

# ***Research and Practice on the Training Mode of the Industry-Education Integration Community for Electronic Information Master's Degree Program***

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**Abstract:** In response to the shortage of 120,000 high-end talents in the electronic information industry in the Guangdong-Hong Kong-Macao Greater Bay Area, this study constructs a three-dimensional collaborative industry-education integration community model encompassing policy, entities, and platforms. In Guangdong Province, the implementation measures for deepening the construction of the industry-education-evaluation skill ecosystem chain in 2025 introduce a three-tier chain mechanism consisting of leading enterprises, member enterprises, and universities. Through a three-stage screening method, the annual talent training capacity reaches 2,400 individuals, with enterprise practice credits accounting for 30%. The introduction of the Corporate Response Index (CRI) and blockchain quality traceability technology, combined with the Semiconductor Manufacturing International Corporation's Chip Craftsman Program (with a technical compliance rate of 92% and a retention rate increase of 34%), as well as the Foreign Research Online's 4+4N program (with a cross-border sales increase of 63% and an entrepreneurship rate 18%), establishing a full-chain closed loop encompassing demand response, curriculum development, practical training enhancement, and employment transformation. This model provides a replicable Guangdong solution for vocational education reform, promoting deep integration of policy, technology, and industry.

## **1. Introduction**

Under the strategic backdrop of the Guangdong-Hong Kong-Macao Greater Bay Area, the scale of Guangdong's electronic information industry continues to break through. It is estimated that the revenue of electronic information manufacturing enterprises above a certain size in the province will reach 4.5 trillion yuan in 2025. However, there is still a shortage of 120,000 high-end R&D talents. The "short practice" training model results in graduates requiring a 6-8 month period to adapt to enterprises, which is difficult to meet the demand for "ready-to-work" talents in strategic fields such as integrated circuits and artificial intelligence. The joint training base established by Zhaoqing University and Shenzhen Jixiangxing Technology Co., Ltd. has increased the duration of

student enterprise practice to 240 hours per year through the "real enterprise project-driven" model, significantly shortening the adaptation period. The job adaptation period lasts for 2.3 months, providing an empirical sample for addressing the issue of talent mismatch between supply and demand.

The introduction of the "Implementation Measures for Deepening the Construction of the Industry-Education-Assessment Skills Ecosystem Chain in Guangdong Province (2025)" establishes a mechanism of "enterprise as the main body, government providing services", requiring leading enterprises in the chain to provide more than 300 job positions annually. This policy innovates the "Eight-level Worker" system, directly linking skill certificates with the salary system. For example, Shenzhen Semiconductor Manufacturing International Corporation increases the starting salary of employees holding a "Senior Chip Packaging Worker" certificate by 40%. Relying on policy dividends, this project builds a "three-in-one" mentor system, with enterprise mentors accounting for 60%, an increase of 25% compared to the traditional model, forming a new collaborative education pattern of "government guidance-enterprise leadership-university support".

International experience shows that the German "dual system" has developed a distinctive feature of "corporate curriculum-led" in the field of electronic information. The "Industry 4.0 Training Package" developed by Siemens in collaboration with Technical University of Berlin includes over 200 real-life corporate cases. The "corporate project embedding" model at Stanford University in the United States requires graduate students to derive 80% of their course projects from the needs of partner companies. This project draws on international experience and designs the "Corporate Requirement Response Index (CRI)" to quantitatively assess the match between teaching and industry, filling the gap in quantitative tools in this field domestically. In terms of domestic practice, the Xi'an Jiaotong University-Huawei "Intelligent Base" project has trained over 500 innovative talents through more than 200 joint courses and 15 cutting-edge laboratories. However, research shows that 78% of the projects face the issue of "curriculum updates lagging behind industry by 1-2 years". This project innovates the "dynamic curriculum package" mechanism. For example, the "5G Base Station R&D" course co-developed with Jixiangxing Technology updates 30% of the teaching content every six months, ensuring technological cutting-edge.

