

Research on the Construction of Modern Industrial Colleges in the Context of Industry-Education Integration

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Abstract: This paper describes the development progress of the construction of modern industrial colleges and analyzes the problems and difficulties in modern industrial colleges, enterprises, and the government. Chengdu Technological University is a modern industrial college that is constructed based on the “five integration” principle. This paper provides three specific paths for the construction of industrial colleges including improving the governance structure, constructing a talent training system, and developing an industry-university-research-application system according to the “five integration” principle.

Keywords: Integration of industry and education; Industrial college; Construction path

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1. Introduction

Modern industrial colleges are a new organizational form of industry-education integration. It is an upgrade of traditional school-enterprise collaboration, consisting of customized classes and training bases. It is an innovative way of combining work with academics^[1]. The concept of modern industrial college originated in the United Kingdom, which involves using modern network technology to provide open distance learning to enterprises and individuals^[2]. Singapore, Japan, Germany, and other countries all have their own version of modern industrial college training; in Britain, it is known as “industrial university”; in Singapore, it is known as “teaching factory”; in Japan, it is known as called “enterprise university”; and in Germany, it is known as “dual system”^[3].

Chinese modern industrial colleges have undergone three stages of development: initially focusing on vocational education in the exploration stage, followed by a continuation of vocational education into the development stage, where the scope expanded to encompass higher education. The mature stage saw a comprehensive integration of vocational and higher education, underscored by the issuance of the Guide of Modern Industrial College (Trial) in July 2020. This pivotal moment ushered in a new phase, promoting

national demonstration projects and signaling a significant advancement in industrial college construction ^[4].

Chengdu Technological University is an applied undergraduate university. In recent years, the university has been constantly exploring and practicing in specialty construction, and talent training around the “five integration” principle of industry and education. The university has made remarkable achievements and established construction ideology and implementation path of the modern industry college construction based on this principle. Therefore, its process of becoming a modern industry college should be studied ^[5].

2. Challenges in the construction of modern industrial college

Under the strong promotion of the policy, universities across the country have innovatively established industrial colleges with different characteristics and various forms based on the integration of industry and education and collaborative education ^[6]. However, due to the different positions and the differences in system, structure, and operation of the three main bodies of modern industrial colleges, many problems have appeared ^[7].

2.1. Universities: Weak ability to meet the needs of enterprises

The talent training systems in many colleges are highly disconnected from industry demands. Although some universities realized the importance of the integration of industry and education, efforts to achieve this integration remain superficial. Consequently, the training provided in modern industrial colleges is detached from industrial demands

Besides, the course content of traditional universities has only been slightly re-adjusted without a complete transformation. The teaching staff lacks practical experience and there is a lack of “double-qualified” teachers. of scientific research and innovation teams with practical abilities, resulting in weak scientific research capabilities and technical service levels. These factors contribute to industrial colleges being less appealing to enterprises.

2.2. Enterprises: Lack of motivation for promoting

As one of the main bodies, enterprises need to invest a lot of manpower, material resources, and financial support in the construction process of industrial colleges. However, the goal of enterprises is to make profits. For most enterprises, participating in school-enterprise collaboration and building a modern industrial college with universities will not only increase management costs but also increase risk factors. Therefore, most enterprises are reluctant to collaborate with universities ^[8].

Enterprises primarily focus on school-enterprise cooperation for talent selection and often overlook the talent training process. In China’s modern industrial colleges, there is a lack of a long-term mechanism to safeguard the rights and interests of enterprises, and a mature and effective corporate governance system has not been established. The role of enterprises within modern industrial colleges remains ambiguous, including their authority and methods of benefiting. Without immediate profitability, Chinese enterprises will remain reluctant to participate in this form of collaboration ^[9].

2.3. Government: Lack of awareness and functions

The role of the government is the promoter, coordinator, and supervisor of the integration of industry and education. Besides, it is also the long-term beneficiary of the benign interaction between modern industrial colleges. However, currently, many local governments fall short in fully exercising their responsibilities of overall planning, coordination, supervision, and policy support in the construction of modern industrial colleges ^[10].

The government’s failure to centralize industrial colleges, which serve as bridges between universities and

enterprises, impedes the true integration of industry and education. Modern industrial colleges are dispersed across various universities, resulting in them merely being “old wine in a new bottle,” with training methods remaining conventional. Moreover, the absence of effective financial support policies, such as tax incentives, heightens enterprise risks and dampens their enthusiasm for involvement in industrial colleges. Additionally, the lack of functions and overall planning and coordination from local governments makes it challenging for universities and enterprises to achieve meaningful cooperation.

3. Implementation of industry-education integration in modern industrial colleges

The guide outlines the construction of modern industry colleges across seven key aspects, where, aside from the management system and mechanism, the remaining six aspects require the importation of corresponding resources. Universities contribute teaching resources encompassing training specifications, teaching content, processes, venues, and educators. Enterprises provide corresponding social resources, including industry standards, practical engineering experience, operational procedures, authentic workplace environments, and skilled engineers. The construction of industrial colleges, based on the “five integration” of industry and education, aims to establish an application-oriented engineering talent training model by integrating these resources between universities and enterprises^[11]. This model consists of three main components: enhancing the corporate governance structure for the “five integration” of industry and education, establishing a talent training system following the “five integration” principle, and developing an industry-university-research-application system aligned with the “five integration” approach.

3.1. Improving the governance structure

Achieving the “five integration” of industry and education in modern industrial colleges necessitates a robust internal governance structure. By establishing comprehensive rules and procedures internally, alongside mutual authority, coordination, and checks and balances, it becomes possible to facilitate joint participation in the affairs of the industrial college by the government, enterprises, and universities.

