

Research on the Transformation of Scientific Research Achievements in Universities and Their Role in Serving Local Economic and Social Development

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Abstract: Under the innovation-driven development strategy, university research achievement transformation faces challenges such as supply–demand mismatch, broken transformation chains, and weak collaboration. Following a “current situation analysis–model construction–practical verification–countermeasure suggestions” logic, this study proposes a “four-subject collaboration (universities, governments, enterprises, intermediaries) and three-stage integration (screening & evaluation, pilot-scale maturation & matching, industrialization & service)” transformation model, along with a performance evaluation model and an output growth model. Multi-stage practice at a university shows that the model significantly improves transformation outcomes: technology transformation projects increased from 58 to 210, technology contract value rose from RMB 42 million to RMB 286 million, and the comprehensive performance index increased from 50.0 to 88.4. Countermeasures are offered regarding institutional supply, platform building, benefit distribution, and ecological collaboration.

Keywords: University Scientific Research; Achievement Transformation; Local Economic and Social Development

1. Introduction

Under the innovation-driven development strategy, transforming university scientific research achievements is crucial for linking innovation with real productivity and serving local economic and social development. However, current transformation faces three major bottlenecks: insufficient alignment between research outputs and industrial demand, weak pilot-scale maturation leading to broken transformation chains, and incomplete multi-

subject collaborative mechanisms. Traditional linear and segmented approaches fail to address these issues effectively. Following a “current situation analysis—model construction—practical verification—countermeasure suggestions” framework, this paper explores the underlying mechanisms of how achievement transformation serves local development, constructs an operable collaborative transformation model featuring four-subject collaboration and three-stage integration, and tests its practical effects. The aim is to provide both theoretical reference and actionable pathways for universities to enhance their role in regional development.

2. Theoretical Basis and Practical Analysis

2.1 Connotation of Scientific Research Achievement Transformation and Service to Local Development

The transformation of scientific research achievements refers to converting knowledge, technologies, and methods generated through research into real productivity and social value via evaluation, maturation, and industrialization. Serving local economic and social development means universities support regional industrial upgrading, economic growth, and livelihood improvement by integrating the education, talent, industrial, and innovation chains. Collaborative transformation empowering local development goes beyond simple output; it reconstructs the organizational, procedural, and benefit logic through multi-subject collaboration, shifting from one-way supply to demand-driven development, from segmented disconnects to full-chain integration, and from individual behavior to ecological collaboration.

2.2 Practical Difficulties in the Transformation of University Scientific Research Achievements

Based on research conducted at a certain university and in its surrounding region, the difficulties in transforming scientific research achievements can be summarized into the four dimensions shown in Table 1. These difficulties

are interwoven with one another. Simply increasing funding or introducing individual policies cannot fundamentally resolve them. Therefore, systematic reconstruction at the level of transformation models is urgently needed.

Table 1. Analysis of Practical Difficulties in the Transformation of University Scientific Research Achievements

Dimension of Difficulty	Specific Manifestations	Limitations of Traditional Transformation Models
Supply-demand matching	Research achievements are detached from industrial realities, and demand is mismatched	Lack of a demand-driven mechanism
Transformation chain	Weak pilot-scale maturation and broken transformation chains	Lack of full-chain integration design
Collaborative mechanism	Unclear rights, responsibilities, and benefits among multiple stakeholders	Lack of collaboration and risk-sharing mechanisms
Service effectiveness	Insufficient evaluation of contributions to local development	Difficult to support continuous improvement

2.3 Mechanisms of Empowerment

The transformation of scientific research achievements empowers local economic and social development through three interrelated mechanisms. First, the supply-demand matching mechanism uses demand research and achievement evaluation to precisely align research outputs with industrial needs, shifting from blind supply to targeted matching. Second, the chain integration mechanism bridges the “valley of death” via pilot-scale platforms and industrialization services, connecting achievement, pilot testing, and industry into an integrated chain. Third, the collaborative efficiency-enhancement mechanism enables resource and risk sharing among universities, governments, enterprises, and intermediaries, amplifying economic and social benefits. Together, these mechanisms drive local development and achieve collaborative win-win outcomes.

3. Construction of the Collaborative Transformation Model

3.1 Design Concepts and Principles

The model is designed around four principles: centering on local development contribution to align transformation with regional goals; adhering to demand orientation for more targeted research supply; emphasizing full-chain integration through three-stage connection to ensure implementation; and focusing on multi-subject collaboration and replicability to enable staged execution under existing university and local conditions.

3.2 The Four-Subject, Three-Stage

Collaborative Model

This model is built on collaboration among universities, governments, enterprises, and intermediaries (four subjects), with a three-stage integration process: achievement screening and evaluation → pilot-scale maturation and matching → industrialization and service (see Figure 1). Universities supply research and talent; governments provide policy and platform support; enterprises drive demand and pilot-scale industrialization; intermediaries offer evaluation, matching, and financial services, forming a co-construction and sharing mechanism. The three stages work sequentially: screening enables precise matching, piloting bridges the “valley of death,” and industrialization realizes value. Demand feedback connects the stages iteratively, systematically improving local economic and social development outcomes.

