# Research on Mechanisms and Pathways for Collaborative Empowerment of Digital Economy Talent Development in Qinghai through Administration-Industry-Academia-Research Synergy

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**Abstract: Against the strategic backdrop of the nation's vigorous promotion of the "Digital China" initiative and the "East Data, West Computing" project, the digital economy has emerged as the core engine driving Qinghai Province's high-quality development. However, constrained by objective conditions such as geographical location, economic foundation, and educational resources, Qinghai faces severe challenges in its digital economic development process, including insufficient digital talent pool, structural imbalance, and high attrition rates. Therefore, this paper adopts a collaborative education perspective involving administration, industry, academia, and research. It delves into the theoretical logic and intrinsic mechanisms of this approach in empowering digital talent cultivation, arguing that the optimized allocation of systemic elements and deep integration of diverse stakeholders can generate a value-added effect where the whole is greater than the sum of its parts. Based on this, the paper proposes specific implementation pathways: establishing a precise strategy guidance system; innovating talent cultivation models that deeply integrate industrial chains with professional chains; building high-level digital industry-education integration practice bases; establishing a dual-qualified teacher workforce through mutual appointment and shared use; and fostering a full-cycle talent service ecosystem encompassing attraction, cultivation, utilization, and retention. The aim is to overcome Qinghai's digital talent shortage through deep collaboration and mechanism innovation among administration, industry, academia, and research entities, thereby providing robust talent support and intellectual assurance for the sustainable development of the regional digital economy.**

**Keywords:**
**Administration-Industry-Academia-Research Collaboration; Qinghai Province; Digital Economy; Talent Development**

## 1. Introduction

The global economy is accelerating its digital transformation, with the digital economy emerging as a pivotal force in restructuring global resources, reshaping economic frameworks, and altering competitive landscapes worldwide. China places high importance on digital economic development. The vigorous development of the digital economy relies not only on technological innovation and data resources but also critically depends on cultivating a large pool of versatile talents equipped with digital literacy, mastery of cutting-edge digital technologies, and adaptability to digital transformation. Therefore, strengthening digital talent cultivation and solidifying the talent foundation for the digital economy has become one of the core strategies for advancing China's high-quality economic development.

Qinghai Province has thoroughly implemented the national digital economy development strategy, successively issuing strategy documents such as the Qinghai Province Digital Economy Development Plan for the 14th Five-Year Plan Period. These documents explicitly propose building a "Digital Qinghai" to drive the digital transformation of distinctive industries with comparative advantages, including clean energy, eco-tourism, and organic agriculture and animal husbandry. With the full launch of the national "East Data, West Computing" initiative, Qinghai is gradually

emerging as a key national green data center cluster, leveraging its unique advantages of cool climate and abundant energy resources. However, compared to developed eastern regions, Qinghai's digital economy remains in its early, challenging development phase. Issues such as a shortage of local digital talent, an unbalanced talent structure, and difficulties in attracting and retaining high-end professionals are becoming increasingly prominent. These challenges have become major bottlenecks constraining the high-quality development of Qinghai's digital economy.

Based on this, this paper focuses on the talent bottleneck in Qinghai Province's digital economic development, aiming to explore effective pathways to address the region's digital talent shortage through a collaborative education mechanism involving administration, industry, academia, and research. This paper first systematically analyzes the practical difficulties and developmental challenges in talent cultivation within Qinghai's digital economy sector. It then systematically outlines the logical mechanisms through which administration-industry-academia-research collaboration can empower digital talent development in Qinghai. Building upon this foundation, it constructs a digital talent cultivation mechanism and implementation pathway system tailored to Qinghai's realities, centered on deep administration-industry-academia-research collaboration. This framework seeks to provide theoretical reference and practical insights for the digital economic development of Qinghai and other underdeveloped regions.

## 2. The Current Challenges and Development Obstacles in Digital Economy Talent Development in Qinghai Province

Against the backdrop of the digital economy emerging as the core engine for regional economic transformation and upgrading, Qinghai Province faces multiple constraints due to its geographical location, industrial foundation, resource endowments, and other factors. Talent development in the digital economy sector is grappling with prominent structural imbalances between supply and demand, rigid mechanisms for industry-education integration, and limitations in regional talent attraction and cultivation environments. These challenges have become the core bottlenecks hindering the high-quality development of the regional digital economy.

