

# ***Logic and Path Exploration of Organized Research Management System Construction for Interdisciplinary Disciplines from the Perspective of Industry-Education-Research Integration***

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**Keywords:** Interdisciplinary, scientific research management, industry-education-research integration, organized scientific research

**Abstract:** Against the backdrop of the global technological revolution and China's strategic layout for interdisciplinary development, traditional discipline-based research management systems can hardly adapt to the problem-oriented, collaborative and industry-demand-driven characteristics of modern interdisciplinary research. From the perspective of industry-education-research integration, this paper explores the theoretical logic of interdisciplinary research management system construction based on the transformation of knowledge production modes, industry-education-research integration and organized scientific research attributes. It systematically sorts out four core practical dilemmas in current university management: rigid disciplinary organizational barriers, single-dimensional research evaluation mechanisms, fragmented resource allocation, and disconnected industry-university-research cooperation mechanisms. Targeting these problems, the study proposes optimized paths including optimizing top-level collaborative governance design, establishing diversified classified evaluation systems, integrating and sharing research resources, and building an industry-education-research collaborative innovation ecosystem. This study provides systematic institutional reform strategies for universities to realize the transformation from single-discipline governance to interdisciplinary collaborative governance. It also prospects future research on differentiated management practices and digital empowerment of interdisciplinary research management.

## **1. Introduction**

The new round of technological revolution and industrial transformation is profoundly reshaping the global innovation landscape. Major scientific and technological breakthroughs usually emerge at the intersections of different disciplines, and interdisciplinary research has become a vital source of scientific and technological innovation as well as a key priority in national strategic planning[1]. In recent years, the Chinese government has issued a succession of policies to boost the development of interdisciplinary disciplines. The Academic Degrees Committee of the State Council officially

designated Interdisciplinary Disciplines as the 14th major academic discipline category. The Ministry of Education launched pilot construction of interdisciplinary centers to advance strategic planning for cutting-edge interdisciplinary fields. The National Natural Science Foundation of China established the Department of Interdisciplinary Sciences to strengthen top-level design for the development of interdisciplinary research[2]. Furthermore, the Outline of the 15th Five-Year Plan for National Economic and Social Development of the People's Republic of China explicitly calls for the coordinated development of platforms and bases for education, science, technology and talent, which further clarifies the policy orientation for interdisciplinary development.

Against this backdrop, traditional research management systems confined to individual disciplines can no longer meet the inherent demands of interdisciplinary development. On the one hand, interdisciplinary research is problem-oriented, team-collaborative and method-integrated in nature, which requires breaking down barriers between schools and departments, restructuring evaluation mechanisms and optimizing resource allocation[3]. On the other hand, the accelerated integration of industry, education and research requires research management to not only support academic exploration, but also align with industrial demands and facilitate the transformation of research achievements. It has become an urgent and critical task to build a research management system tailored to interdisciplinary characteristics through institutional improvement. From the perspective of industry-education-research integration, this paper systematically analyzes the structural contradictions in the current construction of interdisciplinary research management systems, explores the internal logic of institutional development, and puts forward targeted and practical solutions.

## **2. Theoretical Logic of the Construction of Interdisciplinary Research Management System**

### **2.1. Institutional Response to the Transformation of Knowledge Production Modes**

The mode of knowledge production is shifting from the traditional discipline-oriented Model 1 to the interdisciplinary and collaborative Model 2 tailored for practical application scenarios. Such transformation requires research management systems to evolve from discipline-based to problem-oriented, and from individual independent exploration to organized collaborative research[3]. Essentially, knowledge production in interdisciplinary fields breaks and restructures traditional disciplinary boundaries. Given the high uncertainty and exploratory nature of its research process, corresponding research management systems need to offer flexible space and institutional guarantees.

According to the loose coupling theory, the organizational structure of universities features loose coupling, with disciplinary departments operating relatively independently. While this structure guarantees disciplinary autonomy, it also creates inherent institutional barriers to interdisciplinary collaboration[5]. Therefore, the core logic of constructing interdisciplinary research management systems lies in institutional innovation: on the premise of sustaining disciplinary vitality, establish a collaborative framework across disciplines, departments and participants, and realize the institutional transition from loose coupling to in-depth integration.