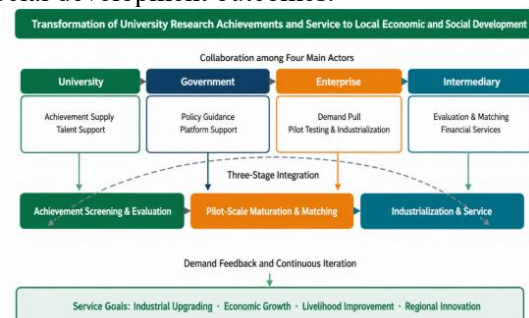


Figure 1. Framework of the “Four-Subject Collaboration and Three-Stage Integration” Model for the Transformation of Scientific Research Achievements

3.3 Key Supports and the Transformation Performance Evaluation Model

To quantitatively evaluate transformation performance, this paper constructs a comprehensive evaluation model for the performance of scientific research achievement

transformation. Let the comprehensive performance index G be composed of transformation efficiency E , economic benefits B , social contribution S , and degree of collaboration C with assigned weights, expressed as:

$$G = w^1 \cdot E + w^2 \cdot B + w^3 \cdot S + w^4 \cdot C \quad (1)$$

Where $w^1 \sim w^4$ are weighting coefficients satisfying $w^1 + w^2 + w^3 + w^4 = 1$, In this study, based on expert consultation and the entropy weight method, the weights are calibrated as $w^1 = 0.30$, $w^2 = 0.30$, $w^3 = 0.25$, $w^4 = 0.15$

, All sub-indicators are normalized to a range of 0~100. Furthermore, the growth of transformation output with the implementation stage t of collaborative transformation can be characterized by a growth curve:

$$G(t) = G_{max} \cdot (1 - e^{-\theta t}) \quad (2)$$

where G_{max} represents the upper limit of transformation performance, and θ represents the output growth rate coefficient. The collaborative transformation model increases the rate coefficient θ . by improving demand matching and collaboration levels. The transformation value added is measured by the difference in comprehensive performance before and after implementation, expressed as $\Delta G = G_{post} - G_{pre}$, which serves as the core indicator for evaluating the effectiveness of the collaborative transformation model.

4. Practice and Effectiveness Analysis

4.1 Practice Design and Data Sources

Using data from science and technology statistics, technology contract registration, and transformation project records at a university and its surrounding region, five implementation stages (baseline, pilot, promotion, deepening, maturity) were established. Under comparable disciplinary structure and research investment, changes in transformation effectiveness before and after implementing the collaborative model were analyzed, with the traditional transformation model serving as the benchmark.

4.2 Analysis of Transformation Effectiveness

After implementing the collaborative transformation model, technology

transformation projects increased from 58 to 210, and technology contract value rose from RMB 42 million to RMB 286 million (Figure 2). This rapid growth indicates that the model effectively expanded both the scale and value of research achievement transformation.

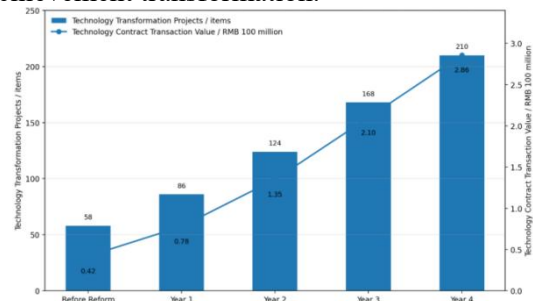


Figure 2. Comparison of Key Transformation Indicators Before and After the Implementation of the Collaborative Transformation Model

Figure 3 shows the evolution of the comprehensive performance index. Under the collaborative model, it rose from 50.0 at baseline to 88.4 at maturity, while the traditional model only reached 60.6 over the same period. The widening gap demonstrates the collaborative model's strong and sustained performance improvement.

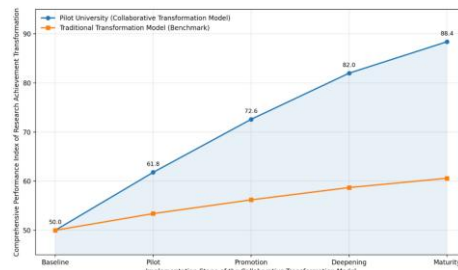


Figure 3. Evolution Curve of the Comprehensive Performance Index of Scientific Research Achievement Transformation Across Implementation Stages

Table 2 shows the comparison of some important comprehensive indicators. We can see that the collaborative transformation model is better than the traditional model in the dimension of transformation efficiency, the dimension of economic benefits, the dimension of social contribution, and the dimension of degree of collaboration. It can be verified that the effectiveness and the superiority of the proposed transformation model.

Table 2. Comparison of Key Indicators Before and After the Implementation of the Collaborative Transformation Model

Evaluation Indicator	Before Implementation	After Implementation	Change
Number of technology transformation projects / items	58	210	+262%

Technology contract transaction value / RMB 100 million	0.42	2.86	+581%
Research achievement transformation rate / %	11.5	28.7	+17.2
Contribution to local development / relative value	100	186	+86.0%
Comprehensive performance index / G	50.0	88.4	+38.4

4.3 Qualitative Feedback and Comprehensive Evaluation

Researchers, enterprises, and local governments positively noted improved matching, smoother transformation, reduced risks, and stronger regional support. However, problems remain: insufficient pilot-scale platforms, imperfect benefit distribution, and lack of liability exemption mechanisms. The model shows marginal diminishing effects, with slower gains in later stages, suggesting a shift toward ecological collaboration and institutional innovation.

5. Conclusions and Prospects

This study draws three main conclusions: first, the transformation of scientific research achievements addresses supply-demand mismatch, broken chains, and insufficient collaboration through supply-demand matching, chain integration, and collaborative efficiency-enhancement mechanisms; second, the proposed “four-subject collaboration and three-stage integration” model provides an operable pathway that systematically improves transformation effectiveness; third, comparative practice shows significant and sustainable increases in technology transformation projects, contract value, and comprehensive performance index. Future research will expand the sample scope and regional coverage, introduce long-term tracking of transformation projects to assess contributions to industrial upgrading and employment, and deeply integrate digital technology transfer platforms with industrial big data to upgrade the evaluation model from output-oriented to value- and ecosystem-oriented, thereby providing more systematic support for universities serving high-quality local development.

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