(1) Clarifying the interests of all parties

The government can obtain more talents that can support the local economic development and the transformation and upgrading of industries. Universities will obtain a higher social reputation and better development resources through talent training mode reform. The cost of training new employees can be greatly reduced through formulating course content with relevant industrial knowledge or benefit from joint scientific research between industrial colleges and universities, etc.

(2) Safeguarding the core interests of all parties

enterprises have diverse requirements when engaging in the construction of industrial colleges. Core interests for enterprises typically involve direct profitability, involvement in industry talent standards, and ensuring a stable talent supply. Suppose an enterprise’s core interest lies in industry talent standards, with training specifications being of primary concern. In that case, the enterprise should have the authority to voice its opinions and participate in decision-making processes related to integrating training specifications with industry standards.

(3) Establishing governance organization

Currently, industrial colleges are predominantly controlled by universities, with minimal involvement from enterprises, and limited direct participation from local governments. To empower the governance organization and transform it into an effective institution, it is imperative to redefine and allocate functions based on a clear understanding of the core interests of all stakeholders. This involves granting

relevant governance rights to all parties and solidifying these rights through the establishment of comprehensive articles of association.

3.2. Building a talent training system

The creation of a modern industrial college embracing the “five integration” of industry and education aims to construct a talent training system that harmonizes various facets. This involves integrating training specifications with industry standards, aligning teaching content with engineering practice, synchronizing the teaching process with the work process, and establishing teaching environments reflective of real factory settings.

- (1) Modern industrial colleges continue to rely on traditional disciplines to align with the educational standards of conventional universities. Degree regulations typically refer to disciplines when establishing degree standards, whereas “majors” are commonly utilized for undergraduate training. However, in contrast to the training specifications of traditional universities within the same major, industrial colleges should prioritize clarifying their core focus. This entails closely aligning with enterprise needs and fostering innovative abilities capable of addressing specific practical challenges encountered by enterprises.
- (2) To address the specific challenges faced by enterprises, it is crucial to foster interdisciplinary comprehensive innovation skills, breaking down the barriers between traditional majors and encouraging students’ interdisciplinary integration. This can be achieved by fully integrating industry standards and involving enterprise resources in the development of teaching content. For enterprises, it means introducing practical engineering elements and practice requirements into the curriculum. Industrial colleges should strive to create high-quality teaching resources that seamlessly integrate with engineering practice. Under government guidance, an open sharing mechanism should facilitate resource sharing among industry enterprises, fostering collaboration and synergy within the sector.
- (3) With innovative teaching content, the teaching process must align with real-world workflows, and the learning environment should bridge the gap between actual factories and university settings, emphasizing the concept of “work-integrated learning.” Alongside general courses, basic professional subjects, and practical training, the curriculum system should include core professional courses dynamically adjusted to meet industry needs. These core courses should involve significant participation from enterprises, exceeding 60% involvement, with a considerable increase in practical coursework. Integrating the working process into teaching breaks down barriers between classroom experiments, school-based practical sessions, production practice, and on-site internships. Additionally, open teaching methods address varying student learning capacities, allowing students flexibility to complete prescribed practical courses within the four-year undergraduate education period.

3.3. Developing an industry-university-research-application system

Teachers are the key to promoting the “industry-university-research and application” system of cooperation between universities and enterprises in scientific research and social services. When teachers have close ties with enterprises, understand their operations, and can effectively address their practical challenges, enterprises are more inclined to entrust real-world problems to these educators. This enhances the social service capabilities of industrial colleges and facilitates a shift in the profit model, ultimately resolving the investment dilemma related to long-term operational capital ^[13].

- (1) Universities and enterprises should establish collaborative teaching teams aimed at fostering integration

between teachers and engineers in the educational process. This initiative serves to enhance the practical and problem-solving skills of university educators while also encouraging engineers to engage in academic study, enabling them to grasp the requisite teaching skills. Industrial colleges should mandate these teaching teams to conduct joint research on teaching strategies. While theoretical and practical teaching may exhibit some degree of specialization, with university teachers focusing more on theory and enterprise instructors providing practical guidance, it is essential to maintain a degree of intersection between the two realms.

- (2) Universities and enterprises should create collaborative research teams to facilitate the integration of teachers and engineers in scientific research. These teams comprise both university faculty and industry professionals, working together on joint scientific research projects. These projects may include horizontal collaborations between various organizations and vertical projects sponsored by government entities. Special policy support from the government should be extended to project applications submitted by university-enterprise cooperative teams affiliated with industrial colleges, particularly for application practice projects. Industrial colleges should incentivize their faculty to guide students in conducting scientific research and encourage students to pursue independent technical innovation and entrepreneurial endeavors ^[14].
- (3) The “industry-university-research-application” system of the industrial college should prioritize serving the industry and the local government. The government should take proactive steps to guide the sustainable growth of industrial colleges within the broader context of local industrial development. This includes formulating talent training strategies that closely align with the local industrial landscape and positioning. Additionally, the government should lead efforts to establish public industrial innovation training bases and supportive infrastructure. This may involve providing venues and professional resources to facilitate the implementation of innovation and entrepreneurship projects within industrial colleges ^[15].

4. Conclusion

The establishment of modern industrial colleges is both a strategic imperative for deepening the integration of industry and education and a necessity for higher education reform and innovation. While universities, enterprises, and government entities all express a willingness to participate in building modern industrial colleges, each faces its own set of challenges. Addressing these challenges requires the implementation of a robust corporate governance structure to bridge the gaps between stakeholders. With government guidance, universities and enterprises can collaboratively construct modern industrial colleges focusing on training specifications, teaching content, teaching processes, facilities, and faculty. Through this integrated approach, modern industrial colleges can effectively serve regional economic development and meet the demand for skilled industrial talent.

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