024). Research on the Digital Reform Strategies of Higher Education Teaching from the Perspective of Cultivating New-quality Talents. Proceedings of the 2024 3rd International Conference on Artificial Intelligence and Education,

Liu, Y. (2024). From interdisciplinary approach to interdisciplines: the new Liberal arts development road of legal education. *Frontiers L. China*, *19*, 191.

Nie, J., & Liu, J. (2025). Research on the Composition of Talent Competencies for Digital Transformation of Industrial Enterprise Management. *Economics & Management Information*, 1–10.

Prakasha, G., Lapina, M., Balakrishnan, D., & Sajid, M. (2024). *Digital Technologies in Modeling and Management: Insights in Education and Industry: Insights in Education and Industry*. IGI Global.

Shenga, G., Gaob, M., & Huang, C. (2024). Transformation and Upgrading of New Liberal Arts. Proceedings of the 4th International Conference on New Media Development and Modernized Education (NMDME 2024),

Shi, Y., & Han, Y. (2025). Optimizing China's Training System of Legal Professionals for Foreign-Related Affairs in the New Era. *Frontiers L. China*, *20*, 209.

Wang, K. (2024). Research on Construction of Cross-border Innovative Teaching Team in "Double First-Class" Universities. *Frontiers in Educational Research*, *7*(9).

Xia, Q., Weng, X., Ouyang, F., Lin, T. J., & Chiu, T. K. (2024). A scoping review on how generative artificial intelligence transforms assessment in higher education. *International Journal of Educational Technology in Higher Education*, *21*(1), 40.

Xu, J., Xu, N., Zhang, F., Wang, H., Li, H., & Yuan, L. (2025). Research on the indicator system of scholarship of teaching and learning ability for medical teachers in the context of new medical science—based on the grounded theory method. *BMC medical education*, *25*(1), 1040.

Zhao, T., Zhu, J., Jian, Z., Zhou, X., Yang, S., & Zhang, P. (2024). Developing an Effective System for Engineering Management Education: A Teaching Practice and Evaluation Perspective. *Education Sciences*, *14*(12), 1412.

Zhao, Y., Liu, L., & Shan, D. (2023). The Exploration of the Path of Building First-Class Graduate Discipline Under the Multi-Disciplinary Intersection. *Journal of Advanced Research in Education*, *2*(6), 11–19.