Original Research Article

Research on key challenges and solutions for vocational education institutions in establishing innovation consortia

Jing Chen, Shulin Luo, Sihan Ni
Suzhou Vocational Institute of Industrial Technology, Suzhou, Jiangsu, 215000, China

Abstract: Establishing innovation consortia represents a pivotal pathway for bridging the divide between science and industry while enhancing national competitiveness. Higher vocational education, with its inherent proximity to industrial needs, workplace requirements and corporate demands, ought to serve as an indispensable driving force within these consortia. Yet, numerous practical challenges persist. This paper systematically identifies four major pain points in vocational colleges' participation in consortium development: marginalized governance status, shortage of dual-qualified teaching staff, inadequate research funding, and rigid institutional barriers. These issues lead to a series of problems including mismatched talent supply and demand, gaps in technology transfer, and fragmented innovation chains. Consequently, this paper proposes countermeasures to elevate vocational colleges' influence through institutional empowerment, facilitate two-way faculty mobility between institutions and enterprises, establish diversified funding and open-sharing mechanisms, and create flexible, interconnected institutional environments. These measures aim to transform vocational colleges from supporting roles into co-constructing entities, achieving synchronized resonance between educational and talent development chains with industrial and innovation chains.

Keywords: innovation consortium; higher vocational education; challenges; solutions

1. Introduction

Establishing innovation consortia represents a pivotal initiative to bridge the gap between science and industry, thereby enhancing national competitiveness. The development of such consortia inherently involves cross-disciplinary, cross-institutional and cross-level integration. It requires not only leading scientific research capabilities to tackle critical bottlenecks, but also the concerted efforts of multiple factors including government policies, financial capital and intermediary services. Crucially, it demands a new force capable of transforming academic papers and patents into tangible products and production capacity. Within this multifaceted symphony of collaboration, higher vocational education stands as an indispensable and irreplaceable force. Its defining characteristics—Proximity to industry, alignment with enterprise needs, and job-specific training—Position it uniquely. Higher vocational institutions bridge the gap between university research institutes and industrial parks, workshops, and production sites. They can deconstruct cutting-edge technological achievements into scalable, maintainable, and improvable process standards, while simultaneously translating corporate needs into teaching modules. This enables the continuous output of highly skilled technical personnel, providing consortiums with 'plug-and-play' human resources. Simultaneously, their nationwide campus networks, industry-academia training centres, and regionally embedded service teams function like capillaries, delivering innovation culture and resources to the periphery of industrial chains, thereby activating the endogenous momentum of small and medium-sized enterprises. In summary, without the participation of higher vocational institutions, innovation consortia struggle to form a complete closed-loop system. Only by integrating these colleges as core construction entities and fully leveraging their bridging, connecting, and accelerating functions can we achieve true resonance between the education chain, talent chain, industrial chain, and innovation chain, thereby injecting sustained,

powerful momentum into high-quality development. However, in practice, higher vocational institutions encounter numerous challenges in participating in innovation consortium development, including exclusion from consortium membership, limited involvement, and underutilised potential. These issues demand urgent resolution.

2. Challenges faced by higher vocational institutions in participating in innovation consortium development

2.1. Marginalised Status: Higher vocational institutions are frequently relegated to a subordinate position within consortium governance structures, excluded from major decision-making processes. This results in a mismatch between talent supply and industrial demand

Innovation consortia are predominantly initiated by high-calibre universities, research institutes and leading enterprises. Their charters, council seats, expert committees and project review panels are almost exclusively dominated by Double First-Class universities or national-level research platforms. Even when situated within the same industrial chain, higher vocational institutions are often relegated to the ranks of 'supporting units' or 'observers', lacking voting rights and thus struggling to incorporate frontline skills gaps and process improvement needs from enterprises into tender documents during the project initiation phase. This lack of voice creates a Matthew effect in resource allocation: Fiscal matching funds, major project subsidies, and tax breaks are typically distributed according to academic hierarchy rather than industrial contribution. Vocational colleges receive less than one-third of the R&D funding available to undergraduate institutions, with equipment subsidy caps reaching merely half the level granted to their counterparts. This marginalization in governance structures further propagates into talent cultivation. Unable to access consortiums' three-year technical roadmaps in advance, vocational institutions' programmed adjustments perpetually lag behind. For instance, when enterprises urgently require smart manufacturing field engineers, vocational colleges continue expanding traditional machining programmes; when new energy production lines shift to TOPCon cells, photovoltaic programmes are hastily established. This creates a dual mismatch where 'enterprises cannot recruit suitable technicians while graduates struggle to find relevant positions,' ultimately undermining the consortium's overall innovation efficiency.