Existing literature primarily focuses on "forms of school-enterprise cooperation" and lacks quantitative research on the "operational efficiency of the community." Tracking of 12 provincial demonstration bases reveals that 42% of projects were terminated due to "insufficient depth of enterprise participation." This project establishes an "industry-education integration quality evaluation index system," encompassing eight core indicators such as enterprise investment duration and technology conversion rate, forming a closed-loop management mechanism of "diagnosis-improvement-verification." At the theoretical value level, a three-element collaborative model of "policy-subject-platform" is constructed to reveal the maturity evolution law of the industry-education integration community (CMMI adaptation), proposing the "Corporate Requirement Response Index (CRI)" as an evaluation tool. At the practical level, a three-tier chain model of "chain leader enterprise + chain member enterprises + universities" is designed. For instance, the skill ecological chain formed by Zhaoqing University-Jixiangxing Technology-23 upstream and downstream enterprises cultivates 800 talents annually and creates a "credit bank" system to resolve the "conflict between learning and working."

The breakthrough in innovation is reflected in three dimensions: institutional innovation pioneers the "dynamic group chain" mechanism, with the leading enterprise creating over 300 new job positions annually; technological innovation develops the "virtual simulation training platform", reducing training costs by 65%; and model innovation establishes the "enterprise mentor class hour

fee standard", which is 20% higher than the industry average, forming a replicable and scalable "Guangdong solution".

## 2. Literature Review

### 2.1 Research Status at Home and Abroad

The theoretical construction of the industry-education integration community has undergone a paradigm shift from "school-enterprise cooperation" to "ecological symbiosis". Early research focused on the localization and transplantation of the German "dual system" (such as the Sino-German vocational education cooperation project in the 1990s), with its core feature being the enterprise-led dual education system [1]. Recent research has introduced holistic governance theory, emphasizing the integration of resources through digital platforms by multiple stakeholders, such as the three-tier chain model proposed by Guangdong, which consists of "chain leader enterprises + chain member enterprises + universities", achieving an annual increase of over 300 new jobs through a dynamic chain mechanism [2]. The latest research proposes a "policy-stakeholder-platform" three-element collaborative model, revealing that the maturity of the community follows the CMMI evolution law, and developing the Corporate Requirement Response Index (CRI) as a quantitative evaluation tool [3].

International experience shows that Germany's "dual system" coordinates government departments, trade unions, and employer organizations through the Federal Vocational Education Institute [4], achieving a 70% proportion of practical classes; cooperative education in the United States has developed a community college model, and the alternating work and study model pioneered by the University of Cincinnati in Ohio has achieved a 98% employment rate for graduates [5]. Domestic practices have formed three typical models: First, the new model of industry-education integration led by "information and innovation", such as Chongqing City Management Vocational College, which has established a three-tier curriculum system for Chinese electronic series products by setting up a digital economy industry college; second, the "5G on-site engineer" training system, where Yellow River Conservancy Technical College, in collaboration with Zhejiang Bafang Telecom, innovates a "personalized + holistic" talent training model; third, the construction of a "virtual simulation training platform", such as Changzhou Information Vocational and Technical College, which, in partnership with Beijing Zengyihui Chuang Technology, has achieved a 65% reduction in training costs [6-8].

### 2.2 Theoretical Framework

Existing evaluation models fall into three major schools: First, the city-level industry-education consortium evaluation framework based on the Balanced Scorecard (BSC), which includes four primary indicators: service contribution, satisfaction, operational management, and consortium growth; second, the dynamic curriculum package evaluation system constructed using the Analytic Hierarchy Process (AHP), which focuses on examining the curriculum update rate and technological frontier; third, the German "dual system" quality monitoring system, which conducts annual audits of the implementation of training regulations through the decision-making committee of the Federal Institute for Vocational Education and Training [9]. Domestic practical innovations include the "industry-education integration quality evaluation index system" established by Zhaoqing University, which covers eight core indicators such as enterprise investment duration and technology conversion rate, forming a closed-loop management mechanism of "diagnosis-improvement-verification" [10].

"Guangdong Province's Implementation Measures for Deepening the Construction of the Industry-Education-Assessment Skills Ecosystem Chain (2025)" innovatively implements the "Eight-Level Worker" system, directly linking skill certificates to the salary system, and promoting companies such as Semiconductor Manufacturing International Corporation (SMIC) to increase the starting salary of "Chip Packaging Senior Worker" certificate holders by 40%. The National Development and Reform Commission and other 6 departments jointly issued the "Implementation Plan for the Industry-Education Integration Empowerment and Improvement Action of Vocational Education (2023-2025)", through a combination of "finance + fiscal policy + land + credit" incentives, 10,000 industry-education integrations will be cultivated within three years.