### 2.1 Structural Imbalances in Supply and Demand Have Become More Pronounced, with a Significant Mismatch between Talent Supply and Industrial Demand

Qinghai Province's digital talent cultivation exhibits pronounced characteristics of “lagging development” and “homogeneity,” struggling to meet the increasingly specialized and diversified demands of the industry. On one hand, there is both an insufficient overall supply and structural oversupply. While the number of graduates in computer science and electronic information disciplines from provincial universities and vocational colleges is limited, it fails to fill the job vacancies in emerging fields such as big data, cloud computing, and artificial intelligence. On the other hand, existing training models predominantly emphasize foundational theoretical instruction, lacking practical application training tailored to Qinghai's distinctive industries like clean energy, eco-tourism, and salt lake chemical processing. This results in an oversupply of generalist talent while creating a severe shortage of “composite, application-oriented” professionals who possess both technical expertise and industry knowledge [1]. Second, talent development standards lag behind technological iteration. Digital technologies undergo rapid updates and iterations, while adjustments to university programs and course content often lag behind. Teaching materials struggle to cover cutting-edge technological trends, forcing graduates to undergo lengthy “secondary training” periods upon joining companies. This increases employers' hiring costs and reduces talent matching efficiency [2].

### 2.2 Rigid Mechanisms for Industry-Education Integration and Insufficient Depth in Collaborative Talent Development among administration, Industry, Academia, and Research

Currently, Qinghai Province has yet to establish an efficient collaborative ecosystem for digital talent cultivation, with significant barriers persisting among stakeholders. On one hand, school-enterprise cooperation remains superficial, lacking deep integration. Existing collaborations mostly remain at low-level forms such as establishing internship bases and

short-term recruitment, failing to extend to core areas like joint curriculum development, collaborative textbook writing, and shared practical training platforms. As the talent demand side, enterprises lack substantive say in shaping talent development plans, leading to a disconnect between training outcomes and market needs—a dichotomy between “teaching” and “using” talent[3]. On the other hand, there is a lack of interest linkage and long-term incentive mechanisms. administration strategy guidance funds remain relatively fragmented, and no effective incentive compensation mechanism has been established to encourage corporate participation in education. Without clear expectations for commercial returns or cost-sharing mechanisms, enterprises lack intrinsic motivation to invest resources in talent development, adopting a wait-and-see attitude. This has led to a pronounced structural contradiction where “schools are enthusiastic while enterprises remain lukewarm,” making it difficult for industry-academia-research collaborative education to escape the trap of superficiality.

### 2.3 Regional Talent Attraction and Cultivation Constraints Intensify “Brain Drain” and “Reverse Migration” Pressures

Constrained by geographical location, economic development levels, and urban soft environment development, Qinghai Province faces a relatively disadvantaged position in the national digital economy talent competition landscape, with prominent structural contradictions in talent recruitment and cultivation. First, attracting high-end talent is challenging. Compared to developed eastern regions, Qinghai lacks competitiveness in career advancement pathways, research innovation platform capabilities, and high-quality public service support. This results in insufficient attraction for top domestic and international digital experts and leading talents, leading to prominent challenges in “attracting and retaining” high-level innovative talent. Second, the risk of local talent loss is high. As the national strategy of “East Data, West Computing” advances, Qinghai's digital economy sector has gained phased development opportunities. However, eastern developed regions exert a strong “siphon effect” on Qinghai's locally cultivated digital talent through generous compensation packages and superior research environments. This trend of “reverse talent flow” further exacerbates Qinghai's severe digital talent shortage, posing a significant challenge to the sustainable development of its regional digital economy.

## 3. The Logical Mechanism of Administration-Industry-Academia-Research Collaboration in Empowering Digital Economy Talent Development in Qinghai

The core of administration-industry-academia-research collaboration in empowering digital economy talent development in Qinghai lies in leveraging the complementary strengths of four key entities—administration, industry, universities, and research institutes—to establish a complete logical chain: "demand-driven—resource integration—Capability Enhancement—Feedback Optimization “to precisely address Qinghai's unique scenario demands, such as green computing power, salt lake digitization, and digital ecological governance. This approach resolves regional challenges in attracting, cultivating, retaining, and utilizing digital talent, forming a talent supply system tailored for the high-quality development of the local digital economy. It provides core support for Qinghai's” Four Regions" development strategy. Specifically, its logical mechanism manifests through the deep coupling and dynamic evolution across three dimensions: systems theory, stakeholder engagement, and full-process empowerment. First, from a systems theory perspective, the collaborative education system involving administration, industry, academia, and research constitutes an open, complex system composed of four subsystems: administration, enterprises, schools, and research institutions. Under traditional models, these subsystems often operate in relative isolation, resulting in a severe disconnect between educational resources and industrial resources [4]. The essence of collaborative education lies in breaking down organizational boundaries between subsystems to achieve cross-domain flow and efficient reorganization of elements such as knowledge, technology, data, and capital. System theory emphasizes that “the whole is greater than the sum of its parts.” Within this collaborative system, the administration's strategy resources, enterprises' market and practical resources, schools' theoretical and talent resources, and

research institutions' technological and innovation resources no longer circulate solely within their respective internal loops. Instead, through nonlinear interactions, they generate "emergent phenomena," forming entirely new momentum for talent development.