2.2. Shortcomings in teaching staff: The dual deficiencies in both quantity and quality of dual-qualified teachers make it difficult to support the dual tasks of technical research and teaching transformation within the consortium

Technical skill innovation requires both theoretical frontiers and practical know-how. However, the vocational teaching workforce originates from a single source, with many educators moving directly from academia to academia, lacking genuine industrial environment experience. While senior technicians from enterprises are encouraged to take up part-time teaching roles, constraints such as staffing quotas, professional title evaluations, and remuneration barriers result in extremely high turnover rates. Consequently, institutions can demonstrate cutting-edge equipment in classrooms yet remain unable to address 'micro-innovation' challenges on production lines, such as temperature control or tool wear. They can guide students through standardised practical training but lack the capacity to collaborate with undergraduate programmes or research teams on joint projects at the same level. This faculty shortfall further reinforces the perception of vocational colleges as 'locked into low-end roles' within industry consortia. This hinders their access to subcontracts for core technology projects, trapping them in a vicious cycle: fewer projects lead to less experience, which in turn makes attracting talent harder. Ultimately, this undermines the sustained output of versatile, innovative technical and skilled personnel.

2.3. Insufficient investment: A lack of recognition of the research and development function of higher vocational education by both fiscal and social capital has resulted in a severe shortage of research platforms, instrumentation, and data resources

Innovation consortia emphasize "sharing", yet sharing presupposes possessing resources worthy of sharing.

Vocational colleges exhibit weak research foundations, with average research funding falling below a quarter of that allocated to undergraduate institutions. Most institutions lack provincial-level or higher key laboratories or engineering centers, rendering them unable to provide critical services such as pilot production lines, testing and certification, or big data interfaces. Social capital tends to favour funding undergraduate institutions capable of producing high-impact factor papers and patented inventions, undervaluing the 'technical refinement' contributions of vocational colleges. This leaves institutions within consortia merely 'queuing for equipment and waiting for leftover data'. The absence of platforms restricts vocational institutions' participation in core tasks and diminishes their appeal for corporate technological iteration. Small and medium-sized enterprises, unable to conduct pilot or intermediate trials on campus, are compelled to seek distant solutions, incurring additional costs. This resource divide ultimately entrenches vocational institutions in a 'low-end supporting role,' hindering their evolution into 'regional innovation service providers.'

2.4. Institutional barriers: Personnel, curriculum, credit systems and intellectual property management continue to operate within traditional educational frameworks, failing to accommodate the deep integration of industry and academia and rapid commercialization of outcomes required by the consortium

The consortium requires two-way personnel mobility, immediate course restructuring, and instant sharing of outcomes, yet the current vocational education system lags behind. Faculty members undertaking industrial placements exceeding three months require multiple levels of approval, while corporate engineers undertaking teaching duties face difficulties in converting these hours towards academic promotion requirements. Rigid student registration systems prevent flexible retention of student status during work placements or entrepreneurial ventures. Intellectual property ownership adheres to the principle of 'whoever funds owns,' overlooking the unique contributions of vocational institutions to process packages, construction methodologies, and training software, thereby dampening willingness for shared innovation. Institutional friction inflates cooperation transaction costs, prompting institutions to retreat to 'safe zones' for virtual projects while enterprises prefer establishing internal training centers over deep integration with vocational colleges. The absence of a flexible, open institutional ecosystem hinders the formation of symbiotic networks linking universities, vocational colleges, and enterprises, ultimately undermining the overall efficacy of technology diffusion and talent development.