### **2.2. Internal Driving Force of Industry-Education-Research Integration**

Industry-education-research integration serves as a vital path for the integrated development of education, science and technology, and talent cultivation. From the perspective of industrial demands, industrial transformation and upgrading call for not merely individual technological breakthroughs, but systematic solutions. This inevitably requires research activities to break disciplinary limits and conduct integrated innovation by combining multidisciplinary knowledge[6]. In terms of education, interdisciplinary talent cultivation relies on practical platforms built through in-depth integration of

industry and education, enabling students to receive interdisciplinary training in real industrial scenarios[7]. From the research perspective, in-depth cooperation with the industry provides research topics, data support and application scenarios for interdisciplinary studies.

Accordingly, industry-education-research integration is not only an external environment for interdisciplinary research, but also an internal driver for the reform of research management systems. Institutional construction must respond to the profound demands of such integration, and build a closed-loop management system integrating demand orientation, research tackling, talent cultivation and achievement transformation.

### **2.3. Institutional Implications of Organized Research**

As a new type of research organization model driven by national strategic needs, organized research is characterized by goal orientation, overall management coordination, leadership of top talents, large-team collaboration and concentrated resource allocation[3]. As a key area of organized research, interdisciplinary studies call for three shifts in research management systems: from decentralized management to systematic planning, from process control to goal orientation, and from single-dimensional evaluation to diversified evaluation.

Relevant research by Ma Yonghong and other scholars further concludes that university organized research, viewed from the interdisciplinary perspective, has four major attributes: mission orientation, resource integration, in-depth interdisciplinarity and high organizational efficiency[4], which offers clear guidance for the design of research management systems.

## **3. Practical Dilemmas of Current Interdisciplinary Research Management Systems**

### **3.1. Dilemma of Disciplinary Barriers in Organizational Structure**

Although the discipline category of interdisciplinarity has been officially established, the research management organizational structure of most universities still follows the traditional disciplinary system. The setup of schools and departments, composition of academic committees, and allocation of research resources all adhere to the management model for single disciplines. Such disciplinary barriers leave interdisciplinary research in an awkward predicament of having no institutional affiliation at the organizational level. Applicants for interdisciplinary projects often fall between two stools in evaluation: their work is not fully recognized by their original disciplines, nor can they obtain sufficient resource support from target interdisciplinary fields[4].

Furthermore, the underdeveloped institutionalization of research institutions exacerbates organizational difficulties. Most interdisciplinary research bodies in universities exist as virtual research centers without independent personnel and financial authority, making it hard to effectively integrate interdisciplinary research teams. According to studies by Zhang Juan and Xun Zhenfang, the primary problems plaguing the practice of organized research in universities are the lack of forward-looking overall planning and inadequate construction of research platforms[3], which are particularly prominent in interdisciplinary fields.

### **3.2. Dilemma of Single-Dimension Evaluation Mechanism**

The research evaluation system lies at the core of research management. Nevertheless, the current evaluation framework fails to accommodate the characteristics of interdisciplinary research in multiple aspects. In personnel assessment, the traditional system prioritizes the number of published papers and journal impact factors, while neglecting the actual contribution distribution of collaborative achievements in interdisciplinary research. This evaluation orientation drives

researchers to opt for single-discipline studies that yield quick results, and shun high-risk, long-cycle interdisciplinary exploration[5].

In project review, interdisciplinary applications frequently suffer from mismatched academic backgrounds among review experts. Most reviewers judge proposals based on the knowledge system of a single discipline, and thus cannot accurately assess the value and innovation of interdisciplinary research[4]. In professional title evaluation, the attribution of interdisciplinary achievements remains ambiguous, and disputes over author order in collaborative papers occur frequently, which dampens researchers' enthusiasm for participating in interdisciplinary work.