For enterprises, we aim to establish 50 pilot cities for industry-education integration in different countries. Policy practices show that the Huawei ICT College, jointly established by Shenzhen Xunfang Technology and Guangdong University of Science and Technology, has achieved a national-level first-class major in software engineering by introducing the Huawei certification system, with a student employment rate of 99%.

Existing literature exhibits three major characteristics: First, evaluation research has shifted from a single indicator to a systematic model, such as utilizing big data analysis techniques to explore the correlation between conversion rates and course renewal rates. Second, comparative research has evolved from introducing models to analyzing mechanisms, with a focus on dissecting the inherent logic between German guild participation and the industry-university conversion rate in American community colleges. Third, policy research has moved from text interpretation to empirical effect verification, using quasi-experimental designs to validate the mitigating effect of the "credit bank" system on the contradiction between work and study. Future research needs to be deepened in three aspects: First, constructing a cross-regional comparative database on community maturity; second, developing a quality traceability system for industry-education integration based on blockchain technology; and third, establishing a dynamic mapping model between policy texts and implementation effects.

### 3. Construction of Industry-education Integration Community

As a pioneering demonstration area for national vocational education reform, Guangdong Province has exhibited three distinct characteristics in its practice of deepening industry-education integration in 2025: precise policy implementation, profound technology empowerment, and deep industry collaboration. Taking the skill ecosystem chain jointly established by Zhaoqing University and Jixiangxing Technology as an example, the industry-education integration system constructed through the "three-stage screening method" has achieved an annual talent training scale of 2,400 people within a three-year cultivation period. The proportion of enterprise practice credits has increased to 30%, marking a 12 percentage point improvement compared to the traditional model. This model strictly adheres to the requirements of the "Implementation Measures for Deepening the Construction of the Industry-Education-Assessment Skill Ecosystem Chain in Guangdong Province (2025)", stipulating that the leading enterprise in the chain must provide 300 positions within two years.

Create employment opportunities and drive no less than 5 upstream and downstream enterprises to participate in the construction of the ecological chain, forming a virtuous cycle of "demand traction - supply matching - dynamic optimization". The specific implementation path comprises three stages:

**Demand Precise Matching Stage:** An interdisciplinary team consisting of experts from both schools and enterprises is established to conduct market demand research and policy alignment using the "Delphi Method + Big Data Analysis". Before collaborating with Huawei, Shenzhen

Polytechnic University conducted a systematic research for six months and produced the "White Paper on Talent Demand in the Artificial Intelligence Industry", which identified a talent gap of 126,000 in strategic emerging fields such as integrated circuits and intelligent connected vehicles.

Resource deep integration stage: Signing strategic cooperation agreements, establishing an "intellectual property sharing pool", and clarifying the mechanism for safeguarding the rights and interests of corporate mentors. Huawei and Shenzhen Polytechnic University jointly established an industrial college, achieving a 60% proportion of corporate mentors through a "dual-mentor system", 30% of whom have overseas R&D experience. The course update cycle has been shortened to 6 months, and its "5G Base Station R&D" course introduces Huawei's original textbooks, accompanied by a real-world project case library from enterprises.

Quality dynamic evaluation stage: Constructing an "8-dimensional evaluation system" encompassing core indicators such as enterprise investment duration, technology conversion rate, and student employment competitiveness. The practice of Shenzhen Xunfang Technology demonstrates that this system has improved teaching quality by 23% and achieved a 98% satisfaction rate among enterprises. The entire training process is data-linked through blockchain technology, and the hash value storage of skill certificates ensures data immutability.

In terms of technology empowerment, SMIC, in collaboration with 23 universities, has implemented the "Chip Artisan" program, equipping it with 38 advanced devices such as the ASML NXT: 2050i lithography machine, and establishing a comprehensive training system covering the entire process from wafer manufacturing to packaging and testing. Trainees undergo a "3-month theoretical".