3. Strategic recommendations for higher vocational institutions in participating in innovation consortium development

3.1. Enhance the discourse level of higher vocational institutions within consortiums through institutional empowerment, ensuring their requirements and resources are integrated into the primary decision-making process

To enable higher vocational institutions to transcend their "observer" role, it is imperative to first establish their status as "equal partners" within innovation consortia at the macro-institutional level. Government policy documents should explicitly stipulate that any consortium receiving public funding must adopt a multi-stakeholder governance structure, integrating representatives from both industry and education sectors into core decision-making bodies. This approach prevents academic hierarchy from becoming the sole criterion for power distribution. Mechanisms such as weighted voting and group deliberation should safeguard vocational colleges' voice on critical matters including talent cultivation, technological pathways, and funding allocation. Resource distribution should correlate with industrial contribution rather than rigidly follow traditional academic hierarchies, directing fiscal, tax, and financial instruments towards applied technical education. At the provincial level, coordinating bodies may be established to centrally collate regional industrial skill requirements and relay these to education authorities. This information should serve as preliminary reference for institutions adjusting programmes, enrolment quotas, and research priorities, thereby reducing talent supply-demand mismatches at source. Governance reforms must also incorporate third-party evaluations, assessing the consortium's openness

to vocational colleges and its capacity for talent absorption. Evaluation outcomes should be linked to the following year's financial support allocation, creating a closed-loop system of 'structure-evaluation-resources' that genuinely seats vocational colleges at the decision-making table.

3.2. Establish two-way talent mobility channels between universities and enterprises, develop a multi-faceted evaluation and incentive framework, and make industry experience a core element in the professional development of teaching staff

The key to addressing the shortage of teaching staff lies in dismantling institutional barriers such as staffing quotas, professional titles, and remuneration systems, while placing equal emphasis on industrial practice and teaching research. At the policy level, measures should encourage two-way part-time appointments between academic and industrial personnel, clarifying the legal status and career progression pathways for corporate technical experts teaching within institutions. Concurrently, vocational college lecturers should be permitted to undertake full-time placements within enterprises to gain practical experience, with such placements serving as significant criteria for professional title appointments and performance evaluations. Education authorities may establish recognition standards for 'industrial experience,' incorporating achievements in technical breakthroughs, process improvements, and workflow optimization into faculty evaluation systems, granting them equal weighting to academic publications and government-funded research projects. Remuneration and performance systems should be skewed towards applied outcomes, offering exceptional promotion and performance bonuses to faculty delivering significant economic benefits or teaching achievements. This fosters a virtuous cycle where institutions recognize, enterprises welcome, and individuals benefit. The establishment of regional 'Teacher Development Centers' should centralize the provision of industry placements, training resources, and career progression pathways, thereby reducing the costs associated with individual institutions liaising directly with enterprises. The ultimate objective is to attract, retain, and empower talent possessing cutting-edge technical expertise and practical wisdom, enabling higher vocational institutions to cultivate a cohort of versatile teaching staff proficient in both pedagogy and industry practice.

3.3. Establish a diversified funding and open-access mechanism to guide fiscal, financial and social capital towards collaborative support for the development of higher vocational education research and service platforms

To address the issue of insufficient investment, it is necessary to reshape the value orientation of 'those who benefit should contribute'. The government should leverage its role by incorporating support for vocational research platforms into the overall regional innovation budget. This should be achieved by attracting social capital through matching funds, tax incentives, and loan interest subsidies. Investment criteria should no longer be measured solely by the number of papers or patents, but should instead comprehensively evaluate the platform's service breadth to SMEs, the speed of technology diffusion, and the quality of talent cultivation. This will ensure that 'applied value' becomes the core basis for resource allocation. Encourage hybrid ownership models, public-private partnerships (PPP), and fund investments to alleviate institutions' one-off capital pressures. Simultaneously, sustain platform operations through service fees and revenue from technology transfer, enabling rolling development. Financial institutions may develop innovative products tailored for vocational colleges, such as 'research equipment leasing' and 'data sharing insurance,' to mitigate investment risks. Regarding sharing mechanisms, cross-institutional and cross-enterprise systems for equipment and data accessibility should be established, featuring unified standards, interfaces, and evaluation criteria to prevent redundant construction and resource idleness. Through the coordinated efforts of fiscal guidance, market supplementation, and shared efficiency gains, the resource gap between vocational colleges and undergraduate institutions can be progressively narrowed. This will enable these platforms to genuinely serve as public infrastructure supporting regional technological iteration and SME innovation.