Second, from a stakeholder perspective, the sustainability of collaborative education hinges on the degree to which core demands are met and interests balanced among all stakeholders. Within Qinghai's digital economy talent cultivation system, each entity possesses distinct resource endowments. Their collaboration is fundamentally a symbiotic game-theoretic process based on "complementary strengths and mutual benefit." Among these, the administration, as the guiding force, has a core demand centered on realizing regional development strategies. Through strategy provision and fiscal investment, it aims to leverage the digital talent dividend to advance Qinghai's "Four Regions" industrial development and high-quality growth in the digital economy, pursuing maximum social benefits. Enterprises, as the demand side, seek to acquire compatible human resources and technological dividends. Their participation in collaboration not only addresses structural challenges like "labor shortages" and "high training costs" but also leverages university intellectual resources to resolve technical bottlenecks in digital transformation, thereby enhancing market competitiveness. Schools, as the supply side, seek to elevate educational standards and employment outcomes. Collaborative education enables them to accurately track industry trends, optimize program structures, access authentic training scenarios and case studies, and enhance graduates' societal adaptability. Research institutions, as knowledge repositories, primarily seek to convert and apply research outcomes. Leveraging collaborative platforms, they validate and disseminate theoretical findings through digital technology applications in teaching. Simultaneously, they identify research topics from industry frontlines, fostering a virtuous cycle where "research enriches teaching, and teaching supports industry" [5].

The collaborative empowerment of Qinghai's digital economy talent cultivation through administration-industry-academia-research synergy involves the coupling of four forces -strategy guidance, demand-driven initiatives, knowledge creation, and technology transfer -to collectively influence the entire talent development process. First, strategy guidance serves as institutional empowerment. Through top-level design, such as tax incentives, project approval mechanisms, and evaluation system reforms, the administration provides institutional safeguards and directional guidance for university-enterprise partnerships. This eliminates systemic barriers in the collaboration process, fostering a favorable external ecosystem for talent cultivation [6]. Second, enterprises, as talent users, feed market demands for digital skills back to the education sector, compelling schools to reform curricula and training programs. This establishes an output-based education (OBE) logic for talent development. Universities and research institutions, as sources of knowledge innovation, not only impart cutting-edge digital theories to students but also enrich teaching through research, transforming frontier technologies into educational resources. simultaneously enabling faculty and students to participate in corporate R&D projects, thereby converting knowledge into practical capabilities. Ultimately, this empowerment is not a single-point intervention but permeates every stage of talent development—from curriculum design and course development to practical training, faculty development, and quality assessment—forming a complete closed-loop system of "demand sensing—resource integration—collaborative cultivation—quality feedback."

## 4. Implementation Pathways for Administration-Industry-Academia-Research Collaboration in Empowering Digital Economy Talent Development in Qinghai

Addressing Qinghai Province's unique strengths and practical challenges in digital economy development, this paper outlines specific pathways across four dimensions-top-level design, model innovation, platform establishment, and faculty development-to advance the effective implementation of collaborative talent cultivation among administration, industry, academia, and research institutions.

### 4.1 Strengthen Top-Level Design to Build a Precise Strategy Guidance and Supply System

As the macro-regulatory entity within the collaborative education system, the administration should foster a favorable strategy environment for digital talent cultivation through institutional innovation and top-level design. First, formulate differentiated and strategic talent development plans. Closely aligning with Qinghai Province's strategic direction of building "four industrial hubs" and the implementation needs of the "East Data, West Computing" initiative, compile the Medium-to-Long-Term Plan for Digital Economy Talent Development in Qinghai Province. Precisely define the quantity and requirements for critical shortage positions such as big data analysts, artificial intelligence engineers, and digital management roles, providing scientific basis for university discipline and program development as well as corporate human resource allocation. Second, establish a certification and incentive system for industry-education integration enterprises. Relevant functional departments such as the Provincial Department of Industry and Information Technology and the Department of Education should jointly issue implementation rules to establish a certification system for "industry-education integration enterprises." Prioritize selecting and certifying leading local enterprises in their respective industries, offering them a combination of incentives including financial, fiscal, land, and credit benefits. Fully implement tax preferential policies such as education fee surcharge credits to stimulate enterprises' intrinsic motivation to participate in collaborative talent cultivation.