### **3.3. Dilemma of Fragmented Resource Allocation**

Interdisciplinary research calls for collaboration across schools and disciplines, yet existing research resources are allocated mainly on a departmental basis, resulting in fragmented resource distribution. Large-scale research instruments and equipment are purchased and used separately by individual departments with no sound sharing mechanism. Research funds are also allocated and managed by discipline, failing to meet the overall planning needs of interdisciplinary research.

The development of interdisciplinary talent teams faces severe resource constraints. On one hand, the recruitment and training of compound talents require cross-department coordination, which cannot be fully supported by current personnel management and talent training systems[6]. On the other hand, there is a lack of systematic support for building interdisciplinary talent echelons within research teams, and young researchers encounter substantial institutional obstacles in pursuing interdisciplinary development[3].

### **3.4. Dilemma of Disconnected Mechanisms in Industry-Education-Research Integration**

In terms of industry-education-research integration, current research management systems are obviously disconnected from corporate demands and market mechanisms. Research topics are often poorly aligned with practical industrial needs, leading to a low transformation rate of research achievements. University-enterprise cooperation mostly takes the form of temporary and project-based short-term partnerships without long-term institutional guarantees. In addition, the industry lacks smooth channels to participate in universities' research decision-making and talent cultivation, giving rise to information asymmetry between research output and industrial demands. Such disconnection undermines the role of interdisciplinary research in driving industrial innovation[7].

## **4. Path Exploration for the Construction of Interdisciplinary Research Management Systems**

### **4.1. Optimize Top-Level Design and Build an Interdisciplinary Collaborative Governance System**

To advance the construction of interdisciplinary research management systems, the primary task is to strengthen top-level design and strategic layout. First, universities should establish and improve the decision-making mechanism for interdisciplinary construction at the institutional level, systematically plan the directional layout, institutional guarantee and resource allocation of interdisciplinary scientific research, and incorporate interdisciplinary construction into the overall planning of "Double First-Class" initiative and disciplinary development[3]. Second, a two-tier collaborative governance framework at the university and school levels should be constructed. At the university level, an interdisciplinary coordination committee shall be set up to coordinate the planning, resource allocation, evaluation and assessment of interdisciplinary research. At the school

level, interdisciplinary research institutes or centers shall be established to form an organizational mode that enables independent research by individual teams and joint tackling of key problems through integrated efforts[3]. Third, institutional reform should be promoted to transform virtual research institutions into substantive entities, endowing interdisciplinary research institutions with independent personnel and financial management authority, so as to enhance their capacity to integrate cross-disciplinary resources.

In terms of disciplinary governance, it is necessary to shift the governance philosophy from "disciplinary construction" to "disciplinary governance". Traditional disciplinary construction emphasizes the independent development of individual disciplines, while disciplinary governance focuses on collaboration and interaction among multiple disciplines. The disciplinary governance mechanism can provide institutional space and resource guarantees for the emergence and development of interdisciplinary disciplines[5].

#### **4.2. Innovate Evaluation System and Implement Diversified and Classified Evaluation Mechanisms**

To address the evaluation dilemmas of interdisciplinary research, a classified evaluation system adapted to the characteristics of interdisciplinary disciplines must be established. First, in personnel assessment and evaluation, the single indicator-oriented evaluation centered on paper quantity should be broken through, and diversified evaluation indicators should be introduced. Combining long-term outcome assessment and short-term process evaluation can create a moderately relaxed research atmosphere and encourage researchers to engage in high-risk, long-cycle interdisciplinary exploration[3]. Second, in project review, a dedicated review channel for interdisciplinary projects should be launched, and a cross-disciplinary expert database should be built to ensure that the professional background of review experts matches the project content. As suggested by Ma Yonghong and other scholars, when evaluating research institutions and teams, in addition to focusing on research achievements, comprehensive evaluation should be conducted on their contributions to promoting interdisciplinary integration, team building and institutional innovation[4]. Third, in professional title evaluation, a mechanism for recognizing the contribution of collaborative achievements should be established. The emphasis on the ranking of achievement completers should be weakened, and actual academic contributions should be prioritized, so as to form a fair and reasonable academic evaluation orientation[3].

