

Conflict of Interest and Coordination Mechanism in Multi-Agent Collaboration

—Analysis of Institutional Tension in the Supply Chain of Technological Innovation

Fangaolei Chen *, Haolin Yang

School of Economics, Wuhan University of Technology, Wuhan, China

*Corresponding Author: 204187896@qq.com

ABSTRACT

The coordination mechanisms for resolving conflicts of interest among multiple stakeholders are crucial for the efficient operation of science and technology innovation supply chains. The fixed proportion allocation model and static incentive system prove inadequate for complex innovation practices, while flexible distribution methods, dynamic adjustments, and multidimensional performance evaluation systems better stimulate initiative and ensure collaborative stability. Multi-level governance frameworks, consensus-building culture cultivation, and incentive compensation mechanisms at the local policy level provide robust safeguards to mitigate cooperation friction and enhance collaborative innovation capabilities. The study concludes that institutional innovation and incentive mechanism optimization serve as the foundation for promoting efficient multi-stakeholder collaboration in science and technology innovation supply chains, enabling resource integration and sustainable development of innovation ecosystems. These findings offer theoretical support and practical references for regional innovation governance and policy formulation.

KEYWORDS

Technological innovation supply chain; Multi-party collaboration; Conflicts of interest; Institutional innovation; Incentive mechanisms

1. INTRODUCTION

In regional innovation systems, technology innovation supply chains drive high-quality development. Unlike single-entity models, they rely on industry-academia-research (IAR) collaboration to integrate innovation/industrial/talent chains via knowledge, tech, capital, and info flows. However, conflicts over objectives, resources, and outcomes reduce efficiency, making interest coordination critical.

IAR collaboration is complex: universities prioritize academia/knowledge, enterprises focus on tech commercialization/profits, governments target public interests/policy effects. Differences in motivation, resources, and risk tolerance cause disputes over goals, investment, IP, and benefits. Weak trust, poor communication, and limited incentives worsen project stalls/failures.

Scholars study benefit distribution/conflict resolution: cooperative game theory links efficiency to equitable distribution [1]; institutional economics examines rule impacts; motivation theory promotes compatible incentives [2][3]. Digital tools (e.g., smart contracts) offer new coordination ways.

Existing research lacks focus on supply chains' "nested, frequent-interaction" complexity. Traditional linear allocation, static incentives, and institutional designs are ill-suited to dynamics. Coordination

mechanisms vary by region/industry/policy, so no single theory works. Analyzing conflict essence and exploring dynamic coordination/institutional innovation is valuable.

This study focuses on IAR dynamics, integrating three theories to analyze conflicts, resources, and institutional innovation, aiming to provide insights/policies for efficient, stable innovation ecosystems.

2. THE ESSENCE OF CONFLICTS OF INTEREST IN MULTI-PARTY COOPERATION

2.1. Theoretical Sources of Goal Differentiation and Value Judgment

The core basis for industry-academia-research (IAR) multi-stakeholder collaboration lies in differing understandings of innovation objectives and value realization. Universities/research institutions focus on basic research, theoretical innovation, knowledge accumulation, academic publications, and talent cultivation's social value. Guided by long-term, original breakthroughs, they prioritize disciplinary development and research accumulation (driven by academic evaluation systems focusing on papers/patents), with weaker attention to commercialization and short-term economic benefits.

Enterprises, market-oriented, pursue tech innovation commercialization and profit maximization. They prioritize market opportunities, high ROI, and R&D outcomes' practicality/market potential—using innovation to boost competitiveness. Thus, they favor projects enabling rapid product development, shorter time-to-market, and immediate returns. They may see some university-led basic research as disconnected from market needs, with collaboration willingness limited by short-term returns and risk control, affecting collaboration depth/sustainability.

Government agencies in innovation networks guide policies and protect public interests, focusing on innovation's role in regional socioeconomic development, resource allocation, social welfare, and achievements' contributions to industrial upgrading/employment. Policy design emphasizes IAR synergy and innovation ecosystem refinement, but tensions exist between government's public objectives, corporate profit motives, and academic goals—public interests demand wide social impact, while private interests prioritize IP/economic distribution, causing conflicts in tech commercialization/benefit allocation.

2.2. The Contradictory Mechanism between Resource Investment and Return Allocation

Resource allocation and benefit distribution in industry-academia-research (IAR) multi-stakeholder collaboration stem from differing interest structures and risk preferences. Universities/research institutes mainly contribute knowledge, technology, and talent; enterprises provide capital, facilities, and market access; governments offer policy support, funding, and resource integration. While this consolidates resources and boosts innovation efficiency, initial disagreements arise from divergent investment types, risk allocation, and profit expectations—key contentions include cost-sharing, risk distribution, and post-implementation revenue criteria. In uncertain environments, some participants may minimize own risks or over-rely on others, leading to imbalanced partnerships.