### 4.2 Innovating Talent Development Models to Build an Education System Deeply Integrating Industrial and Academic Chains

Based on Qinghai Province's digital economy industrial chain layout, dynamically adjust and optimize academic programs to achieve synchronized development of talent cultivation with regional industrial needs. First, establish modern industrial colleges to create innovative collaborative education entities. Leveraging institutions like Qinghai University and Qinghai Normal University, we will partner with Huawei, Alibaba, Tencent, and local industry leaders to establish the "Modern Digital Economy Industry College." This college will operate under a council-led, dean-responsible system where universities and enterprises jointly develop talent cultivation plans. Cutting-edge corporate technical standards and real-world project cases will be transformed into core teaching resources, ensuring deep alignment between curriculum content and professional standards. This approach achieves seamless integration where "entering the campus means entering the enterprise" [7]. Second, deepen the pilot of the "1+X" certificate system and refine the evaluation mechanism for cultivating versatile technical and skilled talent. Guide vocational colleges and applied undergraduate institutions to organically integrate professional skill level certificates (X certificates) in areas like big data and cloud computing into their talent development plans. Establish a dual-track training system that equally emphasizes academic education and vocational skills training. Through the integration of coursework and certification, achieve effective alignment between curriculum content and professional qualification standards, thereby enhancing students' professional competitiveness.

### 4.3 Establish a Shared Platform to Build a High-Level Digital Industry-Education Integration Practice Base

Addressing Qinghai's remote location and relatively scarce internship and training resources, leverage the "East Data, West Computing" initiative to create a collaborative education platform integrating virtual and physical elements with complementary functions. First, establish a national-level industry-education integration training base. Leveraging the Qinghai National High-Tech Industrial Development Zone and Haidong Big Data Industrial Park, integrate resources from administration, enterprises, and universities to build a comprehensive training base integrating "teaching and training, technology R&D, and innovation and entrepreneurship." The base will feature facilities such as a big data analytics center and an industrial internet laboratory, incorporating real business data from enterprises to enable students to conduct hands-on training in simulated or fully authentic environments. Second, establish a collaborative research and technical service platform between universities and enterprises. Encourage universities to establish "professor studios" or "research pilot bases" within enterprises, guiding research teams to tackle technical challenges related to Qinghai's industrial digital transformation.

Simultaneously, promote the opening of key laboratories in research institutes to undergraduate students, supporting their deep involvement in research-assisted practice. This leverages high-level research strengths to empower the cultivation of top-tier innovative talent. Third, create a cloud-based digital resource sharing platform. Leverage next-generation technologies like 5G and cloud computing to overcome spatial and temporal constraints by establishing the "Qinghai Digital Education Resource Sharing Cloud," facilitating the cross-institutional and cross-regional flow of high-quality educational resources[8].

### 4.4 Optimize Faculty Structure and Establish a "Mutual Appointment and Shared Use" Dual-Qualified Faculty Team

Break down barriers to talent mobility between schools and enterprises to build a "dual-qualified" faculty team proficient in both theory and practice. Establish an "Industry Professor" appointment system. Create flexible positions to attract top experts and corporate technical leaders in the digital economy sector to serve as university "Industry Professors" or part-time mentors. These professors will teach core courses, supervise graduation projects, and lead student innovation and entrepreneurship initiatives, bringing cutting-edge industry technologies into the classroom [9]. Second, implement a "faculty-to-enterprise" placement program. Establish a mandatory yet incentivized practical training system requiring newly hired young faculty to undertake at least six months of on-the-job training in relevant corporate positions to understand production processes and digital technology applications. Faculty members' corporate assignments and outcomes from industry-funded research projects are essential criteria for promotion and tenure evaluations, guiding educators to proactively align with industrial demands. Third, establish hybrid teaching teams. Encourage core university faculty to collaborate with corporate technical experts in mixed-team teaching units for joint textbook development, co-taught courses, and co-supervised practical training [10]. Through mentorship across generations and two-way university-industry exchanges, this approach rapidly elevates the overall practical teaching capabilities of the faculty.

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