Furthermore, a diversified evaluation model combining peer review and industrial evaluation should be explored. Enterprise experts and industry representatives should be involved in the evaluation of interdisciplinary research achievements, making evaluation standards more consistent with actual industrial needs and promoting the transformation of scientific research achievements into real productive forces.

#### **4.3. Integrate Resource Allocation and Build a Sharing-Oriented Platform Support System**

Interdisciplinary research management requires the transformation of resource allocation mode from decentralization to integration. First, promote the co-construction and sharing of large-scale research instruments, equipment and scientific research platforms, reduce repeated procurement, and improve resource utilization efficiency. The construction of interdisciplinary public technical service platforms can provide solid technical support for interdisciplinary research. Second, optimize the fund allocation mechanism, set up special funds for interdisciplinary research, and provide key support for strategically important interdisciplinary directions. Third, strengthen the construction of interdisciplinary talent teams, establish a training mechanism for young researchers, and provide personalized guidance and institutional guarantees for young talents to engage in interdisciplinary

research[3].

In terms of platform construction, universities can draw on the development experience of foreign university laboratories to build interdisciplinary research bases with integrated functions of industry, education, research and application. These laboratories should undertake multiple functions including academic research, teaching practice and social services, facilitate interdisciplinary integration, and promote the transformation and application of research achievements[8].

#### **4.4. Deepen Industry-Education-Research Integration and Build a Collaborative Innovation Ecosystem**

Industry-education-research integration provides external support and practical scenarios for interdisciplinary research management. First, establish a university-enterprise collaborative innovation mechanism, and jointly promote the transformation of scientific and technological achievements with leading enterprises in the industry. Guided by industrial demands, the mechanism can guide the topic selection and research direction of interdisciplinary research, realizing effective docking between scientific research supply and industrial demand. Second, explore the model of university-enterprise co-construction of interdisciplinary research platforms. Adopting new research organization modes such as the "post listing and talent recruitment" mechanism, universities and enterprises can jointly tackle key core technical problems. Third, improve the institutional guarantee for integration of industry and education, establish a regular communication mechanism between universities and industrial enterprises, and promote in-depth participation of enterprises in the whole process of university scientific research decision-making, curriculum design and talent training. Liu Huifang's research indicates that the dynamic disciplinary adjustment mechanism under the industry-education integration model can boost the integration of various disciplines and promote the construction of emerging interdisciplinary categories[7].

Specifically, the optimization can be carried out at three levels. At the strategic level, universities should incorporate industry-education-research integration into the overall planning of interdisciplinary construction. At the institutional level, institutions shall formulate special policies and assessment mechanisms for collaborative innovation between industry and education. At the implementation level, universities and enterprises shall build joint research teams spanning multiple universities, enterprises and disciplines, and establish a full closed-loop chain featuring "demand-driven initiation – joint research and problem-solving – achievement commercialization – talent training".

## **5. Conclusion**

The construction of interdisciplinary research management systems is a systematic and long-term project, involving in-depth reforms of multiple dimensions including organizational structure, evaluation mechanism, resource allocation and industry-education-research integration. Driven by national policy orientation and the demands for scientific and technological innovation, universities should actively adapt to the inherent laws of interdisciplinary development, take institutional construction as the core starting point, and promote the transformation of scientific research management from traditional discipline-based governance to interdisciplinary collaborative governance. The path strategies proposed in this paper, namely optimizing top-level design, innovating evaluation systems, integrating resource allocation, and deepening industry-education-research integration, jointly form a mutually supportive and collaboratively promoted framework for institutional construction.

It is worth noting that the successful construction of interdisciplinary research management systems relies on continuous policy support and favorable institutional environment. Future research

can further focus on the specific practice of interdisciplinary research management in different disciplinary fields and summarize differentiated practical experiences. Meanwhile, with the rapid development of digital technology, artificial intelligence and other emerging technologies, how to improve the efficiency of interdisciplinary research management by means of information technology is also an important topic worthy of in-depth discussion.

## Acknowledgement

The 2025 Yunnan Open University scientific research fund project "Research on the Construction of Scientific Research Management System Based on Interdisciplinary Development — A Case Study of Yunnan Open University" (25YNOUZ31).

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