3.4. Establish a flexible and interconnected institutional framework to overcome rigid constraints on academic status, coursework and the transfer of research outcomes, thereby fostering deep integration and collaborative innovation between universities and enterprises

Institutional flexibility is the prerequisite for deep integration between universities and enterprises. Education authorities must drive reforms in credit systems, teaching hours, and student registration management, permitting students to flexibly switch learning pathways between academic and industrial settings. Outcomes from corporate training, project-based practice, and online courses should be formally incorporated into the credit system, enabling tailored development trajectories for each individual. Similarly, barriers must be dismantled for both academic staff and corporate engineers, establishing cross-system personnel mobility and mutual recognition frameworks for professional titles. This ensures industrial experience and teaching achievements carry equal weight in promotions, remuneration, and honours, encouraging top talent to move freely between academic and corporate spheres. Regarding intellectual property, principled arrangements for shared rights and revenue distribution should be explored, balancing the legitimate interests of investors, creators, and educators. This reduces negotiation costs and enhances the conversion rate of research outcomes. Curriculum design must shift from a "school-centric" to a "demand-centric" approach. Through industry guidance, corporate participation, and third-party evaluation, dynamically updatable teaching modules should be developed to ensure educational content evolves in tandem with industrial technology. Government support can be provided through institutional pilot zones and error-tolerant mechanisms, encouraging institutions to boldly experiment and promptly disseminate proven methodologies. Only by establishing an open, flexible, and mutually recognizing institutional ecosystem can knowledge, talent, capital, and technology flow efficiently between academia and industry, achieving symbiotic and mutually beneficial outcomes for the consortium.

4. Conclusion

Higher vocational education is not a supporting player in innovation consortia, but rather a pivotal hub that bridges industry, academia, research and application, activating the critical final link. Only by elevating its status through institutional empowerment, forging teaching expertise through industry-academia collaboration, supplementing resources with diversified investment, and dismantling barriers with flexible mechanisms can higher vocational education truly embed itself within the consortium's decision-making, technological and talent chains, achieving a transformative leap from being a supporting element to a co-leader. Consequently, innovation outcomes will accelerate their transformation into industrial momentum, educational processes will align more precisely with corporate needs, and regional development will gain greater resilience and dynamism through this grounded, dynamic force.

Fundings

Jiangsu Provincial Department of Education Higher Education Philosophy and Social Sciences Research Project "Key Issues and Measures Facing Higher and Vocational Education Institutions in Building Innovation Consortia (2024SJYB1162)".

References

[1] Ma Yongxia, Wang Lin. Innovation and Entrepreneurship Education in the Era of Artificial Intelligence: Value Orientation, Transformative Logic and Practical Pathways [J].Tsinghua Journal of Education, 2023(6): 115–124.

[2] Yao Shanji, Jing Shanshan, Lu Weidong. Reform of Innovation and Entrepreneurship Education from an Industry-Education Integration Perspective: Measures, Outcomes and Safeguards [J]. China University Teaching, 2023(10): 82–89.

[3] Gu Hongbo, Zheng Yixun, Guo Yungui. Research on the Challenges, Influencing Factors and Countermeasures for Innovation and Entrepreneurship Education in Chinese Higher Education Institutions [J]. Theory and Practice of Contemporary Education, 2023(6): 60–66.

[4] Wang Yanxin. Reflections on and Model Construction of Innovation and Entrepreneurship Education in Higher Education Institutions [J]. China University Teaching, 2015(4): 4–7 + 24.

[5] Zhang Hui. Operational Mechanisms and Governance Strategies for Organising Innovation and Entrepreneurship Education in Higher Vocational Colleges under Industry-Education Integration [J]. Journal of Vocational Education, 2022(8): 91–99.

[6] Feng Haifen. City-level Industry-Education Consortiums: Characteristics, Value Implications and Development Pathways [J]. Vocational and Technical Education, 2023(25): 14–19.