In such collaborations, "free-riding" and mismatched contributions-rewards are common. Tech innovation supply chain achievements are often collective, making individual completion of the full process impossible—thus, fair and transparent benefit distribution is critical. Some participants reduce substantive investment but expect equal returns, discouraging high-investors and harming collaboration efficiency. Additionally, information asymmetry and flawed evaluation standards cause cognitive biases about contribution-reward relationships, worsening interest conflicts. Over time, this imbalance erodes trust, reducing future collaboration willingness and capacity [4].

Ownership and value realization of tech achievements are core benefit distribution conflicts. Though innovations are collaborative, IP determination involves complex legal, institutional, and interest factors. Ownership (university, enterprise, or shared) shapes value pathways and distribution models: academia prefers intangible asset/technology licensing benefits, while enterprises seek clear proprietary rights for commercialization. Ambiguous ownership or unfair distribution often triggers disputes, stalling innovations in labs or causing inefficient commercialization—jeopardizing current collaborations and eroding trust/investment in future projects, undermining the innovation supply chain’s healthy operation.

2.3. Unstable Cooperation and Crisis of Trust

The core basis for industry-academia-research (IAR) multi-stakeholder collaboration lies in differing understandings of innovation objectives and value realization. Universities/research institutions focus on basic research, theoretical innovation, knowledge accumulation, academic publications, and talent cultivation’s social value. Guided by long-term, original breakthroughs, they prioritize disciplinary development and research accumulation (driven by academic evaluation systems focusing on papers/patents), with weaker attention to commercialization and short-term economic benefits [5].

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3. INSTITUTIONAL DESIGN FOR DYNAMIC INTEREST COORDINATION

3.1. Flexible Allocation Rules

Multi-party collaboration in tech innovation supply chains needs better benefit distribution. The traditional fixed-proportion model (by preset standards) works for short-term, low-complexity projects but ignores dynamic investment changes and innovation’s uncertainty/phased nature. In diverse-subject, long-cycle, complex tasks, it causes mismatched contributions/benefits, weakening participation and project effectiveness.

To adapt, flexible allocation rules gain attention. Dynamic adjustment and performance-linked models realign distribution with actual investment, phased goals, and risk changes. They stress incentive compatibility—reflecting stage-specific contributions to avoid dampening late participation. E.g., early stages rely on universities’ R&D, later on enterprises’ market/capital; distribution adjusts accordingly. Evaluation covers R&D, tech conversion, market, and management to guide active investment [6].

Weighting multi-dimensional contributions (knowledge, capital, market, management) is key. Their importance changes with stages; scientific quantification/weighting builds fair, dynamic systems. Clear criteria and third-party/negotiation coordination prevent bias and info asymmetry, balancing contributions/risks, boosting enthusiasm, and enhancing supply chain collaboration/innovation.

3.2. Compatibility Between Risk Sharing and Incentives

Multi-stakeholder tech innovation projects have diverse risks: tech uncertainty, market fluctuations, policy changes, management errors, and cooperation instability. Univs/research insts face R&D conversion/IP risks; enterprises bear funding/market/industrialization pressures; governments tackle unmet policy effects/public fund issues. A sound risk-sharing mechanism (allocating by type/intensity) sustains investment, balances incentives, and avoids negative effects.

Incentive compatibility is central. Benefit/risk mechanisms must align to keep parties enthusiastic. Designs fitting interests guide tasks matching abilities, avoiding “free-riding”/short-term tendencies. Long-term stability needs adaptive mechanisms: continuous evaluation and timely benefit adjustments covering initiation, R&D, transformation, and post-cooperation. Design respects entities’ roles and strengthens full-process incentives [7].

Default penalties and profit-sharing are key. Penalties reduce moral hazard, boost credit, and prevent investment halts/breaches. Profit-sharing (fair/transparent) distributes benefits per agreement, ensuring high-investors get returns. Combining breach liability and profit rights enhances binding force/incentives, improving supply chain resilience/innovation.