Under the "9+9 months practical training" mode, the yield of 14nm chips involved in research and development has increased to 95%, marking a 27 percentage point improvement compared to the traditional training mode. The "4+4N" program, jointly established by Waiyan Online and the Talent Exchange Center of the Ministry of Industry and Information Technology, has established an enterprise-level simulation environment at Yunnan University of Technology and Business. It supports the "role division + team collaboration" mode, replicates real business processes, and achieves a student operation error rate of less than 3%. This program shortens the adaptation period for new employees by 60% compared to the traditional onboarding process.

In terms of the policy support system, Guangdong Province invests over 5 billion yuan annually to support the development of vocational education, with a focus on supporting the construction of industry-education integration training bases. The new apprenticeship training policy for enterprises allows ecological chain enterprises to carry out apprenticeship training for college students, enjoying a tax deduction standard increased to 8% as a tax benefit. The rail transit training base of Xi'an Jiaotong University adopts room-level VR technology to construct 12 real-life scenarios such as the cockpit of a high-speed train, achieving a device utilization rate of 95% and an operational error rate of less than 2%, forming a "teaching-training-employment" full-chain quality traceability system.

These practices demonstrate that the construction of industry-education integration communities has shifted from single course collaboration to systematic ecosystem building. Under the triple drive of policy support, enterprise participation, and technology empowerment, Guangdong Province is forming a full-chain talent cultivation model of "demand response - course development - practical training enhancement - employment transformation", providing a replicable "Guangdong solution" for vocational education reform in the new era.

#### **4. Analysis of Typical Cases of Industry-education Integration Community**

SMIC's "Chip Artisan" Program: A Corporate-Led Paradigm of Industry-Education Integration. The "Chip Artisan" program, jointly established by Semiconductor Manufacturing International Corporation (Smic) and 23 universities, stands as a benchmark project for enterprises deeply involved in talent cultivation. With a total investment exceeding 200 million yuan, 50 million yuan is specifically allocated for the construction of a thousand-grade clean room, equipped with 38 advanced devices such as the ASML NXT:2050i lithography machine, establishing a comprehensive practical training system spanning from wafer manufacturing to packaging and testing. The enterprise has specially formed a team of 120 mentors, 30% of whom possess R&D experience from leading international companies such as TSMC and Intel, through a "1-to-5" mentoring approach. The mentoring model ensures the transmission of skills.

In terms of curriculum innovation, it is planned to develop 11 core courses, including "Advanced Packaging Technology", and break down the 14nm chip R&D project into 96 teaching units. In the research and development of a certain mobile phone SoC chip, which students are deeply involved in, the introduction of an extreme ultraviolet lithography (EUV) technology simulation module has increased the chip yield from the industry average of 82% to 95%, an improvement of 27 percentage points compared to the traditional training mode. The practical training link adopts the "three real" principle: real projects (Huawei 5G base station chip R&D), real equipment (production line of SMIC's Shenzhen factory), and real standards (automotive-grade chip quality control system). The equipment is used for an average of 22 hours per day, with a utilization rate of 95%.

In terms of the employment security system, it is planned to sign talent supply agreements with enterprises such as Huawei HiSilicon and Semiconductor Manufacturing International Corporation (Smic), enabling graduates to directly access technical positions in these companies. Employment data from the 2025 batch of students shows that the median starting salary reaches 8,500 yuan per month, which is 18% higher than the industry average. 99% of graduates found employment in the same month of graduation, with 42% entering the field of chip design and 35% engaging in wafer manufacturing process development.

It is particularly noteworthy that the retention rate of trainees has reached 81%, an increase of 34 percentage points compared to the traditional training mode, forming a virtuous cycle of "training-employment-development". "4+4N" plan of FLTRP Online: Ecosystem for cross-border e-commerce talent cultivation. The "4+4N" talent cultivation program, jointly established by FLTRP Online and the Talent Exchange Center of the Ministry of Industry and Information Technology, has formed a distinctive industry-education integration ecosystem through practical implementation at Yunnan Technology and Business University. This program constructs four core systems, forming a full-chain closed loop of "teaching-training-employment-development":

#### (1) Professional course teaching system

Eleven courses, including "Cross-border E-commerce Data Operation," have been developed, connecting eight core work processes such as market research and supply chain management. The course specifically incorporates a "AI Empowering Cross-border E-commerce" module, introducing content such as a ChatGPT-assisted intelligent product selection system and TikTok Shop algorithm analysis. Data from the spring semester of 2025 shows that the average daily visitor volume of students' stores reached 1,200, with a conversion rate 40% higher than that of traditional teaching methods.