3.3. Theoretical Sources of Goal Differentiation and Value Judgment

In multi-stakeholder collaborative innovation supply chains, institutional innovation is key to reducing cooperation friction and resolving interest conflicts. Given major differences in objectives, behavioral logic, and resource allocation among industry, academia, and research entities, traditional rigid institutional frameworks fail to adapt to dynamic changes and diverse needs in innovation collaboration. Flexible institutional design has become a theoretical and practical solution: integrating flexibility principles allows parties to dynamically adjust collaborative goals, resource allocation, benefit distribution, and responsibility delineation based on actual progress and phased achievements. This adaptability enhances institutional responsiveness to environmental changes and creates room for strategic negotiation, reducing friction from deviations from initial expectations [8].

The theory of institutional adaptability and dynamic evolution notes that innovation environments are inherently dynamic, requiring institutions to have self-adjustment and evolutionary capabilities. Effective institutions should refine rules in response to environmental changes, tech advancements, and collaboration experiences. Via regular assessments, feedback, and periodic revisions, institutions shift from rigid regulations to flexible governance—resolving conflicts from mismatched institutional structures and practical needs, enhancing tolerance for innovation, and boosting multi-stakeholder collaboration resilience and efficiency [9].

Multi-level governance system innovation offers diverse ways to reduce institutional friction. Governing tech innovation supply chains needs not only top-level regulations and policy guidance but also meso-level collaborative agreements/industry self-regulation and grassroots self-organization/case-specific consultations. A multi-tiered, collaborative structure lets each level leverage its advantages, ensuring institutional control over overall innovation goals while boosting stakeholders’ autonomy/flexibility in practice. Establishing a governance network with government, market, and society creates a solid institutional foundation for interest coordination and conflict resolution, laying groundwork for sustainable, efficient tech innovation supply chain development [10].

4. CONCLUSION

Interest conflicts and coordination mechanisms in multi-agent collaboration are universal, complex issues in tech innovation supply chain governance. Due to differences in target demands, resource investment, behavioral logic, and profit expectations, industry-academia-research collaboration faces

tension and institutional friction in benefit distribution. These contradictions appear in initial cooperation goal positioning/value judgment, and key links like resource sharing, outcome attribution, and risk bearing—evolving with cooperation history, trust mechanisms, and social capital accumulation.

As innovation chains extend and network structures grow complex, traditional static allocation models and single incentive mechanisms fail to address dynamic changes and diverse demands in collaborative practices. Only by integrating entities' knowledge, capital, and market contributions into a collaborative incentive system via flexible allocation, dynamic adjustment, and multi-dimensional evaluation can a fairer, more sustainable distribution pattern form. Implementing risk sharing and incentive compatibility principles helps stimulate multi-party enthusiasm/creativity and enhance long-term cooperation stability.

Meanwhile, institutional innovation should focus not only on rule flexibility/adaptability but also strengthen consensus mechanisms and cooperative culture under multi-level governance. It should leverage local policies' incentive/compensation functions to balance institutional arrangements and subject autonomy.

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REFERENCES

- [1] Golpayegani, Fatemeh, et al. "Participant selection for short-term collaboration in open multi-agent systems." *Simulation Modelling Practice and Theory* 83 (2018): 149-161.
- [2] Geels, Frank W. "From sectoral systems of innovation to socio-technical systems: Insights about dynamics and change from sociology and institutional theory." *Research policy* 33.6-7 (2004): 897-920.
- [3] Berrone, Pascual, et al. "Necessity as the mother of 'green' inventions: Institutional pressures and environmental innovations." *Strategic management journal* 34.8 (2013): 891-909.
- [4] Hinings, Bob, Thomas Gegenhuber, and Royston Greenwood. "Digital innovation and transformation: An institutional perspective." *Information and organization* 28.1 (2018): 52-61.
- [5] Morgan, Kevin. "The learning region: institutions, innovation and regional renewal." *Regional studies* 41.S1 (2007): S147-S159.
- [6] Raisch, Sebastian, and Julian Birkinshaw. "Organizational ambidexterity: Antecedents, outcomes, and moderators." *Journal of management* 34.3 (2008): 375-409.
- [7] Hekkert, Marko P., et al. "Functions of innovation systems: A new approach for analysing technological change." *Technological forecasting and social change* 74.4 (2007): 413-432.
- [8] Kimberly, John R., and Michael J. Evanisko. "Organizational innovation: The influence of individual, organizational, and contextual factors on hospital adoption of technological and administrative innovations." *Academy of management journal* 24.4 (1981): 689-713.
- [9] Van de Ven, Andrew H. "Central problems in the management of innovation." *Management science* 32.5 (1986): 590-607.
- [10] Henri, Jean-François. "Management control systems and strategy: A resource-based perspective." *Accounting, organizations and society* 31.6 (2006): 529-558.