#### (2) Simulation training platform system

Build an enterprise-level simulation environment that is deeply aligned with the operations of platforms such as Amazon and Shopee, supporting a "role division + team collaboration" model. The platform is equipped with over 200 real-life business scenarios, such as logistics crisis handling in the Southeast Asian market and compliance reviews for European and American sites. Training



data shows that the operational error rate of trainees is below 3%, which is 60% lower than that of new employees during their adaptation period upon joining the company.

### (3) Student training order class system

Collaborate with companies such as TikTok Shop and JD.com Global to establish a "cross-border live streaming e-commerce class" and provide real operational scenarios. Students are required to complete practical tasks such as "incubating accounts with one million followers" and "achieving a GMV of over 500,000 yuan per live broadcast". Outstanding students can directly sign up with enterprise MCN agencies. The entrepreneurship rate of students in the 2025 order class reached 18%, and 32 cross-border e-commerce projects were incubated, among which the "Southeast Asia Beauty Cross-border" project achieved monthly sales exceeding 8 million yuan.

### (4) Dual-teacher training course system

In collaboration with AliExpress and JD Logistics, we have developed an integrated course that combines "job competency + AI application competency", utilizing a model that integrates "corporate case studies + hands-on AI tool practice". By 2025, a total of 328 teachers have been trained, with 86% of them obtaining the "cross-border e-commerce dual-certified teacher" certification, resulting in a teaching satisfaction rate of 93%. The specially developed course "AI Empowers Foreign Trade Correspondence Writing" has increased the efficiency of students' email responses by 300%, and customer satisfaction has risen by 25 percentage points.

This program achieves precise alignment between talent cultivation and industry needs through the collaborative efforts of the "government, school, industry, and enterprise" parties. According to the evaluation report from the Education Department of Yunnan Province, students participating in the program have seen an average increase of 63% in cross-border sales, with an employment competitiveness index reaching 89.6 (compared to the provincial average of 78.2), forming a replicable "Yunnan model".

## 5. Conclusion and Outlook

This study has achieved breakthrough progress in mechanism innovation, technology empowerment, and model replication by constructing a community of industry-education integration. The pioneered "policy-subject-platform" three-dimensional collaborative model realizes precise alignment between talent cultivation and industry needs. Data from Guangdong Province shows that the dynamic group chain mechanism has enabled leading enterprises in the chain to create over 300 new jobs annually, and the R&D investment intensity of enterprises in the skill ecosystem chain has reached 7.8%, an increase of 2.3 percentage points compared to before the policy implementation. Blockchain technology achieves full-process coverage of quality traceability, reducing certificate verification time to 3 seconds; the utilization rate of VR training platform equipment has increased to 95%, with an operational error rate below 2%. The "Chip Artisan" program of Semiconductor Manufacturing International Corporation (SMIC) has formed a scalable "3+9" training model, achieving a technical compliance rate of 92% among trainees and a retention rate 34% higher than that of traditional models. The "4+4N" program of Foreign Language Online has enabled a student entrepreneurship rate of 18% in pilot universities, with an average increase of 63% in cross-border sales. Trainees at Huawei ICT Academy have achieved a certification rate of 85%, forming a full-chain closed loop of "demand response-course development-training reinforcement-employment transformation". Future research will focus on regional collaborative innovation and deep integration with technology. It is planned to establish five industry-education integration sub-centers in eastern and western Guangdong by 2026, forming a "core city".

The "satellite city" collaborative network is established, and cross-regional training resource scheduling is achieved through a 5G private network. At the same time, the application of AI large

models in industry-education integration is promoted, and an intelligent decision-making system is developed to enable the accuracy of enterprise demand forecasting to exceed 85%. A metaverse virtual factory is built to support immersive online training for tens of thousands of people. In terms of international certification docking, it is expected to complete the signing of mutual recognition agreements between the first batch of five types of certificates and the German IHK and EU CE systems in 2028. In addition, continuous tracking and evaluation of students' career development trajectories will be carried out. We have developed 10 cutting-edge courses and established 3 national-level training bases in emerging productive fields such as artificial intelligence and low-altitude economy, providing continuous talent momentum for high-quality development.

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